NOVA SCOTIA
Environment

Comment Index

Replacement Effluent Treatment Facility Project

Publication Date: March 29, 2019

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Public

Regarding Northern Pulp Nova Scotia Corporation's proposed Replacement Effluent Treatment Facility Project, approximately 913 public comment submissions were received by Nova Scotia Environment – Environmental Assessment Branch during the public consultation period (from February 7 to March 9 of 2019) for this Class I environmental assessment. Where possible, duplicates of the same submission (sent via e-mail, fax and/or other means) were removed. Note that individuals or organizations that provided multiple submissions were not consolidated in one place. The public comments below were organized via a chronological order. In addition to the submissions from individuals, organizations including but not limited to the following also provided comments:

Number	Source	Page number
1	Clean Ocean Action Committee	2914-2916
2	Canadian Parks and Wilderness Society – Nova Scotia Chapter	4376-4380
3	EcoJustice and Friends of the Northumberland Strait	651-1055, 3024-4062
4	Ecology Action Centre	4354-4365
5	Forest Nova Scotia	2509
6	Harbour Authority of Caribou	2344-2348, 2513-2514
7	Gulf Nova Scotia Fleet Planning Board and Fishermen's Working Group	2923-2996, 4107-4134, 4180-4205
8	Nova Scotia Salmon Association and Atlantic Salmon Federation	4408-4410
9	Save Our Seas and Shores Coalition	1092-1093
10	Shore Nova Scotia Chapter, Council of Canadians	2998-3000, 4152
11	Sierra Club Canada Foundation	4381-4384
12	Tourism Industry Association of NS	3001-3002
13	UA Local 244	4415-4422
14	UNIFOR	2597-2601

February 21, 2019

Helen Yeh
Environmental Assessment Officer
Environmental Assessment Branch
Nova Scotia Environment

Subject: Northern Pulp Replacement Effluent Treatment Facility Project

Thank you for the opportunity to review and comment on the Environmental Assessment (EA) Registration Document for the proposed Northern Pulp Effluent Treatment Facility Project in Pictou, Nova Scotia.

As Transport Canada has previously informed Provincial and Federal departments, as well as the proponent, a Notice of Works (application) for *Navigation Protection Act* (NPA) approval from Transport Canada Navigation Protection Program (NPP) is required. An application for a Lease or License from Transport Canada may also be required, should the effluent pipeline cross at or near Transport Canada lands at the Caribou Ferry Terminal.

To date, neither application above has been received. Only when these applications are received can Transport Canada ascertain more clearly, its involvement in the project.

Specific comments on the EA Registration document as it relates to Transport Canada's Mandate:

- Suggest re-wording the paragraph under *Navigation Protection Act* (Transport Canada Navigation Protection Program Process) on page 21. Applications to the Navigation Protection and Ports programs are separate. The beginning of the paragraph refers to the 'requirement' for a waterlot lease/licence; however, as previously stated, this has not been determined.
- The EA registration document does not consider the potential impacts to navigation. Since a NPA approval is required, this should be added in Sections 7 and 8 of the document under the Socio-Economic Environment VEC. The direct effects on navigation are mitigated as terms and conditions associated with work approved or permitted pursuant to the NPA.

Should you have any questions in regards to this response, please do not hesitate to contact the undersigned.

J. Jason Flanagan, M. Sc.
Senior Environmental Affairs and Aboriginal consultation Unit

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Date: February 22, 2019

To: Helen Yeh
Environmental Assessment Officer

Cc:

From: Contaminated Sites staff within the Resource Management Unit of Nova Scotia Environment

Subject: Environmental Assessment Registration for Northern Pulp Nova Scotia: Replacement Effluent Treatment Facility

Introduction

The following comments have been developed by technical staff within the Contaminated Sites Unit of NSE based on review of the Environmental Assessment Registration for Northern Pulp Nova Scotia: Replacement Effluent Treatment Facility, January 31, 2019.

Comments

Planning/Design Issues

- A reasonably well-defined characterization of likely effluent chemistry that represents a conservative prediction of the chemicals that may be present in the effluent discharge, as requested by Health Canada prior to the EA Registration submission has not been provided. The proponent has indicated that effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational, as the chemical process engineering design work is continuing and there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge. At this time the proponent has only identified candidate contaminants of potential concern (COPCs) that may be evaluated should a human health risk assessment (HHRA) of the project be a regulatory requirement. This lack of information hampers the evaluation of potential risk associated with the project. Northern Pulp Nova Scotia (NPNS) will likely be required to monitor for additional parameters to those listed within the Pulp and Paper Effluent Regulations (PPER). Without having a comprehensive list of chemicals present in the effluent discharge, it is not practical to establish monitoring

parameters or applicable guidelines for monitoring. The proponent has identified that refinement of the candidate COPCs would be anticipated for a potential HHRA study of the project, should one be required. Additional information on the specific substances present in treated effluent (including chemicals and microorganisms introduced in the treatment process), their anticipated concentrations and their risk to the environment should be provided.

- The potential impact to potable water supplies if a release occurs from the pipe line is a significant concern. The proposed pipeline traverses a drinking water supply area. Limited information has been provided on the proposed maintenance and inspection of pipeline during its operation. The proponent has indicated that there is an intention to have a system in place to detect leaks (or a significant drop in pressure) during operation and maintenance; however, details concerning this system have not been provided. It is unclear what impact a "significant drop in pressure" could have on a groundwater supply before being detected. Clarification should be provided to ensure appropriate leak detection, monitoring and action plans are in place to mitigate potential impacts to potable groundwater, particularly within the source water protection area for the well field. The potential HHRA referenced by the proponent should also consider impacts to drinking water, should the effluent pipeline experience a release in the sections that cross drinking water supply areas.

- The proponent has indicated that a component of the contingency plan for the replacement treatment facility is the construction of a spill basin with a capacity of 35,000 m^3. Little information concerning design flow rates have been provided to determine whether the capacity of the spill basin will be sufficient in all scenarios (e.g. successive days with flow rate of 85,000 m^3). The proposed spill basin will be located in close proximity to Pictou Harbour. The proximity of the spill basin to the harbour is concerning, should the spill basin be compromised due to internal or external forces; such as, berm or liner failures, overflows, storm events or potential impacts of climate change. Limited information has been provided at this stage to ensure that operational activities in and around the spill basin will not adversely affect the environment. The proponent has indicated that the existing NPNS groundwater monitoring network will be updated as required once the construction is complete; however, proposed changes have not been identified at this time.

Operational Issues/Other Permitting Processes

- The proponent has indicated that the US EPA under the Resource Conservation and Recovery Act, has made a technical determination that dewatered pulp and paper sludges managed in a manner that preserves the meaningful heating value of the materials, can be considered a standard fuel, with combustion related emissions that are no different than other forest-based solid fuels such as bark. Little information has been provided to indicate whether the sludge material from the Effluent Treatment Facility (ETF) will satisfy these conditions in order to achieve the objective of displacing the use of fossil fuels.

- The proponent has indicated that modelling results have predicted concentrations of the air contaminants of concern (i.e., CO, NO2, SO2, TSP, PM2.5, and H2S) from the operation of the existing mill and the future mill (with replacement ETF) are both expected to be in compliance with the reference criteria at the representative off-property discrete receptors. The composition of the sludge material has not been defined and it is unclear whether any additional contaminants of concern should be assessed and considered in the model calculations.

Other Observations

- The proponent has indicated that dredging will be required for the installation of the pipeline. Appendix F, *Description of Marine Pipeline Construction* briefly discuses the potential for land-based disposal of dredge materials. Further clarification should be provided. If disposal within provincial jurisdiction is being considered, sample results must be compared to applicable criteria (NS Tier I EQS and relevant CCME criteria (Sodium Absorption Ratio & Electrical Conductivity)) for the land use on which the material is proposed to be disposed. If the material if found to be contaminated, the material must be sent to an approved facility.

Memo

To: Helen Yeh

From: Environmental Health, NSE

Date: February 26, 2019

Subject: Northern Pulp Nova Scotia EA

The following comment are provided by Environmental Health following a review of the Northern Pulp Nova Scotia EA in consultation with the medical Officer of Health. The focus of the review was to evaluate project interactions on the environment and their potential to impact human health.

Planning/Design

A. Atmospheric Environment

The assessment of atmospheric impacts related to the proposed undertaking was limited to a handful of substances that are currently regulated under the NS Air Quality Regulations., and PM2.5. Unregulated substances that may be present in air emissions were not assessed with respect to their impact on air quality and human health, which may result in an underestimation of atmospheric impacts related to this project.

No evidence is provided to support the decision to restrict the assessment to regulated substances only. Based on the information provided there's no evidence to support a conclusion that any unregulated substance present in air emission is of no concern to the atmospheric environment and human health.

In Section 8.1.1.2 following a discussion of the Hoffman et. al. (2017) study, the EA states that VOC's may be released in stack and fugitive emissions from the NPNS mill, but based on a literature review VOC are not known to be associated with pulp mill activities and air emissions to any great extent. Conclusions of this nature need to be supported by evidence, which is not provided in the EA.

B. Sludge

A USEPA rule is referenced to support the proposal to co-combust sludge in the mill boilers. No evidence or analysis is provided, however, to demonstrate that the sludge produced as part of this project will comply with existing requirements related to the application of the EPA rule.

C. Treated Wastewater Effluent

Section 8.11.3.1, page 347 of the EA states,

> The treated effluent will contain the following water quality parameters of concern: absorbable organic halides (AOX), total nitrogen (TN), total phosphorus (TP), colour, biochemical oxygen demand (BOD), total suspended solids (TSS), dissolved oxygen (DO), pH, and water temperature.

No evidence is provided to support the above statement. It is unclear as to how the proponent determined the parameters of concern. Also, no information is provided in support of excluding additional contaminants present in effluent. Conclusions of this nature need to be supported by evidence.

Considering the potential for effluent to impact drinking water (related to a pipeline leak and contamination of groundwater) and the receiving environment, a greater understanding of the type, nature and concentration of environmental contaminants present in effluent, and their potential impacts on groundwater and the receiving environment is warranted.

Operational

A. Noise

Section 5.6.4 of the EA states,

> There will also be elevated noise emissions during HDD operation, if this method is selected for pipeline construction at wetlands and/or watercourses. Some activities will involve 24-hour a day operation for a period of up to several days, and will emit near continuous noise emissions during drilling.

The noise impact study that was undertaken, however, did not consider the impacts of the HDD as a noise source as evidenced in Table 8.2-2. Excluding the noise impacts of the HDD is likely to underestimate the impacts of the project on the acoustic environment. If horizontal directional drilling is undertaken during project construction, further consideration will be needed for the

“elevated noise emissions” generated by the HDD for mitigating impacts to the acoustic environment.

B. ETF and Cooling Towers

A on-line search revealed a case study involving two cases of Legionnaire’s disease that were found to be associated with waste water treatment systems used by the forest industry. A link to the case study is provided for review.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3014939/

The EA does not consider the impact the ETF and cooling towers might have on human health from exposure to Legionella bacteria found in associated with the ETF. An examination of this risk is warranted.

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Date: March 4th, 2019

To: Ms. Helen Yeh, Environmental Assessment Branch, NSE

From: Manager, Climate Change Division

Subject: Class I Environmental Assessment: Northern Pulp's Replacement Effluent Treatment Facility Project FINAL comments

The Climate Change Division has reviewed the Class I Environmental Assessment for Northern Pulp's Replacement Effluent Treatment Facility Project. Please find enclosed below our draft preliminary comments from a greenhouse gas emissions and climate change adaptation perspective.

Planning/Design Issues

Climate Change Adaptation

It is recommended that the proponent consider the combined effects of warmer temperatures as a result of climate change and project activities on water quality of Northumberland Strait and Caribou Harbour.

Greenhouse Gas Emissions

In the construction phase, the proponent states that the primary sources of greenhouse gases for this project are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from fossil fuel combustion in heavy construction equipment, trucks and other mobile equipment. The proponent further mentions that the total greenhouse emissions during the construction phase are expected to be immaterial. Though the immateriality of these emissions may be justifiable, it is recommended that the proponent provide the estimated direct and indirect greenhouse emissions that are expected during this phase to confirm the immateriality conclusion.

The proponent does not commit to implementing direct greenhouse control technologies in this environmental assessment for mitigation of greenhouse emissions in the construction phase of the Effluent Treatment Facility. There is commitment to employ operational measures to mitigate greenhouse gas emissions during construction in

Table 8.1-7. These measures include instituting and anti-idling policy and to maintain equipment. The opinion of the reviewer is that the indicated measures suffice for emissions that are deemed immaterial at this point.

Operational Issues/Other Permitting Processes

Greenhouse Emissions

Regarding the operation phase of the Effluent Treatment Facility, Appendix K indicates that the mill operations are not expected to vary much with the operation of the new Effluent Treatment Facility. The proponent also indicates that the removal of sludge from the rotary press to be co-combusted with hog fuel in the mill's existing power boiler could have a mitigative impact on GHG emissions from the facility. The removal of sludge from the Effluent Treatment Facility could reduce CH_4 emissions from the water treatment due to the reduction of organic solids in the effluent. Furthermore, the co-combustion of sludge in the boiler could displace natural gas which is the secondary fuel used in the boiler. It is recommended that the proponent should consider estimating the direct and indirect greenhouse emissions that are expected during the operation phase of the project. Where necessary the biogenic carbon content of the proposed sludge fuel should be be estimated using methodology available in the Nova Scotia Greenhouse Gas Quantification, Reporting and Verification Standards.

Concerning the combustion of the sludge, Appendix K assumes the properties of the expected sludge will be similar to sewage sludge for which combustion properties are well known. Appendix K also indicates that further tests with the sludge to deduce its actual performance in the boiler will be conducted once operations begin. It is recommended that the proponent commits to these further tests to re-estimate the expected reductions in CH_4 emissions from the Effluent Treatment Facility, and expected reductions of CO_2 emissions from the boiler.

Other Observations

Climate Change Adaptation

While it is noted that the potential impacts of climate change on the project and mitigation measures have been documented the proponent should consider reviewing the Nova Scotia Environment's *Guide to Considering Climate Change in Environmental Assessment in Nova Scotia* for additional guidance on assessing the combined impacts of climate change and the project activities on relevant valuable environmental components.

Health Canada Santé Canada

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March 4, 2019

Helen Yeh
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Subject: Health Canada's Response to the Environmental Assessment (EA) Registration Document for the Northern Pulp Replacement Effluent Treatment Facility[1]

Dear Helen:

Thank-you for your e-mail dated February 7, 2019, requesting Health Canada's review of the above-mentioned provincial Environmental Assessment Registration (EA) document for issues with respect to human health. Health Canada has reviewed the documentation (with particular emphasis on Section 9 (Human Health Evaluation) and Section 8 (Acoustics and Groundwater)) and is providing the following comments for your consideration with respect to the proposed project (hereinafter referred to as 'the project') which includes the treatment facility (power boiler), pipeline and pipeline diffuser to the Northumberland Strait. In general, Health Canada found that the information contained in the sections reviewed to be insufficient in order to fully evaluate the potential future health impacts of the project.

Human Health Evaluation (HHE)

1) **Section 9.1 (Introduction and Background)** states that "*at this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational. Some other current areas of uncertainty include limited recent or current baseline environmental media and marine food item chemistry data, and limited data on traditional marine food item harvesting and consumption patterns within the PLFN community*".

[1]Dillon Consulting. 2019. Northern Pulp Nova Scotia Environmental Assessment Registration Document; Replacement Effluent Treatment Facility. Prepared for Northern Pulp Nova Scotia; submitted to the Nova Scotia Department of Environment, January 31.

Sent by e-mail to Helen.Yeh@novascotia.ca

Given the unknown chemical composition of the future effluent, lack of baseline information on contaminants in the various environmental media (including marine foods), and the lack of understanding of current traditional food harvesting and consumption patterns within the Pictou Landing First Nation (PLFN) community, it is unclear how human health risks from the proposed project can be evaluated with any degree of certainty. In order to reduce these uncertainties, Health Canada advises the following:

- A pilot-scale chemical testing of the effluent be conducted prior to the operational phase of the project (based on the suggested lists of contaminants as presented in Section 9.2.4 and as per Health Canada, 2012);
- adequate baseline sampling of the various environmental media (including marine species) (as per Health Canada, 2010) be conducted prior to any future effluent discharge from the new pipeline to the Northumberland Strait;
- the conduct of either a formal or informal country foods survey with the PLFN prior to the operational discharge of effluent to the Northumberland Strait and prior to the baseline marine food item collection and analysis (Health Canada, 2010; Health Canada, 2017a);
- the conduct of a more formalized human health risk assessment (HHRA) for baseline health risks and also for health risks related to future effluent releases, using the information collected as per the previous three bullets (above).

2) **Section 9.1 (Introduction and Background)** states that "*while such uncertainties would preclude the ability to conduct a HHRA at this time, a qualitative human health evaluation (HHE) was conducted (and presented herein) which serves as an interim approach to address the potential human exposure and risk in relation to project air emissions and treated effluent discharges. The HHE was conducted at the scoping level or screening level of effort and utilizes data and study outcomes that are currently available and/or feasible to address at this time*".

   If there are limited baseline studies and only a qualitative evaluation of health risks based on assumptions that may or may not have been validated with the PLFN or other people who use the area, an understanding of the future health risks associated with the project is limited. Health Canada acknowledges that it has no enforceable regulatory requirements for the project (e.g. permits, authorizations), however, given the lack of information provided in the Human Health Evaluation (HHE), and the unknown chemical composition of the future effluent, any advice provided would be speculative and may not adequately ensure the protection of human health.

   - The information requested in Health Canada's comment 1) above should be used to inform the lack of current data and should be collected prior to the commencement of effluent discharge from the new pipeline to the Northumberland Strait.

3) **Section 9.1 (Introduction and Background)** states that the HHE primarily addresses the following HHRA problem formulation items:

   "• Identifying relevant exposure pathways, routes and scenarios;
   • Identifying relevant human receptors; and
   • Identifying candidate chemicals of potential concern (COPCs) in the project air emissions and treated effluent."

- Given the concerns related to effluent discharges and subsequent uptake by marine species that may be consumed by local people, Health Canada advises that this additional pathway (uptake by marine species and subsequent consumption by people) should be further evaluated in a more quantitative human health risk assessment (HHRA) that should be conducted prior to the commencement of the project (Health Canada, 2010).

4) **Section 9.1 (Introduction and Background)** states that "*with respect to the review and synthesis of historical data and reports, it is noted that a substantial amount of the reviewed historical data were collected from locations outside the current project study boundaries and/or are too old to represent current baseline concentrations of chemicals of interest in air, or in marine environmental media and marine traditional food items*."
   - Given the lack of current and local data, Health Canada advises that this information should be collected prior to the operation of the project in order to give a more fulsome and locally relevant context in which to evaluate human health effects in the local and regional study areas for this project.

5) **Section 9.1 (Introduction and Background)** – states that the "*construction [of the pipeline] is estimated to be approximately 21 months*".
   - Given the deadline of ceasing effluent discharge to Boat Harbour is January 31, 2020 under the provincial *Boat Harbour Act*, and the mill intends to continue operations subsequent to this date, it is unclear where the effluent will be stored or discharged during the project construction phase (estimated to be operational by late 2020). If effluent is expected to be discharged to a temporary location during pipeline construction, Health Canada would suggest that any risk assessment evaluate this temporary discharge location as well for potential human health effects.

6) **Section 9.2.1 (Identification and Potential Exposure Pathways and Routes)** states that "*residual chemicals contained in the treated effluent would.. diffuse within this mixing zone [within 2 m of the diffuser].. thus, this exposure pathway(s) would likely not be carried forward into a HHRA study*".
   - Since the composition of the future effluent is currently unknown, it is unclear how this conclusion (i.e. that chemicals would diffuse within 2 m of the diffuser) could be reached. Health Canada requests additional information be provided to substantiate this statement given the diversity of chemicals likely to be present in the final effluent to be discharged and the lack of characterization as presented in the EA.
   - Given public and Indigenous concerns about marine water quality and contamination of marine foods, it is unclear how this pathway would not be carried forward into an HHRA. Additional explanation is required if this pathway is not considered.

7) **Section 9.2.1 (Identification and Potential Exposure Pathways and Routes)** states that there are four provincially licensed marine shellfish aquaculture operations (all for American Oyster) in the vicinity of Caribou and Monroe's Island near the proposed effluent diffuser location. However, in

Section 9.2.4.2 (Identification of Candidate COPCs in Treated Mill Effluent (page 510), the report states that when determining the potential COPC list, the perspectives that were considered included "*log Kow, bioaccumulation and/or bioconcentration factors, and degree of metabolism/excretion in marine fish*". Given the presence of sedentary 'non-fish' species such as oysters at the aquaculture sites, other bivalves such as blue mussels, and invertebrates such as sea urchins, crabs and lobsters, it is unclear whether this COPC list is sufficient given that these more sedentary species may be more exposed to the effluent that is to be discharged from the diffuser.

- Health Canada requests additional information be provided to support whether or not the proposed chemical list is sufficient in order to evaluate non-fish species and their potential exposure and subsequent consumption by people including the PLFN.

8) **Section 9.2.1 (identification and Potential Exposure Pathways and Routes)** states that "*HHRAs commonly and appropriately exclude exposure pathways and routes …that lack sufficient data to enable their evaluation with a reasonable degree of confidence and/or accuracy*."
   - Health Canada advises that it is not appropriate to exclude any chemicals and/or pathways/routes of exposure that may result in adverse human health effects. See Section 2.4.1 of Health Canada (2012) for more information on appropriate methods to use to screen substances for further evaluation in an HHRA (Health Canada, 2012).

9) **Section 9.2.2 (Identification of Potential Human Receptors and their Characterization)** states that "*general physical/physiological and behavioural characteristics specific to the receptor type (e.g., body weight, breathing rate, food and soil consumption rates, etc.) are used to determine the amount of chemical exposure received by each human receptor*." Based on the information provided, it appears that literature-based sources were used to identify these characteristics for the local study population. Given that the PLFN or other local non-Indigenous people may have different characteristics due to genetics, dietary patterns etc., the use of default assumptions may not represent the characteristics of local people. For example, the PLFN may have an increased reliance on country foods (including marine species), which may not be captured by using default characteristics. As described in Health Canada's comment 1) above, the most accurate means by which to collect community/individual-specific information would be to conduct a targeted survey within the local communities (Health Canada, 2010; 2012; 2017a).
   - Health Canada advises that a community survey (including a dietary survey) be undertaken prior to pipeline construction and operation in order to have more local and up-to-date receptor characteristic information that could then be used in evaluating the potential risk to human health from the proposed project in a more formalized HHRA.

10) **Section 9.2.4 (Identification of Candidate Chemicals of Concern)** states that "*if no health risk are predicted for the chemicals selected for evaluation, then no health risks would be expected for any chemicals not included in the evaluation*". Given that the chemical composition of the future effluent is unknown, additional chemicals that are not part of the evaluation may be unintentionally omitted from any HHRA. In addition, some chemicals may affect the same target organ(s)/have the same adverse impact(s) but may be screened out from further evaluation. As

such, any additive or synergistic effects associated with these chemicals may not be evaluated in an HHRA. The lack of evaluation of certain chemicals (depending on their toxic effect(s) and interactions with other chemicals), may therefore underestimate current and future health risks.

- Health Canada advises that all chemicals which may have an adverse impact on human health be evaluated, including substances with similar toxic endpoints which may have otherwise been screened out. Where similar effects may be possible, the cumulative health risks should be evaluated.

11) **Section 9.2.4.1 (Identification of Candidate COPCs in Project Air Emissions)** states that "*the air dispersion modelling study selected and assessed ten discrete receptor locations that represent the nearest sensitive receptors (residential locations).*" The locations are described as being identified in Stantec (2019). It would be helpful for Health Canada's review if the HHE identified the receptor locations in an appropriately scaled map within the HHE document itself. Nevertheless, given that these locations are considered 'residential locations', the selected locations may not be representative of areas where Indigenous and non-Indigenous peoples may exercise recreational and/or traditional activities, such as country foods harvesting. Given that some of the air contaminants identified have acute and/or chronic thresholds, evaluating concentrations at the nearest residence(s) may not be sufficient to protect human health.
    - Health Canada advises that there should be a discussion about recreational/traditional land use in closer proximity to the proposed project and the possible health implications of shorter-term exposure to the proposed list of air contaminants.

12) **Section 9.2.4.1 (Identification of Candidate COPCs in Project Air Emissions)** - With respect to the air contaminants identified, odour issues may also be of concern, and two groups of substances that were absent from the proposed list were methyl-mercaptans and total reduced sulphurs. Health Canada does not specifically evaluate odours, however, it is important to note that these substances tend to be associated with pulp mill activities and have low olfactory thresholds and therefore can be 'annoying' at levels which may be below any other adverse human-health effects.
    - Although Health Canada does not have specific expertise in the area of odours, if the community is concerned with odours, these substances should also be monitored as part of any air quality monitoring program.

13) **Section 9.2.4.1 (Identification of Candidate COPCs in Project Air Emissions)** of the report cites a recent paper by Hoffman et al. (2017) which evaluated ambient air levels of seven volatile organic compounds (VOCs) near the Northern Pulp Nova Scotia Inc. (NPNS) property, based on ambient monitoring data reported from the Canadian National Air Pollution Surveillance Network (NAPS). The paper reported that results of the temporal and spatial statistical analyses "*indicated that 1,3-butadiene, benzene, and carbon tetrachloride air concentrations routinely exceeded EPA air toxics-associated cancer risk thresholds, and that 1,3-butadiene and perchloroethylene levels in air were significantly higher when the prevailing wind direction blew from the northeast and the NPNS mill towards the Granton NAPS site*." Despite these conclusions, the paper was discounted by the author(s) of the HHE. Health Canada acknowledges that the source(s) of these air pollutants

could not be confirmed (be it the mill and/or other industrial sources in the region), however, in the overall interest of protecting human health, these parameters should be further evaluated in the ambient air once the proposed treatment system (i.e. power boiler) has been installed and commences operation. Given the availability of baseline air quality data related to these COPCs, any changes subsequent to the commencement of the power boiler system could be identified.

- Consider evaluating these seven VOCs as part of the air monitoring program in order to evaluate any future changes and compare the future measured concentrations to applicable guideline values in order to be protective of human health.

14) **Section 9.2.4.1 (Identification of Candidate COPCs in Project Air Emissions)** of the report states that "*should future emission source testing and air dispersion modelling indicate that other air emissions merit evaluation, air quality and human health risk assessment may occur at that time to inform appropriate mitigation strategies (if necessary)*". Given that the report only cites a limited number of air contaminants that may be of interest from a human health perspective, it is unclear how additional air contaminants will be identified and evaluated in order to '*inform appropriate mitigation strategies*'.

- Health Canada requests that additional information be provided to explain how other air contaminant emissions will be identified (and mitigated as necessary) given the limited number of contaminants that will be monitored as part of the air monitoring program.

15) **Section 9.2.4.1 (Identification of Candidate COPCs in Project Air Emissions)** (Page 508) identifies a list of chemicals which may be present in pulp and paper mill effluent. Health Canada (2012) (Table A2) identifies specific chemicals which may be relevant from a contaminated sites perspective for the pulp and paper mill industry.

- The list presented in Health Canada (2012) should be compared to the list of chemicals presented in the HHE to ensure all relevant chemicals related to pulp and paper mills are evaluated in the project.

16) Throughout **Section 9.2.4.2 (Identification of Candidate COPCs in Treated Mill Effluent)** (pages 516-518) there is a discussion about the candidate COPCs for future evaluation with respect to the project (including power boiler, pipeline and pipeline diffuser), which were identified based on a review of current effluent chemical concentrations at Points C and D within the Boat Harbour effluent treatment lagoon. Point C is at the confluence of the aeration/stabilization basin and the Boat Harbour lagoon; and Point D is at the discharge point at the weir between Boat Harbour and the Northumberland Strait. The challenge with using such information is that the new effluent treatment process will be different, and under the current discharge system, effluent released to Boat Harbour undergoes aeration and chemical enrichment, followed by multiple days of retention within Boat Harbour (to allow settling of any suspended particulates) before finally being discharged via the containment weir at Point D, with an approximate residence time in Boat Harbour of 30 or more days. Using the data collected related to water/sediment chemistry in the current process may not be valid considering the new process.

- Health Canada is requesting more information about the appropriateness of comparing the future process to the existing process to determine COPCs given that the current system has a 30 or more day settling process to remove contaminants whereas the new process is expected to result in effluent discharge directly to the Northumberland Strait following treatment in the power boiler.

17) **Section 9.2.4.2 (Identification of Candidate COPCs in Treated Mill Effluent) (page 516)** states that "*it is expected that future treated effluent that will be produced as a result of the NPNS project will be of higher quality than the current effluent and will contain fewer candidate COPC substances. For those substances that are present, it is anticipated that they will occur at lower concentrations in the future effluent relative to current effluent*". However, the HHE also states in **Section 9.1 (Introduction and Background)** that "*at this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational*". It is unclear how the conclusion that the future effluent will be of better quality than the current effluent can be assumed based on this lack of understanding of future COPCs and their respective concentrations.
    - Health Canada is requesting additional information about the expected chemical composition and chemical concentrations of the future effluent be provided in order to substantiate the conclusion that the future treated effluent will be of higher quality than the existing effluent that enters the Northumberland Strait, particularly given that the two effluent treatment processes are very different. Without this information, Health Canada cannot provide advice on whether the contaminants in the future effluent may have an impact on human health (either more or less than the current effluent) either through direct exposure pathways or through the consumption of marine species which may uptake these COPCs.

18) **Section 9.2.4.2 (Identification of Candidate COPCs in Treated Mill Effluent)** (page 517) – The report indicates that environmental effects monitoring programs (EEMs) for Boat Harbour have periodically resulted in the collection of chemistry data on effluent parameters in media and biota. For example, in 1996, Jacques Whitford Environment Limited collected (and composited) a total of 10 blue mussels from the outlet area of Boat Harbour. Health Canada advises against compositing individual specimens given the diversity of contaminants that can occur within individual samples (Health Canada, 2010). Health Canada also advocates for a sufficient number of samples to be collected in order to derive a statistically-significant sample size (Health Canada, 2010). In addition, the samples were collected at the outlet of Boat Harbour after the effluent had spent approximately 30 days residing in Boat Harbour before being discharged to the outlet area. As such, this study (and any other bivalve studies conducted in the region) may have limited validity given that the new effluent pipeline is outside of the Boat Harbour outlet, and the effluent will have limited residency time before final discharge to the marine environment. Thus, the impacts of the new effluent pipe on sedentary species (e.g. oysters and mussels, particularly oysters given the presence of oyster aquaculture facilities in the vicinity of the proposed diffuser) may not be fully captured in the current EA.

- Health Canada requests additional information to validate the use of these bivalve studies in evaluating future contaminant concentrations given the different effluent treatment processes and the decreased residency time of the effluent in the proposed project.

Acoustic Environment

1) **Section 8.2.1.2 (Significance Criteria)** states that "*a significant adverse residual environmental effects on the acoustic environment is defined as one where the project-related emissions of noise (as determined through noise modelling) results in a prolonged exceedance of the NSE noise guidelines (prolonged period defined as a continuous 24 hour period) identified in Section 8.2.1 above, or a prolonged increase in ambient noise levels of 10 dBA above existing background levels at a sensitive receptor. For the purpose of this threshold, "prolonged" is defined as a continuous period of 24 hours*."

   Given that the *Nova Scotia Guidelines for Environmental Noise Measurement and Assessment* is separated into daytime (0700-1900 hours), evening (1900-2300 hours) and nighttime (2300-0700 hours) thresholds (with different acceptable levels for each time period), it would appear the test for significance would imply that noise levels would be required to exceed each of the three time periods over a 24 hour period before the effect is considered significant.

   According to Health Canada (2017b), guidelines and recommendations presented in WHO (1999, 2009) regarding sleep disturbance should be considered in an EA. In particular, WHO guideline levels should not be exceeded for quiet rural areas and susceptible populations, such as those in hospitals, or convalescent or senior homes. For estimating the likelihood of sleep disturbance on any given night, the WHO's Guidelines for Community Noise (1999) report a threshold for sleep disturbance as being an indoor sound level of no more than 30 dBA LAeq for continuous noise, during the sleep period. For individual noise events, the WHO has stated: "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dBA LAmax more than 10–15 times per night...." Health Canada recognizes that in many cases, people will want to keep windows at least partially open, depending on the season. Unless specified otherwise, it is assumed by Health Canada that an outdoor-to-indoor transmission loss with windows at least partially open is 15 dBA (United States Environmental Protection Agency [US EPA] 1974; WHO 1999).
   - Health Canada suggests that in determining significance a greater emphasis be placed on noise levels during the evening and overnight hours in order to be protective against sleep disturbance.

2) **Section 8.2.2.1 (Baseline Noise Levels)** states that the baseline sound monitoring was completed between December 15 and December 19, 2017 (with paused measurements during the evening of December 16, 2017 until the early morning of December 17, 2017 and again during the evening of December 17, 2017 until the morning of December 18, 2017 because of cold temperatures). No additional information was provided with respect to ground cover (e.g. snow cover or bare ground) or the atmospheric conditions during the monitoring such as wind speed, wind direction, temperature, etc.

- Given that all of these variables have implications with respect to noise propagation, this information should be presented in the EA in order to determine the adequacy of the baseline sound pressure levels.

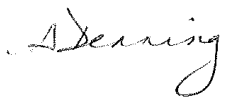
3) **Section 8.2.2.3 (Characterization of Residual Environmental Effects)** states that "*it is acknowledged that for traffic reasons the pipeline construction may occur at night. If this option is chosen, appropriate mitigation measures will be implemented.*" There is no further discussion about what mitigation measures will be implemented in the event of pipeline construction occurring at night to reduce noise levels to meet the provincial guidelines.
   - Health Canada requests additional information related to mitigation measures that would be implemented in the event of night-time construction noise in order to reduce the potential for annoyance and sleep disturbance to nearby human receptors. See Health Canada (2017b) and the WHO (1999; 2009) for more information.

Potable Water Supplies

1) **Section 8.5 (Groundwater)** identifies the number of potable wells within the vicinity of the proposed project (including the effluent treatment facility and the on-land portion of the effluent pipeline). It was noted that the references used in the EA to identify current groundwater chemistry in the area are somewhat dated (e.g. Hennigar, 1968; Gibb and McMullin 1980). If recent groundwater monitoring of these nearby residential wells has not been undertaken (for general chemistry and any other parameters that may be relevant based on the expected new effluent chemical composition), Health Canada advises that baseline sampling be undertaken for any wells that may be impacted in the event of a future pipeline leak.
   - Consider conducting baseline chemistry analyses of any nearby potable groundwater wells in order to have a sufficient understanding of current groundwater quality. In the event of a pipeline break/leak, future samples can then be compared with these baseline concentrations in order to determine whether there has been an impact on local drinking water quality.

If you have any questions, please contact the undersigned at your convenience.

Sincerely,



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March 5, 2019

Helen Yeh
Environmental Assessment Officer
Environmental Assessment Branch
Nova Scotia Environment

Dear Helen:

Re. Northern Pulp Proposed Replacement Effluent Treatment Facility Project (Highway 106 Abercrombie to Caribou Harbour) - Environmental Assessment Comments from TIR Review

Conceptual drawings *(Northern Pulp Effluent Treatment Plan by KSH Solutions Inc. "Conceptual Marine Effluent Outfall Pipeline Routing Plan Caribou Harbour" Rev. 18 dated Dec. 10, 2018 -10 sheets*) outlining Northern Pulp's proposal to construct a pipeline along the shoulder of Highway 106 to carry effluent from their mill in Abercrombie Point to Caribou Harbour were presented and submitted to Nova Scotia Transportation & Infrastructure Renewal (TIR) by representatives of Northern Pulp for preliminary review and feedback shortly prior to the related Environmental Assessment being registered on February 7, 2019. These drawings, and the Environmental Assessment Registration Document by Dillon Consulting were distributed to TIR stakeholders and the following comments are provided:

1. TIR Policy PO1000 "Construction of Gas/Oil Pipelines within or Adjacent to Highway Right-of-Way" offers guidelines and requirements for TIR to consider permitting pipeline infrastructure within TIR highways. This policy has been provided to and discussed with the proponent. With respect to the proposed project the policy states "no installation of low-pressure pipelines will be permitted on or within 30 metres of 100 Series Highways Right-of-Ways in any form. Any exception requires the approval of the Executive Director of Maintenance and Operations."
2. The concept of **placing the pipeline in the shoulder of the road is not acceptable to TIR** and would not be permitted as it would result in significant operational issues to TIR during construction and any future maintenance of the proposed project, may significantly impact TIR's flexibility to implement future highway improvements, and a significant failure of the pipeline could damage the highway.
3. **Placing the pipeline completely outside of TIR right-of-way is preferred by TIR.** It would be permitted adjacent to highway right-of-way (an approved TIR Work Within Highway Right-of-Way Permit is required for any structure within 60 meters of the boundary of a controlled access highway).
4. If TIR permits the pipeline within highway right-of-way in any location, it would be required to be placed as far as possible from the roadway, including adjacent to the causeway (i.e.

within 3 to 5 meters the right-of-way boundary) to minimize operational impacts to TIR during construction and in the future. Along the causeway, it is preferred to locate the pipeline at or near the toe of the slope of the causeway embankment beneath sea level. In other areas adjacent to Highway 106, the pipeline should be placed to the east of the current roadway to minimize impacts on future highway improvements (locate pipeline to opposite side of highway away from lands reserved for future highway twinning and/or expansion) and designed to be capable of supporting maintenance equipment that may be required to operate on the roadside (e.g. excavators).

5. Development and acceptance of a registered agreement between TIR and the proponent would be required to establish formal terms for location, maintenance/monitoring/inspection, emergency measures, liability, remediation/reclamation, relocation costs if required for future highway improvements, responsibilities for potential environmental impacts and to allow for assignment of responsibilities to future heirs/assigns. The Public Highways Act does not allow for any third-party interest in highway right-of-way such an easement.
6. A significant refundable and non-refundable security deposit would be required prior to permit approval, to cover TIR inspection costs and potential damages to the highway. Amounts would be determined upon review of final design plans acceptable to TIR, based on an assessment of risks and potential impacts to TIR. The refundable deposit would be held for at least one year following completion of construction to allow for monitoring of latent design/construction deficiencies and released following final inspection by TIR staff and once any deficiencies/concerns are addressed to the satisfaction of TIR.
7. Lane closures or stoppage of traffic for construction or future maintenance would not be permitted on Highway 106 for any significant amount of time including the Pictou Causeway. Construction phasing, work plans/schedules and traffic management plans would be required and must minimize impacts to highway traffic.
8. Jacking pits for proposed horizontal drilling shall not adversely impact highway infrastructure or traffic operations and would be required to be identified on design plans. Feasibility for horizontal directional drilling must be confirmed at the design stage (notes on current plans indicate contractor is to confirm feasibility for horizontal drilling).
9. The proposed pipeline would not be permitted at elevations above base material supporting highway culverts as not to impact future highway maintenance needs.
10. Encasement of the pipeline in a sleeve of acceptable design and material (e.g. steel or concrete) would be required at all locations where the proposed pipeline is installed across (beneath) structures and other highways including the Pictou Rotary. Further sleeving details would be required for subsequent design reviews.
11. With respect to proposed venting manholes within highway right-of-way, confirmation would be required that there would be no emissions of noxious or unpleasant/unfavourable vapours, gases or odours, or health/safety/environmental concerns to TIR maintenance staff or the public and that they would only be vented during start-up after am ill shut-down when flow resumes through the pipeline.
12. Comments from TIR Structural Engineering are summarized as follows:
    a. All units on design drawings should be metric

b. Section identifiers and stations on the last (section) sheet of drawings provided appear incorrect and do not match plan drawings in some cases.
c. The proponent should review if insulation and protection of pipe is required where above-ground (i.e. along structures), and if insulation/mitigative measures is required for impacts the higher temperature effluent carrying pipeline may have on surrounding soil conditions during winter conditions e.g. potential for differential settlement, melting snow on ground surface, etc.
d. The proponent should consider if additional manholes are required to facilitate future inspection/repair of pipeline.
e. Maintenance provisions for each TIR structure where pipeline is attached or constructed parallel or below would need to be included in formal agreements.
f. It is difficult to provide detailed comments on impacts to structures at this stage as structural analysis and connection details are not provided. The pipe is relatively large and a structural evaluation of each structure to determine if it could support the weight based on CHBDC Code would be required.
g. Running a pipe along any structure shall not impact the vertical clearance that is available.
h. Typically, pipes are run on the underside of bridges, not on the side of barrier, to minimize exposure to elements and risk of impact from traffic collisions with bridge rail.
i. Complete survey should be completed at each structure to confirm all dimensions. TIR may be able to provide design and/or as-built plans of some or all bridges for reference/information only. Plan, elevation, cross-section, excavation and fill details, and proximity to bridge elements for each structure would be required for subsequent design reviews.
j. Actual slopes and grades of pipe through bridge sites would be required. Section Cl appears to show the pipe travelling through substructure (footings); presumably it would be offset laterally to be away from structural components as required.
k. Dimensions showing distances between pipe, excavations, and bridge footings would be required to ensure there are no concerns with excavation near footings.
l. More detailed design/construction notes and standard references would be required for subsequent design reviews.

13. Additional review by internal TIR stakeholders and opportunity to provide additional comments would be required as design for the project progresses.

Thank you for the opportunity to review this project.

Your truly,

Sylvie Colomb
Environmental Analyst

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March 8, 2019

Helen Yeh
Environmental Assessment Officer
Environmental Assessment Branch
Nova Scotia Environment

Dear Helen:

Re. Northern Pulp Proposed Replacement Effluent Treatment Facility Project (Highway 106 Abercrombie to Caribou Harbour) - Environmental Assessment Comments from TIR Review - Addendum

NSTIR is pleased to offer those additional comments to the above-mentioned project:

1. As per our previous comments, any work within the Right Of Way (ROW) will require a Working Within Highway Right Of Way Permit. But the document references multiple PID's, so in addition to the Department, permission would have to be obtained from any relevant property owners. It also references possible changes to access roads, as well as several public and private roads, as well as trenching and vegetation control. The proponent also references that roads frequently travelled will be "repaired as necessary". The complete scope of any work planned will need to be detailed in the ROW permit application and reviewed by local Department staff for suitability.

2. As indicated previously, NSTIR does not support the use of the ROW to have piping placed in the shoulder of the road. Should any work be completed that is outside the ROW, any work areas created on provincially owned roads as a result will need to be in compliance with the appropriate sections of the Nova Scotia Temporary Workplace Traffic Control Manual. The proponent has referenced this in section 5.7.2.11 Traffic Management and Road Infrastructure. Also, the proponent has referenced several possible mitigation measures on p. 539 as well as p. 577. In any case, any traffic control required as a result, speed limit changes etc. will need to be approved and signed off by appropriate Departmental staff.

3. The proponent has identified a possible need for a Special Move Permit for overweight and overdimension loads. If this is required, the proponent should contact our Departmental contact for Special Moves, Manuel Abreu, to determine any necessary requirements. He can be reached at Manuel.Abreu@novascotia.ca . Also, in conjunction with this, the Transportation Route for any loads needs to be clearly identified, so that Department staff can analyze it to determine suitability of the route, in terms of turning radii for trucks, as well as weights on overpasses and clearances on underpasses.

4. It is indicated p. 523 that the risk of a vehicle accident “would be limited to the construction phase of the project, as limited transportation is required for the project during operation and maintenance”. While the likelihood may be more during the construction phase due to the number of vehicles involved, vehicular accidents can occur at any time and are not eliminated completely for any reason. As a result, stringent mitigation and preventative measures need to be present and active at all phases of the project so that the potential for vehicle accidents is minimized.

Thank you for the opportunity to review this project.

Your truly,

Sylvie Colomb
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NOVA SCOTIA

Environment

Date: March 6, 2019

To: Acting Water Management Unit Manager

From: Senior Surface Water Quality Specialist, Water Management Unit

Subject: Northern Pulp Nova Scotia Replacement Effluent Treatment Facility Environmental Assessment – Review Comments & Recommendations

Scope of Review

As Senior Surface Water Quality Specialist with the Nova Scotia Environment (NSE) Sustainability and Applied Science Division, the following Northern Pulp Nova Scotia Replacement Effluent Treatment Facility (ETF) Environmental Assessment (EA) review focuses on the following subjects:

- Surface water quality & its management
- General surface and groundwater resources & their management

The following review considers whether the environmental concerns associated with the above subjects and the proposed mitigation measures have been adequately addressed in the Environmental Assessment. The recommendations provided below are meant to supplement the actions outlined in the EA submission documents.

While general comments on fish and fish habitat, wetlands, effluent discharge, surface water quantity, and groundwater quality and quantity may be included below, applicable technical specialists should be consulted for specific review and comment.

Reviewed Documents

The following document was the basis for this EA review:

Dillon Consulting. 2019. *Northern Pulp Nova Scotia Environmental Assessment Registration Document Replacement Effluent Treatment Facility*. Northern Pulp Nova Scotia Corporation. 17-64631-1300.

Comments

Surface Water Resources

- Section 8.4.2.1 provides a listing of watercourses, wetlands and other surface water features that will be potentially intersected by the Project footprint or are immediately adjacent.
    - The proposed ETF is within the tertiary watershed 1DP-SD8, which discharges into Pictou Harbour. One mapped unnamed watercourse (WC2) is identified within the footprint and the spill basin construction

area, which will require realignment and/or partial removal. The adjacent WC1 unnamed watercourse may require reconfiguration as well for proposed site activities. Both watercourses receive site drainage from the existing NPNS site and will continue to receive localized surface water runoff following Project construction.

  - The pipeline alignment route crosses three tertiary watersheds, which are 1DP-SD8 (1 unnamed watercourse [WC4]), 1DP-SD3 (seven unnamed watercourses [WC5 – 6; WC12 - 16] and 1DP-SD4 (five unnamed watercourses [WC7 – 11]). All of these are shore direct drainage areas that drain into either Pictou Harbour or the Northumberland Strait directly. The pipeline also directly crosses Pictou Harbour and within the Northumberland Strait to the discharge location near Caribou Point. These watercourses would be potentially impacted during the construction phase by the pipeline installation and in the case of an inadvertent release (leak or spill)

- Baseline surface water quality (Section 8.4.2.2) has been collected on a quarterly basis since 2012 from the watercourses WC1 (upstream and downstream of existing NPNS surface water runoff), WC2 (downstream of existing NPNS surface water runoff) and WC3 (upstream of proposed pipeline crossing). The results for the December 11, 2018 sampling event with analysis for general chemistry, total suspended solids (TSS) and metals was provided with discussion of observed exceedances in comparison to the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines for Freshwater Aquatic Life (CEQG-FAL). No reasoning was provided why surface water quality data collected since 2012 was not included in the baseline assessment. General discussion of exceedances was provided.
- Within the pipeline route, surface water quality grab samples were collected on Dec 3, 2018 along with *in-situ* field measurements using a water quality probe (Section 8.4.2.2). The results were compared against the CCME CEQG-FAL as well as CCME CEQG for marine aquatic life for watercourses with a direct marine connection. No additional criteria are provided as to what designates a watercourse a direct marine connection. General discussion of the water quality results in comparison to applicable CCME CEQG criteria is provided.
- Section 8.4.5 indicates that follow-up baseline surface water quality monitoring is not required within the proposed ETF site. Section 8.5.5 indicates additional baseline surface water quality monitoring may occur in areas identified as potential areas where surface water is expected to infiltrate into the local groundwater table along the pipeline footprint area. No other surface water baseline monitoring is proposed prior to Project construction along the pipeline corridor.
- An existing surface water quality monitoring program for the existing NPNS facility is proposed to be continued and expanded for this Project. The minimum surface water quality analysis package proposed is general chemistry, TSS and metals for at least three seasons.

Surface Water Quality

- The quality of the influent from the existing mill to be discharged into the ETF is not fully characterized using field and laboratory quantitative analysis for physical, chemical and biological parameters applicable to the pulp production

process. This characterization is used to identify potential contaminants of concern to be assessed by this EA. Identifying the project contaminants of concern at the influent stage of an ETF supports the following EA activities:

- Treatment system design
- Assessing treatment effectiveness
- Understanding end receiving environments for each contaminant following the treatment process (soil, water, air)
- Assessing potential effects of contaminants of concern to Project valued environmental components (VECs)
- Developing mitigation measures to address potential effects

The following is the level of characterization related to influent to the proposed ETF:

- Concentrations of total suspended solids (TSS) and soluble chemical oxygen demand (COD) of the influent to the ETF are presented and discussed in Sections 5.2.2.4 and 5.2.2.6, respectively.
- Section 9.2.4.2 *Current NPNS Mill Effluent Chemistry* discusses potential contaminants of concern within a single sample collected in 2018 from the plant influent discharge to the Boat Harbour Treatment Lagoon that underwent comprehensive contaminant analysis. No quantitative data, including concentrations or loads, is provided in the section and no reasoning as to why it is not included. No full list of parameters analysed in the sample is provided. No discussion on why one influent sample is enough to characterize the influent is provided. Contaminants of concern are identified as the following: hydrocarbons, toluene, cyanide, metals and metalloids, phenol, o-cresol, a phthalate ester compound, chloroform, total trihalomethanes, phenanthrene and pyrene. The potential contaminants were present at concentrations close to the laboratory reportable detection limits with no inclusion of what those specific quantitative limits were. Mercury, 2,3,7,80-TCDD and 2,3,7,8-TCDF were identified as parameters that were not analysed.

Without quantitative full characterization of the influent quality to identify potential contaminants of concern to be received by the ETF, there is insufficient information to assess the potential Project effects to receiving water systems and their associated VECs, and to support the subsequent selection of appropriate mitigation measures to address those effects.

- The Environmental Effects Assessment (Section 8) and Human Health Effects (Section 9) sections of the Registration Document identify potential contaminants of concern groups associated with the discharge from the proposed ETF. Potential contaminants of concern for the project following treatment are discussed in several sections with varying levels of assessment for each parameter, which are based on *Pulp and Paper Effluent Regulations* (PPER), literature review, characterization of Boat Harbour Treatment Lagoon discharge and review of other relevant historical water quality data:
  - Table 5.6-1 lists the anticipated daily maximum water quality of the treated effluent to be discharged by the Project and its associated concentrations, which are assessed in the discharge receiving water study (Appendices

E1 to E3). The table does not identify whether it is a comprehensive list of potential contaminants of concern.
    - Dioxins and furans are listed within the Registration Document as below laboratory analysis detection limits in the effluent (Table 6.7-1) with no listing of the detection limit value. The metals manganese, cadmium and aluminum are listed in Table 6.7-1 as being potential parameters of concern within the Project effluent during the Operation phase.
    - During the Project construction phase there is the potential for petroleum hydrocarbon spills from stationary and mobile equipment. Petroleum hydrocarbons were also measured above reportable detection limits in the untreated effluent sample in 2018 (Section 9.2.4.2). Reportable detection limit values are not provided.
    - Section 9.2.4.2 *Candidate Contaminants of Potential Concern in Treated Effluent Summary and Path Forward* lists potential contaminants of concern to be evaluated in a Human Health Risk Assessment (HHRA) (if required for the project) which consists of the following:
        - some metals/metalloids (unidentified, except for mercury);
        - some polycyclic aromatic hydrocarbons (PAHs);
        - polychlorinated dibenzo-p-dioxins and dibenzofurans (PCCD/F);
        - some resin compounds;
        - a couple or few chlorophenolic compounds;
        - non-chlorinated phenolic compounds; and
        - chlorinated volatile organic compounds (VOCs)

      The specific number of 'some' compounds is not defined. The list of compounds is expected to be reduced further with the completion of a detailed HHRA. The assessment used to develop this list of potential contaminants discusses concentrations with respect to reportable detection limits and background water quality without quantitative values.

  As with the above influent contaminants of concern characterization comment, the identification of potential contaminants of concern in the treated effluent discharge are discussed using qualitative methods (Section 9). The discussions reference potential sources of quantitative data, but no reasoning is provided as to why this data is not provided in the Registration Document to support the contaminants of concern assessment. A detailed quantitative approach to estimate discharge contaminants of concern concentrations and loads from a treatment system, using a variety of information sources (e.g., literature review, background water quality and similar facility effluent data) would typically be expected as part of an EA Registration Document.

- The effluent water quality listed in Table 5.6-1 and subsequently evaluated with respect to discharge into the marine receiving waters (Appendices E1 to E3) did not include metal compounds, hydrocarbons and several organic compounds listed in Section 9 as potential contaminants of concern. The Registration Document does not discuss why the contaminants of concern listed in Section 9 are not included in Table 5.6-1 and its associated detailed assessments.
- In the Appendix E1 receiving water study, the single port diffusor option at the CH-B site has a simulated discharge plume that does not interact with the seabed for a distance greater than 200 m from the port, while the preferred three

port diffusor is simulated as interacting with the seabed at approximately a 10 m distance from the ports. The receiving water study indicates that dilution rates at this distance are enough to not impact the benthic environment. The effluent water quality is indicated as being primarily diluted to match ambient conditions prior to the 10 m distance for the Table 5.6-1 parameters. There is no detailed assessment of the discharge plume effluent and its interaction with seabed and benthic environment beyond the statement it is unlikely to have adverse effects. The lack of an assessment or further discussion beyond this statement is insufficient information to assess if there are adverse effects to the marine benthic environment.

- The receiving water study (Appendix E1) used the water quality results from the Pictou Road Area (Appendix E3) to represent the ambient water quality at the CH-B discharge point. Discussion was provided to indicate the Pictou Road Area water quality results represented a conservative worst-case estimate than what would be expected at CH-B near Caribou Point, based on existing land uses within the Pictou Harbour watershed. No discussion was provided in the Registration Document about whether follow-up monitoring and assessment at Caribou Point would be used to confirm the input parameter assumption.
- The Appendix E1 receiving water study presents in Figures 3.4 and 3.5 predicted plume dimensions in plan and side views. Two temperature scenarios are discussed prior to these Figures, which are for the winter and summer seasons. No indication is provided as to which seasonal temperature scenario is presented in the Figures. It would be expected that the plume dimensions may be different given the temperature differentiation between the effluent and ambient water for the two seasons. This information would support the effects assessment for the marine environment associated VECs.
- Table 8.4-3 and Appendix M4 present the field and laboratory analysis results from the freshwater surface water quality samples collected during at least one site visit. The samples were analysed for a suite of parameters that included general chemistry including nutrients, select total metals and TSS. The marine baseline water quality is presented in Table 3.1 in Appendix E.3. Table 5.6-1 lists the expected maximum daily effluent water quality of the NPNS effluent, while Section 9 lists several potential contaminants of concern that are not included in the above baseline assessment (e.g., total petroleum hydrocarbons (TPHs), PAHs, resin compounds, phenols (chloro and non-chloro). Having pre-construction analysis results for the full list of potential contaminants of concern in the freshwater and marine systems within the Project footprint provides a comprehensive baseline for evaluating project effects.
- Appendix H, Section 2.5 presents a list of proposed sediment analysis parameters for a baseline follow-up benthic invertebrate community monitoring study. The list of parameters includes some that are listed as project contaminants of concern in Table 5.6-1 and Section 9 (metals, mercury, AOX, dioxins, furans). Three sites are proposed to be sampled along the pipeline route without discussion and/or supporting references as to whether that is a sufficient sampling density for the proposed length of marine pipeline. No sampling is proposed within the discharge plume area. There is no discussion of reportable detection limits for the associated laboratory analysis of the parameters, and applicable federal/provincial criteria for results assessment. Sampling for select parameters (Footnote 3) is proposed to occur as part of another pre-construction

assessment study proposed by Stantec (2017), Registration Document Appendix E3. The following are sediment quality analysis parameters that are listed in Table 5.6-1 and Section 9 as potential contaminants of concern that are not listed in the follow-up study:
    - Nutrients (nitrogen and phosphorus compounds)
    - pH
    - PAHs
    - Specific chlorophenolic compounds
    - Specific non-chlorinated phenolic compounds
    - Specific resin compounds, in addition to resin fatty acids
    - Chlorinated VOCs
    - Total petroleum hydrocarbons, and/or other relevant hydrocarbon parameters
- Appendix H, Section 2.6 presents a list of proposed water quality analysis parameters for the baseline follow-up water quality monitoring study. The list of parameters includes many that are listed as potential contaminants of concern in Table 5.6-1 and Section 9 (pH, colour, TSS, metals, mercury, biochemical oxygen demand [BOD_5], nutrients, dioxins, furans, AOX). There is no discussion of reportable detection limits for the associated laboratory analysis of the parameters, and applicable federal/provincial criteria for results assessment. The following are potential water quality analysis parameters that are listed in Table 5.6-1 and Section 9 as contaminants of concern that are not listed in the follow-up study:
    - Chemical oxygen demand (COD)
    - PAHs
    - Specific chlorophenolic compounds
    - Specific non-chlorinated phenolic compounds
    - Specific resin compounds, in addition to resin fatty acids
    - Chlorinated VOCs
    - Total petroleum hydrocarbons, and/or other relevant hydrocarbon parameters
- Appendix G, Section 3 lists the benthic invertebrate community assessment and fish population assessment pre-discharge surveys as ‘proposed only’ with respect to schedule. The pre-discharge studies are recommended by EcoMetrix to be conducted to improve interpretation of biological monitoring program results.
- Horizontal direction drilling (HDD) is proposed as a pipeline installation method under watercourses/wetlands (Section 5.3.1.8). Drilling muds are listed as predominantly consisting of a mix of water and bentonite clay. Typically HDD mud mixtures also include the addition of polymers and surfactants to stabilize soils and disperse clay particles, respectively (http://factsheets.okstate.edu/documents/pss-2916-can-urban-horizontal-directional-drilling-mud-be-land-applied-2/).
- HDD has the potential to inadvertently release drilling fluid into a wetland or watercourse that is above the borehole, which is sometimes referred to as a frac-out (http://trca.on.ca/dotAsset/105401.pdf). There is no direct discussion of this potential inadvertent release mechanism in the Registration Document and mitigating its impacts to aquatic ecosystems.
- The mixing zone dilution ratio in Appendix E.1 for the CH-B site with a three-port

diffuser is stated as 144 times at 100 m from the discharge point, while the HHE listed the dilution ratio as 168 times at 100 m from the discharge. There is a discrepancy between the two dilution ratios used in the Registration Document.
- Appendix G, Section 2.5 lists proposed sediment analysis parameters for a pre-construction baseline benthic invertebrate community study along the pipeline rout, which includes acid-volatile sulphide and low-level mercury. Both parameters have a Footnote 4 listed next to them with no associated footnote in the document with that number.
- The follow-up monitoring program proposed field verification of fish habitat within watercourses in the vicinity of the Project footprint, which would be conducted prior to the Construction phase.

Surface Water Quantity

- The ETF design includes a spill basin with a design capacity of 35,000 m^3 to handle untreated effluent, which is predicted to handle 10 to 13 hours of full mill effluent diversion assuming an empty condition. The existing plant currently discharges into the Boat Harbour ETF, which would be expected to have substantially more storage capacity volume than the proposed spill basin for handling treatment system upsets. There is no discussion about the change in holding capacity within the proposed ETF compared to the existing process and what impacts to mill operations will be expected, and the robustness of the proposed design capacities in handling ETF system issues without inadvertently discharging into the environment.
- Table 8.4-1 indicates classification of watercourse types (intermittent, small and large permanent) based on site visits with those along the pipeline route only having one site visit in December 2018. Section 8.4.2.1 provides further details on the watercourse observations. One site visit is typically insufficient to assess whether a watercourse has a permanent or intermittent flow regime.
- Flow observations for each watercourse in Appendix M3 are subjective and based on one site visit conducted in December 2018. One site visit is typically insufficient to assess whether a watercourse has intermittent flow, particularly as per the photos in Appendix M2 where several the watercourses have partial ice coverage, which effects flows.
- Flows (Appendix M3) should also have been measured during the site visit for non-ice-covered sites using a velocimeter and calculated using the velocity-area method (or other standard method), instead of general categorization based on visual observations.
- Section 8.6.2.3 refers to watercourse widths and depths for the watercourses within or adjacent to the Project footprint. No table or field notes are provided listing these observed measurements. Having these values in a table or field notes would provide baseline data to support impact assessment and potential future watercourse alteration approval applications.

Groundwater Quantity & Quality

- Section 8.5.3.2 proposes lining the trench within the Town of Pictou source water protection area with an impermeable or low conductivity material/liner. No details are provided as to what type of liner would be considered ‘impermeable’ and where flows from a leak would potentially go and their potential impacts with reduced vertical infiltration. Understanding how leak flows will be managed within

these lined pipeline trench sections would assist with evaluating impacts to various VECs, including surface water resources, and development of appropriate mitigation measures (if required).

- Section 8.5.3.2. indicates that a system will be installed for the pipeline and associated pumping works that will detect leaks or significant drops in pressure during operation and maintenance. No details are provided as to the types of detection systems that are technically feasible for the proposed discharge pipeline and its preliminary design criteria.
- The ETF spill collection system proposes to include a 1.9 mm thick HDPE liner to avoid leakage. No details are provided on whether a monitoring system/program will be instituted around the basin area with respect to detecting leaks. As the spill collection basin will contain untreated effluent, it will be important to confirm the adjacent VECs are being adequately protected or identify if there is an inadvertent release.
- Dewatering activities as part of below grade excavations for the pipeline installation are discussed in general terms within Section 5.3.1.7. There is no mention of whether expected dewatering rates and pumping periods for the project will be assessed with respect to the 'Application Requirements for Water Withdrawal Approvals'. These dewatering activities may trigger the need for the Project to obtain an NSE Water Withdrawal Approval or Approvals.

Recommendations

Planning/ Design Issues

<u>Surface Water Quality</u>

- There is insufficient quantification of the potential contaminants of concern being input into the ETF and subsequently discharged in receiving environments (soil, water and air). A quantitative full characterization of the influent quality to be received by the ETF is required to identify potential contaminants of concern, support treatment system design, evaluate effects on VECs associated with receiving environments for the ETF discharges (e.g., sludge, effluent and air) and develop appropriate mitigation measures to reduce those effects.
- A more detailed quantitative assessment is required to estimate the expected discharge contaminants of concern concentration and/or load ranges to the marine discharge area and other receiving environments. This assessment potentially could use treatment system models or mass balances to support the quantitative estimations. The results of this detailed assessment would then be used to evaluate effects on VECs associated with those ETF discharge receiving environments and develop appropriate mitigation measures to reduce those effects.
    - The effluent receiving water models (Appendix E) should be updated to simulate any potential contaminants of concern that are identified within the discharge effluent that have not been previously modeled. The results of these model runs should be used in the subsequent assessment of their impacts. Additional mitigation measures should be developed to address potential impacts that are identified.
- Further discussion and potentially quantitative assessment of the impacts on ambient marine water quality and the benthic environment with respect to the plume interacting with the seabed at 10 m away from the discharge ports should

be conducted to support the unlikely potential adverse effect statement in Appendix E1. If potential adverse effects are estimated by the additional assessment, then appropriate mitigation measures should be developed.

Groundwater Quantity & Quality

- Although a specific leak or significant pressure drop detection system is expected to be developed during detailed design, examples of relevant leak detection and/or pressure measurement technological options for this type of effluent discharge pipeline and operating flows should be provided to NSE for review. This will indicate to the reviewer whether the leak detection monitoring method types are adequate for the proposed effluent discharge pipeline design. The detailed design and operating parameters of the leak detection and/or pressure drop monitoring system for the pipeline should also be provided to NSE for review, comment and approval prior to the Construction phase.

Operational Issues/Other Permitting Processes

Surface Water Quality

- Additional baseline freshwater surface water quality and marine water sampling within the Project footprint should be conducted, and the field and laboratory analysis should include a suite of parameters that represents the full-list of potential contaminants of concern associated with the ETF influent (e.g., AOX, COD, BOD, mercury, cyanide, PAHs, PCCD/F, resin compounds, chlorophenolic compounds, non-chlorinated phenolic compounds, chlorinated VOCs). This list of parameters would be based on the results of the above requested influent and effluent characterization. A qualified professional should develop the list of additional baseline monitoring parameters to determine which parameters would not be expected to be present in existing water systems, and therefore not require baseline monitoring. This supplemental baseline water quality monitoring will support assessment of potential Project effects.
- Additional baseline marine sediment sampling within the Project footprint should be conducted as part of the EEM program, and the field and laboratory analysis should include a suite of parameters that represents the full-list of potential contaminants of concern associated with the ETF influent. A qualified professional should develop the list of additional baseline monitoring parameters to determine which parameters would not be expected to be present in existing water systems, and therefore not require baseline monitoring.
- Baseline marine water quality sample results within the discharge receiving area near Caribou Point should be compared against the Pictou Road Area water quality results, which were used as inputs in the receiving water study (Appendix E1 & E3). The receiving water study models should be updated, and results re-evaluated if the Caribou Point results represent a more conservative receiving water condition than the Pictou site.
- As part of EMP and/or EPP for the operations phase, the management of the spill containment basin, and associated plant operations, including shutdown, should be discussed with respect to preventing basin overflows.
- Detailed design for the HDD alignments should be conducted, including appropriate geotechnical investigations (including boreholes) and topographic surveys. These designs should be submitted to NSE for review and approval prior to commencement of activities.

- In support of the HDD alignment installations, a Project frac-out monitoring and contingency plan should be developed, particularly focusing on areas immediately adjacent to or within watercourses and wetlands. The monitoring and contingency plan should be submitted to NSE for review and approval prior to commencement of activities. This activity can potentially be done in conjunction with the proposed construction surface water quality monitoring program.
- The Registration Document proposed field verification of fish habitat within watercourses in the vicinity of the Project footprint, prior to the Construction phase, which should be conducted.
- The proposed construction surface water quality monitoring program (Section 8.4.5) should as described in the Registration Document be developed in consultation with NSE and include appropriate upstream and downstream monitoring during storm events. Monitoring should also be conducted when there are in-water activities occurring. Appropriate monitoring compliance criteria (e.g., Canadian Council of Ministers of the Environment Canadian Environmental Quality Guidelines for Freshwater Aquatic Life TSS and/or turbidity criteria [http://st-ts.ccme.ca/en/index.html]) should be part of the program to determine compliance and when to implement additional mitigation measures.

Groundwater Quantity & Quality

- An assessment should be conducted on where flows resulting from a pipeline leak would go with the use of a low permeability liner within certain sections of the pipeline trench during the Operations phase. This assessment should include determining whether flows would be diverted into specific local surface water features. If impacts are determined appropriate mitigation measures should be developed.
- A leak detection system or monitoring program should be developed for the ETF spill collection system. The details of this system/program should be provided to NSE for review, comment and approval prior to the Construction phase.
- The pipeline and ETF excavation dewatering activities should be evaluated with respect to the 'Application Requirements For Water Withdrawal Approvals' and appropriate Approval applications be submitted (if required), including development of mitigation measures to manage discharge flows. This assessment should include an estimation of expected daily dewatering rates and time periods for the Project, and whether they will or will not trigger requirement for an application or applications.

General

- The project specific construction and operations environmental management plan (EMP) and environmental protection plan (EPP) to be developed as part of detailed design within the Registration Document should be provided to NSE for review, comment and approval prior to commencement of applicable Project phases.
- The proposed approval application activities associated with the alteration and/or removal of wetlands and watercourses, and subsequent works within, should be implemented to minimize potential impacts to those aquatic ecosystems, and fish and fish habitat. In support of the approval application process, it is recommended that consultation with appropriate provincial and federal

government departments occur prior to submission of appropriate Approval applications.

Surface Water Quantity

- At least one additional watercourse site visit should be conducted during ice-free conditions to at least the pipeline route intercepted watercourses. The site visits should document qualitative and quantitative channel bed and bank measurements and characteristics (e.g., bed materials, vegetative cover) at an appropriate cross-section and potentially support watercourse and/or wetland applications (if required).

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Date: March 5, 2019

To: Manager, Water Management Unit, Sustainability and Applied Science Division

From: Senior Hydrogeologist, Sustainability and Applied Science Division

Subject: Review of Class 1 Environmental Assessment – Northern Pulp Replacement Effluent Treatment Facility (ETF) Project

This EA review from the Sustainability and Applied Science Division Hydrogeologist focuses on the potential for the proposed undertaking/project to adversely affect groundwater resources, including general groundwater quality and local water wells/drinking water supply.

The purpose of the Project is to replace the existing Northern Pulp effluent treatment facility (ETF) with a new one to treat wastewater received from the Northern Pulp pulp mill at Abercrombie Point, Pictou County. The Project includes a new ETF and a new effluent pipeline that will carry treated effluent to be discharged in the Northumberland Strait.

Once treated, effluent would be sent via an approximately 15.5 kilometres-long pipeline. The effluent pipeline would follow the Highway 106 for approximately 11.4 kilometres, then enter the marine environment near the Northumberland Ferries marine terminal, and continue for approximately 4.1 kilometres through Caribou Harbour to the Northumberland Strait where the treated effluent would be discharged via an engineered diffuser.

Comments

1. There are no provincial Protected Water Area (PWA) near the proposed ETF or along the proposed pipeline route. PWA's are not required for drinking water supplies. The nearest PWA is for the New Glasgow Forbes Lake water supply approximately 17 km southeast of the Northern Pulp proposed ETF.

2. The Town of Pictou does have a Source Water Protection Area (SWPA) that extends to the town boundaries and in areas to the north. In particular, the SWPA covers significant sections (>50%) of Highway 106 to Caribou along the proposed

pipeline route. This SWPA is discussed in more detail under comment 4.

3. The nearest Registered Public Drinking Water Supplies (RPDWS from NSE records) to the ETF and pipeline route are as follows:

   ETF –
   - Country Villa Park RPDWS owned by Rivers Trailer Park company has registered a drilled well located approximately 1 km southeast of the proposed ETF

   - Northern Pulp Nova Scotia Corporation has a RPDWS for the Pictou Mill ETF location

   Pipeline Route north of the causeway –
   - Piper's Landing Restaurant approximately 2.9 km west of the proposed pipeline route

   - Several RPDWS located in the Braeshore area north of the Town of Pictou located >3 km east of the proposed pipeline route (Harbour Light Campground, Pictou Lodge Resort/Maritimes Inn and Caribou – Munroe's Island Provincial Park)

4. Municipal wells – Town of Pictou Wellfields and Source Water Protection Area

   The Town of Pictou operates two municipal water supply wellfields containing 13 wells as reported in their 2013 System Assessment Report to Nova Scotia Environment.

   The Caribou Wellfield is located mainly to the north of the existing town boundary (north of Division Road) and contains 5 wells. The Pictou Well Field is located almost entirely within the town boundaries and contains 8 wells.

   These two wellfields have similar sedimentary bedrock geology, although in the Caribou Wellfield area there is an overlying surficial geological unit of gravel and sands that has potential use as a distinct shallow aquifer. To the south, in the Pictou Wellfield area the surficial geology consists of a silty ground moraine till and is likely not suitable for significant aquifer supplies. Data from the Pictou Group bedrock underlying both wellfields however does show both well and aquifer yields that can provide sustainable long-term supply.

   The nearest municipal well to the proposed pipeline route is the "Public Works Well" located at the Pictou Public Works building about 150 m west of Highway 106, near the causeway. The next closest wells are > 1 km away, including the Caribou Wellfield wells to the north of the town boundary (and south of Highway 106).

   It should be noted that many of the Town of Pictou municipal supply wells are located in urbanized municipal areas and have existing risks related to maintaining source water protection, unrelated to the proposed pipeline. The Town of Pictou has

developed a Source Water Protection Plan (latest revision Oct 2017) to address potential risks. Potential risks related to pipeline routing are not specifically addressed. The attached Figure 1 here shows the SWPA delineated boundary. In comparison to Figure 2 (pipeline route also attached) it can be seen the pipeline route along Highway 106 crosses the SWPA delineated boundary in two areas.

5. The registration document from Northern Pulp identifies in Figure 8.5-1 (p. 192) two sets of dashed lines estimating the Pictou and Caribou wellfields extent, and a delineation boundary from the Pictou Source Water Protection Committee (SWPP report). It should be noted that neither of these estimated boundaries represent a strong scientifically valid description of the wellhead protection zones. However they may be useful for planning purposes. Quantitative hydrogeological determination of the well head protection area (WHPA) (numerical computer modelling) showing wellfield zones of contribution and expected times of travel would be beneficial in managing specific risks to the wellfields.

6. The online Nova Scotia Groundwater Atlas (Energy and Mines) was used (by this reviewer) to estimate the number of residential drilled wells within a 500 m radius buffer (on either side) of the proposed pipeline route from the ETF to Caribou. See the attached Figure 2 showing the 500 m buffer zone. The Atlas identified 62 water wells within the 500 m buffer distance. The majority of these are identified as for domestic use, but two are listed as public (non-municipal).

   In the registration document, the proponent reports 121 existing residential water supply drilled wells within a 500 m buffer of the proposed pipeline route. However, it is possible their search zone was different, as this number of wells could not be replicated using the Atlas identification tools with a 500 m radius buffer.

   It has been noted previously that the Well Logs Database Records and any mapping based on these records need to be considered in terms of locational errors/accuracy of the original data. In addition, the Well Logs Database does not contain a complete listing of every water supply well in the province and some areas may contain water supply wells not reported. Field truthing and field surveys for water supply well locations is necessary. This is particularly important given the discrepancies in the registration document concerning the number of water supply wells.

7. The treated effluent will likely contain natural chemicals found in the wood chips, added chemicals from processing and the effects of treatment which can reduce, create or alter chemicals. The chemical characterization is important from a groundwater and drinking water perspective, primarily with regards to the potential for any leaks, spills or other releases that are uncontrolled and enter groundwater or surface waters. Characterization is beneficial in order to plan potential monitoring and mitigation strategies.

   The chemical characterization of the treated effluent that would flow through the proposed pipeline is not determined, mainly because the new treatment processes proposed are not yet operational and no samples can be analysed. However, the

registration document does look at similar treatment plants from around the world. The document presents some lists of “candidate Chemicals of Potential Concern” or COPC that show the potential scope of chemicals in the treated effluent.

The document presents chemicals determined by similar pulp mill process in Tasmania, Australia. The “Toxikos (2006) study is considered to provide a reasonable interim indication of what may be expected in relation to NPNS project effluent chemical composition and characteristics” (p. 508). However, one uncertainty pointed out is that the wood chips used in the Tasmania are largely hardwood eucalyptus whereas at Northern Pulp they are softwood coniferous. The Tasmania project list of candidate COPC’s include:

From page 508:

• “Metals and metalloids.
• Selected plant sterols and steroids (phytosterols and phytosteroids).
• Methylphenols and other alkyl-substituted phenols.
• Nitrophenols.
• Phenol.
• Plant-based hydrocarbons such as pinenes, camphenes, carenes, limonene.
• Petroleum hydrocarbons (primarily long chain aliphatic hydrocarbons).
• BTEX (benzene, toluene, ethylbenzene, xylenes).
• Polycyclic aromatic hydrocarbons (PAHs).
• Alkyl and chloro-substituted PAHs.
• Numerous chlorinated volatile organic compounds (VOCs).
• Chlorinated benzenes and methoxybenzenes.
• Dehydrojuvabione.
• Juvabione.
• Furanones (chlorinated and non-chlorinated).
• Hydroxy and/or methoxy chlorinated diones and pyranonestals and metalloids.
• Thiolignins.
• Thiosulphates.
• Chloroacetic acids.
• Resin acids (chlorinated and non-chlorinated).
• Fatty acids.
• Various aliphatic and aromatic aldehydes and ketones (chlorinated and non-chlorinated).
• Aniline and chloroanilines.
• Chlorinated anisoles.
• Numerous chlorinated phenolic compounds including chlorinated phenols, catechols, cymenes,guaiacols, guaiacones, vanillins, veratroles.
• Vanillones (chlorinated and non-chlorinated).
• p-Cymene.
• Syringol and syringaldehydes.
• Various aliphatic alcohols.
• Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F).
• Chloromethyl sulfones.
• Chlorohydroxypyron.
• Thiophenes and chlorinated thiophenes.
• Hexachlorocyclopentadiene.
• Various ions such as ammonia, nitrate/nitrite, chloride, sulphate, hydrogen sulphide, carbon disulphide, chlorate, chlorite.”

Candidate COPCs for Northern Pulp Effluent

The proponent has gone further by considering other studies from the present Northern Pulp/Boat Harbour effluent and other Canadian studies that may be more relevant. They have reported another similar list, that is more specific regarding candidate COPC's expected for the Northern Pulp effluent. However, the focus here does seem to be on the ocean as the receiving environment.

From page 514:

"The chemicals that merit consideration as candidate COPCs from the review of previous studies and sediment or sea water data include the following:

• Metals (including mercury) and metalloids
• PAHs.
• PCDD/F.
• Phytosterols.
• Resin and fatty acids (non-chlorinated).
• Petroleum hydrocarbons, oils and greases.
• Chlorinated VOCs.
• Chlorinated phenols, catechols, guaiacols, vanillins and veratroles – [only detected in the ASB and other effluent-treatment process lagoons and basins, and primarily during the early 1990s; these compounds have not been detected in the marine receiving environment influenced by the current mill effluent discharge point].
• H2S and other sulphides.
• Chlorate/chlorite.
• Cyanide.
• Syringaldehydes."

On page 516 of the document, the proponent presents a description of sampling results from the untreated mill effluent. Actual sample results were not provided.

> A recent (2018) sample of untreated mill effluent (collected from Point A) underwent a very similar suite of chemical analyses as the 2018 Point C and D samples. This sample represents worst case effluent chemistry as it was collected at a point prior to the current effluent treatment process. Comprehensive chemical analysis of this sample shows that most candidate COPCs are below detection limits even in untreated mill effluent. The only candidate COPCs that were measurable (above RDLs) in this Point A untreated effluent sample (also generally at low concentrations near RDL values or within typical natural ranges in water) were: hydrocarbons, toluene, cyanide, metals and metalloids, phenol, o-cresol, a phthalate ester compound (likely from pipe materials rather than due to mill processes), chloroform, total trihalomethanes, and trace PAHs (phenanthrene and pyrene only). Mercury was not tested for in this sample, nor was 2,3,7,8-TCDD; 2,3,7,8,-TCDF (as testing of untreated effluent for these dioxin and furan parameters is not required under the PPER).

The above lists of potential COPCs include a variety of metal and chemical parameters that are of potential concern if accidentally released into groundwater or surface water. The potential COPCs from a groundwater, surface water and drinking water quality perspective need to be considered separately from those determined important for the receiving ocean environment.

8. Groundwater is identified as a Valued Environmental Component (VEC) by the

proponent in Section 8.5 of the registration document. The document states:

> "Groundwater was selected as a VEC because it contributes to drinking water aquifers in potable areas and may discharge to surface water and aquatic habitat." (page 185)

Section 8.5 also documents a number of groundwater conditions including numbers of municipal and residential wells along the proposed pipeline route and ETF, as well as in the Town of Pictou wellfield. Statistics based on well construction details are also provided such as well yield and depth. Most wells in the area are very capable of providing adequate yields for domestic water supplies and as demonstrated by the Town of Pictou wellfield, for municipal drinking water supplies. Groundwater quality is also generally good, with some well-specific issues potentially related to chemicals such as chlorides, manganese and other generally natural contaminants (or effects of road salting/salt water intrusion in the case of chlorides).

9. ETF Groundwater Monitoring

The project proponent describes existing groundwater sampling networks at the Northern Pulp Nova Scotia (NPNS) site. One of these networks is the Industrial Landfill Monitoring Network (27 shallow monitoring wells). The other is the operational NPNS Monitoring Network, near the ETF (6 shallow monitoring wells). These networks are being monitored following Approval Conditions specified for the existing plant operation.

Groundwater in the ETF area is relatively isolated in that it is surrounded on three sides by water (Pictou Harbour). To the south of the ETF, there are isolated private well water supply systems, but the nearest of these is about 650 m to the southeast.

Details of the ETF groundwater monitoring program are not fully provided in the registration document (Figure 8.4-1 page 173 does show the existing monitoring well locations and page 194 summarizes some of the results). However, as new facilities are to be constructed on the Northern Pulp site (including clarifiers, aeration basin and effluent spill basin) the monitoring network plan needs to be revised to include these new activities and locations. Groundwater monitoring needs to provide adequate testing to ensure any operational issues are identified and addressed before they become a significant risk to the environment.

10. Pipeline Route Groundwater Monitoring

The project proponent recognizes the critical nature of the groundwater VEC, particularly in relation to drinking water supply. Although the actual proposed monitoring is not specific, the proponent does state (page 202):

> "NPNS will develop a surface water monitoring program to monitor runoff within the pipeline footprint both during and subsequent to construction in areas where surface water can infiltrate to groundwater. As part of this program the frequency of monitoring and parameters to be assessed will be identified in consultation with NSE, particularly with respect to surface waters that could infiltrate

to groundwater within the municipal groundwater watershed areas identified within the SWPP and more populated residential neighbourhoods along the un-serviced portion of the pipeline footprint."

Groundwater monitoring along the proposed pipeline route is also an important function for protection regarding potential post-construction accidental spills from leaks, ruptures or other damage to the pipeline. Groundwater monitoring would need to include two components:

- Baseline monitoring of water wells (residential well survey)
- Monitoring of the pipeline itself for potential leaks, with particular focus on sensitive groundwater use areas and important surface water features (e.g. watercourse crossings and installations of the pipeline below the water table).

11. Pipeline Installation Below the Water Table

The proposed pipeline route may need to include installation below the water table in some areas such as wetlands and watercourse crossings. Some pipeline installation by Horizontal Directional Drilling (HDD) under watercourses is being proposed (page 65). The registration document provides a general description of methodologies to be used, however, if employed, each site using HDD, or with pipe installed below the water table, would need detailed assessment by the proponent and probable NSE approvals.

12. Pipeline Monitoring and Mitigation Measures

Pipeline monitoring for potential leaks resulting from accidental damage is perhaps one of the most important measures for protection groundwater and surface water supplies. Monitoring as close to the potential contaminant source is critical. For a long pipeline, as proposed, this does represent some challenges. The proponent provides some of their potential monitoring/mitigation measures on page 197-198.

"In light of the pipeline route crossing over the Town of Pictou's source water area, additional mitigative measures during construction of the pipeline will include:

- Lining the trench with an impermeable (or low conductivity) material so that, if a leak occurred, it would be contained and prevent vertical infiltration;
- The pipe will be constructed of >2 inch thick HDPE which combines strength and flexibility to withstand stresses as well as being resistant to corrosion;
- The pipeline will be constructed with fusion technology to eliminate most, if not all, jointed sections.
- Having a system in place to detect leaks (or a significant drop in pressure) during operation and maintenance; and
- Inclusion of the Pictou watershed area in the mill ERCP, including contacting the Pictou Water Utility, property owners with potable water wells along the pipeline route, and other stakeholders."

The measures proposed seem preliminary and would need to be expanded upon to provide sufficient risk mitigation. For example, leak detection using only pressure monitoring detection may not be sufficient given the chemical quality expected of the treated effluent, the large volumes of treated effluent passing through the pipe daily and the likelihood that even small accidental release volumes could adversely affect a water supply based on drinking water criteria.

13. Acidic rock drainage (ARD) due to surface water contact with disturbed soils or bedrock geology is a potential concern for both groundwater and surface water where construction excavation projects occur. Acidic rock drainage is not expected by the proponent, based on their review of geological conditions (page 164, 166). They state that the “Underlying Pictou Group bedrock is not known to produce ARD.” However, ARD testing of any bedrock encountered during excavation may be a reasonable expectation in order to confirm this.

14. Although the project does not anticipate involving blasting during construction (page 201), should any blasting be necessary, water wells in the vicinity of blast locations should be included in pre-blast surveys for the ability to determine potential effects to groundwater quantity and quality (see document page 95).

Recommendations

The following recommendations relevant to the groundwater evaluation are made regarding the Northern Pulp proposed ETF industrial activity.

Planning/Design Issues

1. Monitoring design plans for detecting potential spills/leaks resulting from accidental damage to, or malfunctions of the pipeline should be prepared with methodologies for further evaluation.

   Plans should include more details on methods to be used for monitoring for pressure drops/leaks. In addition, plans should address monitoring immediately adjacent to the pipeline where the pipeline is installed in areas of significant risk including: below the water table, in significant wetlands, in areas of watercourse crossings and in the two areas where the pipeline route crosses the Source Water Protection Delineated Boundary for the Town of Pictou Wellfields. The proponent should evaluate and present the use of pressure monitoring systems and shallow groundwater monitoring wells among other potential options.

2. Risk mitigation measures need to be more completely described for further evaluation regarding design to prevent/contain spills/leaks from pipeline accidental damage or malfunction, particularly in areas of significant risk. Description should be made of the practical operational efficacy of measures such as the trench lining proposed, as well as the potential need/benefits of secondary containment of the pipeline in areas of significant risk.

Operational Issues/Other Permitting Processes

1. Field-truthing and locational mapping of water wells within 500 metres radius of the proposed activities (ie. 500 m from each side of the centreline of the pipeline route, or from the ETF site boundaries) should be conducted prior to construction.

2. Pre-Construction Water Well Surveys should be conducted within 500 metres radius of the proposed activities (ie. 500 m from each side of the centreline of the pipeline route, or from the ETF site boundaries). These surveys should include both monitoring for drinking water quality parameters and well water levels and be conducted prior to any construction activities. Methodologies and monitoring proposed for the water well survey should be submitted to NSE for approval prior to implementation.

3. Groundwater monitoring plans in the ETF area will need to be enhanced to include the new activities proposed. This includes additional monitoring to include the area with the proposed new clarifiers, aeration basin and effluent spill basin. The effluent spill basin is proposed to be HDPE lined and this should incorporate leak detection monitoring. The ETF area monitoring plans should be reviewed and approved by NSE.

4. More details on the potential Chemicals of Potential Concern (COPCs) from a groundwater, surface water and drinking water quality perspective need to be provided and evaluated by the proponent in order that their contingency plans for monitoring and mitigation can appropriately include these parameters. Details should include a final list of COPCs and their range of concentrations expected both in untreated influent and treated effluent that could be released accidentally into the environment at the ETF site, or along the pipeline route.

5. Consideration should also be made for including specific measures in Northern Pulp's Environmental Response and Contingency Plan (page 97) that relate to contingencies that potentially involve the Town of Pictou Source Water Protection Plan, SWPA (Source Water Protection Area) and the Town of Pictou water supply wellfields.

6. If the project proceeds to the next stage, it is recommended that standard conditions be provided to the effect that the Proponent is responsible to replace or repair any water supply well found to be adversely affected by the project activities and operations to the satisfaction of the well owner.

Other Observations

1. The current Source Water Protection Plan for the Town of Pictou includes a conceptual indication of the groundwater zones contributing to the two wellfields and a larger Source Water Protection Area. As a greater protection measure, the Well Head Protection Area (WHPA) zones would be updated by better definition and quantitative (numerical) computer modelling to demonstrate the 0-2 year

(Zone A), 2-5 year (Zone B) and 5-25 year (Zone C) time of travel zones for the wells/wellfield. This would be useful in many ways for the beneficial management of the town's wellfield.

This would allow:

a) greater definition of the capture zones of the wellfields,
b) estimated times of travel for various contaminants to the wells which will be useful in providing greater definition and management of source water protection risks for the Town's SWPP
c) greater confidence in a hydrogeological model and wellhead zone protection

It is noted that the Source Water Protection Plan (SWPP) for the town water supply is the responsibility of the Town of Pictou and additional work to better define WHPA zones in the SWPP would require their cooperation and involvement.

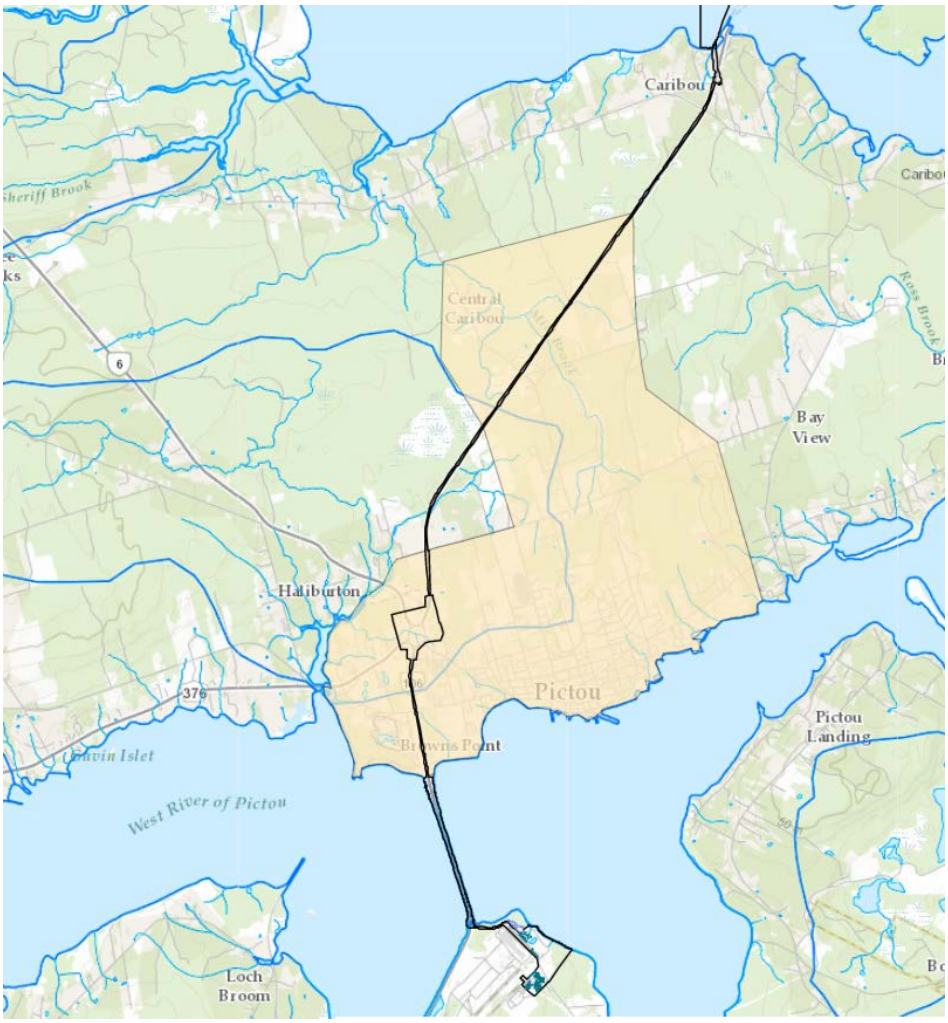

Figure 1 Town of Pictou Source Water Protection Committee Delineated Boundary (Town of Pictou, Pictou / Caribou Source Water Protection Plan 2017, NSE webmapping)

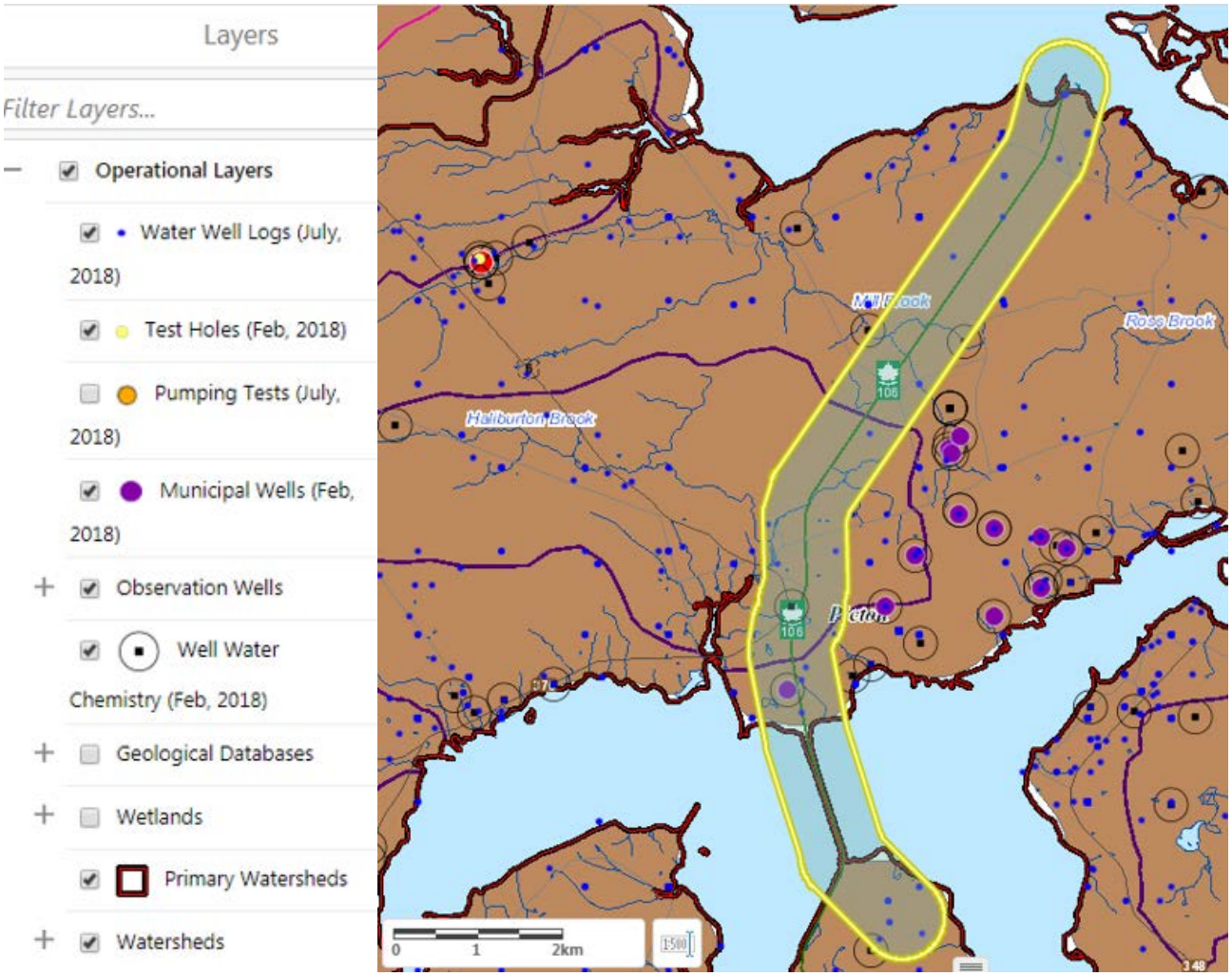

Figure 2 Proposed Pipeline Route 500 m radius buffer zone and water wells (NS Groundwater Atlas, Energy and Mines 2019)

Date: March 6, 2019.

To: Helen Yeh, Nova Scotia Environment

From: Beth Lewis, Consultation Advisor, Office of Aboriginal Affairs

Subject: **Replacement Effluent Treatment Facility Project**

The Nova Scotia Office of Aboriginal Affairs (OAA) reviewed the "Replacement Effluent Treatment Facility Project" and provides the following comments:

- Crown consultation is referenced on page 108 in a paragraph summarizing Northern Pulp's (NPNS) participation in consultation meetings with Pictou Landing First Nation (PLFN). It also mentions that Dillon attended a consultation meeting in November 2017 where the EA was introduced in advance of the public sessions. The EA process was introduced at this meeting but, to clarify, a draft EA was not provided at this time.
- On page 109, Dillon references the April 26 technical meeting but refers to it was "crown-led consultation". We wish to clarify that this was not an on-the-record consultation meeting, but a technical briefing provided by NPNS's consultant (KSH) for PLFN.
- Dillon's engagement summary does not include the meetings between OAA and NPNS/Dillon in which aboriginal engagement was reviewed and discussed (January 24 and February 26, 2018).

NOVA SCOTIA

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Sustainability and Applied Science

MEMORANDUM

To: **Helen Yeh, EA Officer, EA Branch**

From: **Manager, IMU**

Date: **March 6, 2019**

Subject: **Northern Pulp Effluent Treatment Facility EA Review Comments**

Hi Helen, below are comments provided by hydrologist engineering staff in my unit. Thanks

Scope of review:

The scope of this Environmental Assessment review from the NSE Sustainability and Applied Science Division Hydrologist is to assess the potential environmental impacts and proposed mitigations of the proposed undertaking on surface water quantity and management. While comments may also include considerations for impacts on general surface water quality, groundwater, freshwater fish habitat, and wetlands, appropriate technical specialists for these areas should be consulted for specific review and comment. This review is specifically focused on freshwater resources, and not on any potential marine impacts.

Documents reviewed:

The documents outlined below formed the basis for this EA review, and is referred to as the 'EA submission' through the rest of this memorandum:

- Northern Pulp Nova Scotia Environmental Assessment Registration Document – Replacement Effluent Treatment Facility. Including Appendices related to surface water. Report Prepared by Dillon Consulting. Dated January 31, 2019, and accessed from https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/

Comments re: Northern Pulp Effluent Treatment Facility EA document:

General:

- Appendix C outlines that the "current mill average effluent flow varies between 70,000 and 75,000 m^3/day". This does not align with the 62,000 m^3/day average reported in the submission.

- The values used in the receiving water study and for the design of the ETF are a maximum flow rate of 85,000 m3/day. A clear rationale for this design flow has not been provided in the submission.

Water quantity: Watercourses and Site Drainage

- Two watercourses (WC1 and WC2) will be impacted as a result of the construction of the ETF, and are documented to be small or intermittent watercourses that are previously influenced by the existing plant footprint and operations. WC2 is outlined as having potential for fish habitat, and it is reported that "Direct loss of fish habitat may occur at watercourse WC2 due to the spill basin and potential infrastructure footprint" (pg 218). An estimation of an affected area of 45 m^2 of fish habitat is provided in the submission.
- The proposed project "…does not intend to include in-watercourse or in-wetland crossings", with plans to avoid in-stream work "where technically feasible" (p. 65). It is further outlined in the submission that "Instream work will not be considered unless additional assessment is made during appropriate seasons of potential habitat effects and approvable mitigation designed" (pg 65). As part of this approach, Horizontal Directional Drilling (HDD) has been proposed as a potential method to be used.
- It is outlined in the submission that "If open cut crossing or isolation methods are considered, a seasonally appropriate field habitat assessment will be undertaken, appropriate mitigation proposed to meet NSE/DFO requirements, and work would be conducted under applicable NSE and DFO approvals." (pg. 73)
- As the effluent pipeline aligns with previously installed infrastructure, permanent alterations to watercourses and drainages associated with the pipeline are reported to be non-significant, with land clearing adjacent to the highway reported to "…not exceed a 10 m width, and in most areas will be considerably less" (p. 51). However, it is not clear in the submission whether the necessary permissions to use the existing infrastructure right of way in this way have been received.
- It is reported that "An Environmental Inspector will monitor the implementation of the EPP during all critical phases (i.e., clearing/mowing, topsoil salvage, replacement, grading drainage and watercourse crossings and clean-up) of construction;" (pg. 91).
- Monitoring for construction and post-construction near watercourses is outlined in Section 8.4.5. It is reported that "Watercourse monitoring will be conducted as part of the visual inspection of the construction of the project by a specialist" (pg 184), and the submission outlines that watercourses will be monitored and revisited after construction to ensure that they are stabilized (pg 184).
- It is reported that the timing of pipeline route selection only allowed for a preliminary reconnaissance visit to be completed prior to EA submission, and as a result, a "a conservative assessment was made on the potential for freshwater fish and their habitat and it was assumed that such species may be present where potential habitat is present in the pipeline local assessment area" (pg. 205). Additional assessment is reported to be planned for summer of 2019.
- The water availability report provided in Appendix M5 has been previously assessed as part of the Middle River water withdrawal application.

Water Quality

- Section 5.3.2.5 provides general details surrounding proposed approach to pipe leak detection and includes a reliance on regular inspection of the pipeline. Specific details surrounding the frequency and extent of these inspections are not provided in the submission.
- Section 5.7.2.3 outlines planned erosion and sedimentation control mitigations associated with project activities.
- Section 8.4.5. outlines that "The Construction Monitoring Program will be developed in consultation with NSE and will include monitoring of surface water (pH and TSS) during storm events" (pg. 184).
- It is outlined that a spill basin with 35,000 m^3 capacity is proposed, which will have the capacity to store 10 – 13 hours of discharge at full production. It is noted that "The spill basin should never be kept full, since it would then have no capacity to absorb any system upsets" (pg 43). It is not clear in the submission what criteria were used in determining the volume of the spill basin, and whether the volume is appropriate in mitigating cases of system upsets. The plan for operation and maintenance of the spill basin is not clear, and a result it is difficult to understand how the spill basin will be operated to ensure it is an effective mitigation.

<u>Conclusions and Recommendations:</u>

Planning/Design Issues:

- As it drives the design of the EFT and receiving water study, it is critical to have confidence in the 85,000 m^3/day maximum water use. At current, it is unclear how this number was determined and whether it is appropriate. Clarification surrounding the rationale for this number is required.
- The rationale for the adequacy of the proposed Spill Basin size is not clear in the current submission. It is recommended that details regarding the rationale and adequacy of the proposed Spill Basin size be provided to confirm the effectiveness of this proposed mitigation measure.

Operational Issues/Other Permitting Processes:

- Considerations for risks to the environment from using the HDD method have not been provided in the submission. It is recommended that detailed plans for any Horizontal Directional Drilling be provided to the Department for review prior to use of this methodology, with considerations for any potential risk and mitigation to nearby watercourses associated with using this method.
- It is also recommended that alternatives to HDD are presented as part of the application process so that any watercourse alteration activities can proceed effectively if HDD is not deemed feasible in the field.
- A detailed sediment and erosion control plan for the various activities proposed is to be developed by a qualified professional and is required to be submitted for NSE review and approval prior to construction activities, including clearing, grubbing, and stripping, take place.
- Watercourse alteration applications for watercourse crossings shall be accompanied with enough detail to illustrate how impacts to upstream and downstream watercourses and any existing water users will be mitigated as part of construction activities, supported by results of

fish and fish habitat assessments that the submission outlines are to be conducted prior to these activities taking place.

- Additional details for the spill basin are required prior to construction, including details of operation and maintenance that outline the measures that will be taken to mitigate the risk of overflow, failure, and/or accidental release of substances from the basin.
- Additional details surrounding the approach to pipe leak detection, with considerations for addressing the areas with highest downstream risk, is recommended.

NOVA SCOTIA

Agriculture

60 Research Drive
Suite A
Bible Hill, Nova Scotia
B6L 2R2

Date: 2019-03-07

To: Helen Yeh, Environmental Assessment Officer

From: Executive Director, Policy and Corporate Services
Nova Scotia Department of Agriculture

Subject: Replacement Effluent Treatment Facility Project Environmental Assessment

Thank you for the opportunity to review the Replacement Effluent Treatment Facility Project Registration Document.

The Nova Scotia Department of Agriculture (NSDA) has the following comments:

There are agricultural lands within 1 km of the proposed pipeline, however, the proposed pipeline route may not impact agricultural land bordering the Highway 106 directly.

NOVA SCOTIA

Fisheries and Aquaculture

60 Research Drive
Suite A
Bible Hill, Nova Scotia
B6L 2R2

Date: 2019-03-07

To: Helen Yeh, Environmental Assessment Officer

From: Executive Director, Policy and Corporate Services
Nova Scotia Department of Fisheries and Aquaculture

Subject: Replacement Effluent Treatment Facility Project Environmental Assessment

Thank you for the opportunity to review the Replacement Effluent Treatment Facility Project Registration Document.

The Nova Scotia Department of Fisheries and Aquaculture has the following comments:

- The seafood industry in areas adjacent to the project are important commercial fishing waters for many species including lobster. There are three active processing facilities and four active fish buyers operating or located within 25 km of the proposed project.

- The abundance and safety of seafood is important to the Nova Scotia economy and the harvesters, processors and exporters in the area that rely on the fishery. Although the responsibility for the marine environment, commercial fish stocks and safety of seafood rests with the Federal government through agencies including Department of Fisheries and Oceans and the Canadian Food Inspection Agency, any adverse effects on fish stocks would negatively impact the industry and economic growth of Nova Scotia.

- The Province of Nova Scotia issues licenses and leases for commercial aquaculture operations in the province. There are currently 25 licensed aquaculture sites within 25 kilometers of the proposed project, with the potential to grow that number. There are 23 marine shellfish sites and two land-based sites, with the closest marine shellfish site is 2.47 kilometers away from the proposed outlet. Water quality is important to shellfish aquaculture and must be considered in evaluating the nature and dispersion of the effluent and in any mitigation strategies and emergency shutdown planning.

- The proposal outlines watercourses along the proposed pipeline footprint where freshwater habitat and recreational fishing could be impacted. Specific comments

include:

- Under Section 8.6, Table 8.6.1: The proponent describes brook trout as *S3, Uncommon in the province,* however this species is very common in the province, including in area assessed in this document, and the primary species targeted for freshwater sportfishing.
- Clarity on whether there are contingencies in place to mitigate potential large and rapid fluctuations in water temperature at the diffuser location during low production or maintenance shut down periods would be helpful.

NOVA SCOTIA

MEMORANDUM

DATE: March 7, 2019

TO: Helen Yeh, Environmental Assessment Branch

FROM: Director of Protected Areas and Ecosystems

SUBJECT: Northern Pulp Nova Scotia Corporation (Northern Pulp) Replacement Effluent Treatment Facility Project

Following are comments from Protected Areas and Ecosystems Branch with respect to the Environmental Assessment application for Northern Pulp Nova Scotia Corporation (Northern Pulp) Replacement Effluent Treatment Facility Project

Wetland Comments:

Components of the project that have a direct impact on wetlands identified within the study area include the Effluent Treatment Facility (ETF) and the proposed effluent pipeline.

Summary ETF footprint:
Two wetlands were identified on the NPNS property within the footprint of the new ETF. These wetlands have been delineated and assessed in relation to the proposed work associated with construction, maintenance, operation of the facility. Both wetlands (WL1 and WL2) will be impacted by a direct loss of habitat as a result of construction of various components of the facility including the AST building and the effluent spill basin. Both wetlands receive stormwater runoff or have been historically altered/impacted by activities associated with development of the industrial site.

WL-1 (0.036 ha) – total loss of small wet meadow, likely result of site development.
WL-2 (0.75 ha)- removal of approx. 0.12 ha of habitat and associated functions relating to water retention and habitat services.

Wetlands on the landscape of the existing NSNP property represent approximately 4% of the total area, therefore it is unlikely that wetland loss will result in a significant loss of habitat. No species at risk (SAR) where identified to be specifically dependent on these features. As site development will likely require stormwater management, it is not anticipated that WL-2 would provide a significant role in this capacity as there is no defined inlet/outlet. Potential for impacts to wetlands as a result of operation of the facility are addressed through design of the effluent spillway and EPP document relating to spills/accidental releases.

Planning/Design
No specific concerns relating to design of the ETF.

Operational Issues/Other Permitting Processes
It is our understanding that specific design of the effluent spillway will be evaluated in conjunction with review of the treatment processes. This should be designed to ensure sufficient capacity in the event of a major malfunction/release from the mill facility and suitability of proposed system monitoring and environmental contingency plans.

Wetland approvals will be required for WL1 and WL2. Under the approval process, compensation for wetland loss will be required and additional monitoring of WL2 will be required to determine indirect impacts associated with construction/operation of the ETF. This could include vegetation, hydrology, soil/water quality monitoring.

Other Observations
Noted that both wetlands within the ETF have historically been impacted/influenced by site development history.

Summary of Pipeline:

While no formal delineation or assessment of wetlands that occur along the proposed pipeline route, preliminary identification of wetland habitats adjacent to the route have been identified using available datasets and sire reconnaissance.

In total, 20 wetlands were observed in vicinity to the proposed pipeline route. No direct disturbance of wetlands associated with construction of the pipeline are anticipated based on the use of the existing Highway 106 shoulder and proposed trenchless methodologies for construction to avoid sensitive habitats (including wetland associated with watercourse crossings).

Indirect impacts associated with construction of the pipeline are addressed through the EPP relating to spills/releases of treated effluent. Ongoing maintenance (routine vegetation maintenance) of the route is also expected to minimally impact wetlands along the route by following NS TIR standard maintenance procedures used along roadways throughout the province. Indirect impacts, relating to hydrology changes and water quality inputs associated with the pipeline construction can be mitigated based on the construction procedures proposed and through post construction monitoring. Based on the proposed route, it is unlikely that construction and maintenance of the pipeline will result in significant impacts to the adjacent wetlands.

One saltmarsh (WS3) was identified adjacent to the proposed pipeline route. All saltmarshes (tidal/estuarine marshes) are designated as Wetlands of Special Significance by the NS Wetland Conservation Policy. Again, no direct impact is anticipated associated with construction activities as the route will be confined to the existing causeway and road infrastructure.

The pipeline route reportedly crosses lands included in the source water area for drinking water for the Town of Pictou. As the source water area has not been designated under legislation, these wetlands are not necessarily afforded status as Wetlands of Special Significance.

It was noted that vernal pools may be present along the pipeline route. These tend to be small wetlands and may not exceed 100 m^2 in which case they would be exempt from the NS Wetland Conservation Policy and approval process. The location and size of these features should be provided. Field delineation and assessment of all the wetlands, including presence or absence of priority species, will be required to support wetland alteration applications.

Planning/Design Issues
It is our understanding that the pipeline route as identified in the registration document is dependent on approval from NS TIR to construct the pipeline within the developed Right-of-way of Highway #106. Additional work would be required to determine wetlands that may be impacted as a result of a change to the proposed route (i.e. a new route is determined to be required).

Operational Issues/Other Permitting Processes
Where applicable, formal delineation and assessment of wetlands along the pipeline route will be required prior to construction activities. Dependent on method chosen to cross wetlands, post construction monitoring will also be a requirement under wetland approval process and can include vegetation, hydrology, water/soil quality monitoring.

Permissions from property owners is also be a requirement of the wetland approval process, which should be considered with respect to the proposed pipeline route.

Risks associated with pipeline construction and effluent monitoring should be evaluated in conjunction with treatment objectives, relevant environmental criteria, and environmental protection and emergency response plans.

Other Observations
Proposed route is along an existing developed corridor and methods proposed for wetland and watercourse crossings include methods that would limit or mitigate the potential for alterations to wetland area and function.

Summary of Marine Effluent Discharge:

The marine effluent discharge does not directly impact on wetlands through construction activities. Potential indirect impacts, as discussed below, relate primarily to characteristics of the effluent itself, ability to achieve treatment objectives, and identification of environmental criteria that are protective of aquatic environments as well as characteristics of the receiving waters.

The potential indirect risks to coastal wetlands associated with a marine effluent discharge is possible in the event of a major malfunction of treatment facility. While evaluation of treatment objectives and receiving water body characteristics (i.e. currents, tides, fate of contaminants in marine environments) are beyond current staff expertise, it is the understanding that modelling of the discharge plume has been completed. Evaluation of the modelling and proposed treatment objectives should be conducted to ensure sufficient protection is afforded and treatment objectives are achievable based on the proposed treatment processes and any other requirements for discharges of pulp mill effluents into marine waters.

Planning/Design Issues
Identification and evaluation of coastal wetlands habitats that may be impacted as a result of effluent

discharge has not been provided in the registration document and were not included within the study area presumably based on the results of the discharge plume modelling conducted. Identification of these features, and other coastal habitat (beaches, estuaries, etc.), could be required if deficiencies within the modelling and treatment capabilities are identified in subsequent review of these components of the registration document.

Operational Issues/Other Permitting Processes
It is our understanding that environmental effects monitoring, which could include water and sediment quality monitoring programs, would be required under various approvals required to be obtain should the proposed project be approved.

Other observations:
None at this time.

Summary

- Prior to any wetland alterations, the proponent must obtain Wetland Alteration Approval for any wetland directly or indirectly altered by the proposed development and assess wetland function and resulting changes to wetland area/function in association with the approval application.

- Prior to work within 30 metres of a wetland, the proponent should develop, in consultation with Lands and Forestry and other regulatory bodies, a wildlife management plan that includes priority species associated with the wetlands and be referenced in any wetland alteration applications.

- Prior to altering any wetlands, the proponent must develop a wetland monitoring plan, which should include the following:
    - How baseline conditions will be documented before construction (and grubbing) begins. This should include indicators of hydrology, water quality parameters and vegetation community.
    - How changes in hydrology of the partially impacted wetlands will be monitored and proposed performance indicators.
    - How changes in the vegetation community of the partially in filled wetlands will be monitored, especially regarding the proportions of wetland specific plants, and invasive species and proposed performance indicators.
    - How changes in water quality of the impacted wetlands will be monitored and proposed performance indicators.

- Prior to any wetland alterations, the proponent must develop a Wetland Compensation Plan. The Wetland Compensation Plan and associated reporting requirements must be developed to establish specific objectives intended to prevent the net loss of wetlands and functions in accordance with the Nova Scotia Wetland Conservation Policy.

Protected Areas Comments:

- Due to the distance from any Nova Scotia's protected areas there are no comments or concerns.

NOVA SCOTIA

Environment

Barrington Place
1903 Barrington Street
Suite 2085
Halifax, Nova Scotia
Canada B3J 2P8

File No: 40100-30-273

Date: March 8th, 2019

To: Helen Yeh, Environmental Assessment Officer

From: Air Quality Unit

Subject: Northern Pulp Replacement Effluent Treatment Facility Environmental Assessment

Further to your request, the Air Quality Unit provides the following comments with respect to the Air Quality sections of the Class I Environmental Assessment Registration Document, dated January 31st, 2019, for the above-mentioned project:

Planning/Design Issues

1) The Air Dispersion Modeling Study limited the evaluation to air contaminants identified in Schedule A of the Air Quality Regulations and the current Operating Approval for the mill. The proponent should have identified the full air emissions inventory for the facility and modeled all potential air contaminants of concern, as a result of the proposed project.
2) An updated ambient air monitoring plan based on the air dispersion modeling results should be provided. This plan should include the identification and proposed location of additional monitor(s).

Operational Issues/Other Permitting Processes

1) Technical details associated with the method of sludge dewatering and proposed operational or physical modifications to the power boiler to manage sludge, should be provided with the Application for Approval under Division V of the Activities Designation Regulations.
2) Section 4 of the Air Dispersion Modeling Study indicates that the mill will conduct a pilot study on the co-combustion of hog fuel and wastewater sludge in the power boiler. Details of the proposed pilot study should be included as part of the Division V Application for Approval. The study plan should include, but not be limited to:
    a. Proposed volume of fuels to be burned, fuel mixtures, fuel feed rates;
    b. Proposed fuel feed method;
    c. Analytical characterization of the wastewater sludge to identify the contaminants of concern;

d. Comparison of the wastewater sludge with existing fuel characterization;
e. Proposed contaminants of concern for testing;
f. Proposed test methodologies;
g. Identification of air quality standards proposed for comparison during testing;
h. Proposed operating conditions of the power boiler during testing;
i. Proposed testing scenarios to demonstrate that testing will be conducted for the cases when the highest concentration of air contaminants would occur.

Depending on the results of the study, further modeling and testing may be required.

3) The Division V Application for Approval should include an alternate method for sludge disposal in case the pilot study for co-combustion proves unsuccessful.
4) The Division V Application for Approval should include an environmental response plan to address any malfunctions or upset conditions at the power boiler resulting from the co-combustion of wastewater sludge with primary fuels.
5) The Division V Application should include odor mitigation strategies for operations as a result of the proposed activity.

Other Observations

1) The following issues should be addressed in an updated Air Dispersion Modeling Study:
    a. The mill is authorized to operate at an annual production rate of 330 000 air dried metric tonnes/year. The air dispersion modeling study indicates that the mill currently produces between 280 000 to 300 000 air dried metric tonnes per year. The air dispersion modelling should represent results for the mill under its authorized production rate.
    b. The Tables of Emissions included in the Emissions Inventory Section provides the emission rates of air contaminants for the mill sources. The “Other Mill Point Sources” category should be broken down to individual mill point sources and include the specific modeled emission rate for each source.
    c. Sections 6.1 and 6.2 of the Air Dispersion Modeling Study should identify the maximum predicted concentrations of the modeling and the specific UTM Coordinates for the maximum concentration location.

Fisheries and Oceans Canada | Pêches et Océans Canada

P.O. Box 1006, P500
Dartmouth, NS B2Y 4A2

March 8, 2019

Your file *Votre référence*
17-6461-1300

Our file *Notre référence*
19-HMAR-00032

Nova Scotia Environment
Environmental Assessment Branch, Attn: Helen Yeh
Barrington Place
1903 Barrington Street, Suite 2085
Halifax, Nova Scotia B3J 2P8

Dear Helen Yeh:

Subject: Class I Environmental Assessment on the Northern Pulp Replacement Effluent Treatment Project

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received the Class I Environmental Assessment (EA) on the proposed Northern Pulp Replacement Effluent Treatment Project on January 31, 2019. For future reference, please refer to the below DFO file number and title:

DFO File No.: 19-HMAR-00032 / 19-EA-032
Title: Northern Pulp Replacement Effluent Treatment Project

At this time, the Program is pleased to offer general comments on the proposal for the Minister's consideration. A further evaluation of some aspects of the EA, such as fish species assemblages and fish population levels and distributions may follow, after the submission of additional information by Northern Pulp Nova Scotia (NPNS), through DFO's regulatory review process.

To begin, DFO would like to address the EA references to DFO's responsibilities for regulating effluent under the *Fisheries Act* (FA). The Pollution Prevention Provisions of the FA are intended to control the deposition of deleterious substances affecting fish, fish habitat or the use of fish, and are therefore of interest of DFO, Environment and Climate Change Canada (ECCC) and Health Canada (HC) in fulfilling their respective mandates. The administration and enforcement of Subsections 36(3) to 36(6) of the FA is led by ECCC, with support, cooperation and communication with DFO and HC, as appropriate.

With respect to the scope of the below comments, DFO's review of the EA was conducted pursuant to Section 35 of the FA; specifically related to the physical impacts from the proposed projects or activities, and the potential for them to cause serious harm to fish or fish habitat, which are part of, or support a commercial, recreational or

Aboriginal fishery. DFO's review also considered potential impacts to species at risk, as defined in subsection 2(1) of the *Species at Risk Act* (SARA).

At this time, the Project description is not sufficient to completely characterize the potential effects related to Section 35 of the FA. Additional information is required to sufficiently address the following information gaps: the disposal at sea location; the underwater marine benthic habitat survey; the detailed wetland and watercourse crossing information; and, the final pipeline construction methodology.

The Project description also identified and provided a thorough preliminary assessment of nine freshwater watercourses, and 11 wetlands that provide fish habitat. It should be noted that any watercourse or wetland alteration from pipeline installation works would be subject to regulatory review by DFO, under Section 35 of the FA. Therefore, DFO would require, for each watercourse or wetland alteration application, site specific information, including but not limited to, pipeline methodologies and timelines for any pipe installation. Additionally, a detailed fish habitat assessment, conducted by a certified habitat assessment specialist, would be required.

The Project also identifies that there will be approximately 4 kilometers of marine pipeline work, including the following: dredging, side casting, rock mattress placement, pipe placement, potential pipe armoring, construction of temporary access roads, and disposal at sea activities. Despite Appendix F of the EA document being detailed in terms of the potential installation methods for the marine section of the pipeline, additional information is required for the completion of DFO's full assessment of the proposed activities. This information includes the following:

a) Detailed benthic habitat information in the pipeline route;
b) Mitigation measures associated with each potential installation method;
c) Information at the pre-construction (baseline) and post construction monitoring phases of the Project, as well as during construction (e.g., information on turbidity monitoring, and how it will be conducted (divers, ROV, sampling program, etc.);
d) Construction timelines; and
e) Blasting details, if likely.

Once the above information has been provided by NPNS, the potential effects can be reviewed and evaluated through DFO's request for review process, which will determine if there is a need for a Section 35 FA Authorization. At this time, DFO's regulatory review of the marine pipeline construction is underway, and additional information has been requested from NPNS.

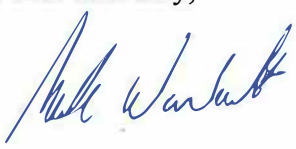
With respect to the Marine Refuge Scallop Buffer Zone (SBZ) within Scallop Fishing Area 24, it forms part of DFO's Other Effective Area Based Conservation Measures that contribute toward Canada's 2020 Marine Conservation Targets (MCTs). The conservation objective is to protect juvenile lobster and its habitat by restricting the activity of scallop dragging in this area. If a new activity such as the effluent discharge is permitted in or around this area and later deemed incompatible with the stated

conservation objectives, loss of Marine Refuge status may occur, in whole or in part. DFO has noted that the boundary of the marine refuge is not accurately represented in the EA document. As such, DFO is developing a more accurate image of the boundaries to clearly define the current Marine Refuge. It should be noted that, it is probable that the marine portion of the effluent pipe construction will travel through, and discharge inside the Marine Refuge. DFO recommends that the EA document also reflect that other species such as Sea Scallop and Winter Flounder are protected as part of the Marine Refuge. DFO will carefully assess the potential impacts to this physical habitat as part of the regulatory review process.

In closing, DFO looks forward to continued involvement in the review of the Project, and all associated works, such that fish and fish habitat is protected and conserved, and residual adverse impacts are reduced and mitigated to acceptable levels.

Thank you for the opportunity to review and provide comment. Should you wish to discuss the above, please do not hesitate to contact me at Michael.Wambolt@dfo-mpo.gc.ca or 902-402-5851.

Yours sincerely,



Mike Wambolt,
Section Head, Marine Developments
Regulatory Review, Ecosystem Management

NOVA SCOTIA

Lands and Forestry

M E M O R A N D U M

TO: Helen Yeh, NS Department of Environment

FROM: Department of Lands and Forestry

DATE: March 8, 2019

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

---

The Department of Lands and Forestry provides the following comments on the above project:

Crown Land

The proponent will require permissions from Land Administration (permit/easement/lease) for any pipelines, outfalls/intakes and other associated infrastructure beneath the Ordinary High-Water mark of both the large crossing at the junction of the three rivers before federal Pictou Harbour and in the Northumberland Strait.

The project description notes portions of the pipeline will be constructed within the limits of the public highway, should this design change, there are Crown lands that abut that public highway, and would require permissions from Land Administration (easement).

Coast Line Area:

The Department's mandate includes operating provincial parks in the immediate coast line area of the outfall. The cumulative effects monitoring program should be expanded to include monitoring for impacts to recreation activities, specifically swimming and beach use, as part of the socioeconomic impacts in the outfall area. Provincial park coast line areas of interest include: Caribou-Munroes Islands, Waterside Beach, MacKenzie Beach and Melmerby Beach.

Wildlife, Wildlife Habitat and Surveys:

The Department recommends that the following mitigation measures be included:

- *Section 8.9.3.1 and 8.10.3.1.* Construction activities should be mitigated to address any impacts to wildlife and wildlife habitat with respect to light, noise, and dust.

- *Section 8.10.3.1.* Options be developed to discourage waterfowl and other wildlife from using spill basin and clarifiers.

- *Section 8.10.3.2.*
    - The majority of anticipated work for the pipeline appears to occur within the highway Right of Way (ROW). If this project receives approval, a condition of approval should be that development of mitigations for non-migratory bird species, and nests or habitat for reptile and amphibian species that may be encountered during the course of work, must be done in consultation with, and approved by the Department of Lands and Forestry.

    - A mitigation plan specific to raptor species be developed, given the high number of raptors encountered within the Local Area of Assessment (LAA) through desktop analysis and encountered during field work (Appendix Q).

- An explanation is required on how the interpretation of the bird survey results may have been affected as a result of discrepancies in the survey methods. Section 8.10.2.3 indicated that surveys were conducted for 10 min and all birds seen and heard during this timing window recorded from a stationary location, with additional time given to ensure all birds were recorded. However, Appendix Q shows time spent at each survey site, with a range from 1 min-33 min spent on site. Although there is sufficient explanation for the time extension beyond 10 min, no explanation is given for when a survey took less than 10 min to complete.

- Develop a mitigation plan for *priority species (as defined in Section 8.0 under Valued Environmental Components (VECs))* that are encountered during field surveys to be undertaken in 2019 along the proposed pipeline route. The proponent is also advised to consult with the Department of Lands and Forestry and to seek approval for the plan.

- Section 8.13.3.2: The Department requires additional mitigation measures be taken to prevent disturbance of the colony of Double Crested Cormorants nesting on the banks of the causeway. A colony survey by the Department in 2009 recorded 413 Double Crested Cormorants nests on the banks of the causeway and 83 nests of the causeway pilings. This bird is a provincial responsibility; therefore, appropriate mitigation measures must be approved by the Department of Lands and Forestry.

It is recommended that the following surveys be added to the 2019 field season survey for birds and plants:

- Dedicated owl surveys and raptor nest searches at all project locations prior to the commencement of any work.
- Previous survey efforts were not sufficient to assess Common Nighthawk (*Chordeiles minor*) as they are most active at dawn and dusk. Surveys for Common Nighthawks be conducted within the project area prior to

commencement of work.

- Surveys for the colony of Double Crested Cormorants nesting on the banks of the causeway and adjacent wharf pilings. This survey was not identified in the Environment Assessment under: *Nesting Calendar for Breeding Birds within the Northumberland Lowlands Ecodistrict* (section 8.10.1.2).
- *Section 8.9.2.* Herptile surveys were conducted once in June 2018. Herptiles typically have peak activity periods twice in the year (spring and fall). Additional herptile surveys be conducted during the fall activity period.

Other information:

- *Section 8.10.2.4.* Great Cormorants are known to have bred on Amet Island in the Northumberland Strait and may still occur. This is a corrective note that the proponents may want to consider in future work on potential impacts to marine birds.

NOVA SCOTIA
Municipal Affairs

Maritime Centre, Floor 14 North
1505 Barrington Street
PO Box 216
Halifax, NS B3J 2M4

Date: March 8, 2019

To: Helen Yeh, Environmental Assessment Officer

From: Gordon Smith, Provincial Director of Planning

Subject: Northern Pulp's Replacement Effluent Treatment Facility Project

As requested, the Department of Municipal Affairs has reviewed the Environmental Assessment Registration Documents for the proposed Northern Pulp's Replacement Effluent Treatment Facility Project.

Departmental staff in their review have found nothing of particular concern within our Department's area of mandate. Still, we highlight the Statement of Provincial Interest Regarding Drinking Water, and assume that adequate consideration is being given to the Town of Pictou's water supply, since the proposed effluent pipeline crosses the source water area for that supply.

Thank you for the opportunity to review the Registration Document for the above-noted project. Should you require additional information, please feel free to contact either Andrew Paton, Senior Planner (902-424-7492) or me (902-424-7918).

Yours truly,

Gordon Smith
Provincial Director of Planning

c: Andrew Paton, Senior Planner, DMA

From: John Appleby <John.Appleby@pwgsc-tpsgc.gc.ca>
Sent: March 8, 2019 4:50 PM
To: Yeh, Helen X <Helen.Yeh@novascotia.ca>
Subject: FW: NPNS EA

Hello Helen. By way of introduction, I am the Operations Manager for PSPC Environmental Services group for Nova Scotia. I have attached our comments on the NPNS Replacement Effluent Treatment Facility registration material, originally provided to the Canadian Environmental Assessment Agency (Agency) on February 27th. The document summarizes our Department's interest and mandated responsibilities in relation to the Project. While the comments were originally developed to assist the Agency in making a decision concerning the most appropriate EA track, they may also provide some useful context to your current exercise related to Class l process elements. Please contact me at any time should wish to discuss. Have a great weekend.

PSPC Atlantic Response to the Canadian Environmental Assessment Agency: NPNS Designation Request. February 27, 2019.

1). Indicate if the project description of the Project presented in the project website is sufficient in characterizing project effects to the components of the environment as defined under section 5 of CEAA 2012 that related to your mandate including whether these effects may be adverse.

Public Service and Procurement Canada (PSPC) has provided a brief description of its mandated authority in respect of the Project in response to question 3 (below). As the custodian of the seabed for the affected portion of the internal waters and territorial sea of Canada lying outside a province, PSPC would need to be asked to provide a licence allowing the use of the ocean floor for the construction and operation of the effluent pipe and outfall.

PSPC has determined the Departments' scope of participation as a Federal Authority in relation to the Project according to CEAA 2012 (Act). In this regard, Section 2 of the Act provides a broad definition of the environment including specified "components of the Earth", and defines federal lands to include the relevant portions of the sea floor. Section 5(1)(a) of the Act requires several environmental effects to be taken into account by a federal authority, and Section 5 (1)(b) specifies that related effects need to be assessed for federal lands. Section 5(1) (c) of the Act provides specific requirements related to Aboriginal peoples that must be met over the course of any Federal environmental assessment of a Project, and Section 5(2) provides further requirements for involved Federal Authorities which include effects relating to health, socioeconomics, and physical and cultural heritage.

The majority of concern expressed in relation to the potential effects of the Project on the environment are focused on the potential adverse impacts from sustained effluent introduction into the marine environment, either during normal operations or due to upset conditions. While PSPC regards the environmental assessment registration document produced by Dillon Consulting Ltd. as being of professional quality, the Department also notes informational deficiencies related to the marine environment. Specifically, Dillon has indicated in the registration submission that for situational reasons"... it was not possible to conduct field work in the new pipeline corridor or marine environment in order to inform this EA Registration". It is understood that the additional work will be carried out during the spring and summer of 2019.

Under CEAA section 5, PSPC will need to satisfy itself as to the potential significance of environmental effects related to the Project, and in particular with those respecting the ocean floor and receiving waters, prior to making any final decision concerning the licencing of the seabed to enable the Project to proceed. Part of the related decision making will be dependent upon addressing these informational deficiencies.

PSPC is mindful of the duty to consult First Nations on the Project, and in this regard will consult with, or will participate in broader federal consultations with, First Nations communities and organizations to meet these obligations.

PSPC also notes that the Province of Prince Edward Island has officially expressed concern over the potential environmental effects of the Project on the Northumberland Strait lobster fishery, and has asked that a federal environmental assessment be carried out prior to approving the Project.

Subject to receiving a request for a license, PSPC is of the opinion that additional environmental assessment work will need to be carried out in order to satisfy CEAA 2012 Section 5 requirements and that additional consultations, particularly with First Nations, will be required.

2).Identify potential environmental effects not described on the project website and their linkage to components of the environment under federal jurisdiction (as defined under section 5 of CEAA 2012.

a).Identify whether any potential adverse effects are likely to be significant in nature; and,

b). Comment on whether any potential adverse effects identified could be managed by existing regulatory processes.

The registration material indicates that no residual impacts are likely to be significant in nature. As indicated above, the document has been crafted to a high standard. That being said, it is reasonable to assume that the additional information required regarding potential marine environmental effects will inform an evaluation of potential significance. Pursuant to CEAA 2012, Section 5(1) and 5(2), PSPC expects that additional consultations and assessment efforts pertaining to social, economic and cultural factors will also require additional assessment.
Once the environmental effects and mitigation strategies are understood, it is expected that existing regulatory processes (outside of PSPC) will figure prominently in ensuring that predicted effects are verified through follow up and monitoring and in evaluating mitigation efficacy. Regulatory compliance monitoring and associated enforcement activity lying within the purview of our federal counterparts is anticipated to comprise an essential part of this.
3).List the potential powers, duties or functions that your department may issue to enable the project to proceed, why they might be issued, and which project components and activities are related to the power, duties or function.

PSPC is the custodian of the seabed for the affected portion of the internal waters and territorial sea of Canada lying outside a province. PSPC would need to be asked to provide a licence allowing the construction and operation of the pipeline and outfall components proposed for that portion of the seabed that is subject to the Department's jurisdiction.

4). Potential environmental effects associated with power, duty or functions identified above., as described in subsection 5(2) of CEAA 2012. Please include in your response a description of the scope or extent (i.e. project activities addressed and components of the environment included) under this power, duty or function).

As previously noted, PSPC may be asked by the proponent to licence the use of the seabed. Should this occur, PSPC will need to be satisfied with regard to the significance of impacts on the marine environment as well as socioeconomic and cultural issues in relation to these environmental effects. PSPC will engage with other directly mandated federal counterparts for advice as we proceed.

5).Has your department or agency already exercised the above-noted power or performed a duty or function to enable the proposed project to proceed in whole or in part? If yes, please describe.

No.

John Appleby
Manager, Regional Operations
Public Services and Procurement Canada
Environmental Services
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Halifax, Nova Scotia.
B3J 1T3

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Birthplace of New Scotland

Office of the Mayor
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Nova Scotia Environment
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Halifax, NS, B3J 2P8
Fax: (902) 424-6925

March 8, 2019

Attached is a formal response from the Town of Pictou regarding the Northern Pulp Nova Scotia, Replacement Effluent Treatment Facility Project.

Thank you for your consideration of the identified concerns.

James Ryan
Mayor

Town of Pictou

Response to

Northern Pulp Nova Scotia
Environmental Assessment Registration Document
Replacement Effluent Treatment Facility

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   C: Economic Effects for the Town During the Construction Phase of the Project

5. Appendices

1. Town of Pictou Statement of Position:

The Town of Pictou hereby informs the Nova Scotia Department of Environment that it can not support the Northern Pulp Nova Scotia plan for the Replacement Effluent Treatment Facility. Additional risk, however small, to the domestic water supply is unacceptable.

2. List of Concerns to be Addressed:

A. The plan creates additional risk to the Town water supply by the on-land portion of the proposed transmission pipe carrying treated effluent to Caribou Harbour.
B. The limited information in the Environmental Assessment Registration Document regarding the potential for increased (new) toxins and/or odours produced as a result of the re-location of the Activated Sludge Treatment (AST) facility to Abercrombie Point, the burning of sludge in the power boiler, and the venting of air as part of the transmission of warm effluent through the Town of Pictou.
C. Economic effects of potential disruption(s) to tourism traffic to and from the (Caribou, NS – Wood Island, PEI) ferry terminal during the construction phase of both the on-land and under water portions of the effluent pipe.

3. Context for Responding:

The Town of Pictou is a community of approximately 3200 residents located on the north shore of Pictou Harbour approximately three kilometers from the Northern Pulp Nova Scotia facility. The Trans-Canada Highway (TCH) 106 runs through the west end of the Town and proceeds to the Northumberland Ferry Terminal at Caribou Harbour. The Harvey A. Veniot Causeway connects the Town of Pictou to Abercrombie Point where Northern Pulp is located.

For 52 years Northern Pulp and its previous owners have provided a reliable and, depending with whom you speak, a greatly appreciated source of income for many members of the community through direct employment at the processing facility and the integrated forestry and trucking industries. The mill and its air emissions are visible from most (all) locations in the Town of Pictou. In November 2017, Pictou Town Council passed a Resolution to request

consideration for Federal oversight of the Northern Pulp project and that there be 'no harm to the Northumberland Strait fishery' (Appendix F, Pg. 1)

In the 1990s The Town of Pictou created the Pictou Waterfront Development Corporation with the goal of improving the waterfront/downtown district while promoting the tourism sector. The signature attraction for the development was the construction of a full-size replica of the *Ship Hector*. The $10M project was completed with financial support from the Atlantic Canada Opportunities Agency (ACOA), the Province of Nova Scotia and the Town of Pictou. The Pictou Waterfront has since been and is expected to continue to be significant focus of economic interest within the Town.

Pictou is the home of Advocate Printing and Publishing, AECON Fabco (Shipyard), CMS Steel Pro Mechanical. Council continues to embark on projects promoting the Town as the service and entertainment centre for Pictou West and a tourist destination.

Within the past 15-20 years the Town of Pictou, with financial support from Provincial and Federal governments, has completed several significant additions and upgrades to important infrastructure ensuring the comfort and security of residents and visitors. This work is aimed at ensuring long term sustainability and compliance with health and safety standards.

Construction and commissioning of a municipal Wastewater Treatment Facility for the Town of Pictou and surrounding area took place in 2011. The facility processes one hundred percent (100%) of the Town's sewage and, unfortunately, a large portion of the storm water. Our tests reveal one hundred percent (100%) compliance in achieving standards for effluent and the development of a storm water plan for the Town is now underway so future wastewater needs can be met. We are extremely proud of our advances in service to the community and the protection of our environment.

The Town of Pictou has, in the past, consistently experienced issues associated with water discolouration and mineral build-up in the distribution pipes. A new 'state of the art' Water Treatment Plant was commissioned in October 2019 to centralize water treatment and distribution while removing high levels of manganese and iron from the supply. We are very pleased that initial scientific testing and a positive public response indicate great success as we continue to upgrade our infrastructure to ensure safe and reliable water for home and commercial use.

4. Environmental Assessment Concerns (In Order of Significance):

A. Risk of Ground Water Contamination

The proposed on-land portion of the pipe carrying treated effluent to Caribou Harbour will cross both the Pictou wellfield which is completely within the Town of Pictou boundaries, and, the Caribou wellfield which is situated completely within the boundaries of the Municipality of Pictou County. Both wellfields are located within the delineated boundary of the Caribou/Pictou Watershed protected area identified of in Figure 1 of Appendix D (Pg 6).

The Town has been granted Permits from the Province of Nova Scotia to draw approximately half of the Town's potable water from wells within the Caribou wellfield and the rest from the Pictou wellfield. A total of approximately 600K cubic meters are pumped annually from eight active wells. Limits for water extraction from the various wells can be found in Table 2 of the Permit (Appendix B, Pg. 8). As part of the permitting process, the Caribou/Pictou Source Water Protection Committee was formed, and the Pictou/Caribou Source Water Protection Plan was completed (Appendix D). This plan identifies risk and best management practices for mitigating risk should accidents occur.

Residents of the Town of Pictou depend on the groundwater drawn from the Pictou/Caribou watershed for their drinking water. The Caribou and Pictou wellfields are the only viable sources of potable water and it would be safe to conclude that without this dependable source of water there could be no town. It is the Town's position that we can not be supportive of any activity that would add additional risk to our water supply regardless of the many references to 'insignificant' risk in the Environmental Registration Document. More specifically, we cannot support the planned construction of a pipe carrying the treated effluent containing 'residual contaminants' (Registration Document, Pg. 32) along TCH 106. In the original Source Water Protection Program from 2005 the hydrologist representing *ADI Limited* identified a 'Zone of Influence' which shows the extent of the sand and gravel aquifer where surface water could affect the Town water supply (Appendix A, Pg. 4). A large stretch of TCH 106 is situated well within the aquifer and, therefore, we should assume that any accidental spills in the area could be harmful to our citizens.

It should also be noted that, as a 'General Term' within the Town's Permit To Withdraw Water, the Town has indemnified the Province against our (the Town) actions in causing 'damage resulting from the activities performed pursuant to this Approval' (Appendix B, Sec. 3(v)).

B. Additional Air Emissions and Odours Associated with the AST (Activated Sludge Treatment) and Transmission of Effluent

The Pictou West area, including the Town of Pictou is the recipient of a significant portion of the air emissions from the mill operations as shown in (Appendix E, Figures 1 and 2, Pages 3 and 5). As a result of this, residents and visitors alike have complained about the emissions including concerns for the long term effects on their health. Numerous studies suggest that higher levels of certain illnesses are evident in the area. For many years, dining and accommodation operators have also expressed concern about lost revenue as the result of odours associated with the air emissions from the mill.

Despite significant improvements to overall emissions with the recent construction of the Precipitator Unit, emissions and associated odours continue to affect the Town on a regular basis.

With the relocation of the Activated Sludge Treatment (AST) Facility to Abercrombie Point we are concerned that new odours, similar to those that have been a problem around Boat Harbour since the mill was made operational, might have a tendency to 'drift' in the Town's direction. Additional contaminants in the emissions from the Power Boiler when the sludge from the new treatment facility is incinerated will also be of concern. The Environmental Assessment fails to provide comfort that particulate emission and odours will be handled to the Town's satisfaction.

An additional concern exists regarding the proposed venting along the on-land portion of the effluent pipe. It is our understanding the vent must be placed at a high point in the transmission line which could be between the Harvey A. Veniot Causeway and the Pictou Rotary. If this is to be the case, we expect that there could be additional odours from the warm treated effluent at that location. Also, should any unintended blockages of the pipe occur beyond that point, it could be concluded that the vent would provide a release point for effluent until the flow is stopped. It is important to note that his point is within the Town limits and is above the Pictou Wellfield.

C. Potential Economic Effects of the Pipe Construction Phase on the Economy

The Town of Pictou is located approximately eight kilometers from the ferry linking Nova Scotia to Prince Edward Island. This is a major entry and exit point to Nova Scotia where approximately 20 000 vehicles use the ferry each year between April and December.

Our community is, not only, a service centre for the Pictou West area but also a stopping place for travellers and a tourist destination. Many of the Town's businesses and tourist attractions are seasonal operations and depend on the high traffic volumes from May to October.

The timeline for construction outlined in Table 5.4-1 (Registration Document, Pg. 82) indicates that land clearing, construction and watercourse construction for the land portion of the pipe will take place from November 2019 until possibly September 2020 and the Marine portion from April 2020 to October 2020.

Should travellers choose to avoid the Northumberland or TCH 106 due to construction, financial impacts would be felt by the businesses and seasonal operators in the Town and the surrounding area.

5. Appendices:

Appendix A: Source Water Protection Program (Prepared by ADI Limited, September 2005)

Appendix B: NSE Approval to Withdraw Groundwater from Pictou and Caribou Wellfields (Approval No: 2002-026956-R01, June 21, 2013)

Appendix C: NSE Permit to Operate a Water Supply System (Approval No: 2012-080096-R02, March 4, 2016)

Appendix D: Pictou Caribou Source Water Protection Plan (2013, Revised in 2014 and 2017)

Appendix E: *Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia* (Hoffman, Guernsey, Walker, Kim Sherren, Andreou, 2017)

Appendix F: Correspondence on the Matter of the Effluent Treatment Facility Proposal(s).

- To: NS Minister of Environment, Federal Minister of Environment and Climate Change, Federal Minister of Fisheries and Oceans (December 2017)
- From: Canadian Environmental Assessment Agency (CEAA), (March 27, 2018)
- To: Mr. Bruce Chapman, General Manager, Northern Pulp Nova Scotia (October 24, 2018 and November 2, 2018)
- From: Mr. Bruce Chapman (October 26, 2018)
- To: Canadian Environmental Assessment Agency (CEAA) (February 24, 2019)

Appendix A

Source Water Protection Program

(Prepared by ADI Limited, September 2005)

Environment and Labour
Environmental and Natural
Areas Management Division
Water and Wastewater Branch

5151 Terminal Road 5th floor
PO Box 697
Halifax, NS B3J 2T8

NOVA SCOTIA

Fred J. Bonner, MASc.
MURP
Watershed Planner

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Oblique aerial view of the Town of Pictou looking north with the urbanized "Town" Well Field in the foreground and the forested area surrounding the "Caribou" Well Field in the background.

Source Water Protection Program
Town of Pictou

ADI Limited

File: (24) 3945-001.1
Date: September 2005

This report was prepared by ADI Limited for the account of the Town of Pictou.

The material in it reflects ADI Limited's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ADI Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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ADI Quality System Checks			
Project No.:	(24) 3945-001.1	Date:	2005.Sept.22
Issue Status:	Final	Revision No.:	0
Prepared By:	Fred Baechler, M.Sc., P.Geo.		Fred Baechler
Reviewed By:	Matt Blais, B.Sc., CET		mBlais

1.0 INTRODUCTION

1.1 Location

The Town of Pictou is located along the Northumberland shore of Nova Scotia within the Municipality of the County of Pictou (Figure 1-1A). The Town encompasses some 8.14 km^2 within its political jurisdiction along the north shore of Pictou Harbour.

Pictou was first settled in 1767 with the Hector arriving in 1773. It was subsequently "founded" (1788), and given its name as the Shiretown of Pictou County in 1792. It became incorporated in 1873. Since that time, the Town's population has grown gradually to its present level of approximately 4000 people.

1.2 Goals of This Report

This report has been prepared for the Town of Pictou by ADI Limited (ADI) to meet the requirements of the Nova Scotia Department of Environment and Labour's (NSDEL) Source Water Protection Planning. This is now a condition of approval for all water works in the Province. Given historical work (Section 1.3) and ongoing studies (Section 1.4) this Protection Plan should be considered a continual "work in progress".

1.3 Background

The Town of Pictou was authorized to develop its water supply in 1888 and has been extracting groundwater for municipal services since 1901. Up until 1901, water was supplied from privately owned wells in the Town, which were not maintained in a sanitary condition. To overcome the danger of disease, the first council (1874) appointed a Superintendent of Wells and Pumps and requested aid from the provincial government. Subsequently, Chapter 120 of the Nova Scotia Acts in 1888 provided for supplying the Town with water. This authorized and empowered the Town Council to provide a sufficient supply of water for domestic, fire and other purposes. These early actions started what is now over 125 years of Development, Management and Protection of its water supply. *This foresight and list of accomplishments form a remarkable achievement for such a small community, and only a 1250 domestic user rate base.*

The first well field outside the Town, referred to as the Caribou Well Field, was constructed in the early 1900's. The first seven wells were drilled in 1901, followed by additional ones in 1907 (Smith-Grant) and 1943 (Footes Lane), all drawing from the bedrock aquifer. Although outside of urban activities, and easier to protect, it was within a different political

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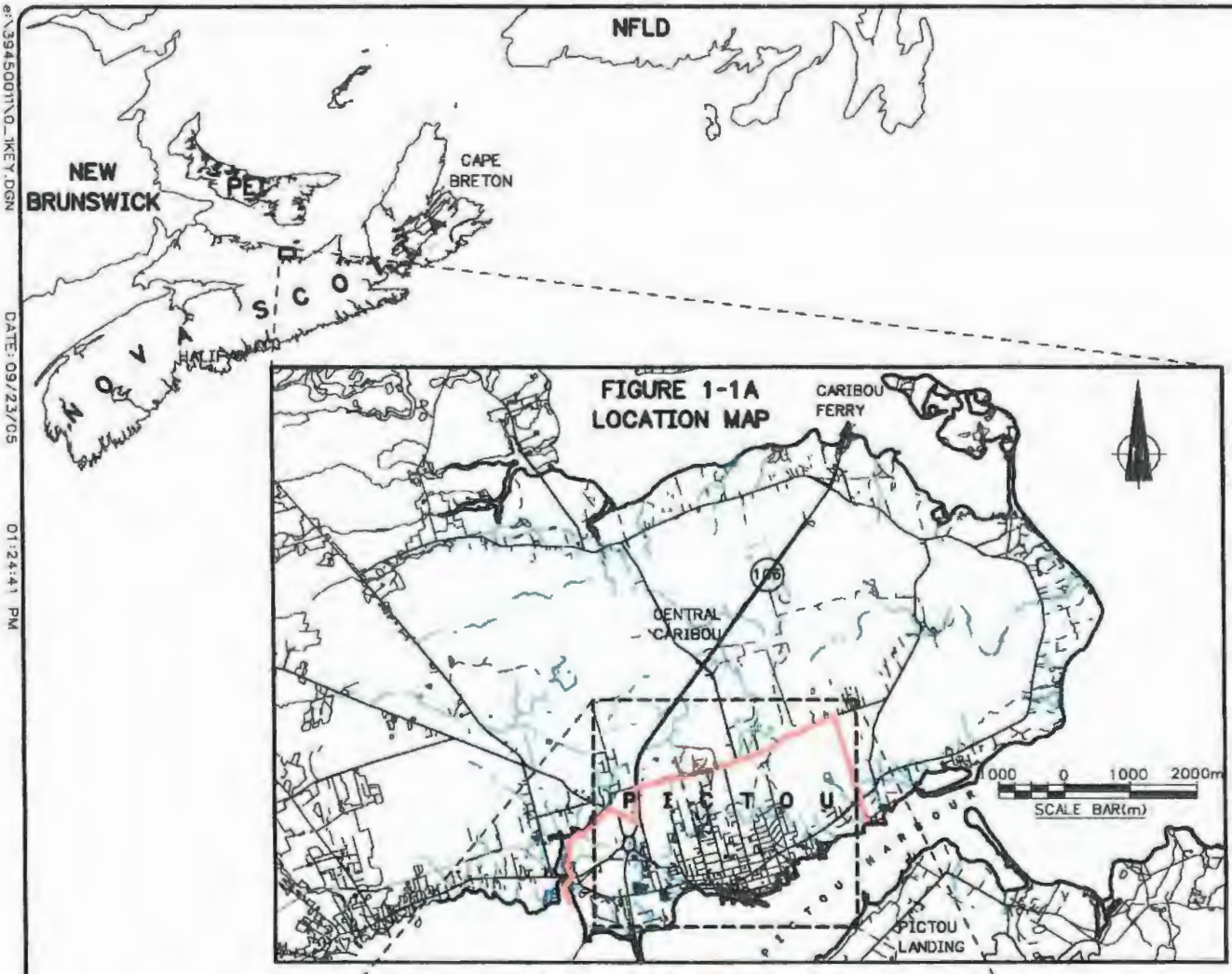

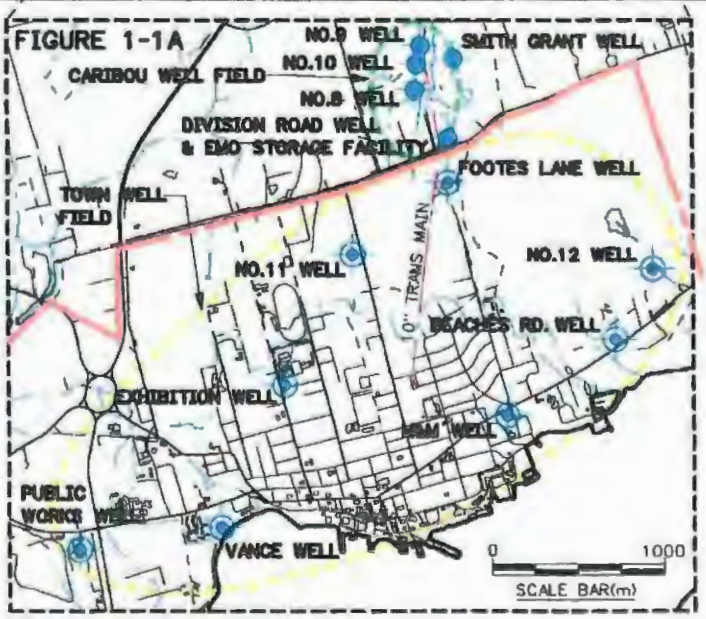

FIGURE 1-1B
LOCATION OF WELL FIELDS

LEGEND:

CARIBOU WELL FIELD

TOWN WELL FIELD

TOWN BOUNDARY

This drawing is not to be scaled

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Proj. TOWN OF PICTOU GROUNDWATER RESOURCE MANAGEMENT

Dwg. LOCATION OF TWO WELL FIELDS SUPPLYING TOWN OF PICTOU

Drawn By: NEB		Proj. No. 3945-001.1	
Dwg Standards Chk. By:		Dwg. No. FIGURE 1-1	
Designed By: FEB		Date Last Modified: 05.AUG.25	
Design Chkd. By: FEB	Last Modified By: NEB		Rev. 0

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jurisdiction, a source of future problems. By the late 1960's the well field supplying the Town encompassed 14 active pumping wells, nine of which were on the vacuum system within the Caribou Well Field (Figure 1-1B).

The 1970's and 1980's saw a period of *Resource Evaluation and Well Field Expansion.* These technical studies culminated in two new production wells in the Caribou Well Field and delineation of additional target areas for future expansion.

The 1990's focused on *Well Field Protection*, long before it became the "thing-to-do" after the Walkerton tragedy in 2000. During this decade, the Town brought on a hydrogeologist for technical guidance. Numerous studies focused on delineating the extent and source of recharge supplying the Caribou Well Field aquifer, as well as assessing and mitigating potential risks; before NSDEL requested it in 2002. A three zone Well Head Protection Area (WHPA) was outlined with a listing of "permitted uses" and suggested "constraints".

This work culminated in a formal request to the Minister of NSDEL to designate lands surrounding the Caribou Well Field as a protected area in 2002. Unfortunately, this request was turned down.

The last five to eight years have been characterized as *Adaptive Management.* This approach is "learn by doing", which manages multiple issues with action based on incomplete knowledge using the Pre-Cautionary Principle, supported by feedback through monitoring. requirements.

1.4 On-Going Studies

At the time of submission of the Surface Water Protection Program (SWP) a number of relevant studies and activities are ongoing, specifically:

1.4.1 Activities

The Town is maintaining their hydrogeological technical advisor, purchasing land around the Caribou Well Field, developing protection plans for the Urban Well Field, hiring summer staff, upgrading the distribution system, searching for additional supplies within the Town boundaries, expanding their digital database, working with the Pictou County District Planning Commission on land use constraints, addressing demand side management by installing water meters and requesting rate increases, as well as continuing to educate the public on water.

1.4.2 Studies

Groundwater under Direct Influence (GUDI): The Town is presently eight months into the one year assessment of NSDEL's Phase II level GUDI of surface water effort on 12 wells.

Distribution System: The Town is presently assessing and upgrading the distribution system, parts of which are over 100 years old. It has instituted an assessment of chlorine demands, potential for trihalomethanes (THMs) and haloacetic acids.

Additional Production Wells: Foresight necessitated assuming replacement wells would be a more efficient response to any GUDI problems which arise, if they can be positioned within Town boundaries and direct flow to the central reservoir for treatment. A test drilling/pump exploration program is underway to locate such supplies.

Water Sampling of Wells: As part of "due diligence" associated with the Adaptive Management Approach, the monitoring program supplying feedback on the Town's actions encompasses more than that required by the NSDEL permit. Along with "Source" and "Distribution" system monitoring, the Town has incorporated a "Source Protection" program, which monitors the "health" of the aquifers and allows us to reflect impacts of climate change into our strategies.

1.5 Report Outline

Building upon the background outlined above, the main body of the report initially summarizes the characteristics of the existing water system supplying the Town of Pictou (Section 2.0). The remaining sections follow NSDEL's five steps to Source Water Protection Planning namely:

Section 3.0 Delineate Source Areas
Section 4.0 Identify Potential Risks
Section 5.0 Develop SWP Strategies to Manage Risks
Section 6.0 Develop a Monitoring Plan
Section 7.0 Develop SWP Advisory Committee

The text for each section summarizes salient points. Support documentation can be provided upon request.

2.0 EXISTING SYSTEM

The groundwater supply for the Town presently comprises 13 wells encompassed with two well fields identified as the "Caribou" and "Town" Well Fields (Figure 1-1B). Presently, the demand ranges from 950 to 1040 Lpm for a population of about 4,400.

The Pictou Water Utility was issued an operating permit for the Town of Pictou's Water Supply by the NSDEL on 19 March 2003: Approval No. 2001-024443.

The Caribou Well Field is located north of the Town Boundaries, within the basin-shaped, central part of the Pictou Peninsula. It is presently comprised of five active pumping wells (No's 8, 9 and 10, as well as Smith-Grant and Division Road wells). This comprises approximately 45% of the present total Town demand.

The Town Well Field is located within the Town of Pictou's political boundaries. It is presently comprised of eight active pumping wells. They include Footes Lane, Public Works, Exhibition, Vance, M and M, Beeches Road, No. 11 and No. 12. All were constructed between 1942 and 1969, except for No.'s 11 and 12, which were brought on line in 1989 and 1996 respectively.

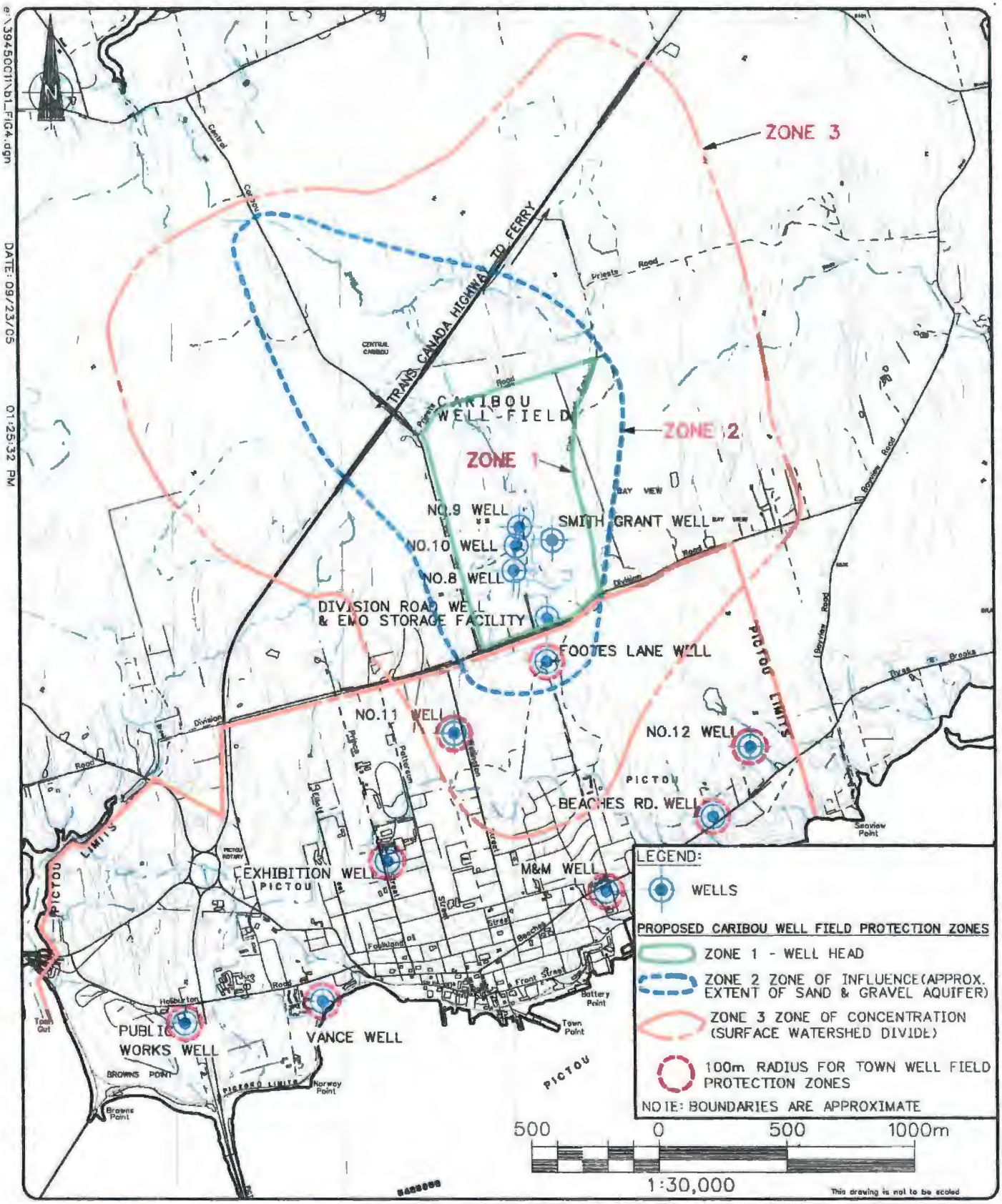
3.0 DELINEATION OF SOURCE AREAS

This section initially summarizes the present state of knowledge of the physical and chemical characteristics of the hydrological cycle within which the extractions are occurring; support documentation can be provided if so required. This forms the technical base upon which the delineation of Source Water Protection areas is based, as outlined in Section 3.2.

3.1 Conceptual Model for Ground and Surface Water Flow Fields

Climatologically, the area experiences a humid continental climate. A water balance analysis indicates slight water deficits in June, July and August, with moisture surplus creating Spring and Fall groundwater recharge periods. Longer term trends note gradual declining precipitation and elevated air temperature since the early 1990's, suggesting less water available for recharge.

Physiographically, the Town and its well fields are located within the Pictou peninsula (Figure 1-1A), bounded to the northeast and south by salt water of the Northumberland Straits and Pictou Harbour.



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Proj.	TOWN OF PICTOU GROUNDWATER RESOURCE MANAGEMENT
Dwg.	CARIBOU WELL FIELD PROTECTION ZONES - 2001

Drawn By: NEB	Proj. No. 3945-001.1	
Dwg Standards Chk. By:	Dwg. No. FIGURE 3-1	
Designed By: FEB	Date Last Modified: 05.SEP.09	
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Hydrogeologically, the Peninsula is positioned with a "Lowland Setting" consisting generally of a glacial till over bedded sedimentary rock. The Caribou Well Field extracts water from the Upland Aquifer Complex, combining both a surficial sand/gravel, as well as a bedrock aquifer. The Town Well Field draws water from the bedrock aquifer.

There are three Hydrostratigraphic Units (HUs), which control water flow to the well fields, including the Pictou (bedrock) HU, Sand and Gravel (S/G) HU and the Till HU. The Pictou and S/G HUs can be defined as a Class 1 Aquifers, utilizing NSDEL's classification (Shawinigan Eng. Ltd., 1980). The Till HU is an aquitard, which semi confines the Pictou HU.

Hydrological analysis has keyed to the Caribou Well Field, given the surficial nature of the S/G aquifer, and its susceptibility to the introduction of contaminants from streamflow. A tributary of Mill Brook, identified as Beaton's Brook, extends through the middle of the well field, draining from south to north. Of the four inflow streams, only one is perennial, primarily since it over lies the S/G aquifer, which provides base flow during the summer. All channels disappear upon entering the central core of the S/G aquifer in the lowland area surrounding the production wells, and continuing through almost to Priest Road. This is expected to be a function of recharge into the S/G aquifer.

3.2 Source Water Protection Areas

3.2.1 Approach

Delineation of SWP's for a groundwater source requires detailed hydrogeological analysis of the aquifers transmissivity (T) and storage coefficient (S) in order to delineate drawdown cones and travel times. However, most of the production wells became operational prior to requirements for pump testing and cannot be turned off to allow for testing, due to demand on the system. Therefore, T and S values for every well are not available and delineation of Well Head Protection Zones based upon travel times is not possible. At this stage the conceptual/analytical model summarized in Section 3.1 has been used to aid in delineating protection area coupled with the Pre-Cautionary approach; numerical modelling has not been incorporated to date.

3.2.2 Caribou Well Field

For the Caribou Well Field, a three zone WHPA was tentatively outlined utilizing existing information (Figure 3-1). Zone 1 (Well Head) was based upon existing roads, and the historical approach by the Town in acquiring land. Zone 2 (Zone of Influence) was based

upon the known limits of the S/G aquifer. Zone 3 (Zone of Contribution) was delineated using surface watershed boundaries.

3.2.3 Town Well Field

Three wells have been pump tested to date. Pump testing of No. 12 production well provided a T of 15 to 22 m^2/d with a storage coefficient of 1 x 10^{-4} to 1 x 10^{-5}, representing a semi-confined aquifer with leakage. Assuming these values are representative of the Pictou HU, an average continuous pumping rate over 30 days of 250 to 295 Lpm creates a 1 metre drawdown some 3 km radius from the pumping well, assuming equivalent porous media approach applies. At the 100 metre radius, drawdown is in the order of 1.5 to 5 metres. The 100 metre radius has been applied to each well to delineate Zone 1 of a WHPA, the extents of which is shown on Figure 3-1. Zone 2 and 3 would be encompassed by the 3 km radius. It was this zone that an intensive study was undertaken to assess land use and potential sources of contamination.

4.0 RISK IDENTIFICATION

4.1 Caribou Well Field

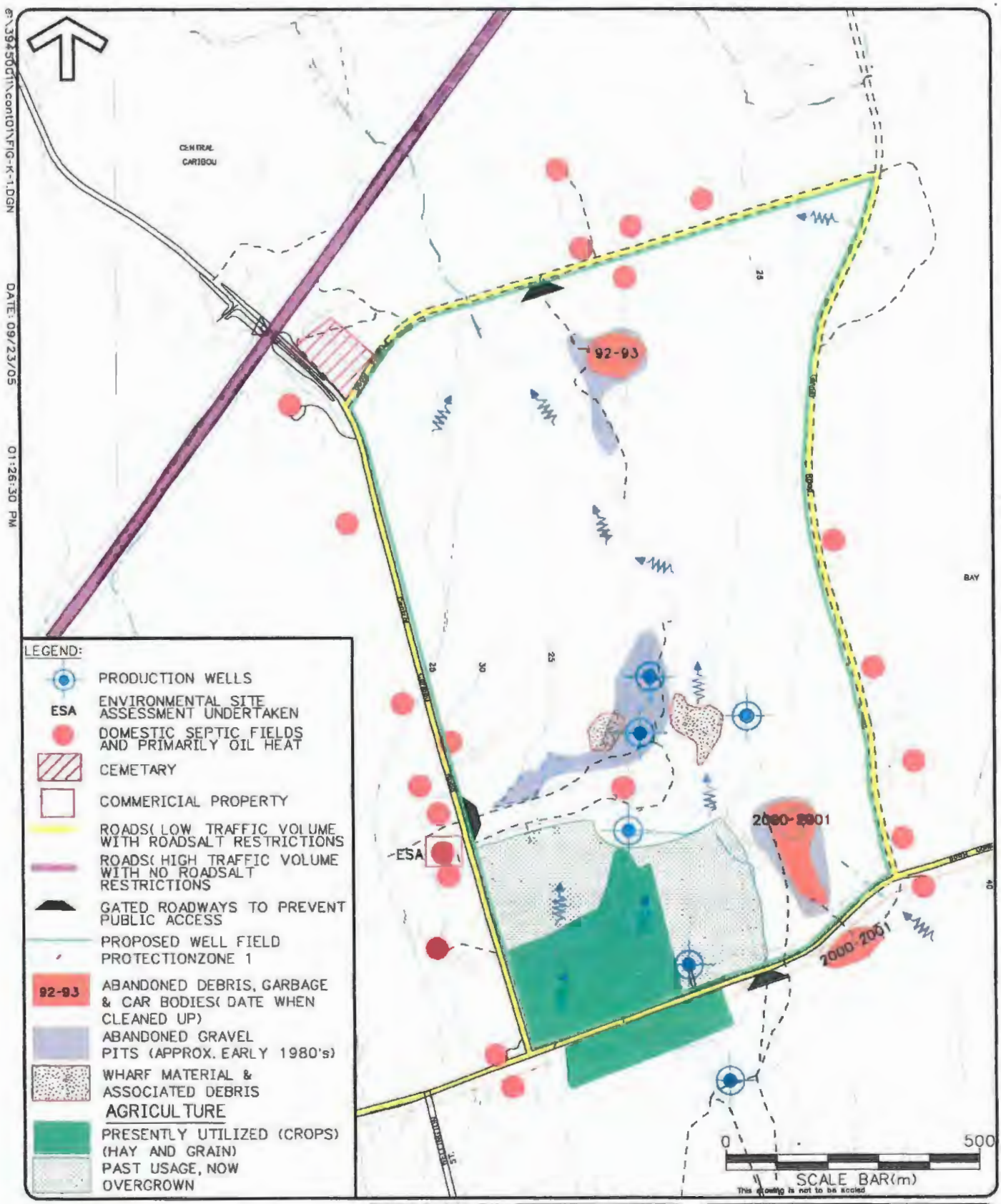
Review of aerial photographs and field assessment of WHPA Zone 1 identified a number of potential risks as summarized below and on Figure 4-1.

4.1.1 Sand and Gravel Pits

Extraction of sand and gravel for aggregate from the S/G HU in the southeast corner and north boundary occurred historically from the early 1900's until the late 1970's. Although operations have ceased, indiscriminate disposal of various municipal wastes and auto bodies has sporadically continued to present. In 1985, the Town barricaded all access roads into Zone 1. Debris was gradually removed from 1987 to present and continues as necessary.

4.1.2 Waste Disposal

In approximately 1959, burnt creosote timbers from a fire on the Pictou Wharf were disposed of in the core of the Well Field, adjacent to Production Wells No.s 9 and 10. Concern expressed with leaching of PAHs into the S/G HU prompted NSDEL to undertake an investigation; sampling indicated no problems were being created. Monitoring wells were installed within the S/G HU between the disposal area and the wells by the Town in 2000.



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Proj. TOWN OF PICTOU
GROUNDWATER RESOURCE MANAGEMENT

Dwg CARIBOU WELL FIELD-ZONE 1
INVENTORY OF POTENTIAL CONTAMINANT SOURCES
AS OF AUGUST 2001

Drawn By: NEB	Proj. No. 3945-001.1	
Dwg Standards Chk. By:	Dwg. No. FIGURE 4-1	
Designed By: FEB	Date Last Modified: 05.AUG.25	
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There was no visual or analytical evidence of PAHs. Some of the surficial materials were removed by the Town in 1998.

4.1.3 Septic System

One septic field is present for the Fraser household in proximity to the No. 8 Production Well. The Town removed the old tank/field bed system and installed a new approved system at its expense during the summer of 2001. One septic bed is in use just north of the gated roadway along Central Caribou Road. This private residence has its own well and the Town has no access to validate the condition of either.

4.1.4 Abandoned Wells

The Town located and securely capped all of the known test holes and monitoring wells from previous hydrogeological investigations. This was to prevent contamination from entering the aquifer by transmission through open abandoned wells and deteriorated casing

4.1.5 Domestic Dwellings

A total of 38 private lots are present in Zone 2, but immediately adjacent to Zone 1. Each home is supported by its own drilled well water supply utilizing primarily the Pictou HU and on-site septic systems. Of these, 22 have been identified as of primary or secondary priority for Environmental Site Assessments (ESAs) to document past and present activities.

4.1.6 Agricultural Activities

Land use is present in the southwest corner of Zone 1, adjacent to Division Road and No. 8 Production Wells. The land is utilized for crop production utilizing standard acceptable agricultural practices. Manure spreading is not undertaken within 150 metres from each well head.

4.1.7 Forestry Activities

The forest within Zone 1 has been extensively harvested in the past. While little harvesting work has been conducted within the past 30 years, a significant amount of wood was harvested by clear cutting 20 to 40 years ago, for forestry as well as sand and gravel extraction. The abandonment of the latter since the 1970's has resulted in the regeneration of stands of pioneering species such as white birch, grey birch, poplar, white spruce, eastern larch (tamarack) and alder, generally with a high hardwood component. The abandonment

of agricultural land has also contributed to development of similar stands of pioneering species, usually with a greater softwood component.

4.2 Town Well Field

Since the wells are spread far apart, an investigation was undertaken within the 100 metre radius of each site to identify risk factors. To date, four well sites have been assessed as summarized below. Investigations are on-going for the remaining four sites.

4.2.1 No 12 Production Well

The pump house is on land owned by J.R. MacDonald of Far East Construction with the well parcel under easement to the Town.

There are four residential lots within the 100 metre radius of the well. There are no records of homes or subsurface facilities dating back at least to 1970. A quarry is present 300 metres north of the well used in the past to extract building stone, it is presently abandoned. The base of the quarry drains to the southeast corner, where a pond remains during dry periods some 320 metres from the well.

It would appear that most of the properties were wooded prior to construction of the homes, therefore, historical land use issues do not appear to present an issue of concern.

Garbage was noted scattered throughout all properties including car parts, beer bottles, cans, scrap metal and miscellaneous items. There is a small amount of household garbage in the northeast corner of the quarry; garbage has been removed in the past. Two power poles exist at 60 and 120 metres south from the well that have been treated with tar.

Two homes apply manure to their gardens some 110 to 130 metres from the well but do not use pesticides/insecticides/herbicides. Annual use of "roundup" as a lawn application was confirmed on one property, as well as use of a compost pile 125 metres from the well.

All homes are on individual septic tanks/fields at distances of 90, 125, 130 and 140 metres from the production well, primarily down-ground-surface gradient. The systems are older than 30 years; maintenance is unknown. Two of the homes are heated with oil and have on-site storage tanks. No chemicals are stored at any of the sites. Each dwelling has at least one abandoned water well, not in use since central water was brought in; one house has three wells. None have been abandoned according to well construction regulations. Negotiations are on-going with homeowners to ensure compliance.

A major transportation corridor, Beeches Road, is present 160 metres downgradient, which is salted.

4.2.2 No. 11 Production Well

This well is located in a rural residential area, just west of Wellington Street. There are no homes within the 100 metre radius of the well. The Town owns the building lot around the pump house encompassing approximately 0.39 hectares.

There are five nearby lots, two of which are empty. The land directly north and south of the well is vacant residential property. No historical land use was documented for the last 20 years, although 1971 aerial photos indicate land was used to grow hay. There are no surface or subsurface facilities (i.e., storm/sanitary sewers, power/communication lines) adjacent the site.

All lots within a 100 metre radius are in the R2 Zone, rural residential. There are few restrictions on land use activity, i.e., permitted to keep agricultural animals if this is subordinate to residential use. However, the land to the east across Wellington Street is the H_20 Zone which has more restrictions.

One house nearby is heated with oil; pesticides/insecticides/herbicide or fertilizers are not used. The house is on a septic system installed in 1979 less than 100 metres from the well; maintenance of the system appears to be poor. At least two abandoned wells are in the vicinity. One rusted vehicle full of garbage is within 70 metres of the pump house.

The site lies between Patterson and Wellington Streets some 280 and 110 metres respectively from the well head; both are paved and salted with no curb/gutter. They are not used for transporting goods, the only transport truck traffic would be for local oil supply.

Surface facilities include two power poles 17 and 90 metres from the well.

4.2.3 Beeches Road Production Well

The Town owns a rectangular area around the pump house of approximately 0.25 hectares, positioned adjacent Beeches Road. The next closest street is Sea Birch Drive, a residential road 160 metres directly north and upgradient.

Most of the lots within a 100 metre radius of Beeches Road well are in the R1 Zone, residential. There are more restrictions on land use activity in the R1 zone versus R2, i.e.,

not permitted to keep agricultural animals even if this is subordinate to residential use. Other zones in the proposed protected area are W-waterfront and R2. Currently, there are no by-laws protecting the wells in town. There are no restrictions in the entire town on pesticide/herbicide/insecticide use.

The well is located in a residential area. There are nine residential homes and a golf course within the 100 metre radius. Previous land use noted farming in the area. The homes are located between 50 and 160 metres from the well head. All are on Town water and sewer but some are expected to still have remnants of old well and septic systems. With the exception of one, all are heated with oil. There is no recorded residential use of pesticides/herbicides/ insecticides; some use compost piles. There is no known chemical storage.

The club house for a golf course is 375 metres from the well head, with the course used since 1922. It operates off its own 63 metre deep well and on-site septic system; with oil used for heating. Herbicides/pesticides and fungicides are applied twice per year on greens and fairways. Runoff from the course comes within 100 metres of the well, and considering surface gradients, will run to Pictou Harbour.

The pump house is 3.8 metres off Beeches Road, which is paved with no curb/gutter and large ditches on each side of the road. It is a main road with relatively a large amount of traffic, but is not used for transporting goods.

A small first order stream runs within metres of the well head draining south into Pictou Harbour.

Garbage was noted scattered throughout the woods, including car parts, beer bottles, cans, scrap metal, etc.

4.2.4 M and M Production Well

The pump house is located in a residential area off Beeches Road along Union Street. The Town owns a small rectangular area around the pump house.

There are 23 residential homes within the 100 metre radius of the well. Most of the lots within the 100 metre radius are in the R1 Zone, residential. Other zones are I - Institutional and C2 - neighborhood commercial. Most lots have small wartime houses built in the early 1940's, all have been connected to town water and sewer. Most are heated with oil. No pesticides/herbicides/insecticides are used; there is no known chemical storage.

Beeches Road (some 30 metres upgradient of the well) has moderate traffic, but not used for transporting goods. Union Street may be a route for shipping supplies to the shipyard and servicing oil tanks. Both are salted.

The pump house is surrounded by a parcel of land owned by East End Grocery Store, which has been in operation since the 1940's. The building is 10 metres upgradient from the well with a rental unit upstairs and a hairdressing shop next door. The building is heated with oil, pesticides, etc., are not used, no chemicals are stored.

An existing storm drain and sewer line are positioned 90 and 60 metres from the well head respectively.

The new DND facility just south of the well head was constructed in 1992. An environmental site assessment prior to construction noted no contamination. Surface run off from the parking lot is controlled by curb and gutter and discharges to the existing Town storm drain system. The facility is heated by oil with a state-of-the-art, outside tank facility.

5.0 SOURCE WATER PROTECTION STRATEGIES

A total of 14 strategies have been developed to manage the risks outlined above, including:

- Land Use Planning
- Emergency Response
- Land Acquisition
- Forestry Management
- Inspection/Enforcement
- Building/Maintaining a Database
- Ecosystem Approach
- Public Education
- Counter Terrorism
- Road Maintenance
- Planning for Impact of Climate Change
- Personnel and Training
- Demand Side Management
- Best Management Practices

A summary of each is provided below, details can be provided for regulatory perusal only, if so required.

5.1 Land Use and Planning

The goal of land use planning was taken as the development of a practical, cost-effective means of managing land use activities within the Town of Pictou's well fields, to ensure the long-term viability of the water supply.

In so doing, it is recognized that since some of the land is privately owned, this will require balancing the rights and responsibilities of private citizens and Municipal Governments with the long-term costs and benefits of an uncontaminated water supply. As more data become available in the future, it may be possible to reduce any constraints while maintaining the same risk. In essence, science will never know all there is to know. Rather than allowing the unknown or uncertainty to paralyse us, we must apply the best of what we know today and at the same time be flexible enough to allow for change and for what we do not yet know.

5.1.1 Caribou Well Field

A three zone WHPA was tentatively outlined (Figure 3-1), including Zone 1 (Well Head), Zone 2 (Zone of Influence) and Zone 3 (Zone of Contribution). This was based upon protecting the Caribou aquifer, rather than a residence timing around a well head. A listing of "permitted uses" and "constraints" was developed for 10 land use activities within Zone 1 including: Residential/Industrial/ Commercial and Institutional, Waste Disposal, Agriculture, Forestry, Transportation/Power/Communication Corridors, Mining/Pits/ Quarries, Pest Control Products and Biocide Restrictions, Soil Erosion and Sedimentation Control, Cemeteries and Recreational. Uses and constraints within Zones 2 and 3 were to be governed by existing County, Provincial and Federal Regulations.

Aquifer monitoring suggests no noticeable impact of operational pumping of the Caribou Well Field in either the bedrock or S/G aquifers along the outer ring roads, where the domestic wells are located (Figure 5-1B). Therefore, the well field extraction is not mining the resource.

5.1.2 Town Well Field

A portion of the Town is still predominately under rural land use. An H_20 Protection Zone (Figure 5-1) was established in this area by the Town Council, then approved by the Minister in June 1994. Zoning By-laws were developed to protect the groundwater resources by placing constraints on land use within this zone. As noted in Figure 5-1, the H_20 zone also protects that portion of Zones 2 and 3 for the Caribou Well Field, which are positioned within the Towns' political boundaries.

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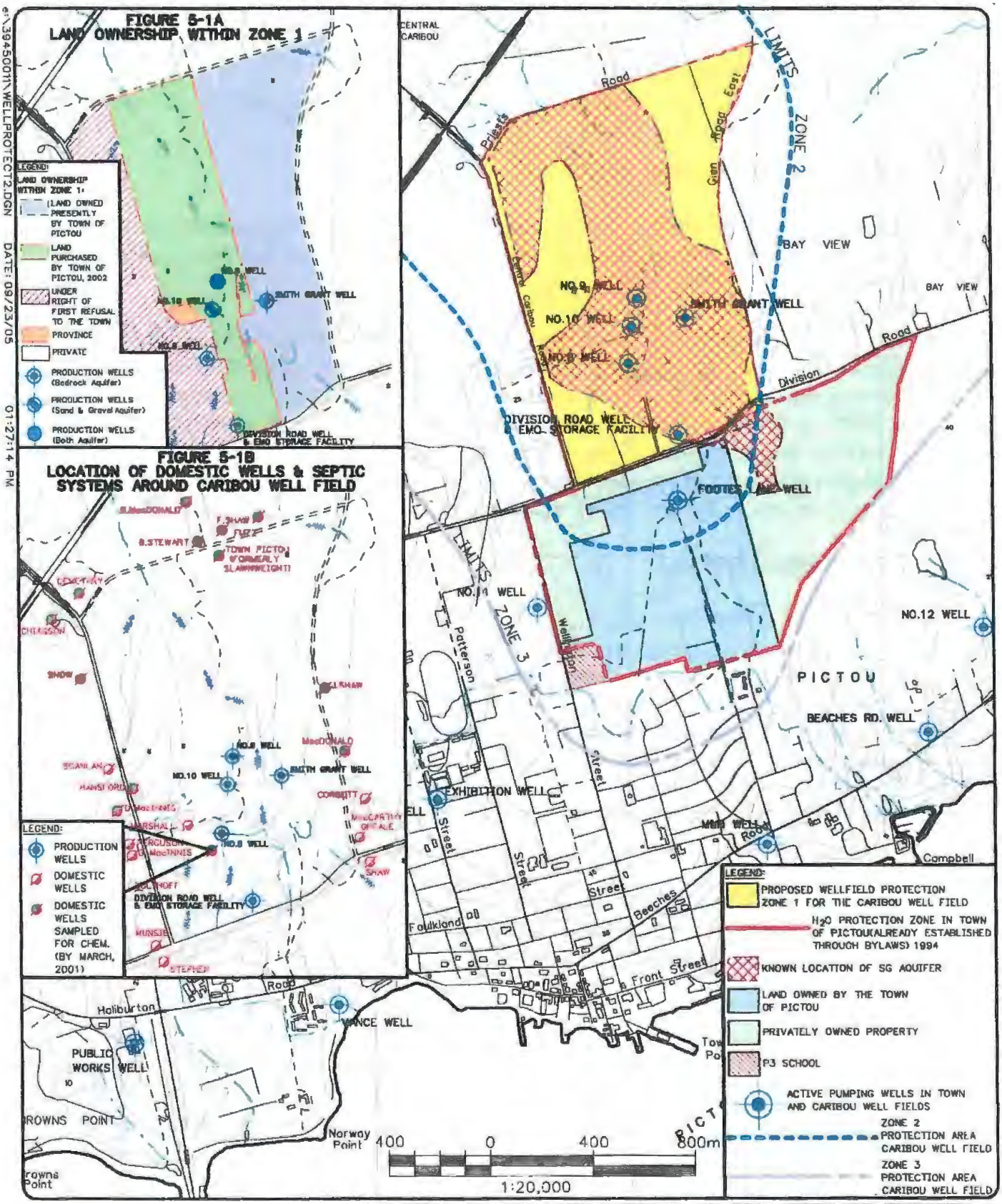

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Proj. TOWN OF PICTOU GROUNDWATER RESOURCE MANAGEMENT

Dwg. WELLFIELD PROTECTION ZONES

Drawn By: NEB		Proj. No. 3945-001.1	
Dwg Standards Chk. By:		Dwg. No. FIGURE 5-1	
Designed By: FEB		Date Last Modified: 00.06.05	
Design Chkd. By: FEB	Last Modified By: NEB	Rev. 0	

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Over the last decade, work has gradually been undertaken to provide additional land use protection. Starting in the summer of 2001, production well sites had begun to be inspected to develop short and long-term protection strategies.

5.2 Best Management Practices

On privately owned land, the Town will suggest, demonstrate and, where necessary, financially support the use of Best Management Practices, as exemplified by activities in the Caribou Well Field.

1. For homeowners who agreed to support the request for designation, the Town Council agreed to share the costs of required upgrades in fuel storage, on-site septic disposal and other matters on a 50% basis to a total of $2,500.00 per home.

2. Upgrades to the on-site septic system on the Fraser property were paid for by the Town. In addition, a new fuel containment structure was installed at the Town's expense.

3. An ESA was carried out on the former North Shore Ballast property in proximity to Production Well No. 8.

4. A total of 13 domestic wells surrounding Zone 1 have been sampled for inorganic water chemistry at least once, at the Town's expense.

5. Agricultural land use is present in the southwest corner of Zone 1 WHPA for the Caribou Well Field adjacent to Division Road and No. 8 Production Wells. The land is utilized for crop production. Discussions with the farmer in 2001 resulted in his acceptance not to spread manure within 150 metres of the two wells.

To demonstrate the Town's willingness to meet its own targets imposed on private citizens it has undertaken upgrades in areas it has responsibility for, as exemplified by work undertaken to date in both well fields:

Exhibition Well: A nearby sewer line was upgraded to ensure no leaks could occur in close proximity to the well head. An open ditch was collected with piping to divert road wash runoff to a location 65 metres northwest of the well head.

Public Works Well: Underground oil storage tanks were removed and changed to aboveground systems. A french drain system was installed to divert chlorides and/or oil away from the well head. The salt storage was placed on an asphalt pad.

Vance Well: A new service line was installed in 1991, just north of the well head. An abandoned septic field bed at the former Odd Fellows building was abandoned and connections made to a new sewer in 1995.

The Caribou Well Field: The Town located and securely capped/abandoned a number of test holes and monitoring wells installed during previous hydrogeological investigations to prevent aquifer contamination.

5.3 Emergency Response Plan

As a part of the Town's Emergency Response Plan, a number of procedures and equipment have been put in place to enable Town staff to quickly respond to accidental spills that could potentially affect the production wells.

In summary, these activities include storage of "soak-up" products and disposal bags at selected well sites, as well as information on well sites and contact numbers distributed to local petroleum delivery vehicles. The Town's Public Works Department is equipped with a vacuum operated sucker truck to lift and remove any floating products. Water Utility staff are trained in Transportation of Dangerous Goods to ensure their ability to react in the appropriate manner in event of a spill. The Watershed Emergency Response Plan will become part of the Emergency Measures Organization Response Plan for the Town of Pictou and the Municipality of the County of Pictou.

5.4 Counter Terrorism Plan

Given the results of September 11, 2001 counter terrorism plans have been formulated to assess the risks to all three attributes crucial to water supply, namely: quantity of water on demand, delivered at sufficient pressure and safe for any use. Presently, the utility is assessing its vulnerabilities and prioritizing them for necessary security improvements.

Overall, a groundwater supply is more difficult to contaminate, given its slow transport rate and natural attenuation. All well heads are enclosed in locked structures and checked daily by Town personnel. Additional activities have been put in place, or are under development, but are not for discussion in a public environment.

5.5 Land Acquisition

5.5.1 Caribou Well Field

The Town purchased the land on which the former well-vacuum system was situated between 1907 and 1916. Arrangements were made with the major land owner within Zone 1 of the WHPA for this Well Field to purchase their land when it became available.

In 2001, the Town purchased one 1.34 hectare property within Zone 1 and in 2002, acquired 19.87 hectares. Figure 5-1A outlines the 68% of Zone 1 presently owned by the Town. The additional land is under right of first refusal for the Town.

Production Wells No. 9, 10 and Division Road are located on land purchased by the Town in 2002. Production Well No. 8 is on land for which rights for water were purchased from the Fraser Estate on September 12, 1907.

5.5.2 Town Well Field

A H_20 Protection Zone was established within a portion of the Town limits in June 1994. It encompasses a portion of the Town boundaries still under predominately natural land use, effectively covering the topographic high, or groundwater recharge area for the Bedrock aquifer underlying the Town itself.

In 2001, the Town purchased an additional 18.5 hectare piece of property within this zone to provide additional protection. Figure 5-1 outlines the 47.5 hectare or 52% of the H_20 area now owned by the Town. In the summer of 2005, the Town acquired an additional 2.17 hectacres, not shown on Figure 5-1.

The Zone encompasses, however, only one of the production wells, Footes Lane. A very small portion of land around each of the other Town well heads is owned by the Town, the rest is privately owned. There is no intention at this stage of purchasing additional land around each until the results of the GUDI testing and assessment of the new production well are known.

5.6 Road Maintenance

Consultation between the Pictou Water Utility and Nova Scotia Department of Transportation and Public Works has lead to cessation of the use of highway salt on Division Road for one kilometre east and west of the Caribou Well Field. This also included Central Caribou Road

along the west boundary. The other two boundary roads are gravelled surface and not normally salted. Dust suppression products are discouraged on secondary gravel roads within the Caribou Well Field

The Town has agreed to maintain the access road (private lane) into the Caribou Well Field to ensure that non-contaminated products are used for road maintenance work.

Illegal dumping and quarrying sites along woods roads within the Caribou Well Field have been curtailed by preventing access. Off-road motorized recreational vehicles will be prohibited on Town owned lands and discouraged within the Caribou Well Field's WHPA Zone 1.

Risk identification (Section 4.0) noted numerous paved roads surrounding most of the Town wells. Discussions are presently on-going to determine how best to address road salting and road wash runoff to storm sewer issues.

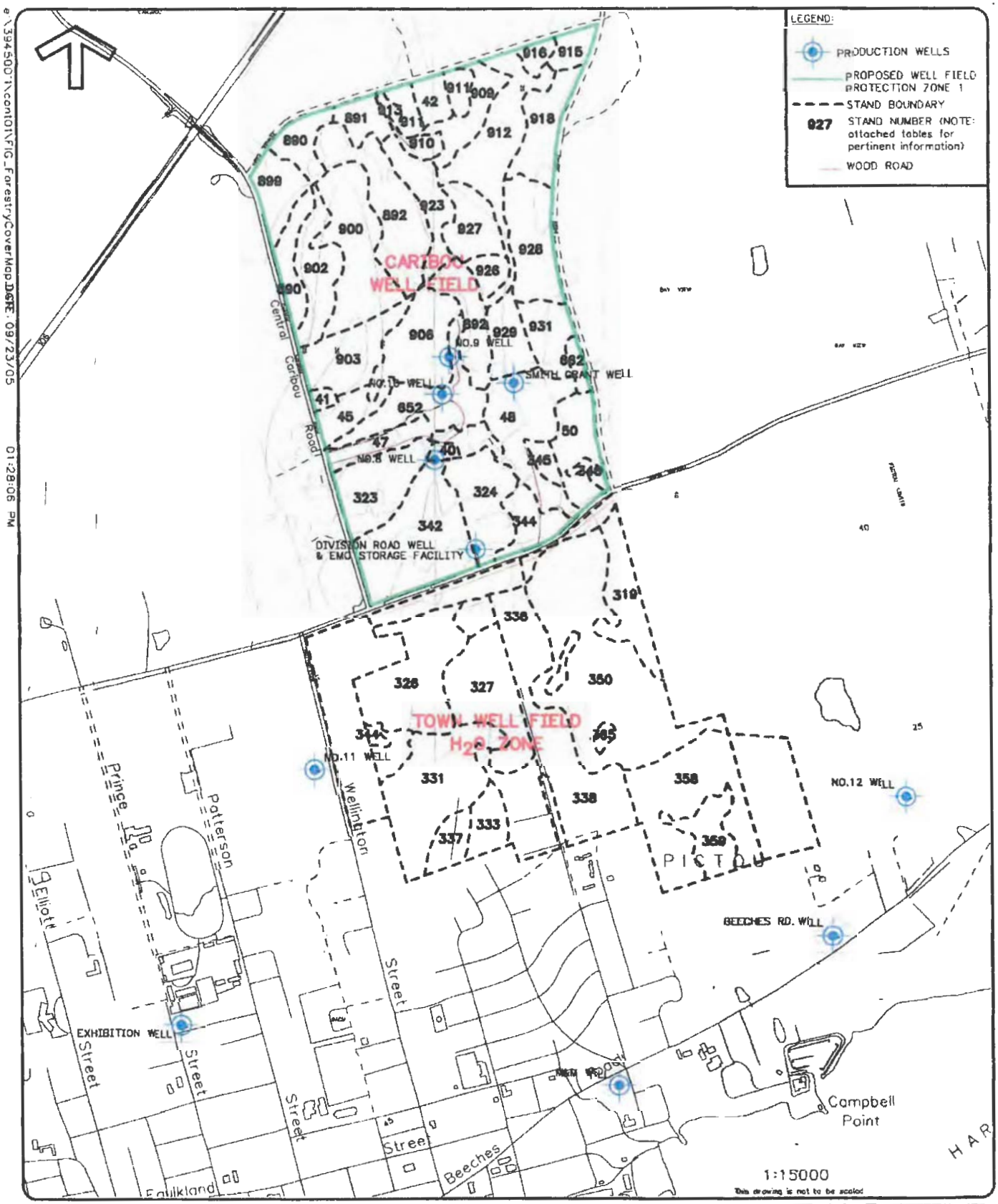
5.7 Forestry Management Plan

Century Forestry Consultants Ltd. was contracted by the Town to develop a Forestry Management Plan for Zone 1 of the WHPA area of the Caribou Well Field and the H_20 Zone within the Town boundaries (Figure 5-2). The following forms a summary of the reports. Details are available for the regulators upon request.

5.7.1 Caribou Well Field

The block contains approximately 126 hectares in total. The area is occupied by 104 hectares (82%) forested land and 22 hectares (18%) non-forested. The most dominant cover types within the block are mixed wood and softwood, which each comprise 29 hectares. Hardwood cover types make up the next most significant portion of productive forest at 23 hectares or 18% of the landmass. There is a significant proportion of non-productive forest land within the block at 23.5 hectares or 19% of the landmass. Agricultural land covers 19 hectares (15%) and residential lands occupy 3 hectares (2%).

Very little in the way of serious insect and disease problems or blow down were found throughout the block.



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Proj: TOWN OF PICTOU GROUNDWATER RESOURCE MANAGEMENT

Dwg: FORESTRY COVER MAP

Drawn By: NEB	Proj. No. 3945-001.1	
Dwg Standards Chk. By:	Dwg. No. FIGURE 5-2	
Designed By: FEB	Date Last Modified: 05.AUG.26	
Design Chkd. By: FEB	Last Modified By: NEB	Rev 0

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5.7.2 Town H_20 Zone

The plan includes approximately 73 hectares containing the Town's H_2O Zone along with a small portion outside of the zone. The area is split in ownership between the Town (41 hectares) and a private woodlot owner (32 hectares). The land base of this block is occupied by 57.5 hectares of forested land (78%) and 11 hectares of abandoned farm land (22%).

Forest cover types are divided into softwood, mixed wood and hardwood. Hardwood occupies the largest portion of the forest at 29.5 hectares (51%), followed by mixed wood cover types at 19 hectares (33%) and softwood at 9 hectares (16%). Immature stands make up the largest portion (40%) and occur on Town owned land. Regenerating stands cover 30% as a result of a recent harvest on privately owned land. There are no over mature stands. Very few serious insect or disease problems were encountered throughout the block.

5.7.3 Management Plans

The basis of the Forestry Management Plan is the understanding that the forest is a dynamic entity, continually changing as trees grow and die with the overall structure of the forest evolving through a number of stages. Because the forest is dynamic, it must be continually monitored for changes which have occurred as a result of significant influences, often unpredictable in nature.

The operators of the plan must be committed to acting decisively when the need arises, while staying the course on the overall plan, its long-term principles and goals, and its short-term objectives. If the management principles, management recommendations and the operating recommendations are followed, it is possible to conduct forestry activities while protecting the Town's most valuable natural resource - its water supply.

Put in the context of strategic planning, long-term management principles and goals must support the mission of maintaining water quality and quantity. A total of four Management Principles and 26 Management Recommendations and six Operating Recommendations based upon Best Management Practices of the day were outlined to guide decisions that affect the future structure of the forest by guiding (limiting and encouraging) activities conducted on the ground. The Principles are summarized below.

> *MANAGEMENT PRINCIPLE 1.0 - Forest related activities should encourage the establishment and growth of long-lived species such as red spruce, white pine, eastern hemlock and red oak.*

MANAGEMENT PRINCIPLE 2.0 - Forested areas should maintain a tree cover of not less than ten (10) feet in height and not less than fifty (50) percent stocking.

MANAGEMENT PRINCIPLE 3.0 - The forest should be maintained in a healthy, actively growing state.

MANAGEMENT PRINCIPLE 4.0 - Forestry activities should be conducted so as to minimize disturbance or pollution to the forest floor and the underlying soil.

5.8 Adaptation for Climate Change

At present, the operational concept in how the utility is adapting to climate change is to assume the climate is warming, whether due to man-made and/or natural factors. The results will be seen more in terms of extremes, i.e., floods, droughts.

The actual impact of this change in climate on groundwater resources is less clear. Baechler (2003) noted that deep groundwater supplies were less susceptible to on-going changes in climate over the last 15 years than surface waters.

The nearest Environment Canada Climate Stations most representative of the well field were selected in consultation with personnel of the Atlantic Climate Centre. These were determined to be Lyons Brook and Caribou.

Since 1998, the Town received the data on a monthly basis to assess monthly and seasonal trends in precipitation and temperature. Longer term trends have been established by updating a moving decadal analysis (Figures 5-3). To date the "warm" years experienced over the last portion of the 1990's have resulted in declining precipitation and rising air temperature.

The Atlantic Climate Centre was also requested to undertake a water balance analysis to better define Fall and Spring Groundwater recharge periods (Figure 5-3).

To quantify the impact of climate change on groundwater resources within the two main aquifers, two automated groundwater level recorders have been installed to monitor changes in head levels (Figure 5-4). No large scale long-term trends are apparent in the data to date.

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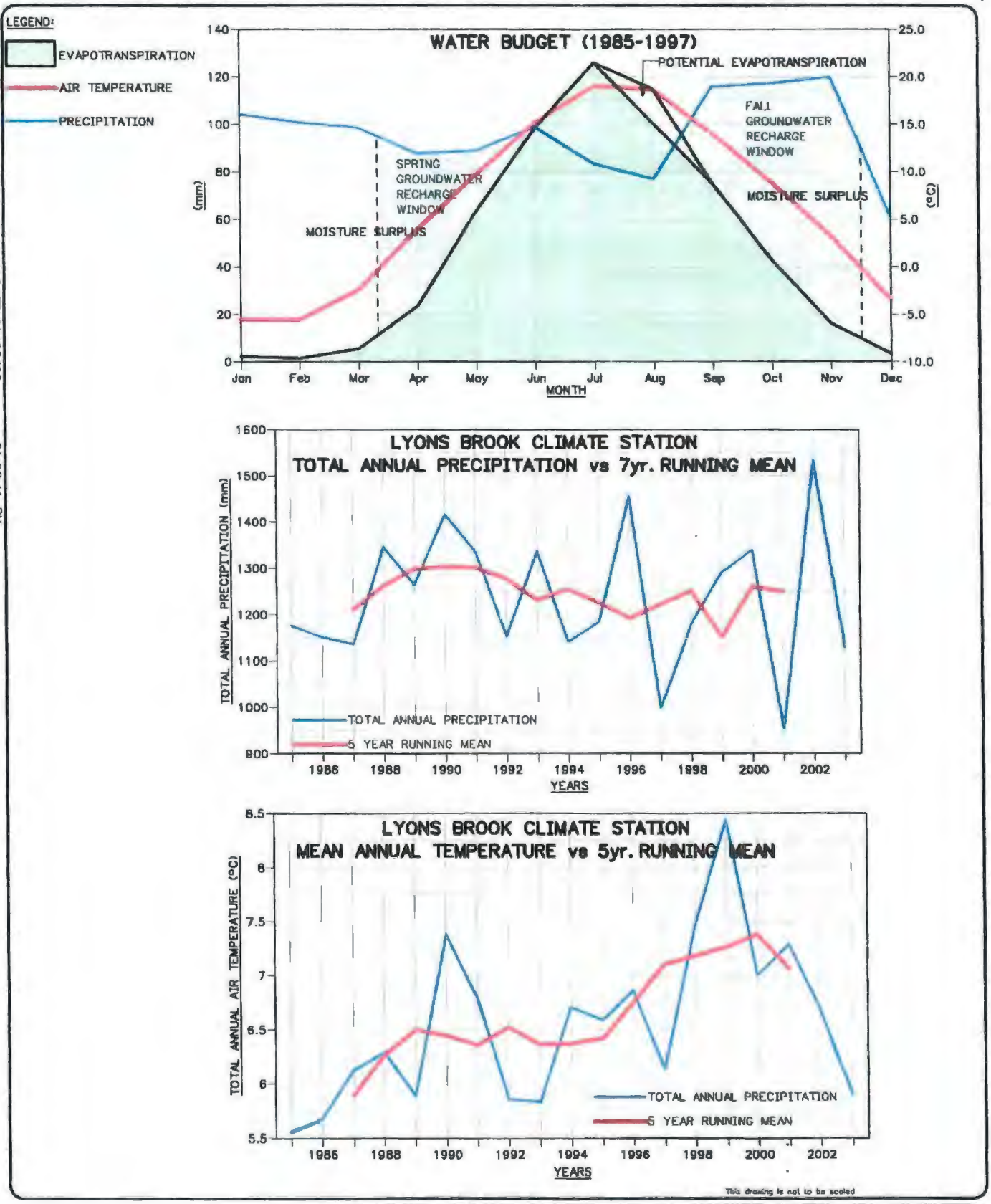

This drawing is not to be scaled

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Proj. TOWN OF PICTOU
GROUNDWATER RESOURCE MANAGEMENT

Dwg. CLIMATIC TRENDS AND WATER BUDGET

Drawn By: NEB		Proj. No. 3945-001.1	
Dwg Standards Chk. By:		Dwg. No. FIGURE 5-3	
Designed By: FEB		Date Last Modified: 05.SEP.09	
Design Chkd. By: FEB	Last Modified By: NEB		Rev. 0

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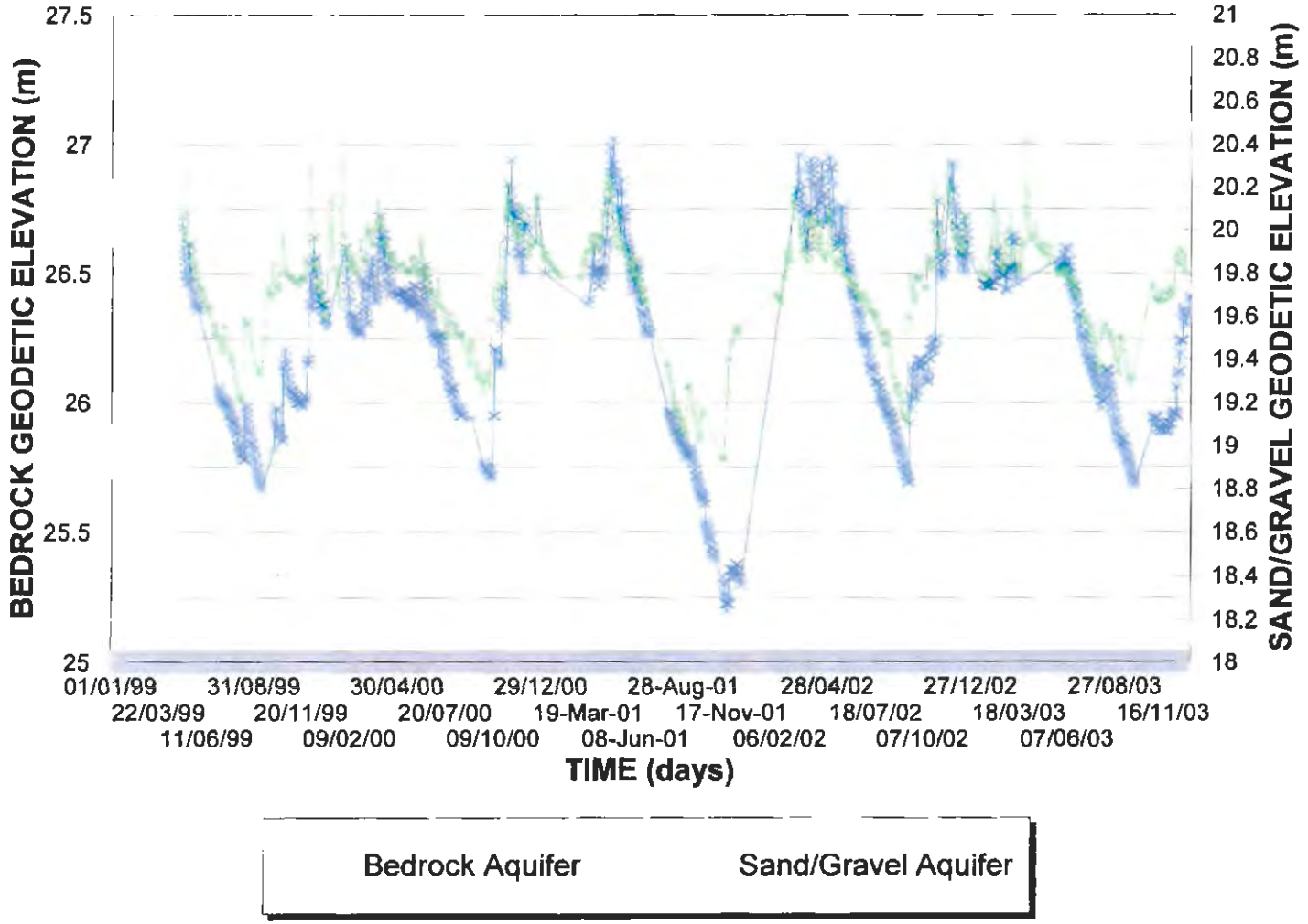
FIG.5-4: 5 YEAR HYDROGRAPH
BEDROCK and SAND/GRAVEL AQUIFERS



5.9 Public Education Program

Given the critical nature of the groundwater resources and the importance of public education and consultation, a range of activities have been on-going since 1991.

In 1996, ADI and Town staff held a public open house to provide the residents with detailed information about groundwater in general, and about the development of the aquifer in the immediate Caribou Well Field area. Prior to this Public Open House, the Town notified all affected landowners again by letter and advertised in the Pictou Advocate newspaper of this "Open House" information session. Seventeen interested persons attended. A second, well publicized open house was held on March 13, 2000, less than five people attended.

Meetings were held twice with the owners of the Fraser property, located in the middle of the well field during 1999 and 2000 to discuss the proposed land use guidelines and their impact on them. Modifications were made to the plan to accommodate some of their concerns. Town representatives presented information on preliminary land use constraints to a public open house on December 6, 2000. Town representatives met with the core of the Caribou Well Field Community Ad Hoc Committee on Land Use in February 2001.

A continuous display of educational information on the Town's water supply and water related issues was established, and made available to the public. The Director of Public Works continues to discuss the well field and the groundwater aquifer in this area with any interested persons

5.10 Inspection/Enforcement

Staff visit each production well site daily to record production and inspect for security violations. A weekly inspection of the perimeter of the watershed is undertaken to note any unauthorized use of Town lands.

For those private lands, especially in the County, the Town strongly believes it is the responsibility of the NSDEL to undertake a weekly to bi-weekly inspection visit of lands within WHPA Zones 2 and 3 for the Caribou Well Field and enforce existing environmental legislation as required.

5.11 Development of a Hydrogeological Model for the Well Fields

The Town has committed to acquire and fund the collection of additional technical information on the ground and surface water resources forming the Well Fields and

Protection Zones. These data have been used to continually update the database and refine the hydrogeological model. This allows for a more comprehensive understanding of the occurrence, quantity and quality of the water resources. When sufficient data has been collected to form a satisfactory conceptual model, consideration will then be given to development of a computer numerical model for the groundwater flow field, the impact of the pumping wells and groundwater stream interaction.

The intention is to undertake affordable, practical program each year over the long-term to obtain information pertinent to answering specific operation/protection issues as they arise. The overriding concept is "It is difficult to protect what you don't understand".

This commitment includes the hiring of a summer student each year to aid in these investigations, while providing practical experience to upcoming qualified students.

5.12 Building and Maintaining a Database

A computerized map of the well field and environs has been established by ADI using MICROSTATION. The base was developed with existing LRIS digital mapping at a scale of 1:10,000. This base allows for development of the technical figures presented in this report, as well as large scale colour overlays for public presentation.

Information being collected on wells, GUDI, chemistry, etc., is entered into EXCEL spreadsheets, which are being maintained at two sites to prevent loss of data. This database includes information such as water levels, water chemistry, pumping rates and volumes, streamflow, subsurface lithographic logs, etc. This forms the basis for presenting updated information in the annual reports to NSDEL.

5.13 Demand Side Management

The Town recognizes that Demand Side Management (controlling demand) is as important as Supply Side Management (finding new water sources) in managing its water supply. This not only reduces the demand on the system, but also supplies additional revenues to undertake additional monitoring and investigations as so required.

A recent investigation on usage in the Town by ADI noted that the average residential water consumption in Pictou is high, with a residential usage of approximately 380 litres/person/day. This is compared with average Canadian residential water demands in 1996-1997 of 72 to 76 litres/person/day. The Atlas of Canada reported in 1999 that average per capita water demand in Nova Scotia ranged from 160 to 320 litres/person/day.

Domestic users are presently unmetered. There are 1251 such users currently being charged a quarterly rate of $41.25. Schools pay $291.50 per quarter. A total of 116 commercial services are metered based upon service size. A total of 16 sprinkler systems are billed at $110/yr. The above rates were set out and agreed to by the Board of Public Utilities as of January 1, 1986. Recently the Town has made a submission to the Board for a new rate structure based upon domestic metering.

5.14 Ecosystem Approach

A relatively new system is being employed in source water protection in specific Ontario communities identified as the Ecosystem approach. This approach is grounded in ecological science and a belief that human decisions should be made with due regard for essential ecological process, biodiversity and sustainable uses. It acknowledges the importance of human needs while at the same time confronting the reality that the capacity of our world to meet these needs in perpetuity has limits and depends on the functions of ecosystems.

In essence, it combines what was already covered with the above strategies for land use management, forestry management, adaptation for climate change and Public Education Program. The Town is considering other ways to incorporate this strategy into Source Water Protection Planning and is watching its implementation in Ontario with interest.

6.0 SOURCE WATER PROTECTION ADVISORY COMMITTEE

The Pictou Watershed Management Committee was established in 1993 to guide future initiatives designed to protect the Town's water resource and to pursue the designation for the Caribou Well Field. Participation included a member of the Pictou County Council, since the designated land in question was positioned within the County. The Committee also included a hydrogeological technical advisor from ADI. In 1993, the Town contacted each identified landowner within the boundaries of the survey and advised them of the Town's proposal to protect the groundwater resources within the well field. Out of the 74 separate landowners, only 14 responded by mail or telephone.

The Town pro-actively commenced a public consultation program. Two newsletters were sent out to property owners within the proposed protection area identifying the watershed management committee and its long-term goals. In 1996, they invited the residents to a public open house and requested their input and ideas.

The Management Committee has held ongoing meetings with NSDEL, a representative from the Pictou Planning Advisory Committee and the Warden of Pictou County since 1994.

On going participation from the Pictou County District Planning Commission has included the preparation of the Caribou Well Field Protection Project Status Report and a draft Joint Land Use By-Law between the Town of Pictou and the Municipality of the County of Pictou.

As part of the requirement for designation, the Town developed a Terms of Reference in 2002 for a Town of Pictou Watershed Advisory Committee for the Caribou Well Field. Given that designation is not possible at this time, it is the Town's intent to build upon those guidelines to develop a Source Water Protection Committee that would be responsible for "advising" on both well fields. The key components of the mandate for the committee are expected to include:

1. It exists by the authority of the Council of the Town of Pictou and will act as an advisory body to Council. However, individuals still retain the ability to address Town Council directly on issues relating to the well fields.
2. On-going contact with the Committee shall be provided for by the Town of Pictou's Administrative offices.

3. The committee has an advisory mandate only, and is not responsible for managing the day-to-day operations of the Pictou Water Utility.

4. Its mandate is to provide assistance and suggestions with regard to:
   - Land use activities that have an impact on the water supply;
   - Providing for public comment and education on specific matters;
   - Making recommendations regarding remedial measures aimed at correcting, or minimizing harmful effects on the water supply; and
   - Maintaining an appropriate emergency response protocol to respond to any crisis, which might affect the water supply.

5. All meetings shall be open to the public and press, or as allowed under the municipal Government Act

6. Membership shall be comprised of at least
   - The mayor for the Town of Pictou
   - The Warden for the Municipality of Pictou County
   - The Chair of the Planning Advisory Committee
   - A member of Municipal Council for Pictou County

- A member at large representing the Town of Pictou
- A member of the Ad Hoc Committee representing the Municipality of Pictou County. This member shall be a land owner who occupies a dwelling year round within Zones 1, 2 or 3 of the WHPA for the Caribou Well field; and
- Technical and support staff may be present when requested and agreed to by the Committee.

7.0 MONITORING PLAN

As part of "due diligence", the water supply monitoring program established by the Utility encompasses more than that required by the NSDEL permit. It involves both "Source" and "Distribution" System monitoring. The key components are located on Figure 7-1.

The Town draws groundwater from the Pictou (bedrock) aquifer and the Caribou (S/G) aquifer. The monitoring program entails head levels and chemistry from background wells within the aquifer. This includes two automated head level recorders, as well as monthly head levels on up to 35 observation wells, with periodic chemical analysis.

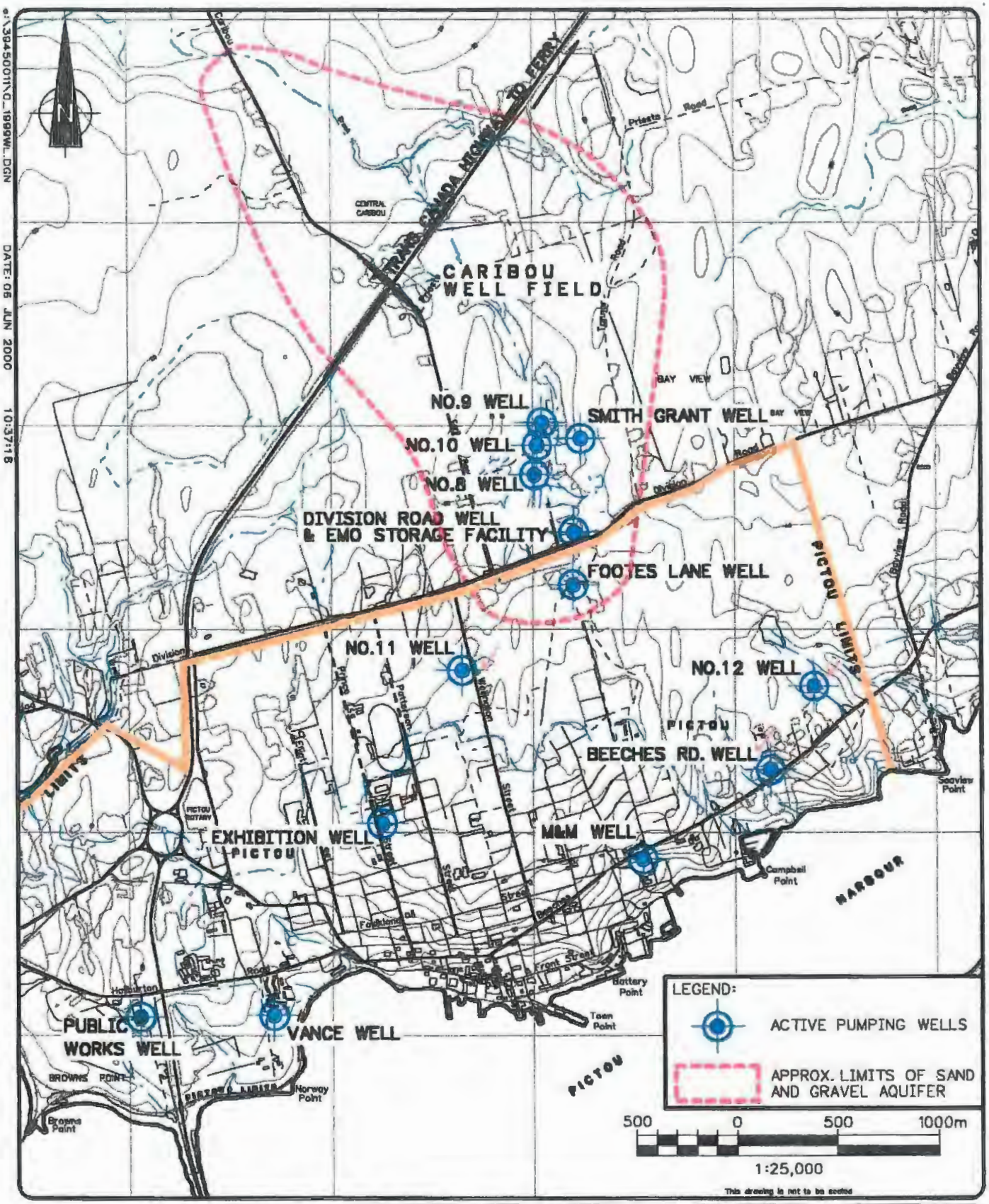
Environment Canada's Lyons Brook and Caribou weather stations provide real time weather data on temperature and precipitation. NSDEL's Durham groundwater level recorder provides historical head level data on the Pictou Aquifer.

Staff visit each production well daily to record production and chlorine levels at each injection site. Tri-monthly chemical analyses are conducted on raw and treated samples for iron and manganese, where treatment is provided. Weekly sampling is undertaken for bacteria at various locations. The water level is continuously monitored in the reservoir.

Annual monitoring reports are submitted to NSDEL as a requirement of the approval to operate.

External monitoring wells to Caribou aquifer are in place and monitored, designed around aquifer protection, not necessarily well head protection. To date, there are no monitoring wells positioned around any of the Town's production wells to forewarn of contaminant incursion.

The costs/benefits of utilizing a SCADA system to aid in data collection is presently being assessed.



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Proj.	TOWN OF PICTOU GROUNDWATER RESOURCE MANAGEMENT
Dwg.	PUMPING WELLS, 1999

Drawn By: NEB	Proj. No. 3945-01.1	
Dwg Standards Chk. By:	Dwg. No. 2	
Designed By: FEB	Date Last Modified: 00.06.05	
Design Chkd. By: FEB	Last Modified By: NEB	Rev. 0

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TOWN OF PICTOU - TOWN WELL FIELD
WELL HEAD PROTECTION - URBAN WELLS
CHECK LIST FOR EVALUATION OF EACH WELL

DRAFT 1 JUNE 18/02 - for review and comment

NOTES ON METHOD OF APPROACH

√ includes wells, but not storage tank or distribution system
√ assesses principally Zone 1 - assumes between 150 - 300 m radius around each well head - until refined by analysis of drawdown cone(incorporates all properties within that zone therefore extent of zone not circular but determined by property boundaries).
√ historical perspective goes back 100 years
√ Will result in a report on each well, with appendices including interview forms, photos, maps etc.

← for an example

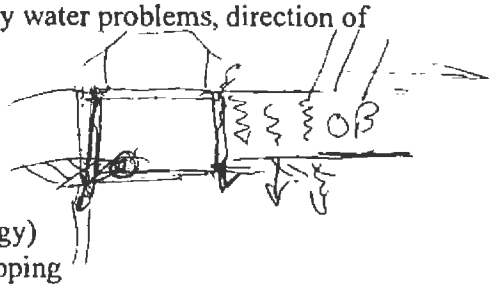
A - FACILITY EVALUATION (pumphouse and property)

√ Extent, shape, size of Town owned land around well head
√ Pump House Construction (size, structure, building materials)
√ facilities contained within Pump House (treatment, chemicals etc)
√ Signage ←
√ access restriction :\1)personnel, rodents, 2) vehicles,\3) back flow preventers, 4) well cap, 5) link with distribution system(seepage collars), and 6) airborne.
√ Well Construction details(casing, annular seal, drive shoe, age, total depth)
√ Wastes (type, nature of disposal)
√ Level and type of surveillance, inspection frequency, alarms ←
√ History of land use on site - prior to well installation
√ Presence of groundwater monitoring program at perimeter of drawdown cone
√ Groundwater chemical/quality monitoring of Production Well
√ Direction which on-site drainage is transported to
√ Remoteness (distance to existing structure, access to site, distance to nearest road and sidewalk/trail)
√ Distance to and height above sea level
√ Distance and direction to nearest watercourse

B- LAND USE IN PROPOSED PROTECTION AREA

√ present land use - all types (domestic, commercial, industrial, parks etc) with description and photos
√ past land use (historical research, air photos, interviews)
√ Subsurface facilities - storm/sanitary sewers, power/communication lines, wet wells, drains from homes (need age and construction details if possible)
√ Surface facilities(power, communication poles, transformers, grounding etc)
√ vegetation (trees, lawns, gardens etc.)
√ surface drainage patterns (natural and man-made)

√ present property ownership, names, contact numbers, address
√ road network - location ,construction , curb and gutter, age, direction of roadwash runoff, culverts, AADT's if available, truck/tanker traffic (and type of chemicals), accident rates, de-icing materials and volume
√ land use policies/restrictions
√ any previous history of blasting
√ buildings (description, presence of basements and any water problems, direction of roof gutter drainage etc.)



C - HYDROGEOLOGIC SETTING

√ Overburden (type, thickness, presence of fill, pedology)
√ bedrock (lithology, structure - from well log and mapping
√ hydrostratigraphic units
√ pumping rates and water levels
√ water chemistry from pumping well (looking for signs of contamination or trends)
√ surface watersheds (upstream of well site)
√ groundwater water watershed (upstream of well site)
√ Sewersheds (for storm and sanitary sewers passing well head)
√ location and description of any other wells (i.e. drilled wells, geotechnical boreholes, sumps, wet wells etc)

D - CONTAMINANT SOURCE INVENTORY

√ Nature of contaminant(chemical, biological, physical, radiological etc)
√ Nature of release (point or non-point, surface or subsurface release, continuous or time related, volume)
√ i.e. - fuel handling and storage(LUSTs)
- road wash runoff
- storm/sanitary sewers
- fertilizer/pesticides/herbicides/insecticide application
- material handled by tanker trucks
- roof wash runoff

√ Identify toxicity of contaminant to man(acute, chronic, carcinogenicity, mutagenicity etc)
√ Characterize pertinent Properties(solubility, density viscosity vapour pressure etc)
√ Characterize Relationship to Water(dissolved, colloidal, LNAPL, DNAPL)
√ Identify what concentrations necessitate "Action"(Drinking Water Guideline)
√ Identify whether contaminant is presently analyzed for in Pumping well and what concentrations are found

E - HAZARD ASSESSMENT

Natural and human disasters that can create major emergencies specific to each well - doesn't include general ones that would in all likelihood impact all wells (i.e. earthquakes, hurricanes etc.

Appendix B

NSE Approval to Withdraw Groundwater from Pictou and Caribou Wellfields

(Approval No: 2002-026956-R01, June 21, 2013)

NOVA SCOTIA
Environment
Environmental Monitoring and Compliance

JR #3, New Glasgow
Nova Scotia
B2H 5G8

902 396-4194 T
902 396-1765 F
www.gov.ns.ca

Our File Number: 95100-30-PIC-2002-026956R01

June 20, 2013

Mr. James Chisholm
Town of Pictou
40 Water St
PO Box 640
Pictou, NS
B0K 1H0

Dear Mr. Chisholm:

RE: Approval to Withdraw Groundwater - Town of Pictou; Approval No. 2002-026956-R01; Authorization No. 3889

Enclosed please find Approval # 2002-026956-R01 issued to the Town of Pictou to withdraw groundwater from wells within the Town Wellfield and the Caribou Wellfield, located at or near Pictou and Central Caribou, Pictou County, Nova Scotia.

You will be invoiced an annual user fee based on the approved withdrawal volumes. You will also be invoiced for an annual approval administration fee. These fees are subject to review and adjustment by the Minister and you will be invoiced annually.

This Approval or a copy is to be kept on-site at all times. All personnel involved in the project must be made fully aware of the terms and conditions of this Approval. The terms and conditions are shown as attached and it is the Approval Holder's responsibility to ensure that they are followed. Failure to comply with the terms and conditions is an offence under the *Environment Act*.

It is the Approval Holder's duty to advise the Department of any new and relevant information respecting any adverse effect that results or may result from the approved activity, which comes to the Approval Holder's attention after the issuance of the Approval. This is required under Section 60 of *the Environment Act*.

If the activity is altered, extended or modified beyond the description given in this Approval, please reapply as a new Approval may be required.

Despite the issuance of this Approval, the Approval Holder is still responsible for obtaining any other authorization which may be required to carry out the activity, including those which may be necessary under provincial, federal or municipal law.

Should you have any questions, please contact Bonnie MacDonald, Northern Region, Pictou Office at (902) 396-2426.

Yours truly,

Jennifer D McDonald, M.Sc., P.Geo.
Regional Hydrogeologist

cc: B MacDonald
P McLeod
S Conrod, Town of Pictou

Elmes #: 2002-026956-R01

NOVA SCOTIA

Environment

APPROVAL

Province of Nova Scotia
Environment Act, S.N.S. 1994-95, c.1

APPROVAL HOLDER: Town of Pictou

SITE PID: 00812909

APPROVAL NO: 2002-026956-R01

AUTHORIZATION NO: 3889

EXPIRY DATE: June 20, 2023

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Withdrawal of groundwater from multiple wells within the Town Wellfield and Caribou Wellfield, located at or near Pictou and Central Caribou, Pictou County in the Province of Nova Scotia.

Administrator Penny McLeod
Penny McLeod

Effective Date June 21, 2013

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Environment

Approval Holder:	Town of Pictou
Project:	Withdrawal of Groundwater
Site:	Pictou and Central Caribou, Pictou County PID # 00812909
Approval No:	2002-026956-R01
Authorization No.	3889
File No:	95100-30-PIC-2002-026956A02

Average Withdrawal Volume: 2.26 million litere per day

Maximum Withdrawal Volume: 4.28 million liters per day

Reference Documents:

- Application dated April 3, 2013 and attachments.
- exp Services Inc. April 2013. *Application of Approval Water Withdrawal Production Well Foots Lane (No. 2) Town Wellfield.*
- exp Services Inc. November 1, 2012. *Memorandum: Pump Test Analysis PW #15 Addendum Report for NS Environment.*
- exp Services Inc. September 2011. *Town of Pictou: Application of Approval Water Withdrawal Production Well No. 15, Town Well Field.*
- CBCL Limited. November 2010. *Town of Pictou Water System Upgrades Pre-Design Report.*
- ADI Limited. July 2006. *Town of Pictou Application of Approval Water Withdrawal Well No. 14 - Town Wellfield*; ADI Report: (24)3945-001.1.
- ADI Limited. October 2002. *Town of Pictou Groundwater Wellfield Hydrological Budget Analysis*; ADI Report: (24) 3945-001.1.
- C.J. MacLellan and Associates Inc. March 12, 2004. *System Assessment Report for the Town of Pictou Water Works.*
- ADI Limited. February 2002. *Town of Pictou Caribou Wellfield Report for Designation as a Protected Water Supply*; ADI Report (24) 3945-001.1.
- ADI Limited. October 2001. *Town of Pictou Data Supporting Wellfield Water Withdrawal Permit*; ADI Report: (24)3945-001.1.

1.0 Definitions:

a) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act.

b) "Activity" means the withdrawal of groundwater from multiple wells within the Town and Caribou Wellfields, and associated works.

c) "Administrator" means the Manager of the Northern Region, Pictou Office of Nova Scotia Environment or the Manager's designate.

d) "Department" means the Northern Region, Pictou Office, of Nova Scotia Environment located at the following address:

Nova Scotia Environment
Environmental Monitoring and Compliance Division
Northern Region, Pictou Office (Granton)
20 Pumphouse Road
RR #3
New Glasgow
Pictou County, NS B2H 5C6

Phone: (902) 396-4194
Fax: (902) 396-4765

e) "Groundwater" means all water naturally occurring under the surface of the Province of Nova Scotia.

f) "Minister" means the Minister of Nova Scotia Environment.

g) "NSE" means Nova Scotia Environment.

h) "Watercourse" means
   i) the bed banks and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and
   ii) all groundwater;

2.0 Scope of Approval

a) This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to withdraw groundwater from multiple wells within the Town and Caribou Wellfields, situated at or near Pictou and Central Caribou, Pictou County.

b) This Approval supercedes previous Approval number(s) which is/are now null and void.

3.0 General Terms and Conditions

a) The Approval Holder shall construct the watercourse alterations in accordance with provisions of the:

i) *Environment Act* S.N.S. 1994-1995, c.1;
ii) Regulations, as amended from time to time, pursuant to the above Act;
iii) Standards, Policies, or Guidelines issued by Nova Scotia Environment, as amended from time to time.

b) The Activity shall be conducted in accordance with the details and specifications in the Application and attached appendices and the reference documents. **If there is a discrepancy between the reference documents and these terms and conditions, the terms and conditions of this Approval shall apply.**

c) Any request for renewal or extension of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.

d) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.

e) This Approval is not transferable without the consent of the Minister or Administrator.

f) i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.

ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.

g) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Activity, including, but not limited to, an increase in withdrawal rates or the addition of production wells. The Approval holder shall obtain written authorization or amendment from the Administrator before implementing any change that would not comply with the Terms and Conditions of this Approval.

h) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.

i) Pursuant to Section 60 of the *Act*, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.

j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.

k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.

l) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, All monitoring results shall be submitted within 30 days following the month of monitoring.

m) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the watercourse alterations are made fully aware of the terms and conditions which pertain to this Approval.

n) Within one month of the issuance of this Approval, the Approval Holder shall designate in writing, to the Department, a contact for this Approval. If the contact should change, the Approval Holder shall immediately notify the Department in writing.

o) The Approval Holder shall, upon receipt of an invoice from the Minister of Nova Scotia Environment stating the amount owing, pay to the Minister of Finance the amount stipulated in said invoice. Said amount shall be, in accordance with the schedule of fees established by the Minister of Nova Scotia Environment, as may be revised from time to time.

p) The failure of the Minister to insist upon a strict performance of a Term and Condition contained in this Approval shall not be deemed a waiver of any rights or remedies that the Minister may have and shall not be deemed a waiver of any subsequent breach of the Terms and Conditions of this Approval.

q) This Approval does not give sole or exclusive rights to any watercourse or water resource, and the Minister reserves the right to use and to allow others to use the watercourse or water resource and the water therein.

r) The Approval Holder may not alter or use the watercourse or water resource so as to:

   i) prejudice any riparian or other rights, should any such rights exist, of a person lawfully in possession lands abutting the watercourse or water resource;
   ii) cause damage or nuisance to adjacent or abutting lands.

s) The Approval Holder shall not place a pecuniary value on or claim any pecuniary value for the rights granted by this Approval, over and above the amounts, if any, paid to the Minister by the Approval Holder for the rights.

t) The Approval Holder shall maintain a culvert, bridge, dam, sluice, flume, conduit, well or other structure built or used in or on the watercourse or water resources so that it does not cause an adverse effect. This conditions survives the expiry or cancellation of this Approval.

u) The Approval Holder shall conform to a direction of the Minister or an Administrator concerning the maintenance or rehabilitation of a watercourse or water resource or the maintenance, rehabilitation or removal of a culvert, bridge, dam, sluice, flume, conduit, or structure used or maintained in and on the watercourse or water resource. The Approval Holder shall, pursuant to an Approval where required, remove a culvert, bridge, dam, sluice, flume, conduit or other structure and any equipment or personal property built, used or maintained in and on the watercourse or water resource at the end of the useful life of the culvert, bridge, dam, sluice, flume, conduit or structure. In the event the Approval Holder fails to remove a culvert, bridge, dam, sluice, flume, conduit or other structure or equipment or personal property, the Minister may, without any liability, remove or demolish the same in whatever manner the Minister deems necessary and the Approval Holder shall reimburse the Minister for all expenses and costs of such removal or demolition. This condition survives the expiry or cancellation of this Approval.

v) The Approval Holder shall indemnify and save harmless the Minister and an employee, servant or agent of the Department against any loss, cost or damage resulting from the activities performed pursuant to this Approval. Such indemnity shall include, but not be restricted to, all losses, costs or damages occasioned by the improper or faulty relocation of a watercourse or water resource or the improper or faulty construction of, repair, alteration or addition to any culvert, bridge, dam, sluice, flume, conduit or other structure in or on the watercourse or water resource, or by any trespass, negligence or wilful act of the Approval Holder or any employees, agents, contractors or guests of the Approval Holder.

w) This Approval shall enure to the benefit of and be binding upon the Minister, the Minister's successors, assigns and authorized representatives and upon the Approval Holder, and the heirs, administrators, executors and assigns of the Approval Holder.

x) The Minister and all persons designated as Inspectors pursuant to the *Environment Act* shall have free access at all times to the Activity and to land under control of the Approval Holder to ensure these Terms and Conditions are being fulfilled.

y) Nothing in this Approval relieves the Approval Holder of the responsibility for obtaining and paying for all licences, permits, approvals or authorizations necessary for carrying out the work authorized to be performed by this Approval which may be required by municipal by-laws or provincial or federal legislation. The Minister does not warrant that such licences, permits, approvals or other authorizations will be issued.

4.0 Approved Withdrawal

a) The location and construction of the production wells covered by this Approval is restricted to those shown in Table 1.

b) The maximum pumping rate, average pumping rate, 30 day withdrawal volume and annual withdrawal volume for each individual well and the total wellfield shall not exceed the values shown in Table 2.

c) The Department may amend the approved withdrawal limits specified in Table 2. The Approval Holder will be notified in writing of any changes to the approved withdrawal limits.

Table 1 - Well Construction Information

Production Well	Date Completed	NSE Well Log Number	Well UTM Coordinates		Well Total Depth (m)	Casing Depth (m)	Diameter (mm)	Screen Description
			Easting	Northing				
Beaches Road	1945	-	-	-	156	-	203	none
Division Road	1974	740136	523052	5060347	152	13	203	none
Exhibition	1972	-	-	-	117	10	203	none
Footes Lane 2	2012	121531	522960	5059950	87	15.2	203	none
M&M	-	-	-	-	152	82	184	none
Public Works	1982	-	-	-	188	-	203	none
Smith Grant	1908	-	-	-	103.6	-	203	none
No. 8	-	-	-	-	49	6.8	203	none
No. 10	1966	-	-	-	5.4	4.2	162	4.2-6.1
No. 11	1989	891345	522465	5059463	66	13	203	none
No. 12	1998	960944	524144	5058632	87	25.6	203	none
No. 14	2005	050064	521084	5057969	67	19.2	203	none
No. 15	2009	090257	523942	5059682	99	18	203	none

Table 2 - Approved Withdrawal				
Production Well	Pumping Rate (litres/day)		Withdrawal Volume (litres)	
	Maximum [1] (over 3 days)	Average [2] (Over 30 days)	30 day [3]	Annual [4]
Beaches Road	393,120	230,400	6,912,000	84,096,000
Division Road	264,880	164,160	4,924,800	59,918,400
Exhibition	164,160	79,200	2,376,000	28,908,000
Footes Lane 2	328,880	230,400	6,912,000	84,096,000
M&M	228,960	144,000	4,320,000	52,560,000
Public Works	228,960	164,160	4,924,800	59,918,400
Smith Grant	228,960	129,600	3,888,000	47,304,000
No. 8	131,040	93,600	2,808,000	34,164,000
No. 10	817,920	194,400	5,832,000	70,956,000
No. 11	228,960	129,600	3,888,000	47,304,000
No. 12	681,120	331,200	9,936,000	120,888,000
No. 14	524,160	367,200	11,016,000	134,028,000
No. 16	326,880	326,880	9,806,400	119,311,200
Total Wellfield [5]	**4,280,000**	**2,260,000**	**67,800,000**	**824,900,000**

Notes:

1 Pumping rate shall at no time exceed the maximum based on actual rate averaged after 3 days.

2 Average allowable pumping rate is based on the demonstrated water needs of the applicant and sustainable yield.

3 30 day withdrawal volume = Average pumping rate multiplied by 30 days.

4 Annual withdrawal volume = Average pumping rate multiplied by the number days pumped per year (i.e. 365).

5 Total well field is based on the previous approved withdrawal limits and current demand; it is not a sum of the approved limits for all production wells.

5.0 Flow Monitoring

a) Well production flow meters shall be installed, maintained and monitored separately for all production well(s).

b) The Approval Holder shall keep daily well production records for each well to include water usage volumes. Data shall be tabulated within a spreadsheet program.

6.0 Groundwater Withdrawal Records

a) The Approval Holder shall maintain monitoring records for:
   i) pumping flow rates;
   ii) duration of pumping;
   iii) total withdrawal volumes;
   iv) water quality;
   v) changes in use; and
   vi) reported effects of the withdrawal on other groundwater users.

b) These records shall be maintained on Site for a period of ten years and are to be available for review immediately upon request by the Department.

7.0 Well Interference Remedy

a) If production causes interference problems with any existing well supplies, the withdrawal rates shall be reduced and/or the problem rectified by the Approval Holder in accordance with an action plan acceptable to the Department.

8.0 Well Decommissioning

a) Any new or existing well located at the Site that is required to be decommissioned by the Minister or is not used or maintained for present or future use shall be decommissioned in accordance with the *Well Construction Regulations* and Water Well Decommissioning Guidelines. This condition survives the expiry or cancellation of this Approval.

9.0 Water Level Monitoring

a) The Approval Holder shall collect manually, or with electronic data loggers, water levels in all production wells on at least a weekly basis. Data shall be tabulated within a spreadsheet program.

b) The Approval Holder shall collect manually, or with electronic data loggers, water levels in dedicated observation wells on at least a semi-annual basis. Data shall be tabulated within a spreadsheet program.

c) The water level monitoring data is to be maintained on Site for a period of ten years and is to be available for review immediately upon request by the Department.

10.0 Groundwater Withdrawal Reporting

a) The Approval Holder shall submit the following records to the Department on an annual basis:
   i) production records for each well (i.e. groundwater withdrawal volumes), in comparison with approved withdrawal limits;
   ii) a summary of any occurrences during the year that may have resulted in potential hazards or changes to the water supply (nearby land development, new wells or pumps installed, wells abandoned, contaminant spills etc.);
   iii) a description of any water conservation measures implemented;
   iv) a summary of any effects reported by other groundwater users in the area;

b) The records shall be incorporated as part of the annual report for the Municipal Water Works Approval and submitted to the Department on or before April 1 following completion of the calendar year being reported upon.

c) Data submissions completed for the requirements of this Approval does not remove the Approval Holder from meeting any other registration, reporting, data maintenance and compliance requirements such as those specified in the Guidelines for Monitoring Public Drinking Water Supplies or other regulatory guidelines.

11.0 Site Specific

a) If salt water intrusion problems occur as evidenced by changes to water level or water quality effects, the Approval Holder shall notify the Department immediately and the withdrawal rate shall be reduced and/or the problem rectified to the satisfaction of the Department.

b) i) The Approval Holder shall review the safe yield estimates for the following production wells: No. 12, No. 14, No. 15, and Footes Lane 2 after the collection of one year of operational data with No. 15 and Footes Lane 2 added to the system.

ii) A report outlining the results of this review shall be submitted to the Department within 18 months of Well No. 15 and Footes Lane 2 being connected to the system. The report shall included recommended updates to the safe yields and withdrawal rates specified in Table 2, as applicable. Approved withdrawal limits specified in this Approval may be amended by the Department pending the results of this review.

ii) The items referenced in 11 b) i) and 11 b) ii) shall be completed by a qualified Hydrogeologist, licensed to practice by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS).

Appendix C

NSE Permit to Operate a Water Supply System

(Approval No: 2012-080096-R02, March 4, 2016)

NOVA SCOTIA
Environment

APPROVAL

Province of Nova Scotia
***Environment Act*, S.N.S. 1994-95, c.1, s.1**

APPROVAL HOLDER: Town of Pictou

APPROVAL NO: 2012-080096-R02

EXPIRY DATE: February 16, 2026

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1, s.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Operation of non-GUDI and medium risk GUDI wells with natural filtration credit, greensand filters, and UV and chlorine for primary and secondary disinfection, water distribution system and associated works, located at or near 40 Water St, Pictou, Pictou County in the Province of Nova Scotia.

Administrator Penny McLeod
Penny McLeod

Effective Date March 4, 2016

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Environment

Approval Holder: Town of Pictou
Project: Water Supply System Serviced by non-GUDI and Medium Risk GUDI wells with Natural Filtration Credit, Greensand Filters, and UV and Chlorine for Primary and Secondary Disinfection

40 Water St
Pictou, Pictou County

Approval No: 2012-080096-R02

File No: 94600-30

Reference Documents:

- Application dated February 2, 2015 and attachments.
- E-Mail Correspondence between NSE and the Town dated October - December 2015.
- Town of Pictou. August 2014. Water Utility Operating Manual.
- K. Slaunwhite. July 30, 2014. Approval No. 2012-0800096 Compliance Update.
- K. Slaunwhite. September 16, 2013. Corrective Action Plan for Approval No. 2012-0800096.
- B. McDonald. March 31, 2013. System Assessment Report for Town of Pictou.
- K. Slaunwhite. March 2013 - June 2014. Quarterly Update Reports for Approval No. 2012-0800096:
  - Quarterly Update #1. March 15, 2013.
  - Quarterly Update #2. June 14, 2013.
  - Quarterly Update #3. September 16, 2013.
  - Quarterly Update #4. December 17, 2013.
  - Quarterly Update #5. March 14, 2014.
  - Quarterly Update #6. June 20, 2014.
- CBCL Limited. July 2011. Town of Pictou Phase I - Water Treatment Upgrades
- GUDI Assessment Reports:
  - CJ MacLellan and Associates Inc. March 12, 2004. System Assessment Report and Step 1 GUDI Assessment.
  - ADI Limited. November 2006. Step 2 GUDI Report.
  - ADI Limited. June 2009. Step 3 GUDI Report.
- exp Services Inc. September 2011. GUDI Natural Filtration Credits.
- Source Water Protection Plan (Draft). No date. Received via e-mail October 26, 2015.

1. **Definitions:**

a. "Act" means the Environment Act S.N.S. 1994-1995, c.1, s.1 and includes all regulations made pursuant to the Act.

b. "Administrator" means a person appointed pursuant to Section 21 of the Act.

c. "Associated Works" means all the piping, valves, instrumentation, controls, electrical works, etc., required for the operation of the Facility and Water Supply System.

d. "CT" means disinfectant residual in mg/L multiplied by the contact time in minutes.

e. "Contact Time" denoted as T_{10} is an effective contact time for disinfection in minutes and represents the time when 10% of the water passes the contact unit; that is 90% of the water remains in the unit and will be exposed to longer disinfection within the unit. T_{10} can be established by tracer studies or calculated using theoretical hydraulic detention times multiplied by an appropriate baffling factor listed in the "Treatment Standard for Municipal Surface Source Water Treatment Facilities" or "Treatment Standards for Municipal Groundwater Source Water Treatment Facilities".

f. "Continuous monitoring" is sampling or flow through analysis equipment that creates an output signal a minimum of once every five minutes.

g. "Department" means the Northern Region, Pictou Office, of Nova Scotia Environment located at the following address:

Nova Scotia Environment
Environmental Health and Food Safety Division
Northern Region, Pictou Office (Granton)
20 Pumphouse Road
RR #3
New Glasgow
Pictou County, NS B2H 5C6

Phone: (902) 396-4194
Fax: (902) 396-4765

h. "Facility" means the medium risk GUDI wells, greensand filters, Chlorine for primary disinfection, Chlorine for secondary disinfection and associated works.

i. "GCDWQ" means the latest edition of "Guidelines for Canadian Drinking Water Quality".

j. "Grab sample" means an individual sample collected in less than 30 minutes and which is representative of the substance sampled.

k. "Groundwater under the direct influence of surface water " or "GUDI" means any water beneath the surface of the ground with:

   i. significant occurrence of insects or other macro-organisms, algae, organic debris, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*; or

   ii. significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.

l. "GUDI well" means a well that has been classified as GUDI based on the "Protocol for Determining Groundwater Under the Direct Influence of Surface Water" and has been accepted as such in writing by the Regional Hydrogeologist.

m. "Inadequately disinfected" means water that does not meet the required contact time.

n. "Log reduction" means a negative of the base 10 logarithm of the fraction of pathogens remaining after the treatment process.

   log reduction = log removal by physical treatment + log inactivation by disinfection

   where log removal by physical treatment is equal to the credit assigned to the filtration technology indicated in the Department's "Treatment Standard for Municipal Surface Source Water Treatment Facilities", as amended from time to time; and

   log inactivation by disinfection is equal to the inactivation which shall be calculated as defined by the Department's "Treatment Standard for Municipal Surface Source Water Treatment Facilities" or "Treatment Standard for Municipal Groundwater Source Water Treatment Facilities", as amended from time to time.

o. "Maximum day demand" means the highest daily use rate during the year.

p. "Minister" means the Minister of Nova Scotia Environment.

q. "MPA testing" means Microscopic Particulate Analysis which analyses for significant numbers of large macro-organisms, algae, and surrogate indicators of surface water.

r. "Non-GUDI well" means a well that has been classified as non-GUDI based on the "Protocol for Determining Groundwater Under the Direct Influence of Surface Water" and has been accepted as such in writing by the Regional Hydrogeologist.

s. "NSE" means Nova Scotia Environment.

t. "QA/QC" means quality assurance and quality control.

u. "Quarterly sampling" means samples taken once per quarter with no less than 45 days interval between sampling events.

v. "Site" means the structure used by the operator in overall direct responsible charge to maintain and store documents and records required by this approval.

w. "Total trihalomethanes" means the level of total trihalomethanes as defined by the latest edition of the GCDWQ.

x. "Water Supply System" means the Facility and all auxiliaries/associated works for the collection, treatment, storage and distribution of water from the source of supply to the service connection of the ultimate consumer.

y. "Water Withdrawal Approval" means an approval from Nova Scotia Environment for the withdrawal of water from a surface or groundwater source. For clarity, this approval was also formerly known as a "water rights", "water licence", "water permit" or "water authorization".

2. Scope of Approval

a. This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to operate the Water Supply System.

b. This approval relates to aspects of the application and reference documents necessary to meet the operational, environmental, and public health requirements of the Water Supply System.

c. This Approval supercedes previous approval number 2012-080096-R01, which is now null and void.

3. General

a. The Approval Holder shall operate the Water Supply System in accordance with provisions of the:

   i. *Environment Act* S.N.S. 1994-1995, c.1, s.1 as amended from time to time;
   ii. Regulations, as amended from time to time, pursuant to the above Act.

b. The Water Supply System shall be operated in accordance with the details and specifications in the Application and attached appendices and the reference documents. **If there is a discrepancy between the reference documents and these terms and conditions, the terms and conditions of this approval shall apply.**

c. Any request for renewal or extension of this Approval is to be made in writing, to the Department, at least ninety (90) days prior to the Approval expiry.

d. The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.

e. This Approval is not transferable without the consent of the Minister or Administrator.

f. i. If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(A)(1) and 58(A)(2) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.

   ii. Despite a cancellation or suspension of this Approval, the Approval Holder is at all times subject to the penalty provisions of the Act and regulations.

g. The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Water Supply System, including process changes or waste disposal practices which are not granted under this Approval. Written approval from the Administrator may be required before implementing any change.

h. Pursuant to Section 60 of the Act, the Approval Holder shall submit to the Administrator any information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.

i. The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.

j. The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.

k. Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.

l. Unless written approval is received otherwise from the Administrator, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.

m. Notwithstanding the above item, the following parameters may be analysed at the Facility or a laboratory that is not certified.

Alkalinity*, Aluminium Residual*, Chloramines, Chlorine Dioxide Residual, Chlorine Residual, Colour, Conductivity*, Fluoride Residual*, Hardness*, Iron*, Manganese*, Methane*, Free Ammonia (as N)*, Ozone Residual, pH, Temperature, Total Organic Carbon, Turbidity and UV Absorbance.

* These parameters must have a QA/QC component that includes quarterly confirmation by an accredited laboratory.

n. The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel involved in the Water Supply System operation are made fully aware of the terms and conditions which pertain to this Approval.

4. Spills or Releases

a. All spills or releases shall be reported in accordance with the Act (Part VI) and the *Environmental Emergency Regulations*.

b. Spills or releases shall be cleaned up in accordance with the Act.

5. Operations - General

a. The Water Supply System has been classified as a **Class II Water Treatment Facility** and a **Class II Water Distribution Facility**.

b. In accordance with the *Water and Wastewater Facilities and Public Drinking Water Supplies Regulations*, the Approval Holder shall place the responsibility for the operation, repair and maintenance of the Water Supply System under the overall direct responsible charge of an operator who holds a valid Operator Certification Certificate of a classification rating that is equivalent to or greater than the classification rating applied to the Water Supply System.

c. Notwithstanding Clause 5(b) above, if the Approval Holder cannot meet the requirement of Clause 5(b), the Approval Holder shall work towards satisfying Clause 5(b) in accordance with a transition plan approved by the Administrator. The transition plan shall be submitted to the Administrator within 90 days of being unable to satisfy Clause 5(b). This plan shall be subject to review and acceptance by the Department.

d. The Approval Holder shall ensure the contingency plan for the Water Supply System:
   i. meets the minimum requirements of the Department's "Water Utility Standard Operating Procedures and Contingency Plan Guidance", as amended from time to time.
   ii. is reviewed and updated on a yearly basis, if required. The Approval Holder shall document in the annual report what modifications were made to the plan, if any, and how the plan was communicated to their staff.
   iii. A copy is maintained on Site at all times and is available to the Department upon request.
   iv. All employees are apprised of the contingency plan.

e. When it is necessary to use a by-pass, the Approval Holder shall immediately notify NSE, identify the anticipated period of time that the by-pass system will be in service and initiate a Boil Water Advisory as stated in the "Guidelines for Monitoring Public Drinking Water Supplies". The Approval Holder shall maintain the boil advisory until otherwise advised by Nova Scotia Environment.

f. The Approval Holder shall take immediate preventive or corrective action, using methods that are acceptable to the Department, when results of an inspection or sampling results identify conditions which are currently or may result in an adverse effect to the environment or public health.

g. The Approval Holder shall protect the Water Supply System from

contamination due to cross-connections. If repairs, construction or maintenance are required, the Approval Holder shall ensure that the necessary work meets the requirements of the latest revision of CSA B64.10/B64.10.1.

h. The Approval Holder shall demonstrate that any Water Supply System component in contact with treated water has been disinfected after construction, repair or maintenance in accordance with ANSI(American National Standards Institute)/AWWA (American Water Works Association) C651 - Disinfection of Water Mains, ANSI/AWWA-C653 - Disinfection of Water Treatment Plant, and ANSI/AWWA C652 - Disinfection of Water Storage Facilities or the latest revisions.

i. The Approval Holder shall ensure that all chemicals used in the treatment process and all materials contacting the water are of "food grade" quality and meet both the AWWA quality criteria as set out in AWWA standards and the ANSI safety criteria as set out in ANSI standard NSF/60 (for chemical additives) or NSF/61 (for materials). A copy of the appropriate NSF certification is to be kept on Site and is to be available for review immediately upon request by the Department.

j. The Approval Holder shall discontinue use of any chemical found to have adverse effects on finished water quality limits as prescribed in the GCDWQ or this Approval.

k. i. The Approval Holder shall ensure that the emergency notification procedures are reviewed and updated on a yearly basis. The Approval Holder shall document in the annual report what modifications were made to the emergency notification procedures and how the procedures were communicated to their staff.

ii. A copy of the emergency notification procedures are to be maintained on Site at all times and are to be available to the Department upon request.

iii. All employees shall be apprised of the emergency notification procedures.

l. i. The Approval Holder shall ensure a comprehensive operations manual is kept up to date.

ii. A copy of the operations manual is to be kept on Site at all times and is to be available for review immediately upon request by the Department.

iii. All employees shall be apprised of the operations manual.

m. A set of current engineering drawings, shall be retained on Site by the Approval Holder for as long as the Water Supply System is in operation. These drawings shall be made available to the Department upon request.

n. The Approval Holder shall establish procedures for receiving and responding to complaints including a reporting system which records and documents what steps were taken to determine the cause of complaint and the corrective measures taken to alleviate the cause and prevent its recurrence.

o. The Approval Holder shall establish security measures to assure the safety of the Water Supply System.

p. The Approval Holder shall maintain a written list of the name of each laboratory utilized, and the parameters analysed by each laboratory, and shall submit this list to the Department upon request.

6. **Source Water Protection**

a. On or before May 2, 2016, the Approval Holder shall submit the updated Source Water Protection Plan to the Department for review and acceptance.

b. On or before June 30, 2016, the Approval Holder shall submit an updated implementation schedule for the Source Water Protection Plan to the Department for review and acceptance.

c. The Approval Holder shall implement the accepted Source Water Protection Plan, required under Condition 6 (b), in accordance with the accepted schedule.

d. The Approval Holder shall review and update the Source Water Protection Plan and implementation schedule on a yearly basis, if required. The Approval Holder shall document in the annual report the status and activities of the Source Water Protection Plan and modifications made to the Source Water Protection Plan or implementation schedule, if any.

e. If directed by NSE, the Approval Holder shall modify the updated Source Water Protection Plan or implementation schedule to the satisfaction of the Department.

7. Water Quality Requirements - Performance and Limits

a. General Requirements

i. The treated water shall meet the health-related concentration limits for the substances listed in the "Guidelines for Canadian Drinking Water Quality" (GCDWQ), latest edition unless stated otherwise in this Approval. These are described in the guidelines as Maximum Acceptable Concentration (MAC).

ii. For the medium risk GUDI wells (No. 8, No. 10, Smith Grant, Public Works, Beeches Road, and M&M), through a combination of natural filtration, UV, and chlorination, the treatment facility shall meet the following treatment efficiencies:

(1) Treatment shall be sufficient to ensure 99.9% reduction of *Giardia* cysts and *Cryptosporidium* oocysts (3-Log Reduction);

(2) Treatment shall be sufficient to ensure 99.99% reduction of viruses (4-Log Reduction); and

(3) Natural filtration is assigned a 1-log reduction credit for *Giardia* and *Cryptosporidium*.

(4) Primary disinfection shall address a minimum of 2-log inactivation for *Giardia* and *Cryptosporidium* and 4-log inactivation for viruses. CT/IT values shall be calculated in accordance with the Nova Scotia Treatment Standards for Municipal Drinking Water Systems, 2012.

iii. For the non-GUDI wells (No. 11, No. 12, No. 14, No. 15, Division Road, Exhibition, and Footes Lane 2), using both the natural filtration and disinfection processes, the treatment facility shall meet the following treatment efficiencies:

(1) Treatment shall be sufficient to ensure 99.99% reduction of viruses (4-Log Reduction); and

(2) Primary disinfection shall address a minimum of 4-log reduction for viruses. CT values shall be calculated in accordance with the "Nova Scotia Treatment Standards for Municipal Drinking Water Systems" (2012).

iv. The treated water shall be treated to minimize corrosion of the water distribution and/or plumbing systems.

b. **Primary Disinfection Requirements**

i. Primary disinfection through the use of chlorine, ultraviolet light or an alternate disinfection method which is acceptable to the Department, shall contribute a minimum of 2-log reduction for *Giardia* and *Cryptosporidium* and 4-log inactivation for viruses for each GUDI well or if water from individual GUDI wells is combined, for the combined flow. The disinfection log inactivation shall be based on CT values which shall be calculated as defined by the Department's "Treatment Standard for Municipal Surface Source Water Treatment Facilities".

ii. Primary disinfection through the use of chlorine shall contribute a minimum of 4-log inactivation for viruses for each non-GUDI well or if water from individual non-GUDI wells is combined, for the combined flow. The disinfection log inactivation shall be based on CT values which shall be calculated as defined by the Department's "Treatment Standard for Municipal Drinking Water Systems" (2012).

iii. System-wide redundancy shall apply - individual disinfection units shall be configured to apply primary disinfection at all times to ensure that inadequately disinfected water does not enter the distribution system. A well shall shut down automatically when the monitoring system detects inadequate disinfection.

iv. Each disinfection unit shall be designed to meet the rated design flow capacity of the wells or combined wells.

v. Disinfection equipment shall be operated in such a manner as to prevent inadequately disinfected water from being distributed.

vi. Continuous monitoring of the primary disinfection process is required with measurements taken at no more than five minute intervals.

vii. The Facility shall be equipped with instrumentation capabilities to notify operations staff if the disinfection process fails to operate properly.

viii. In the event of an emergency situation where inadequately disinfected water enters the water distribution system, the Approval Holder shall issue a boil water advisory and immediately notify the Department as required by the "Guidelines for Monitoring Public Drinking Water Supplies".

ix. UV Light Requirements

(1) UV systems shall provide a minimum dosage of 40 mJ/cm^2 at all points within the reactor at all times when water is passing through the treatment process provided that the water quality characteristics indicate that this is a sufficient dosage.

(2) Water flow shall be stopped or directed to waste, or another method of disinfection shall be used, during the minimum design warm-up period for the UV unit.

(3) UV disinfection unit shall be equipped with UV sensors reading calibrated UV intensity.

(4) The system shall be equipped with an alarm notification and shutdown procedures in the event of:
- high temperature in the reactor, lamp, ballast or transformer;
- high flow rate that causes dose to fall below design specifications;
- low UV dose;
- low UV intensity;
- UV has shutdown;
- or any other emergency situation.

(5) UV lamp operation shall be monitored in a manner that ensures bulb replacement can be accomplished prior to reaching the maximum lamp life expectancy.

(6) The Approval Holder shall receive written verification from an independent third party that the manufacturer's system will continually meet the 40 mJ/cm^2 requirement and provide this information to NSE immediately upon request.

x. On or before May 2, 2016 the Approval Holder shall submit standard operating procedures (SOPs) for the disinfection process to the Department. The SOP's shall be implemented and communicated to all operations staff and documented in the operations manual required by Clause 5(l) above. The procedures and a log indicating the date and method of communication to staff shall be made available to NSE upon request.

xi. The SOPs shall indicate the design ranges for achieving the required log inactivation by disinfection, for example:
- CT: lowest temperature, highest pH, lowest chlorine, minimum contact time.

- IT: UV intensity, UV transmittance, flow rate.

xii. The Approval Holder shall maintain a log of events when operational conditions are outside the design ranges for achieving the CT/IT. These records shall be made available to NSE immediately upon request. Log inactivation shall be calculated during every such event.

xiii. When operational conditions are outside the design ranges, the Approval Holder shall immediately notify NSE, investigate the cause and take necessary corrective action. CT/IT shall be calculated during every such event.

c. **Secondary Disinfection and Residual Monitoring Requirements**

i. Secondary disinfection through the use of chlorination shall be used to maintain a chlorine residual in the water distribution system.

ii. The disinfection process shall be operated in such a manner as to ensure that the following minimum chlorine residual value is achieved throughout the water distribution system at all times:

- 0.20 mg/L free chlorine residual.

The disinfection process shall be operated in such a manner as to ensure that the maximum chlorine residual delivered to consumers does not exceed the following values:

- 4.0 mg/L free chlorine residual.

iii. Continuous online monitoring of the chlorine residual is required for finished water at each location where water enters the water distribution system from an individual well or combined wells, with measurements taken at no more than five minute intervals.

iv. Continuous on-line monitoring of the chlorine residual is required for the water entering the distribution system and leaving any water storage structure within the water distribution system, with measurements taken at no more than five minute intervals.

v. Monitoring of the water distribution system for chlorine residual is required. Unless specified otherwise in this approval, sampling and testing frequency is the same as for bacteriological sampling requirements as stated in the "Guidelines for Monitoring Public Drinking Water Supplies".

d. **Turbidity Requirements:**

i. Continuous raw water turbidity monitoring (with measurements taken at no more than five minute intervals) is required at the wellhead prior to disinfection for the medium risk GUDI wells (i.e., Public Works, M&M, Beeches Road, No. 8, No. 10, and Smith Grant).

ii. Continuous (with measurements taken at no more than five minute intervals) or daily grab raw water turbidity monitoring is required from each non-GUDI well or combined flow from non-GUDI wells entering the distribution system (i.e., No. 11, No. 12, No. 14, No. 15, Division Road, Exhibition, and Footes Lane 2).

iii. Turbidity levels entering the distribution system from individual wells or combination of wells shall not exceed 1.0 NTU:

- in at least 95% of the measurements taken by grab sample for each calendar month; or

- in at least 95% of the time each calendar month if continuous monitoring is the method of turbidity measurement.

iv. Notwithstanding clause 7(d)(iii), if the Approval Holder cannot meet the requirement of clause 7(d)(iii), the Approval Holder may request that a less stringent value apply provided the Approval Holder can demonstrate to NSE that the turbidity is not health-related and that the disinfection process is not compromised by the use of a less stringent value.

v. A turbidity value of 5.0 NTU or less shall be achieved on water distribution system sampling. Unless specified otherwise in this approval, sampling and testing frequency is the same as for bacteriological sampling requirements as stated in the "Guidelines for Monitoring Public Drinking Water Supplies".

vi. i. Where turbidity values of greater than 1.0 NTU are observed entering the water distribution system, from individual GUDI or non-GUDI wells or combined flow from non-GUDI wells, the Approval Holder shall investigate the cause and take corrective action as necessary and notify the Department.

ii. Where turbidity values of greater than 5.0 NTU are observed in the water distribution system, the Approval Holder shall investigate the cause and take corrective action as necessary and notify the Department.

e. **Greensand Filtration Requirements:**

i. The greensand filtration process shall be monitored and equipped with alarms and instrumentation to notify the Approval Holder of any problems that may compromise the disinfection process or result in a health-related drinking water guideline exceedence.

ii. Standard operational procedures for the greensand filtration process shall be developed, implemented and communicated to all operations staff and documented in the operations manual required by Clause 5(l) above. The procedures and a log indicating the date and method of communication to staff shall be made available to the Department immediately upon request.

iii. The standard operational procedures referenced in 7 e) ii) shall be submitted to NSE by May 2, 2016.

8. **Filter Backwash Water System - Performance and Limits**

a. Filter backwash water from the Facility shall be discharged to an approved location.

b. The Approval Holder shall submit an updated filter backwash plan to NSE for approval on or before June 30, 2016, for the independent wells and an interim plan for the wells that will be connected to the treatment plant. The filter backwash plan shall address the concerns identified in the 2013 System Assessment Report and shall include discharge locations and limits.

9. **Sludge Disposal**

a. The Approval Holder shall submit a plan for the ultimate disposal of solids from the waste treatment process to the Department for review and approval on or before June 30, 2016.

b. All solids from the waste treatment process shall be disposed in accordance with the approved sludge disposal plan.

c. Written approval is required from the Department to modify the sludge disposal plan.

10. **Upgrade Approvals**

a. The Approval Holder shall obtain from NSE a separate Approval for the construction of any proposed facilities required to meet the drinking water treatment standards and waste discharge requirements.

b. The Approval Holder shall submit an application for an amendment to this Approval if any new wells are to be connected to the existing Water Supply System. No additional wells shall be connected to the existing Water Supply System without prior written approval from the Minister.

11. **Production**

a. The Approval Holder shall comply with the Terms and Conditions of the water withdrawal approval for the Facility.

b. The Approval Holder shall report water withdrawal data in the annual report.

12. **Backup Water Systems**

a. When a backup water system is used for supplying water for human consumption, the Approval Holder shall immediately notify the Department and identify the anticipated period of time that the backup system will be in service.

b. For backup systems that do not meet the Nova Scotia Treatment Standards, the Approval Holder shall immediately initiate a Boil Water Advisory as stated in the "Guidelines for Monitoring Public Water Supplies". The Approval Holder shall maintain the boil advisory until otherwise advised by Nova Scotia Environment.

c. For backup systems that meet the Nova Scotia Treatment Standards, the backup water system may continue to operate as under normal conditions until the main water system is ready to be put back into service.

13. **Monitoring and Recording**

a. All monitoring shall be carried out as per the requirements of the *Water and Wastewater Facilities and Public Drinking Water Supplies Regulations* and the "Guidelines for Monitoring Public Drinking Water Supplies" as amended from time to time.

b. The Approval Holder shall monitor and sample the Water Supply System in accordance with a monitoring program approved by the Department and which meets the minimum requirements of Schedule A attached. In the case of a discrepancy between Schedule A and the approved monitoring program, the approved monitoring program shall apply.

c. Sampling shall be representative of the water distribution system.

d. i. On or before October 1, 2016, the Approval Holder shall undertake a review of sampling sites (post water upgrades) and submit to the Department for approval a recommended monitoring program for the Water Supply System for the current year. The proposed sampling plan shall address the items identified in the 2013 System Assessment Report and associated Corrective Action Plan.

ii. On or before October 1 of each year, the Approval Holder shall recommend to the Department the monitoring program for the Water Supply System for the following year highlighting any changes and the reason for the change. Any existing monitoring program shall remain in place until the recommended monitoring program is approved by the Department.

ii. The monitoring program shall include compliance monitoring, as required by this Approval, and process monitoring, response monitoring, special process characterization and optimization monitoring and source water characterization monitoring.

iii. The monitoring program shall meet the minimum requirements of the Department's "A Guide to Assist Nova Scotia Municipal Water Works Prepare Annual Sampling Plans", as amended from time to time.

Iv. The monitoring program shall be acceptable to the Department.

v. The Approval Holder is responsible for implementing, on an annual basis, the monitoring program and subsequent revisions as approved by the Department.

vi. The Approval Holder shall not move, relocate or otherwise alter the location of the sampling locations indicated in the approved monitoring program without written permission from the Department.

vii. Following a review of any of the analytical results required by this Approval, NSE may alter the frequencies, location, and parameters for analyses required for this Approval or require other remedial action.

e. Any flow measuring devices and continuous water quality analysers and indicators with alarm systems shall be installed, maintained and calibrated as specified by the instrument manufacturer's instructions. Calibration logs for each instrument shall be maintained on Site and be available for inspection immediately upon request by the Department.

f. The Approval Holder shall establish a QA/QC program to validate the measurements obtained from continuous monitoring equipment and for all analysis conducted at the Facility or a non-certified laboratory.

g. The Approval Holder shall establish and conduct process control testing and sampling and record the results. Results are to be made available for inspection or review by departmental staff immediately upon request.

h. The Approval Holder shall establish and conduct source water protection testing and sampling and record the results. Results are to be made available for inspection or review by departmental staff immediately upon request.

14. Laboratory Reports and Water Quality Results

a. The Approval Holder shall submit copies of the laboratory certificate of analysis to the Department immediately upon request.

b. The Approval Holder will authorize and work with laboratories to electronically report water quality results to the Department upon implementation of an on-line drinking water quality surveillance program.

c. Electronic reporting shall not replace the Approval Holder's responsibility to immediately notify the Department when bacteria is present or an exceedance of a maximum acceptable concentration or interim maximum acceptable concentration for a health-related parameter listed in the "Guidelines for Canadian Drinking Water Quality" is detected.

15. Reporting

a. Reporting Upon Request

i. The Approval Holder shall keep records continually updated in such a way that weekly and/or monthly reporting of monitoring and sampling results can be immediately sent to the Department upon request.

b. **Annual Reporting**

ii. The Approval Holder shall prepare and submit to the Department, an annual performance report for the Water Supply System.

iii. The annual report shall be submitted on or before April 1 following the completion of the calendar year being reported upon.

iv. The annual report shall contain but not be limited to the following information on the form provided by the Department.

(1) a summary and discussion of the quantity of water supplied during the reporting period on a per month basis showing design values, maximum daily flow and average daily flow for each month and any other parameters or conditions specified in the Water Withdrawal Approval.

(2) a summary and interpretation of analytical results obtained in accordance with the monitoring and recording section of this Approval, including an explanation for any exceedance of the maximum acceptable concentration (MAC) or interim maximum acceptable concentration (IMAC) of health-related parameters listed in the "Guidelines for Canadian Water Quality", latest edition and the actions taken to address the exceedance.

(3) annual trend graphs for parameters that are continuously monitored.

(4) date and description of any emergency or upset conditions which occurred during the period being reported upon and action taken to correct them.

(5) any modifications to the contingency plan or emergency notification procedures including a description of how the information was communicated to staff.

(6) a list of the names of each laboratory utilized by the Approval Holder and the parameters analysed by each laboratory.

(7) an update on the status of the source water protection plan, including any modifications to the plan or implementation schedule, and a summary of activities taken to achieve the goals and objectives of the plan.

(8) all incidents of free chlorine residual below 0.20 mg/L in the water

distribution system shall be detailed with a description of any actions taken.

(9) verification that the operational conditions remained within the design range for achieving CT/IT; if operational conditions went outside the design ranges, provide CT/IT calculations and a summary of corrective actions taken.

(10) records of any violations of the conditions of this Approval and actions taken by the Approval Holder to correct those violations.

(11) any complaints received and the steps taken to determine the cause of the complaint and the corrective measures taken to alleviate the cause and prevent its recurrence.

(12) a review of the QA/QC program to validate the measurements obtained from continuous monitoring equipment and for all analysis conducted at the Facility or a non-certified laboratory.

(13) a list of each certified operator and their level of certification.

c. Immediate Reporting on Operation

i. The Approval Holder shall notify NSE immediately in the event of an incident that may adversely affect the quality of the water within the Water Supply System. Notification shall be made to a live person followed by fax or email. These incidents shall include but not be limited to: the presence of bacteria; inadequately disinfected water being directed to the water distribution system; sewage or other spills in the source water supply area; line breakage that may result in cross contamination; etc.

ii. The Approval Holder shall notify NSE immediately if any analytical results of any specific parameter exceed the maximum acceptable concentration (MAC) or interim maximum acceptable concentration (IMAC) of health-related parameters listed in the "Guidelines for Canadian Drinking Water Quality", latest edition.

iii. When bacteria are detected at the Facility or in the water distribution system the Approval Holder shall notify NSE immediately and undertake corrective action as outlined in the latest edition of the "Guidelines for Monitoring Public Drinking Water Supplies", as amended from time to time or other Policies or directives issued by NSE.

iv. If the chlorine residual in the water distribution system is less than 0.20 mg/L free chlorine, the Approval Holder shall notify NSE immediately and take immediate action to obtain the required residual.

16. **MPA Testing and Reporting**

a. MPA testing (of the raw water from each individual GUDI well) is required every two years in spring following a rainfall.

b. The Approval Holder shall immediately notify the Department if the GUDI status of a well changes and take any necessary corrective action.

c. MPA testing shall be conducted in accordance with Appendix A of the Nova Scotia Treatment Standard for Municipal Drinking Water Systems, Protocol for Determining Groundwater Under the Direct Influence of Surface Water.

17. **Records**

a. The Approval Holder shall keep the following records and water quality analyses:

i. All incidents of suspected and/or confirmed disease outbreaks attributed to the water system shall be documented and kept for a minimum of ten years.

ii. Bacteriological, chlorine residual and turbidity analyses shall be kept for two years.

iii. Chemical analysis shall be kept for 10 years.

iv. Annual water withdrawal records shall be kept for 10 years.

b. The Approval Holder shall also retain the following information for a period of three years:

i. calibration and maintenance records;

ii. continuous monitoring data.

c. A copy of project reports, construction documents and drawings, inspection

reports, shall be kept for the life of the Water Supply System.

18. **Site Specific Conditions**

a. i. The Approval Holders shall sample the following wells on a quarterly basis, to be analyzed for polycyclic aromatic hydrocarbons (PAHs): Well No. 10 and observation well No. GWMW 99-5.

ii. Any amendment(s) to the sampling program referenced in 19(a)(i) must be approved in writing by NSE.

b. The Approval Holder shall inspect all observation wells within the Town of Pictou Wellfield and Caribou Wellfield on an annual basis to evaluate the structural integrity of the wells and make repairs as necessary. All observation wells shall be properly capped with security measures in place.

SCHEDULE A

SAMPLING REQUIREMENTS

Non-GUDI and Medium Risk GUDI Wells, with Natural Filtration, Greensand Filtration, Disinfection and Water Distribution System

PARAMETER	MINIMUM FREQUENCY	LOCATION
parameters as per the source water protection monitoring plan	In accordance with Step 5 of the Source Water Protection Plan and approved annual monitoring program	In accordance with Step 5 of the Source Water Protection Plan and approved annual monitoring program
water volume	continuous*	each individual well and combined flow; as per the Water Withdrawal Approval
temperature	daily grab or continuous*	CT control point
pH	daily grab or continuous*	water entering the distribution system; and as required by process monitoring if pH control is practised

SCHEDULE A		
SAMPLING REQUIREMENTS		
Non-GUDI and Medium Risk GUDI Wells, with Natural Filtration, Greensand Filtration, Disinfection and Water Distribution System		
PARAMETER	**MINIMUM FREQUENCY**	**LOCATION**
turbidity	<u>For GUDI Wells</u> continuous*	<u>For GUDI Wells</u> raw water at each individual GUDI well before pre-treatment and/or disinfection; and as requested by NSE.
	<u>For Non-GUDI Wells</u> Daily Grab or continuous*	<u>For Non-GUDI Wells</u> from individual wells or the combined flow entering the distribution system; and as requested by NSE
turbidity within distribution system	weekly grab	distribution system sample points
backwash waste water	in accordance with the approved annual monitoring program to comply with discharge criteria	in accordance with the approved annual monitoring program to comply with discharge criteria
chlorine residual	continuous*	all locations where water enters the distribution system from individual wells or combined wells; storage tank outlet
	twice weekly grab, spread evenly throughout the week	distribution system sample points

SCHEDULE A		
SAMPLING REQUIREMENTS		
Non-GUDI and Medium Risk GUDI Wells, with Natural Filtration, Greensand Filtration, Disinfection and Water Distribution System		
PARAMETER	**MINIMUM FREQUENCY**	**LOCATION**
total coliform and E.coli (present/absent) **	twice weekly (spread evenly throughout the week)	all locations where water enters the distribution system from individual wells or combined wells; and distribution system sample points
parameters as per the corrosion control program	quarterly grab sample	select distribution sample points
lead	annual grab sample - during warmest month	select distribution system sample point(s)
total trihalomethanes	quarterly grab sample	select water distribution system sample point(s) representative of the longest retention time - generally furthest from the source
haloacetic acids	quarterly grab sample	select distribution system sample point(s)
parameters as per the process monitoring program	in accordance with the approved annual monitoring program	in accordance with the approved annual monitoring program
	UV monitoring	see 7(b), UV light requirements

SCHEDULE A		
SAMPLING REQUIREMENTS		
Non-GUDI and Medium Risk GUDI Wells, with Natural Filtration, Greensand Filtration, Disinfection and Water Distribution System		
PARAMETER	**MINIMUM FREQUENCY**	**LOCATION**
parameters as per the Guidelines for Monitoring Public Drinking Water Supplies (GMPDWS)	annually for GUDI wells; every two years for non-GUDI wells (Note - fluoride is a required parameter regardless of whether fluoridation is occurring or not because natural fluoride may be present)	raw water from each individual well; and treated water entering the distribution system
MPA testing	every 2 years, in spring following a rainfall	raw water from each individual GUDI well; in accordance with the Protocol for Determining Groundwater Under the Direct Influence of Surface Water.
unless specifled otherwise in the approved monitoring program, all health-related parameters in the Guidelines for Canadian Drinking Water Quality, latest edition, having maximum acceptable concentrations (MACs)	every 5 years - timing for individual parameters may fluctuate (e.g. pesticides during application periods, etc.) (Note - algal toxins does not apply to groundwater supplies.)	raw water from each individual well; and treated water entering the distribution system except bacteria, THMs, HAAs, and lead which are to be taken in the distribution system
Viruses	as requested by NSE	raw water from each individual well; and water distribution system

SCHEDULE A		
SAMPLING REQUIREMENTS		
Non-GUDI and Medium Risk GUDI Wells, with Natural Filtration, Greensand Filtration, Disinfection and Water Distribution System		
PARAMETER	**MINIMUM FREQUENCY**	**LOCATION**
Giardia & *Cryptosporidium*	as requested by NSE	raw water from each individual well; and water distribution system

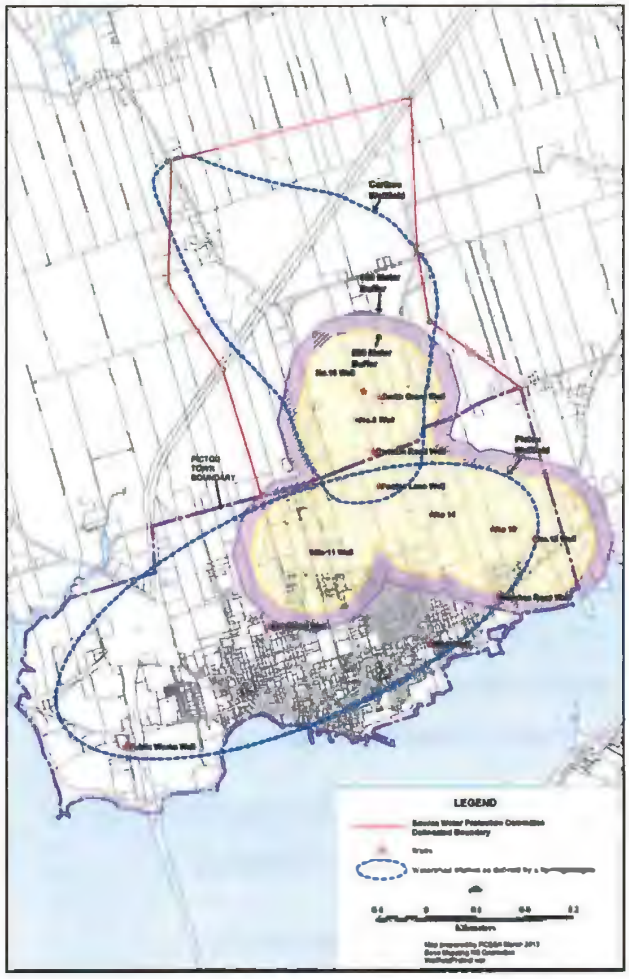
* Continuous monitoring - readings shall be taken a minimum of once every five minutes. Any report submitted to NSE shall include the maximum value for turbidity and the minimum value for residual chlorine recorded on the continuous monitoring equipment.

** The presence of coliform will require an immediate notification to NSE and resampling of the water.

Appendix D

Pictou Caribou Source Water Protection Plan

(2013, Revised in 2014 and 2017)



Pictou / Caribou Source Water Protection Plan

Approved: October 16, 2017

Revised: October 10, 2017

Prepared For

NOVA SCOTIA

Environment

Prepared By

Town of Pictou

Birthplace of New Scotland

Caribou Source Water Protection Committee

Members

REVISIONS

October 2017

REMO officer updated

January 2017

Minor Grammar Changes

Deleted Preamble – this section did not add value to the report and was captured in the Introduction.

Added Sections 3.7 and 4.7 to include "environmental risk" and how the source water protection committee can identify and respond. This changed the numbering the proceeding subsection headers.

3.7	To include reference to the sampling and monitoring standards the town has applied since the 2014 wellhead upgrades.
4.7	Added this section on Climate Change monitoring and mitigation strategies. Updated the status of current town related best practices to reflect recent upgrades. This describes current actions taken to monitor impact of climate change and suggested action plans in events of major droughts.
4.10	Include action plan to eliminate all chemical and minimize travel requirements to wells located in the connected wellfield (Caribou and Pictou Wellfields)
5.2	Added new program to address water conservation in drought events Included newly programmed alarms to notify if well parameter or water chemistry exceeds guidelines set by NSE or internally. Describe the impact and monitoring of centralized treatment on source water safety.

December 2014

Updated Figures and Table numbers to reflect new map

Section 4.4	Included graphic of Town sewer and water systems
Section 5.8	Created a risk management ranking system
Section 5.9	Renumbered Implementation Plan and included references to Utility EP and CP as well as REMO involvement

July 2013

General	Updated names of all provincial and federal government departments. Changed NSEL to NSE.
Table of Contents	Update Table to reflect changes in plan
Section 1.	Updated Introduction.
Section 1.1	Changed to Section 2.
Section 2.	Changed to Section 3.
Section 3.	Changed to Section 4.
Section 4	Changed to Section 5.
Section 5.	Changed to Section 6.
Section 3.	Updated map of delineated source water area.
Section 4.	Modified Table 1 to include type/category of potential risk.
Section 4.6	Changed Forestry to Forestry Operations
Section 5.4	Referenced all NSE pesticide regulations in second bullet.
Section 5.8	Included Tables 2. Modified table to identify status of activity, completion date, and the activities intended audience. Activities organized by risk management strategy (i.e. Education and Stewardship Initiatives, Best Management Practices, Emergency and Contingency Planning, Monitoring).
Section 6.2	Added Table 3. Table provides a status of monitoring activities, and recommended next steps.
APPENDICES	All Appendices updated include websites, names of provincial departments, and contact information.
APPENDIX II	Appendix II has been replaced with Wellfield Management Policy adopted by the Town of Pictou. Text from previous Appendix II has been incorporated into sections 1 and 2 of the document.

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INTRODUCTION

Water is a provincial resource and regulated by Nova Scotia Environment (NSE) under the Environment Act. All Municipalities are required to obtain an approval from NSE to withdraw from water sources (i.e. groundwater and surface water) in Nova Scotia. The Town of Pictou (Town) holds water withdrawal approvals for both the Caribou and Pictou wellfields and an Approval to Operate (Approval) for their water treatment and water distribution system from NSE under the Activities Designation Regulation. The Approval details the operational conditions for the Town to ensure compliance with the Environment Act. Included are provisions for the Town to develop a source water protection plan (SWPP).

In 2002, NSE introduced its Drinking Water Strategy to ensure clean drinking water for all Nova Scotians. The main goal of a Water Utility is to provide safe, clean drinking water to its customers. Protecting the quality and quantity of the source water is a top priority for utilities as one-step in the multiple barrier strategy developed for the protection of drinking water quality in Nova Scotia.

The Town is located along the Northumberland shore of Nova Scotia. The Town's source of drinking water comes from two wellfields - one directly underlying the Town itself (Town Wellfield) and one to the north of the Town, referred to as the Caribou Wellfield. The Town Wellfield is bounded to the south by Pictou Harbour while the Caribou Wellfield extends from the Town boundary north into central Pictou Peninsula.

The Town's two wellfields utilize 13 wells. The Caribou Wellfield contains five wells (#8, #10, Division Road, Smith Grant and Footes Lane) while the Town Wellfield contains the remaining eight (#11, #12, #14, #15, Public Works, Exhibition, M&M and Beeches Road). All 13 wells are housed in structures constructed and maintained by the Town's water utility on lands owned by the Town and supply water to a population of 4,400.

The fundamental goal of the SWPP is to ensure the continued safety and quality of the Town's drinking water supply through protection of its source waters in the Town and Caribou watersheds. The procedures for development of the Plan are:

1) Form a Source Water Protection Advisory Committee (Committee);

2) Delineate a Source Water Protection Area Boundary;

3) Identify Potential Contaminants and Assess Risk;

4) Develop a Source Water Protection Management Plan; and

5) Develop a Monitoring Program to Evaluate the Effectiveness of a Plan.

This document provides details for source water protection through education and monitoring processes, and is not intended to form a basis for any regulation or watershed designation brought forth at a future time.

STEP 1: WATERSHED ADVISORY COMMITTEE

A Watershed Advisory Committee was appointed to develop a Source Water Management Plan and provide advice to Town and Municipality of the County of Pictou Councils, as well as the residents living in the area. The Watershed Advisory Committee consists of members representing a cross section of the various interested stakeholders such as the Water Utility, council members (Town and Municipality of the County of Pictou Councils), landowners, and land users. The Terms of Reference (Appendix I: Pictou / Caribou Source Water Protection: Advisory Committee - Terms of Reference) explains the details of operations and make-up of the Committee. The Wellfield Management Policy (Appendix II: Wellfield Management Policy) provides a framework for ensuring a co-ordinated effort by the Town and the Municipality of the County of Pictou representatives for protecting water quality and quantity for all residents served by the Town and Caribou Wellfields.

The goals of this committee are to:

1) Protect water quality and quantity for both Town and Municipality of the County of Pictou Residences;
2) Establish an effective SWPP; and
3) Develop a SWPP that enhances information sharing, promotes mutual respect and fosters open communications;

STEP 2: Delineating the Source Water Area

The source water area is determined as any lands inside the Town boundaries and those lands north of town included in the area shown in Figure 1: Source Water Area for the Town's water supply. The following geographical coordinates bind the source water area:

"From the intersection of Patterson St. and Division Rd. 343 degrees to Highway 106 at:

N4S 42.101 W62 43.275

Then 327 degrees to N 45 42.470 W 62 43.618

Then 02 degrees to the Central Caribou Rd. at N 45 43.016 W 62 43.596

Then 76 degrees to Highway 106 at N45 43.289 W 62 42.078

Then 178 degrees to Glenn East Rd. at N 45 42.631 W 62 42.046

Then 171 degrees to N 45 42.305 W 62 41.969

Then to the Division Rd. at the eastern town boundary"

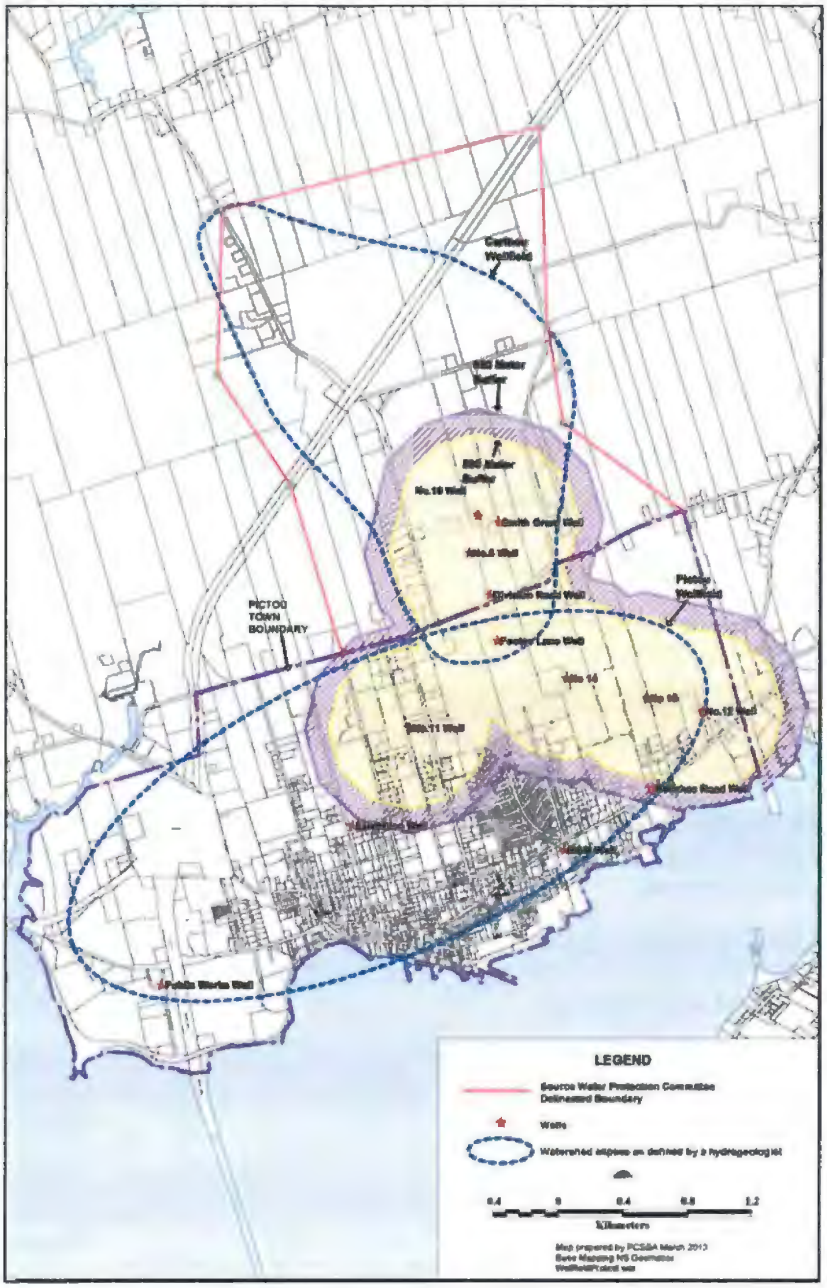

Figure 1: Source Water Area for the Town's water supply

The Pink shaded area is where privately owned domestic wells located within 650 m of a planned installation of a Town production well, with consent, will have an Hydrogeologist pre-assessment (Appendix II: Wellfield Management Policy). This boundary roughly represents the geological "bowl" of the source water area and is not a legal or surveyed description.

STEP 3: SOURCE WATER RISK IDENTIFICATION

The risks to water quality have been identified and are discussed with respect to the activity or land use. These activities include transportation, residential development, waste disposal, agriculture, industrial development, recreation and environmental. Potential risks associated with these activities are listed in Table 1: Potential Risks for Source Water Quality. These include pathogens, salt, petroleum products, pesticides, sediment and climate change.

These risks are grouped into activities or land uses in the following section to more easily apply selected management strategies. For example, residential risks might utilize educational initiatives. The implementation of an education program would cover several of the individual risks identified such as oil tanks, septic tanks and storage of pesticides.

Table 1: Potential Risks for Source Water Quality

Risk	Category
Changing Conditions of Wellfield including test well security	All
Well Drilling Activities	Utility / Residential
Creosote Timbers in Wellfield, above and below ground	Industrial
Increase in Water Demand	Utility
Salvage Yard impact on water quality	Industrial
Use of round-up and liquid manure	Agricultural
Forest clear cutting	Forestry Operations
Speed Zones	Transportation
Garbage Dumping	Other
Road Conditions	Transportation
Abandoned Sand and Gravel Pits	Industrial
Abandoned Wells	Utility / Residential
Septic Tank System malfunctions	Residential
Oil Tank leaks	Residential / Industrial / Commercial

Risk	Category
Transportation, fuel trucks, etc.	Transportation
Urban run-off and contaminants generated by Commercial, Residential & Recreational activities	Commercial / Residential / Recreational
Existing Commercial Activities	Commercial
Cemeteries	Other
Use of Pesticides	Agricultural / Residential
Forest or building fires	Forestry Operations
Climate Change	Environmental

3.1 AGRICULTURE

Agriculture risks are considered low because of the limited activity in the watershed. Potential risks can exist and should be addressed to protect drinking water quality. Risks are primarily associated with pesticide/herbicide use and manure storage and spreading, i.e. biological and organic contaminates. Continued due diligence on the part of the farming community will ensure that any risks associated with agricultural operations will be managed appropriately.

3.2 INDUSTRIAL AND COMMERCIAL ACTIVITIES

Industrial and commercial risks are mainly related to shops and services in the watershed area. Risks include chemical spills/leaks, septic system malfunctions, petroleum contamination, and contaminants generated from salvage yards.

The following commercial sites are potential sources of contaminants in the Town or Caribou Wellfields:

- Salvage Yard (petroleum products, chemicals, antifreeze)
- Abandoned Sand and Gravel Pit (direct pathway to groundwater)
- Gas Stations (petroleum products, antifreeze)
- Ship Yard (petroleum products, various chemicals)
- Print Shop (chemicals associated with inks and solvents)
- Metal Fabrication (petroleum products, various chemicals used in fabrication)
- Landscaping (pesticides/herbicides, organic materials)
- Concrete Plant (chemicals)
- Power Substations (herbicides, petroleum products)

3.3 Recreation

Recreation risks are mainly chemical and biological in nature. These include pesticide use on sports fields, the exhibition grounds, and chemicals used at various sports venues such as the arena and the pool.

Marinas also have potential risks as various potential contaminants are transported to and from the sites.

Garbage disposal and campfires are also additional recreation risks.

Finally, risks are sometimes associated with pet wastes. Pet owners should be encouraged to pick-up waste and dispose of it appropriately.

3.4 Residential Activities

The main risks identified in the Caribou and Town wellfields included those from septic systems, oil tanks, runoff, yard maintenance and household waste.

Septic systems are potential sources of microbial, inorganic, organic contaminants, pesticides and herbicides as well as pharmaceutical products. Septic systems are considered an elevated risk to water quality in some situations.

Oil tanks are a potential source of organic contaminants. Oil entering a watercourse or groundwater is both difficult and extremely expensive to remove. Accidental spills can occur in several ways. Fuel storage tanks can rust over time and develop holes in the tank. Fuel lines can leak or break if something falls on the line, such as snow or ice. Spills can also occur during fueling. Only certified fuel storage tanks should be used for fuel storage and the owner is responsible to inspect their tank for signs of deterioration or damage.

Residential runoff could contain pesticides, herbicides, as well as other chemicals used for household and landscaping maintenance.

Fire suppression could also create runoff contamination. Runoff should be contained if possible or remediated as soon as possible after the fire is extinguished.

The Town of Pictou also understands that residential sewage collection and water distribution could impact groundwater. To fully understand the area of influence, the map on the next page displays all water and sewer lines.

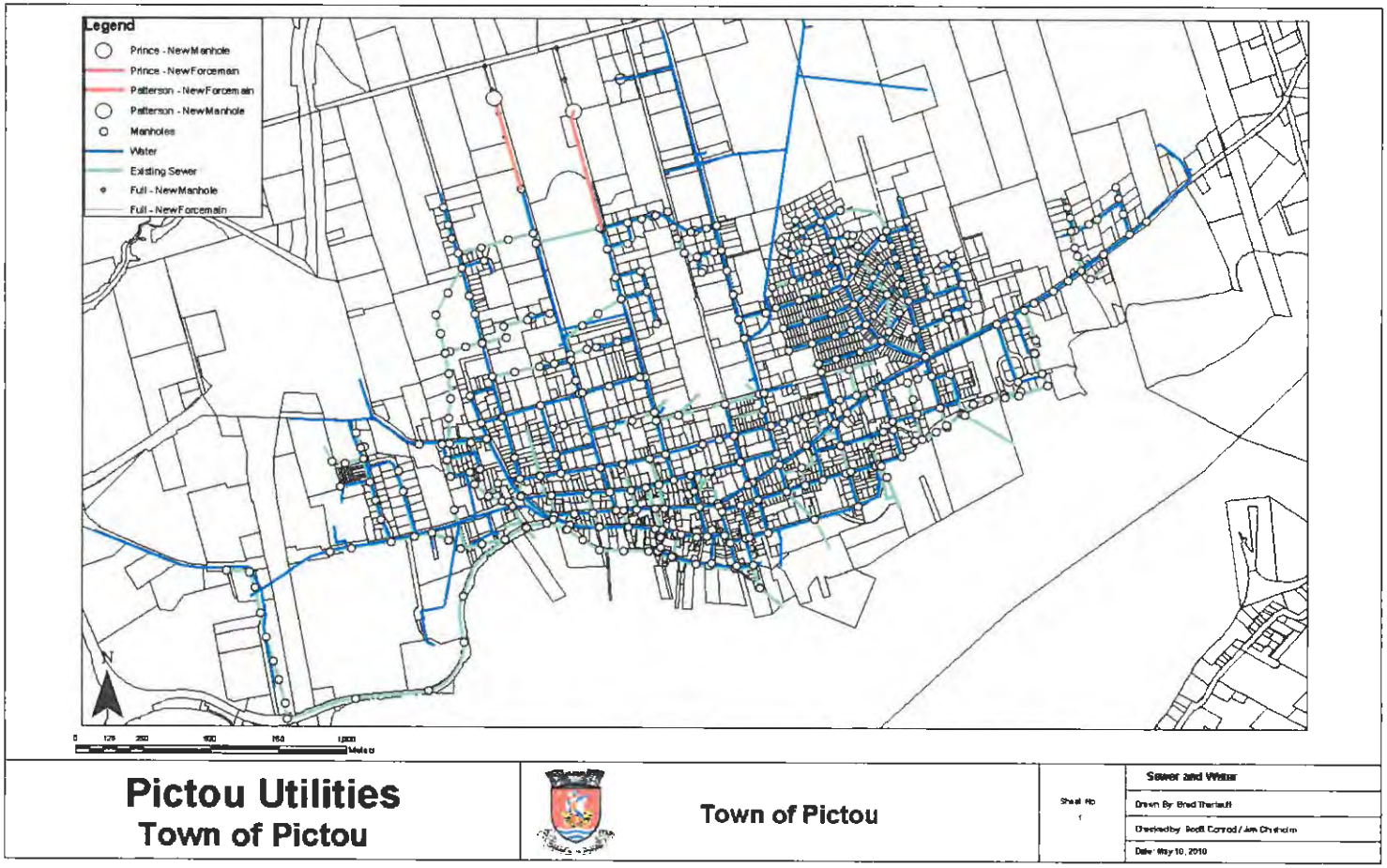

Figure 2: Town sewer and water mains

3.5 Transportation / Road Maintenance

Accidental spills resulting from transport of various materials (ex. petroleum products, chemicals used in commercial businesses or industrial processes in the area) are potential threats. The use of oil for residential heating and its transportation pose the greatest risk. Petroleum products (oil, gasoline and diesel) may enter watercourses and subsequently groundwater, because of automobile or transport accidents.

Contaminants could also be biological in nature. This could occur as in the case of a spill during the transport of septic sludge. Since accidents are always a possibility, these risks must be managed appropriately.

Road salt is a contaminant associated with winter road maintenance. Salt contamination can find its way into groundwater via ditches or direct infiltration and affect water quality.

Another risk associated with transportation is the high occurrence of excessive vehicular speeding on various roads through the watershed. Speeding is the leading cause of accidents and in a sensitive area like the Central Caribou Watershed, any increased potential for accidents should be addressed.

3.6 Forestry Operations

Risks associated with forestry operations include:

- wood harvesting and extraction;
- road construction and maintenance;
- pest and weed control; and
- fuel use, transfer and storage.

These are potential sources of pesticides and organic contaminants. A significant concern exists with respect to the long-term impact of clear cutting and the impact on changes in water table levels due to the loss of vegetative cover.

Forestry operations have been mainly mechanized clear cutting of various stands. Unfortunately, several properties were clear cut as a response to the uncertainty of regulations being proposed that were perceived to affect a landowner's ability to carry out forestry activities.

The selective harvesting of mature stands is a common practice in several watersheds in Nova Scotia. A forest management plan designed to protect water quality is the best way to minimize the impacts in the watershed.

Forestry operations utilize petroleum products for fuel and lubrication. Accidental spills can occur because of the use of these products and pose an elevated risk if the operation is within the recharge area for town or other individual wells. Accidental spills can occur during refueling or when hydraulic hoses break. Containers used for temporary storage of petroleum products can pose a risk to water quality if the containers are not properly constructed.

Other risks associated with forestry include fire and the suppressants utilized to control forest fires. Since the watershed is mainly covered by forest and that there are active forestry operations, there is a potential for fire and degraded water quality from the loss of forest cover and possibly from the use of chemical suppressants. In the case of large forest fires, the use of appropriate additives to water, or even the use of salt water is preferable to loss of cover.

The term "pesticide" is a generic term used to describe a variety of poisons used to kill plants (herbicides), insects (insecticides) and even fungus (fungicides). The use of pesticides in the watershed can potentially contaminate drinking water. Runoff from areas where these chemicals have been applied can enter groundwater and pose a human health risk.

3.7 Environmental

Global warming is inevitable, therefore and it is essential to consider this risk of it. Specifically, naturally occurring events, such as drought, will increase in frequency. The committee and Pictou Water Utility should consider these events as probable and should determine best practices for creating indicators and mitigating impact.

3.8 Other

The watershed committee has identified several other concerns that may affect water quality. A frequent problem in rural Nova Scotia is the uncontrolled and illegal dumping of garbage. Road networks through watershed lands provide the perfect access to remote locations where unconcerned individuals will simply

dump garbage regardless of the potential impacts. It is often the case that those that dump the garbage do not usually live in the watershed area. Illegal dumping can introduce various contaminants into the groundwater system depending on the nature of the garbage.

A legacy of past practices, i.e. creosote timbers that once were the structural framework of wharfs along the waterfront, are now buried in the middle of the Central Caribou Wellfield. While, in cooler temperatures, creosote is immobile, contamination of drinking water from the creosote remains a concern for Town and Municipality of the County of Pictou residents and should continue to be monitored over time.

The location of cemeteries is another concern for residents although they are considered a minor concern at this point. There are two cemeteries - one located on the fringes of the Caribou Wellfield and one is in the Town Wellfield. The main contaminant associated with cemeteries is formaldehyde in embalming fluid that leaches out during decomposition. Other contaminants can be associated with cemeteries as well, such as ammonia, nitrate, bacteria, viruses, etc. Continued monitoring is required to identify any changes in groundwater quality.

Although bio-solids are not in use at this time, the development of application methods in other areas suggests that they should be considered a potential risk, and their use in the source water area must be discouraged.

Refer to Table 4: Status of Effectiveness of Monitoring Land-use Activities.

Finally, the Town of Pictou water withdrawal is also considered a risk. To mitigate risks, the Town has installed state-of-the-art monitoring and controlling devices as well follow a rigorous sampling protocol defined by NSE. In 2016, the Town of Pictou did not have any Health Parameter exceedances.

STEP 4: RISK MANAGEMENT RECOMMENDATIONS

A SWPP contains a variety of management options that work together to effectively manage risks to water quality in a watershed. Management options fall into a variety of categories referred to as the ABC's of source water protection as outlined by the NSE guides to source water protection planning. They include Acquisition of land, By-laws, Best management practices (BMP's), Contingency plans, Designation and Education and stewardship.

Acquisition of Land: The acquisition of land by the Town gives direct ownership and control of portions of the source water area to the Town. This allows for a high level of protection of a source area due to direct control over the activities that can take place there. Targeted acquisition of specific parcels of land, as the need and opportunity arises are common practices in water supply areas throughout Nova Scotia. For more information please see Figure 3: Map of Town owned Land (brown).

Best Management Practices (BMP's): These standardized and widely accepted practices for activities and products are the most practical and effective means of preventing or reducing contaminants from reaching source water. BMP's have been developed for most activities, which occur in a wellfield. They can be applied to various aspects of residential development, including septic system and oil tank installation and maintenance, and construction activities. Most aspects of agriculture have operating BMP's in place through a variety of regulatory and market driven processes. Many of these practices are specifically designed to manage specific activities, which may affect water quality. BMP's are also in place for many industrial products, services, and activities related to motorized recreation and transportation.

Land Use By-laws – Municipal Planning Strategy: Development and implementation of a Municipal Planning Strategy (MPS) allows a municipality to develop land-use bylaws to manage development and control activities near sensitive areas. The Town has developed a MPS that covers the Town Wellfield, which outlines policies aimed at protecting water quality. There are no Municipality of the County of Pictou By-laws for the Caribou area.

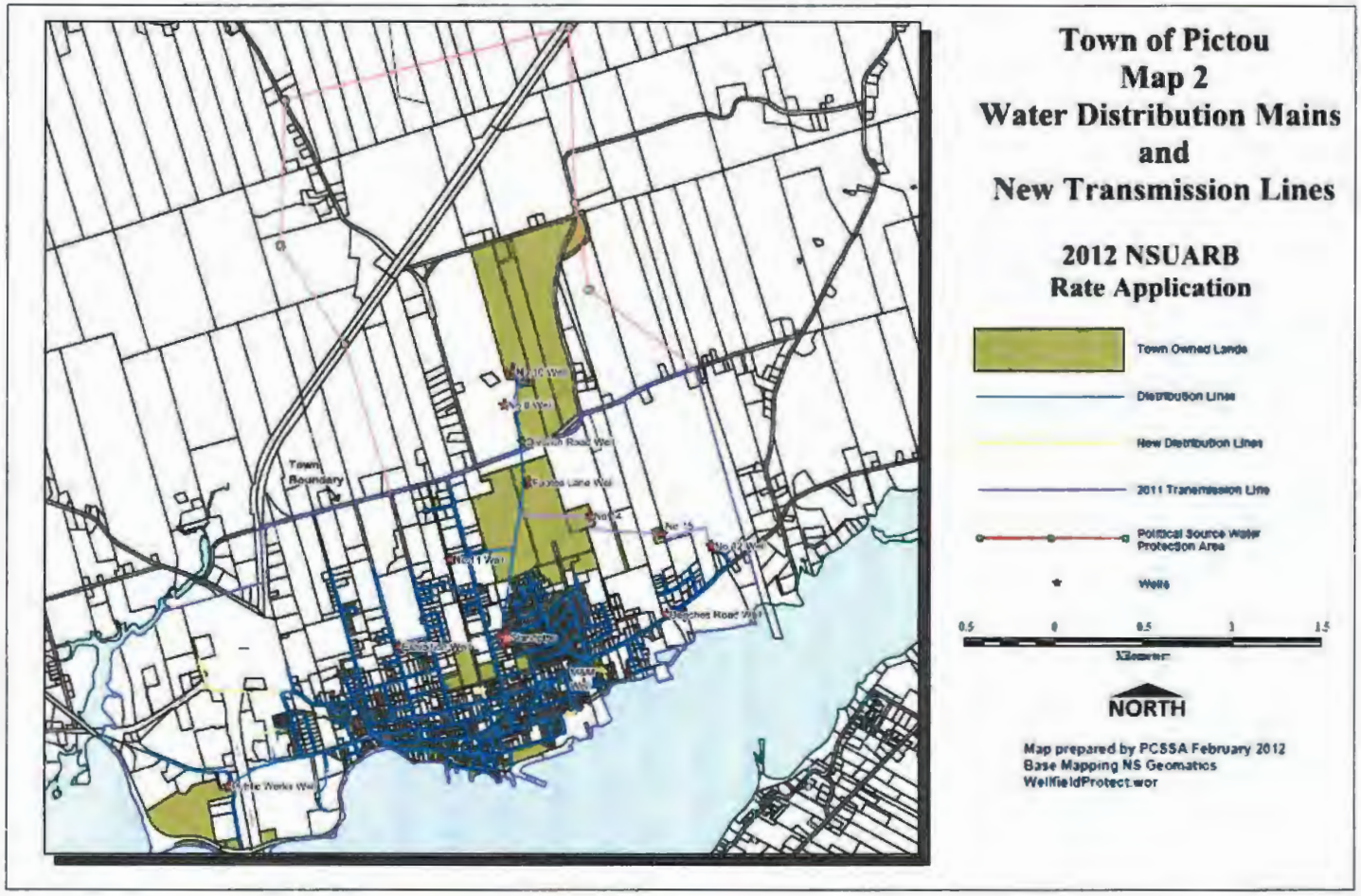

Figure 3: Map of Town owned Land (brown)

Contingency Planning: Contingency planning provides protocols to use in case of a contamination emergency in the source water area. The goal of the plan is to protect residents against contamination and ensure the immediate and long-term viability of the source area for water supply. The Town currently has an emergency response plan in place that includes boil water directives, mapping, resource lists, work plans and communications protocols to deal with emergency situations. These plans are reviewed and updated annually.

Designation as Source Water Protection Area: Designation is not being considered as a management option.

Education and Stewardship Initiatives: The development and promotion of an education and stewardship program can be an effective management option for protecting source water quality.

Education of stakeholders can reduce the uncertainty of the objectives of the Town and can help introduce a change in behavior if necessary. Education also creates a sense of ownership and responsibility among residents in a water supply area, which can significantly increase the success of other con-current management practices adopted. Specific opportunities for education and stewardship initiatives have been identified in the residential development, recreation, and forestry sectors.

The following sections describe the management options selected to address and reduce the risks identified in STEP 3: Source Water . The Watershed Advisory Committee selected these management options based on the type of water supply, the physical nature of the watershed and the specific activities that take place within the watershed. Refer to Table 3: Activities to Manage Identified Risks in Pictou/Caribou Wellfields in Implementation Plan for all the activities identified below.

4.1 AGRICULTURE

Agriculture activities are limited within the Central Caribou Watershed. The following management options are proposed to manage risks associated with, bacterial contamination of source water due to manure spreading and storage, and the use of chemical fertilizers.

- Make available the Recommended Agriculture Practices within Municipal Watersheds that has been developed by NSE, and Nova Scotia Department of Agriculture (Appendix III: A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia) and general information on the Source Water Protection initiative.

4.2 Industrial/Commercial Activities

Industrial and commercial development is found throughout the watershed area, especially in the Town. It is important to emphasize contaminants that runoff from these activities can enter the groundwater system either directly through infiltration or through leaking storm sewers. It is important to educate proprietors that prevention and due diligence is the key to preventing accidental release of substances into the environment that can adversely affect water quality. The following recommendation was developed to address industrial and commercial contamination/pollution concerns.

- Develop an information/education package targeted at commercial and industrial users in the watershed area that introduces the Source Water Area Planning initiative and discusses potential contaminants associated with industrial/commercial activities such as petroleum storage, fuel spills, chemical storage, the use of pesticides, etc. The package should highlight the various best management practices for fuel storage, spill clean up, chemical storage, etc. Proper disposal of substances that could potentially affect groundwater quality should be explained. The information package should also include existing publications that discuss issues such as spraying. (See Appendix IV: Industrial/Commercial Best Management Practice References and Appendix V: Emergency Response Planning)

4.3 Recreation

Recreation is generally considered a desirable aspect associated with living in a rural setting. Passive recreation needs to be promoted. Passive recreation fosters an appreciation for the environment and aids in the informal policing of sensitive areas. Recommended management options include:

- Establish signage at trail heads in the Caribou Wellfield and at Town boundaries educating users on the sensitive nature of the area (i.e. as a source water protection zone) and to keep it clean by not littering and being diligent with respect to forest fires etc.
- Develop bylaws regarding pet waste pickup near streams, and other sensitive areas.

Activities or concerns associated with "active recreation" include golfing, ice making and maintenance at the arena, the swimming pool and activities at the marinas. As illustrated in STEP 3: Source Water , the main concerns are associated with transfer of petroleum products, various chemicals used in cleaning and disinfecting and the use of pesticides. The recommended management options to address concerns associated with these activities include:

- Develop an information package for managers of the various recreational venues in the source water area. This package should include BMP's for golf courses, BMP's for the handling/disposal of chemicals or liquids, petroleum products and other substances that may impact water quality and general information on the Source Water Protection Planning initiative.
- Signage discussed in the above section is also an important management option that can be used.

4.4 Residential Activities

The main risk activities associated with existing residential development in the watershed were identified as on-site septic systems, sewage lines, exterior oil tanks and household hazardous waste management. The management options selected to manage risks in the residential sector are as follows:

- Develop a Homeowner Education Program to help residents understand the importance of maintaining septic systems and oil tanks and the potential impacts to water quality from malfunctioning systems. The education program will include BMP's that have been developed by NSE with respect to septic systems, oil tanks, the use/storage and disposal of various household hazardous wastes and general information on other practices that contributes to watershed protection and the Source Water Protection initiative. (See Appendix VI: Residential Best Management Practice References).
- Develop a general SWP Newsletter to educate the public about impact on water quality, because of specific activities. For example, stress the importance of eliminating or restricting the use of pesticides, and when necessary use only those that degrade quickly and are recommended for use in such areas. Pesticide application must be done in accordance to the Non-Essential Pesticides Control Act, List of Allowable Pesticides Regulations, and Exceptions to Prohibitions on Non-Essential Pesticides Regulations from NSE.
- Encourage landowner responsibility for clean-up of derelict vehicles, old tanks, drums, tires, etc. for proper disposal through the SWP Newsletter.

4.5 Transportation

In Transportation / Road Maintenance, the main risks identified with the transportation sector were associated with road construction/maintenance and accidental spills of petroleum products or other contaminants and the management of road salt contamination. The critical areas were identified as the intersections between roads and watercourses, roadside ditches and proximity to wellheads. The recommended options to manage these risks are as follows:

- Establish high profile signage along public access routes indicating the presence of the Water Supply Area and to use caution.
- Develop an awareness program (BMP's i.e. reduced speeds) for transport companies focusing on watershed protection. Include contact numbers for Emergency Response.

- Employ Contingency/Emergency Response Plan for spill response and containment (Appendix V: Emergency Response Planning).
- Continue to monitor salt levels and evaluate alternatives (i.e. sanding, de-icing chemicals) if required.

4.6 Forestry Operations

Forests are the dominate vegetation in the watershed. Healthy and properly managed forests support quality water protection, generate economic activity for public and private owners, and support wildlife, recreation, and other forest-based values. Potential risks to water quality identified in STEP 3: Source Water include biological, chemical and petroleum contamination and potential impacts to water quantity/availability. The following management options have been identified to manage risks associated with harvesting, pest and weed control, and fuel use, transfer and storage.

- Stress the benefit of maintaining forest cover in watershed areas. Landowners should be encouraged to minimize forestry harvesting, and to follow best management practices regarding harvest/extraction, silviculture, and fuel use and storage, developed by the Departments of Natural Resources and Environment (Appendix III: A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia). In addition, any forestry activities on Town owned lands must follow the Forestry Management Plan (Appendix VII: Forest Management Plan).
- Discourage the use of pesticides for silviculture and forest protection through education (newsletter, etc.).

4.7 Environmental

Drought is the immediate concern for conservation of water. Steps have already been conducted to ensure early indication of adverse effects. The Town has several monitoring sites as well as real time water level monitoring in all well houses. The Town currently has all wells alarm to notify operators when the water level in wells drop below 100 feet above the sensor. This value was chosen as it provides the operator early noticed of well drawdown and time to respond. In the event of alarms, operators will adjust the pumping rate down to help reduce the impact on drawdown. It is noticed that an immediate pumping rate change creates instantaneous relief in circumstances observed to date.

If decreases in pumping rates do not create the desired affects, a policy should be created for water conservation. This policy will be triggered by a series of events such as XX number of days without rain, XX consecutive attempts at decreasing pumping rates or some other consideration. Several communities currently

have similar policies in place which limits grass watering or car washes on certain days of the week or just provides a request to the public to conserve water.

The Source Water Protection Committee should with Pictou's Water Utility to develop a communications plan before these events occur or happen on a regular basis. For example, water conservation plans will need to be developed and proper communication channels considered. These could include alternating days of the week for watering lawns/gardens or public awareness campaigns.

4.8 OTHER

The Watershed Advisory Committee identified three additional concerns were through the development of this plan; illegal dumping, the creosote timbers buried in the watershed area and the two cemeteries - one inside Town and one in the Central Caribou Watershed area. The following management strategies are proposed to address these concerns.

- Develop a general education package or newsletter on the value of protecting source water for all residents. Groundwater is a shared resource and all residents play a part in protecting it.
- Develop a school education program focusing on the groundwater resources in the area. Education programs of this nature are generally successful in helping to educate an entire family with respect to the various challenges in protecting water quality and the important roles the various stakeholders play.
- Continue to monitor groundwater quality in monitoring wells and residential wells adjacent to the buried creosote timbers.
- Continue to monitor water quality in wells adjacent to the cemeteries.

4.9 RISK RANKING

Each risk has a varying level of probability and potential impact on the source water. To assess each risk, a rating system must be developed to rank the risk based on threat to the water system. A rating system should be based on possibility of occurrence and the severity of the impact on the water system.

As a single contamination of the water source, which makes the water unsafe could have a greater impact than several minor inconveniences. It is proposed to weigh impact as 8/10 and the probability of occurrence at 2/10. These two factors will provide a risk rating out of 10 for each activity. The table below ranks each activity based on risk:

TABLE 2: RISK ASSESSMENT

Section	Activity	Frequency (2)	Severity (8)	Total Score (10)
5.1	Agriculture			
5.2	Industrial/Commercial			
5.3	Recreation			
5.4	Residential			
5.5	Transportation			
5.6	Forestry			
5.7	Other (creasote piles, illegal dumping, two cemeteries)			

4.10 Implementation Plan

Following the adoption of the SWPP the management options or strategies that have been identified to manage the risks in the Town and Central Caribou Watersheds. Several general management strategies could be implemented immediately after the SWP Plan has been approved and these are outlined below:

- Develop a broad education and stewardship program outlining the purpose and status of the management plan and opportunities for participation. This could be done internally (with help from NSE) and take the form of a watershed newsletter and include information on sewer lines, septic systems, oil tanks, passive recreation and other general stewardship initiatives. Encourage feedback and questions from homeowners and other interested parties.
- Establish signage at access roads indicating the nature of the area as a source water protection zone and provide contact information in case of an emergency.
- Contingency Plans (CP) and Emergency Procedures (EP) are annually updated within the Town of Pictou's operating manual in Chapter 5. Any suggestions for new plans or procedures can be suggested through email or directly to the Utility. These procedures identify the plan of action in the event of emergencies and a contact list depending on the type of issue (news, high-risk customers, emergency services, etc.). The Utility's EP and CP focus on well site-specific contamination or failures and how to mitigate them.
- The Regional Emergency Measures Organization (REMO) has a countywide response plan on dealing with emergencies or disasters. All major emergencies should involve this committee. The Chief Administrative Officer (CAO), Scott Conrod, of the Town of Pictou is the local contact, while John Davison is the regional contact. To contact Scott, call the Town Office at 902-485-4372 and to reach John call 902- 759-1797.

The remaining strategies identified in Step 4: Risk Management Recommendations are listed in the Table 3: Activities to Manage Identified Risks in Pictou/Caribou Wellfields to illustrate when the strategy may be implemented.

Table 3: Activities to Manage Identified Risks in Pictou/Caribou Wellfields

Management Activity	Target Area	Status	Date of Completion	Comments
Education and Stewardship Initiatives				
Develop and distribute SWPP Newsletter	All	Ongoing		Distributed in 2007, 2008, and 2011.
Establish Signage at Access Roads	Transportation / Recreation	Complete	September 2007	
Assemble and Distribute Homeowner Information Package (Appendix VI: Residential Best Management Practice References)	Residents	Complete	September 2007	Available on the Town's website.
Develop & Distribute Forestry Education Package (Appendix VII: Forest Management Plan)	Forestry Operations	Complete	September 2007	Available on the Town's website.
Develop an information package: Managers of recreational venues	Recreation	Complete	September 2007	
Develop an information package: Industrial / Commercial sector (Appendix IV: Industrial/Commercial Best Management Practice References)	Industrial / Commercial	Complete	December 2008	Available on the Town's website.
Develop and deliver a school education program	Residents	Incomplete	TBD	
Develop conservation plans	Residents	Incomplete	TBD	
Best Management Practices				
Distribute Agricultural BMP's (Appendix III: A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia)	Agricultural	Complete	September 2007	Contact NS Department of Agriculture annually to determine if any changes have been made. Available on NS Department of Agriculture website.
Develop & Distribute Transportation BMP's	Transportation	Complete	December 2007	Contact NS Department of TIR annually to determine

Management Activity	Target Area	Status	Date of Completion	Comments
				if any changes have been made.
Develop Forestry Management Plan	Forestry Operations	Complete	December 2008	Contact NSDNR annually to determine if any changes have been made.
Wellhead Upgrade Project	Utility	Complete	November 2014	Phase 1: November 2013 Phase 2: November 2014
Water Meter Installation	All	Complete	Spring 2014	Conservation
Wellfield Management Policy (Appendix II: Wellfield Management Policy)[1]	Utility	Complete	August 2011	
Eliminate Chemical Use at multiple sites and reduce traffic near water sources	Utility	In Progress	April 2019	When the Town builds a Water Treatment Plant it will centralize chemical and monitor requirements
Emergency and Contingency Planning				
Review Existing Contingency / EMO Plans	All	Complete	March 2008	
Develop Contingency Plan for Accidental Spills (residential) (Appendix V: Emergency Response Planning)	Residents	Complete	September 2007	Available on the Town's website.
Develop Contingency Plan for Accidental Spills / Accidents	All	Complete	September 2007	
Monitoring				
Monitor salt levels		Ongoing		Sampled annually
Monitor wells adjacent to buried creosote timbers		Ongoing		Sampled quarterly
Monitor water quality in wells adjacent to the cemeteries		Ongoing		Sampling frequency to be determined.
Review and Evaluation				
Review and update SWPP		Ongoing		Latest Update January 2017

[1]Activity added since previous version of SWPP.

STEP 5: EVALUATION AND MONITORING

An evaluation and monitoring program has been developed in conjunction with the management plan described above. Monitoring is the basis for Step 5 of the Five Step Guide under the Drinking Water Strategy for Nova Scotia. The purpose of the program will be to carry out on-going monitoring of water quality within the watershed to assess the effectiveness of management controls, warn of potential problem areas and contaminants in the watershed and track the overall health of the supply area.

The evaluation and monitoring program will provide an on-going snapshot of conditions in the watershed and help to provide early warning of potential risks to water quality and target areas where attention is required. Monitoring will also help to determine whether the management plan is working effectively and if any changes to the plan need to be made.

The monitoring program is comprised of two main components – a water quality-monitoring component, to directly measure the quality of source water; and a general component, to monitor land use changes and other activities in the watershed.

The SWPP should be reviewed regularly to assess effectiveness and reflect any major changes in activities or land uses in the watershed or changes in source water quality. Management options should be reviewed individually to assess their effectiveness, usefulness and cost/benefit. It is recommended that the watershed committee meet at least once a year to review the plan and source water quality, or as additional information, concerning the source area, becomes available.

5.1 WATER QUALITY MONITORING

The main component of the monitoring plan is the regular sampling of the source waters within the watershed for quality analysis. Water analyses will provide an indication of the overall source water quality within the watershed and any changes in quality that occur over time because of changing land use practices or other activities in the watershed.

At present, the Utility has in place a comprehensive raw water-monitoring program for each of the wells, as part of its operating permit for drinking water supply. The program includes continual, weekly, quarterly, annual, and five-year sampling. Water quality parameters related to the SWPP are sampled on

a quarterly basis. District 3 residents, under the guidance of the Pictou County Council should develop plans to test private wells adjacent to the creosote timbers, the cemetery, and the salvage yard, at four to six well locations on a semi-annual basis, or as deemed necessary.

5.2 SWPP Evaluation and Review

Monitoring of the activities and issues identified during the risk analysis (Step 3) of the source water protection planning process should be carried out as a general provision of the overall monitoring activities. This can be accomplished by the Watershed Advisory Committee meeting regularly to exchange information regarding changes in land use, water quality or proposed activities throughout the watershed. The Committee may also choose to review and change portions of the SWPP to reflect changes in the watershed.

The following specific monitoring and evaluation activities may be conducted, either formally or informally, and reviewed by the Source Water Protection Committee. The monitoring activities are grouped by major land-use activities:

TABLE 4: STATUS OF EFFECTIVENESS OF MONITORING LAND-USE ACTIVITIES

Monitoring Activities	Status	Next Steps
Agriculture		
Monitor changes in agricultural operations and monitor water quality with respect to changes in water quality from contamination that is associated with agriculture such as nutrient levels or coliform counts.	No major change in activity identified. The Utility monitors for coliform counts weekly at each well operated by the utility. Nutrient levels are monitored annually at each well operated by the utility. Results are found in the Utility's Annual Report submitted to NSE.	Continue monitoring. Evaluate Committee's ability to monitor agricultural operations.
Industrial / Commercial		
Monitor changes in water quality with respect to industrial and commercial operations throughout the watershed	No major changes in industrial or commercial activity in the watershed.	Evaluate Committee's ability to monitor this activity.
Recreation		
Continue monitoring recreation activities with respect to potential fuel spills and littering. Encourage recreational users of the watershed to report any irregularities or problems they encounter.	No significant issues identified with respect to recreational activities.	Evaluate Committee's ability to monitor this activity.
Residential Development		
Monitor the development activities within the watershed, especially new commercial or industrial developments.	No major activities identified.	Continue monitoring.
Monitor any serious issues that arise with septic systems/sewers, such as major malfunctions or changes in policy with respect to waste	No key issues identified with respect to septic	Work closer with NSE to discuss whether septic

Monitoring Activities	Status	Next Steps
disposal.	systems / sewers.	systems malfunctions occur in watershed, and discuss methods for notification.
Develop plans for monitoring private wells adjacent to the creosote timbers, the cemetery, and the salvage yard, at four to six well locations on a semi-annual basis, or as deemed necessary.	No monitoring plan developed.	TBD
Transportation		
Monitor water quality results for any signs of potential contamination of source waters from road salting (i.e. high chloride levels).	Salt levels are continually monitored at each well operated by the Utility. Wells with increasing levels have been identified. These wells do not have surface water influences. Road salt not suspected to be source of increasing levels. Results are found in the Utility's Annual Report.	Continue monitoring.
Monitor transportation patterns in the watershed, to ensure that dangerous goods that are transported through the watershed follow BMP's.	No monitoring of this activity.	Evaluate Committee's ability to monitor this activity. Invite Nova Scotia Department of Transportation and Infrastructural Renewal and / or Transportation Canada to committee meeting to discuss approaches and feasibility.
Forestry Operations		

Monitoring Activities	Status	Next Steps
Monitor changes the forest cover due to the frequency, size, and extent of harvesting or natural disasters such as from wind, fire, insects/diseases, or other agents.	No monitoring of this activity.	Evaluate Committee's ability to monitor this activity. Invite Nova Scotia Department of Natural Resource to committee meeting to discuss approaches and feasibility.
Monitor water quality results for any signs of potential contamination of source waters due to construction, development or other activities (i.e. nutrient levels, coliform counts, TSS).	No major change in activity identified. The Utility monitors for coliform counts weekly at each well operated by the utility. Nutrient levels are monitored annually at each well operated by the utility. Results are found in the Utility's Annual Report submitted to NSE.	Continue monitoring.
Environmental		
The Town will monitor groundwater level and set alarms to provide early notice adverse effects.	These alarms are programmed through the Utilities SCADA system and send automatic alarms to the operators	Continual Monitoring. This should be supplemented by a communication plan during time when conservation protocols are in place.
Other		
Monitor changes in PAH's due to creosote timber burial.	PAHs are sampled quarter annually since 2009 and included in the Utility's	Continue monitoring. Developed policy / procedure for enhanced sampling and

Monitoring Activities	Status	Next Steps
	Annual Report submitted to NSE. Benzo(a)pyrene detected in June 2009. No detection since June 2009.	notification. Develop plan for including private well owners in sampling.
Monitor changes in water chemistry due to contaminants associated with cemeteries.	No sampling frequency established.	Establish sampling frequency. Developed policy / procedure for enhanced sampling and notification. Develop plan for including private well owners in sampling.
Monitor solid waste practices.	No major change in activity identified.	Evaluate Committee's ability to monitor solids waste practices of individuals.
Groundwater Level	Continually through SCADA system	The system is designed to alarm if the water level drops below 100 feet above the sensor's head.
System turbidity, pH, temperature	Continually through SCADA	Alarms will sound if parameters exceed NSE recommended parameters
Centralize Treatment and Disinfection Operations	Build and use a centralized treatment plant	This will eliminate untreated backwash, multiple chemical injection sites and several vehicle trips to the wellfield.

Appendix I: Pictou / Caribou Source Water Protection:

Advisory Committee - Terms of Reference

Advisory Committee - Terms of Reference

The following are the Terms of Reference for the Source Water Protection Advisory Committee for the Town and Central Caribou Wellfields, the source area for Town, Central Caribou & surrounding area, Pictou County, Nova Scotia. The Pictou / Caribou Source Water Advisory Committee will be recognized by the Pictou Town Council (the Town), the Municipality of the County of Pictou, and the Water Utility.

Mandate:

The Pictou /Caribou Source Water Protection Advisory Committee (the Committee) shall:

1. Elect a Chair to provide leadership to the Committee;

2. Review and make recommendations to the Pictou Town Council and Municipality of the County of Pictou Council on all activities that may adversely affect the water quality in the Town and Central Caribou Source Water Area (source area) as requested by the Utility, Council, the Central Caribou Watershed Advisory Committee, landowners or other stakeholders in the source area;

3. Provide a forum for landowner and stakeholder involvement and for reporting to landowners and stakeholders on matters regarding water resources and water quality/quantity protection;

4. Review and make recommendations regarding monitoring of water quality and quantity programs and other studies related to the source area. All water quality/quantity information shall be available to the Committee;

5. The Committee will develop information for educational programs regarding water quality/quantity and source water protection for landowners and other stakeholders in the source area;

6. Develop a SWPP and Implementation Schedule to protect the Town and Central Caribou Wellfields.

Membership of the Committee:

To develop and implement a comprehensive SWPP, the following will be included as members of the Committee:

- members of the Pictou County Council;
- members of Town Council;
- members of Municipality of the County of Pictou Council;
- the water utility operator;
- landowners from the area;
- other interested stakeholders;

The following may be invited to assist the Committee in an advisory capacity:

- Nova Scotia Department of Environment;
- Other government or technical advisors if necessary.

Operation of the Committee:

1 The Committee will be chaired by a member selected by the Committee;

2 Members will serve for a term that is to be determined by the Committee;

3 Secretarial services will be provided by the Committee;

4 These terms of reference may be amended by the Committee;

5 The Committee will endeavour to conduct business by consensus, but should voting be necessary, all motions require support from a quorum (two-thirds) of the Committee members;

6 Disputes that cannot be resolved through consensus will be addressed at a special session mediated by a third-party;

7 The Committee will meet as necessary, but no less than once in each calendar year.

8 The Committee may from time to time request or admit individuals or groups to make representation to the Committee regarding matters or issues affecting the source area.

9 The Committee will liaise with government agencies not represented on the Committee, particularly Nova Scotia Environment;

10 The Committee will prepare an annual report at the end of each calendar year and circulate it to all members of the committee

APPENDIX II: WELLFIELD MANAGEMENT POLICY

Wellfield Management Policy

Policy Objective

The policy objective is to efficiently and effectively address management of existing Town wells and the activities related to the planning of new well installations.

Policy Presentation

1. Exploration and Installation of New Production Wells

The Town's statement of general policy is to:

1.1 Employ the services of a licensed Hydrogeologist to recommend future Town well sites, assess valid complaints, and to prepare an aquifer testing report (ATR). Such an ATR will include, with the permission of private well owners, the completion of pre-assessment reports as described in provision 1.3 of this policy.

1.2 To reduce impacts on private wells, the Town will first focus its exploration for new wells, when and if new Town wells are required, to sites located within the northeastern portion of the Town as shown on the attached map.

1.3 For privately owned domestic well(s) located within 650 meters of a planned installation of a Town production well, and upon consent of the private well owner(s), the Town shall have a Hydrogeologist conduct a pre-assessment.[a] The purpose of the pre-assessment is to collect baseline information specific to the private well(s), e.g., the collection of pre-pumping data, which can be used for comparison purposes should private well interference effects be suspected in the future. Private well owners who do not wish to participate in a pre-assessment process are not necessarily excluded from opportunity to make future complaint, but are advised that a determination of future impact without a pre-assessment is less probable.

[a] The Guide to Groundwater Withdrawal Approvals issued by the Province of Nova Scotia references 500m for the identification of potential interference effects of new installations on nearby groundwater users, The Town increased this distance to 650m due to the number of homes that are just beyond the 500m distance from Town owned lands.

1.4 To advise the owners of private wells within 650 meters of a new Town production well of the expected date of well testing and the date on which the new Town production well is expected to be operational; and

1.5 To maintain observation (background) wells located outside of Town pumping areas (outside of Town pumping influence) for the purposes of collecting data related to natural fluctuations in the water table.[b]

2. Operation of Existing Production Well

The Town's statement of general policy is to:

2.1 Apply steps 2.2 through 2.4 below for the operation of existing production wells following the commissioning of Well #15, currently underway, and including any other new wells after commissioning.

2.2 Employ the services of a licensed Hydrogeologist to prepare an aquifer testing report (ATR) and act upon written complaints from private land owners. Such an ATR will include an assessment of valid complaints from private land owners within 650 meters of a Town production well in a manner consistent with provisions 3.1 through 3.6 of this policy (excluding 3.2))c

2.3 Maintain a series of observation wells, which are both within the Zone of Influence of existing production wells, and located outside the Zone of Influence between the production wells and adjacent private wells. These wells will be used for the purposes of establishing background aquifer water levels and variations due to pumping of Town wells.

2.4 For the purposes of establishing baseline conditions for existing production wells installed prior to the implementation of this policy, the aquifer data to be considered shall be that available under the present wellfield conditions, and is limited to data collected on or after the installation of a production well.

[b] The Town maintains two backgrounds wells, each is equipped with a hydrograph. One well is located within an aquifer comprising sand and gravels, while the second is located within an aquifer comprising bedrock.

[c] This aspect will be part of a standardized application to NSE for Groundwater Withdrawal Approval by the Town. Other requisites of the NSE application typically include the drilling and monitoring of an observation well within the adjacent influence area of a proposed production well. The observation well is to be used by the Hydrogeologist to gauge the pumping effects of the production well (drawdown cone) relative to groundwater levels within the related area.

3. Administration of Valid Complaints

Specific to the processing of valid written complaints received from private owner(s) of well(s) wherein the owner(s) of said well(s) alleges unacceptable interference (diminished water levels) caused by Town activities, the Town shall:

3.1 A written complaint received by the Town shall be deemed valid based on records of aquifer water levels in existing production and observation wells in addition to pumping rates from existing wells Water levels in observation wells must be shown to have varied outside normal seasonal fluctuations and/or production rates must have exceeded normal 3-day maximum withdrawal volumes for a written complaint to be deemed valid. Such an assessment will be made by a licensed Hydrogeologist engaged by the Town.

3.2 Engage a licensed Hydrogeologist to undertake an independent review of the complaint. The independent review shall include:

a) a comparison of the conditions encountered by the private well owner(s) to those benchmarked during the pre-assessment (if completed) as referenced above;

b) a comparison of the conditions encountered by the private well owner(s) to those benchmarked within the observation (background) wells as referenced above; and

c) a determination by the reviewing Hydrogeologist of whether there is a relationship between Town pumping activity and water shortage encountered by the complainant.

3.3 In response to valid written complaint(s) received by the Town from owner(s) of private well(s), where the subject well(s) are located within 500 meters of a Town well currently in production, and upon the owner of such well executing a release of liability to the Town in respect of responsibility for loss of water prior to the completion of the Hydrogeologist independent review, the Town shall furnish the owner of said private domestic well with a temporary supply of water, at Town expense, until such time as the independent review referenced in provision 3.2 of this policy is complete.

3.4 In response to a written complaint(s) received by the Town from the owner(s) of a private well(s), where the subject well(s), is located between 500 and 650 meters of a Town well currently in production, the Town shall engage an independent licensed Hydrogeologist as soon as possible to

undertake an independent review and file a report pursuant to provision 3.2 of this policy. The Town will not provide temporary water supply in this instance.

3.5 If it is determined in the independent review that Town pumping activities create unacceptable interference (diminished water levels) within private wells, the Town shall:

a) Notify the owner of the well and NSE in the form of a copy of the report upon its receipt;

b) Attempt at the earliest reasonable date to negotiate a resolution with the private well owner, wherein the deficiencies being experienced are satisfactorily addressed to an objectively reasonable standard. The negotiation/resolution may require the engagement of professional and independent Hydrogeologists and/or professional design engineers; and

c) To keep NSE apprised of independent review work and negotiations in a timely manner.

3.6 This policy shall not relate to new or replacement domestic wells drilled after the date on which Town production wells are operational.

4. Water Conservation Planning

Over the eighteen (18) months succeeding the adoption of this policy, the Town agrees to develop a water conservation program that may include without limitation:

4.1 Determining the feasibility of installing residential water meters and a central water monitoring system for Town wells (known as ***SCADA) that in part could be used to conserve usage and to quantify and locate unoccounted water production.***

4.2 Have the Nova Scotia Utility and Review Board modify the Town's regulations to include a conservation provision empowering the Town to control (restriction or denial) of water usage by its customers during dry periods.

4.3 Analyze historic data relative to precipitation and well operating parameters (e.g., rates of drawdown and recharge) for benchmarking normal operating parameters and quantifying points under which the Town would invoke conservation regulations described above.

Appendix III: A Guide to Recommended Agricultural Practices within Municipal Drinking Water Supply Areas in Nova Scotia

Prepared by

Nova Scotia Department of Agriculture and Fisheries

Nova Scotia Department of Environment and Labour

2005

INTRODUCTION

Some types of agricultural practices can impair water quality. If not carefully managed, common pollutants of water originating from farming activities may include: sediment, nutrients (especially nitrogen and phosphorous), bacteria, and pesticides. The challenge to farmers is to balance agricultural production with the protection and conservation of water quality.

This document is designed as a guide to farmers and to operators of municipal drinking water supplies, providing recommended management practices that can be incorporated into daily farming activities to help protect water quality in areas, which drain into public drinking water supply areas. It was developed in conjunction with the Nova Scotia Department of Agriculture and Fisheries and the Nova Scotia Department of Environment and Labour. It is aimed at minimizing the risk of an impact on water supply areas, while recognizing that there is no practical method of ensuring an absolute zero risk approach, particularly regarding surface water supplies (rivers and lakes).

Farmers operating within drainage areas contributing to municipal drinking water supplies are expected to demonstrate due diligence. This means taking every reasonable precaution to prevent or minimize impacts from activities that can impair water quality. The best approach to ensuring due diligence is achieved is by using Beneficial Management Practices, or BMPs. The BMPs outlined in this guidance document have a proven record of success in reducing impacts to water from farming activities. Some of the management practices in this document may be superseded by regulations in some water supply areas. For certainty, contact the water utility operator responsible for the water supply in question, or the Nova Scotia Department of the Environment and Labour.

BENEFICIAL MANAGEMENT PRACTICES

ENVIRONMENTAL FARMS PLANS AND NUTRIENT MANAGEMENT

The Nova Scotia Federation of Agriculture and Department of Agriculture and Fisheries have developed programs to assist farmers in reducing impact to the environment from farming activities.

The **Environmental Farm Plan (EFP)** is a voluntary program that helps farmers identify and assess environmental risks on their property. Farmers work with an EFP coordinator and engineer to develop a confidential environmental farm plan for their operation.

The objective of the EFP Initiative is to help farm families develop a practical plan for operating the farm in an environmentally responsible manner. The Environmental Farm Plan acts as a guide which enables farm families to incorporate sound environmental practices into their operations. The EFP Initiative is industry-led and industry-driven.

The **Nutrient Management Program (NMP)** is a farm-specific tool that determines the amount, timing and application of nutrients from manures and fertilizer. Livestock and poultry producers operating in areas which drain into municipal drinking water supplies are strongly encouraged to develop a nutrient management plan for their farming operations. The major elements of such a plan should include:

1.1 Periodic analysis of the manure produced in the animal operation

1.2 Routine soil testing program

1.3 Realistic yield goals for rate calculation

1.4 Accurate records of fields manured and the application rates used

1.5 Sufficient storage capacity

1 6 Field maps where wetland and other freshwater ecosystems are identified

1.7 Proper timing of manure application

1.8 Calibration of manure spreaders so application rates can be determined

For more information about these programs please contact:

Environmental Farm Plan Coordinator

NSFA office - (902) 839-2293.

Email: info@nsfa-fane.ca

Website: www.nsfa-fane.ca

Programs and Risk Management Division

Farm Investment Fund

Nova Scotia Department of Agriculture and Fisheries

176 College Road, PO Box 550, Truro, NS B2N 5E3

Tel: (902) 893-6510 Toll-free: 1-866-844-4276, Fax: (902) 893-7579

MANAGEMENT OF LIVESTOCK MANURES

The land application of livestock manure is recognized as an acceptable farming practice. When properly managed, the risk of an impact on a water supply area is minimized to a level that can be managed by other components of a water supply protection plan.

Between the time manure is excreted and the time it is incorporated into the soil, the loss of nutrients and the resulting potential for pollution can be quite high depending on how manure is handled. The following methods should be employed when managing manure in drinking water supply areas:

1.1 Ensure that all manure hauling and spreading equipment is suited to the type and consistency of the manure produced on the farm.

1.2 Ensure storage structures have the capacity to hold the total volume of manure, wastewater, and bedding produced between periods of land application.

1.3 Time the loading and field application of manure to reduce the potential for environmental contamination and to provide the greatest benefit for soils and crops.

1.4 Make storage facilities manure tight to contain and protect manure from the weather thereby

providing the greatest conservation of nutrients and the best protection against water contamination.

1.5 Keep manure handling to a minimum, agitating manure, particularly in liquid form, causes the gaseous loss of nitrogen, which causes odours. Manage manure to minimize the number of times that manure is mixed and spread.

1.6 Plan the location of animal production and manure storage facilities so that they are adequately separated from water sources.

1.7 Always apply manure following minimum separation distances for water resources.

1.8 Avoid applying manure on wet soils to minimize compaction, runoff and leaching.

1.9 Unless immediately incorporated into the soil, surface apply manure at reasonable distances from residences and public buildings to reduce odor problems.

1.10 Rotate fields receiving manure to avoid nutrient buildup and maximize nutrient utilization, as dictated in the nutrient management plan.

1.11 Only spread manure on slopes greater than 5% between the months of June and August.

1.12 Supplement commercial fertilizers only when manure nutrients do not meet crop yield goals.

1.13 Apply manures as close as possible to the time crop utilization of the nutrients in the manure. Utilize fall cover crops to minimize soil erosion and runoff and to maximize nutrient utilization from manure application.

1.14 Avoid surface application of manure on steep slopes, frozen soil or near surface waters.

SEPARATION DISTANCES FROM WATERCOURSES AND WELLS

The Department of Agriculture and Fisheries has developed Manure Management Guidelines that recommend minimum setback distances for spreading manure on agricultural land. The following tables summarize minimum setback distances recommended for use within the manure management

guidelines.

TABLE 5: MINIMUM SEPARATION DISTANCES FOR MANURE APPLICATION

Water Source	Separation Distance (meters)	
	clay loam & loam soils	sand & gravel soils
Dug or Drilled Wells	30	60
Primary Watercourse	10	10
Tributaries to Primary	5	5
Ditches	3	3

TABLE 6: RECOMMENDED SEPARATION DISTANCES FOR SPREADING MANURE ON SLOPED LAND

Slope gradient to watercourse (located within 2 km of water treatment plant intake)	Separation Distance (meters)
< 2 %	20
2 - 5 %	50
5 - 10 %	100
> 10 %	Not Recommended

Farmers operating within a water supply area that has been designated as a Protected Water Area (PWA) under the Environment Act, may have to comply to other specified setback distances outlined within the PWA designation regulations.

Farmers should also be familiar with the Department of Agriculture and Fisheries Guidelines for the Siting and Management of Hog Farms in Nova Scotia, as well as any guidelines or regulations associated

with separation distances required for the storage of animal manures.

For more information:

http://www.gov.ns.ca/agri/rs/envman/pub.shtml

Nova Scotia Department of Agriculture and Fisheries, Guidelines for the Management and Use of Animal Manure in Nova Scotia, Publication No. R-91-2000, 1991.

Nova Scotia Department of Agriculture and Fisheries, Environmental Regulations Handbook for Nova Scotia Agriculture, January 1997.

Nova Scotia Department of Agriculture and Fisheries, The Development of an On-Farm Manure Management Program, March 1996.

Nova Scotia Department of Agriculture and Fisheries, Factsheets on Manure Nutrients, Manure Spreader Calibration, Earthen Manure Storages, and Integrated Fly Management for Livestock Farms.

PASTURING LIVESTOCK

As a measure of due diligence, pasture land must be fenced to prohibit the entry of livestock into adjacent watercourses.

The minimum recommended setback for fencing pastured cattle from a well or watercourse is 5 meters. If livestock are pastured on both sides of the water supply, an approved crossing must be constructed so the livestock can cross without entering and disturbing the watercourse.

MANAGEMENT OF CHEMICAL FERTILIZERS

Farmers operating in areas which drain into municipal drinking water supplies that use surface water should use the following setback distances when applying fertilizer to crops:

< 10 meters from the primary watercourse

< 5 meters (minimum) from a natural watercourse other than the primary watercourse

< 3 meters from a ditch

BUFFER STRIPS

Buffers are strips of land in permanent vegetation, designed to intercept pollutants and manage other environmental concerns. Buffers include: filter strips, grassed waterways, shelterbelts, windbreaks, living snow fences, contour grass strips, cross-wind trap strips, shallow water areas for wildlife, field borders, alley cropping, herbaceous wind barriers, and vegetative barriers. Riparian buffers refer to a buffer strip along a stream.

Strategically placed buffer strips in the agricultural landscape can effectively mitigate the movement of sediment, nutrients, and pesticides within farm fields and from farm fields. When combined with appropriate beneficial management practices, buffer strips should allow farmers to achieve a measure of economic and environmental sustainability in their operations. Buffer strips can also enhance wildlife habitat and protect biodiversity. Buffers slow water runoff, trap sediment, and enhance infiltration within the buffer. Buffers also trap fertilizers, pesticides, pathogens, and heavy metals, and they help trap snow and cut down on blowing soil in areas with strong winds. Buffers help stabilize a stream, create shade and reduce its water temperature. Buffer strips also offer a setback distance for agricultural activities from water sources. If properly installed and maintained, they have the capacity to:

1.1 remove up to 50 percent or more of nutrients and pesticides.

1.2 remove up to 60 percent or more of certain pathogens.

1.3 remove up to 75 percent or more of sediment.

1.4 reduce noise and odor.

MANAGEMENT AND USE OF PEST CONTROL PRODUCTS

All users of pest control products within a municipal drinking water supply area shall hold a valid certificate of qualification as defined in the Pesticide Regulations of the Nova Scotia Environment Act (1995). Farms operating within a Designated Protected Water Area must comply with Section 21 of the Pesticide Regulations of the Nova Scotia Environment Act (1995), which states.

> "No person shall apply a pesticide within a protected water area designated under Section 106 of the Act unless the person complies with any regulations regarding the use of pesticides within the protected water area."

In other words, farmers are responsible for finding out if they are conducting their agricultural activities within a Protected Water Area, in addition to, complying with any associated regulations which may apply to their farm activities.

SOIL CONSERVATION AND MANAGEMENT

The following recommended practices for soil conservation and management apply only within those Municipal Drinking Water Supply Areas in which the water supply is derived from surface waters (lake, river, stream, etc.). Farmers are encouraged to use erosion control methods if the following circumstances apply to their operation:

1.1 In any year that annual crops (i.e. corn, small grains, vegetables, etc.) are grown on slopes exceeding 3%.

1.2 Tillage operations or harvesting are conducted that will expose bare soil during mid-October through mid-April.

1.3 Perennial crops which are subject to erosion (i.e. small fruits and tree fruits) are grown.

1.1 Reduce soil compaction by tilling or harvesting when soil is not wet. Studies have shown fields with soil compacted by farm equipment results in greater runoff of nutrients and pesticides.

1.2 Avoid exposing large areas of bare soil during the winter period

1.3 In Nova Scotia, it is recommended that fields with bare soil or less than 50% cover, be mulched with hay or straw if it is too late to provide adequate field cover with cover crop

Appendix IV: Industrial/Commercial Best Management Practice References

Industrial/Commercial Best Management Practices; Nova Scotia Environment online references:

Pollution Prevention Guide for Printers in Atlantic Canada

http://www.gov.ns.ca/nse/pollutionprevention/docs/Printer_PollutionPreventionGuide.pdf

Business Environmental Checklist

http://www.gov.ns.ca/nse/pollutionprevention/docs/biz_checklist_factsheet.pdf

Pollution Prevention Workbook for Business

http://www.gov.ns.ca/nse/pollutionprevention/docs/PollutionPreventionBusinessWorkbook.pdf

Appendix V: Emergency Response Planning

Emergency Response Plan

In general, initial response to emergency situations will be provided by the fire departments, police and ambulance services. The provincial emergency system is set up to facilitate quick response from these agencies. The responding group will be able to assess the nature of the situation and call for additional resources, ranging from the town and local contractors with equipment and materials to construct containment areas, regional EMO managers, environment department personnel, to hazardous materials response units, and environmental consulting firms with knowledge of the proper procedures. These first response groups have been informed of the sensitive nature of the area, and have been given contact information to the resources available.

The Town has provided emergency response procedures related to source water protection in the regional emergency response plan. For additional information related to the protection of the source water during the emergency responses refer to the Regional Emergency Response Plan and the Water Utility Operations Manual. The Operations Manual can be found at the Town Office or the Public Works building.

Appendix VI: Residential Best Management Practice References

Residential Best Management Practices; NSE online references:

Installation and Environmental Management Guide for Aboveground Domestic Oil Tanks

http://www.gov.ns.ca/nse/petroleum/docs/OilTankInstall.pdf

Homeowners Guide to Heating Oil Tank Systems

http://www.gov.ns.ca/nse/petroleum/docs/OilTankGuide.pdf

Heating Oil Tank System Checkup

http://www.gov.ns.ca/nse/petroleum/docs/DomesticOilTankChecklist.pdf

Non-essential Pesticide Uses

http://www.gov.ns.ca/nse/pests/docs/Non-Essential-Consumer.Brochure.pdf

Taking Care of Your Home Sewage Disposal System

http://www.gov.ns.ca/nse/wastewater/docs/Homeowners.Guide.to.Septic.Systems.pdf

APPENDIX VII: FOREST MANAGEMENT PLAN

FOREST MANAGEMENT PLAN

INTRODUCTION

The committee recommends that landowners follow a management plan which would provide a mature forest cover on lands in the source water area, providing the benefits of such wooded areas to water protection and conservation. While acknowledging the owner's rights to the property it is suggested that a long term sustainable harvesting plan be used to insure the regeneration of new growth while thinning over mature trees and keeping a healthy land cover.

MANAGEMENT PRINCIPLES

1 Forest related activities should encourage the establishment and growth of long-lived species such as red spruce, white pine, eastern hemlock and red oak.

2 Forested areas should maintain a tree cover of not less than 10' in height and not less than 50% stocking.

3 The forest should be maintained in a healthy, actively growing state.

4 Forestry activities should be conducted to minimize disturbance or pollution to the forest floor and the underlying soil.

SHORT-TERM OPERATING PLAN (5 YEAR5)

Operating recommendations are as follows:

Shelterwood Harvesting

The primary objective is to establish the natural regeneration of shade-tolerant species under the existing canopy of mature or over mature stands through a series of partial cuttings.

Selection Harvesting

Selection harvesting will include partial cutting in which the salvaging of over-mature components of stands is the primary objective, whereas the establishment of natural regeneration is the secondary objective.

It must be remembered that the forest is a dynamic entity, continually changing as trees grow and die with the overall structure of the forest evolving through several seral stages. Because the forest is dynamic, it must be continually monitored for changes which have occurred because of significant influences, often unpredictable in nature. The operators of the plan must be committed to acting decisively when the need arises, while staying the course on the plan, its long-term principles and goals, and its short-term objectives.

GUIDELINES FOR FORESTRY ACTIVITIES AND OPERATIONS

NOTE: All guidelines as presented are subject to amendment from time to time by the Source Water Protection Committee.

1. White pine and red oak should only be cut when individual trees are diseased or pose a health threat.
2. Where possible, tolerant tree species such as red spruce, hemlock, white pine and red oak should be selected as crop trees (leave trees) over all other species in harvesting or thinning treatments.
3. Maximum basil area removal should not exceed 50% at any given time.
4. Any equipment proposed for use should be free of leaks.
5. Fuel barrel and jugs, oil containers or other similar containers should not be stored on site other than enough to complete a day's work and then on PVC lined areas.
6. It is recommended that absorbent materials such as peat moss, saw dust, or other material be on hand in case of spillage of fuel, oil, lubricants, antifreeze, or other liquids. All contaminated materials, including contaminated soil, should be immediately removed from the area and properly disposed.
7. Carpet or other absorbent mats will be used at the point of chainsaw refueling to absorb spillage from fuel and oil jugs. The mats should be removed from the site daily and properly disposed of when they become saturated.
8. Adequate fire fighting equipment must be kept on site during fire season. Only fresh water may be used for fire suppression. Flame retardant chemicals may not be used other than as approved commercial fire extinguishers, which must be kept with each piece of equipment

Appendix E

Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia

(Hoffman, Guernsey, Walker, Kim Sherren, Andreou, 2017)

Environ Sci Pollut Res (2017) 24:20685–20698
DOI 10.1007/s11356-017-9719-5

RESEARCH ARTICLE

Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia

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Received: 15 December 2016 / Accepted: 21 June 2017 / Published online: 15 July 2017
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Abstract Air toxics are airborne pollutants known or suspected to cause cancer or other serious health effects, including certain volatile organic compounds (VOCs), prioritized by the US Environmental Protection Agency (EPA). While several EPA-designated air toxics are monitored at a subset of Canadian National Air Pollution Surveillance (NAPS) sites, Canada has no specific "air toxics" control priorities. Although pulp and paper (P&P) mills are major industrial emitters of air pollutants, few studies quantified the spectrum of air quality exposures. Moreover, most NAPS monitoring sites are in urban centers; in contrast, rural NAPS sites are sparse with few exposure risk records. The objective of this pilot study was to investigate prioritized air toxic ambient VOC concentrations using NAPS hourly emissions data from a rural Pictou, Nova Scotia Kraft P&P town to document concentration levels, and to determine whether these concentrations correlated with wind direction at the NAPS site (located southwest of the mill). Publicly accessible Environment and Climate Change Canada data (VOC concentrations [Granton NAPS ID: 31201] and local meteorological conditions [Caribou Point]) were examined using temporal (2006–2013) and spatial analytic methods. Results revealed several VOCs (1,3-butadiene, benzene, and carbon tetrachloride) routinely exceeded EPA air toxics-associated cancer risk thresholds. 1,3-Butadiene and tetrachloroethylene were significantly higher ($p < 0.05$) when prevailing wind direction blew from the northeast and the mill towards the NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. Despite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with P&P emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in P&P towns and contribute to poor health in nearby communities.

Keywords Air toxics · Air quality · Volatile organic compounds (VOCs) · Community health · Pulp and paper · Cancer risk

Responsible editor: Constantini Samara

Electronic supplementary material The online version of this article (doi:10.1007/s11356-017-9719-5) contains supplementary material, which is available to authorized users.

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Introduction

Poor ambient air quality is an increasing global concern with recent revelations that 92% of the world's population is exposed to air pollution levels above the World Health Organization (WHO) air quality guidelines (WHO 2006, 2016; Kelly and Fussell 2015). Ambient air pollution is widely recognized and increasingly associated with a wide range of acute and chronic adverse health effects, including cancer, cardiovascular, respiratory, and mortality outcomes (IOM 2011; Villeneuve et al. 2013; ECCC 2015a). The pathological mechanisms by which these toxic exposures exert their effects are not well understood. WHO highlights the need for research in order to better inform exposure-response relationships (WHO 2016).

Most air pollution surveillance activities are limited to measurement of respirable fine particulate matter ≤2.5 μm ($PM_{2.5}$), without regard to their specific chemical composition and criterion air contaminant (CAC) gases (i.e., nitrogen oxides [NO_x] and ground-level ozone [O_3]). There is growing concern about the toxicity of volatile organic compounds (VOCs) (Cicolella 2008) and the consequences of long-term, low-dose exposure to these agents. VOCs are varied and widespread air pollutants (e.g., hydrocarbons, aromatics, and some chlorinated compounds) that are increasingly recognized as important precursors to $PM_{2.5}$ and ground-level O_3 formation through photochemical reactions (Ryerson et al. 2001). Atmospheric deposition of VOCs may contaminate other environmental media (e.g., soils, sediments, and biota) (ATSDR 2014a; MacAskill et al. 2016). Many VOCs are included in the US Environmental Protection Agency (EPA) "air toxics" list. "Air toxics" are defined as "those pollutants that cause or may cause cancer or other serious health effects [...] or adverse environmental and ecological effects" (EPA 2015a).

According to the Canadian Environmental Protection Act 1999 (CEPA), VOC releases are acknowledged as a health concern, but, due to their highly volatile properties, are challenging to monitor and manage (CCME 2011). Although no specific Canadian legislative or regulatory tools address ambient VOC levels, emissions are indirectly controlled through regulatory mitigation of $PM_{2.5}$ and ground-level O_3 under the Canadian Ambient Air Quality Standards (CAAQS). Under CEPA, it is mandatory for owners or facility operators, who meet reporting requirements, to self-report pollutant releases to air, water, and land to Environment and Climate Change Canada (ECCC)'s National Pollutant Release Inventory (NPRI) (ECCC 2014). While this provides a disincentive to those industries releasing these agents, there is less regulatory control or routine monitoring of these agents in Canada which, in turn, limits scientific understanding of sources, exposures, and the effectiveness of current control measures across the country.

Ambient air monitoring in the US is conducted in accordance with the *Clean Air Act* (CAA) (Clean Air Act 1970). CAA amendments identify 187 air toxics, which form the basis for EPA's approach to regulating emissions (EPA 2015a). Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas (EPA 2015b). Although many CEPA-toxic or equivalent agents are monitored by the National Air Pollution Surveillance (NAPS) network, it includes a selection (not all) of EPA's list of prioritized air toxics, and the main criteria for air toxics monitoring in Canada has been their potential contribution to ambient PM and ground-level O_3 (Galarneau et al. 2016). Consequently, there are gaps in understanding of air toxics concentrations across the NAPS network. Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment (NATA), a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics (EPA 2015c). Such a rigorous initiative has yet to be implemented in Canada, where no federal guidelines exist for ambient air toxics.

Despite economic benefits of the P&P industry, it generates large quantities of atmospheric and effluent emissions, resulting in environmental degradation (Hewitt et al. 2006; Hoffman et al. 2015; Hoffman et al. 2017). P&P mill emissions vary depending on the pulping method, wood species, and by the age and technology used (Soskolne and Sieswerda 2010). P&P mills are industrial emitters of air toxics, although few investigations (e.g., the Nez Perce National Air Toxics Program, funded by EPA [STI 2009]) have characterized ambient concentrations in nearby communities.

Potential adverse health effects associated with exposure to air pollutants in the vicinity and downwind from P&P facilities include respiratory disease, neurophysical symptoms, and higher risks of contracting lung cancer (Soto et al. 1991; Toren et al. 1996; Mirabelli and Wing 2006). Yet, few investigations reported adverse health effects from chronic community-level ambient exposures to P&P mills emissions in Canada (Mirabelli and Wing 2006; Soskolne and Sieswerda 2010). While there have been a number of occupational epidemiological studies of P&P workers, these investigations have not been extended to examine community exposures, due to research design challenges including ecological fallacy (i.e., inferences made about individuals deduced from the population) in community studies (Soskolne and Sieswerda 2010). Additionally, most of these studies focused on respiratory disease outcomes; there is a dearth of epidemiological studies of cardiovascular effects or cancer effects in these communities.

Decades-long concerns for perceived higher incidence and mortality rates for all-cause cancer, cardiovascular disease, chronic respiratory disease, and diabetes (Reid 1989; PCHA 2008; Statistics Canada 2013) in PC, Nova Scotia, have generated considerable community antipathy among residents towards a local P&P mill (Hoffman et al. 2015). This bleached kraft P&P mill ("the mill") is located approximately 3 km south of the town of Pictou (population 3500) and produces approximately 280,000 t of bleached kraft pulp annually from softwood and hardwood chips (NP 2016b) (Fig. 1) and has been in production since 1967 (Ogden 1972). Public backlash gained momentum during 2014 due to the failure of the recovery boiler electrostatic precipitator (i.e., particulate filtration device).

Environmental reporting by the mill, when compared against provincial and federal regulatory compliance standards, contrasted to local perceptions of impacts. Most environmental monitoring reports indicated some

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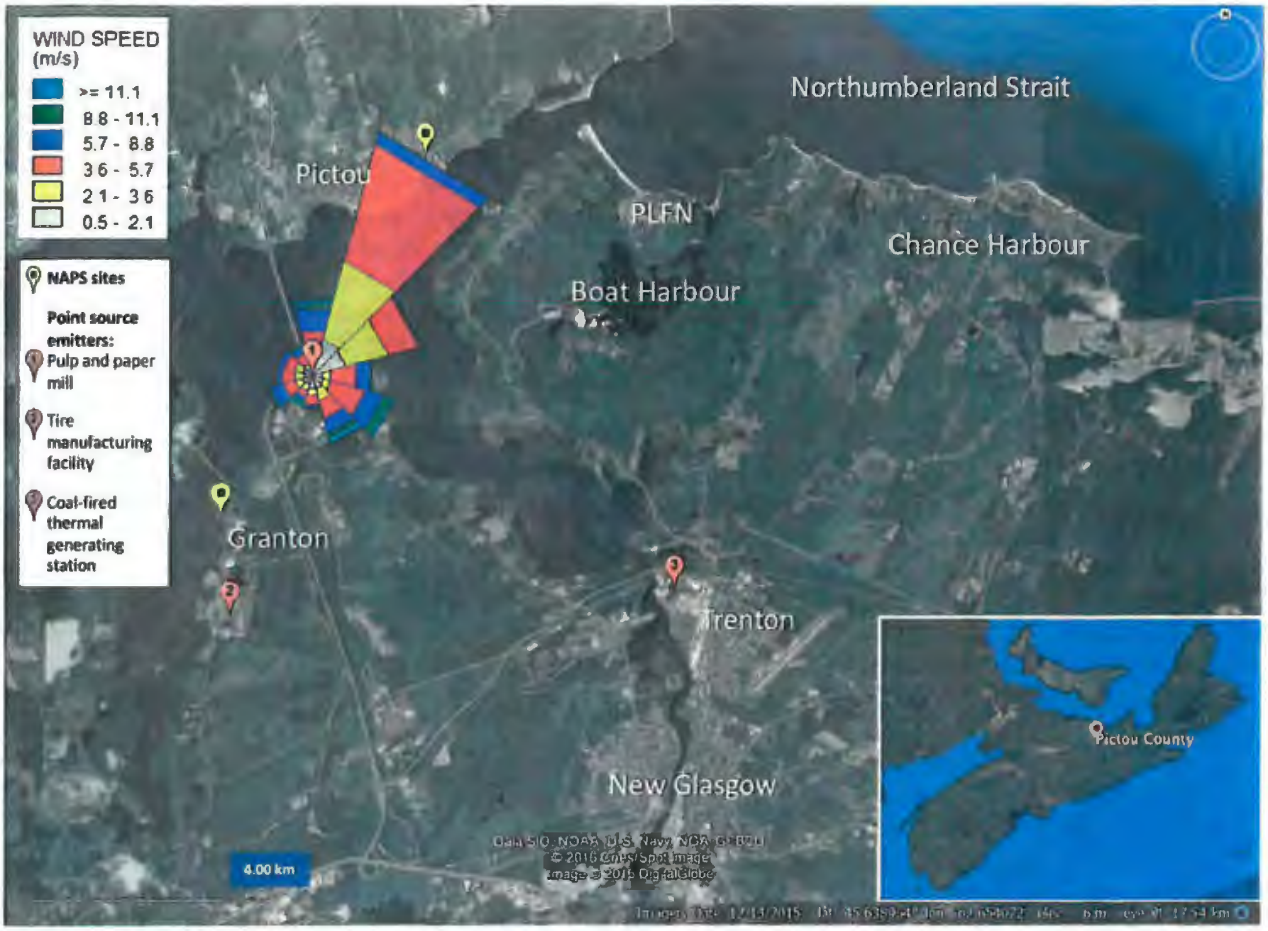

Fig. 1 Summer (2006–2013) wind rose simulation using WRPlot View™ (blowing to direction) with the mill as the focal point (*1*), relative to communities (e.g., Pictou and Pictou Landing First Nation [PLFN]), NAPS discrete receptor sites, and other local point source emitters (e.g., tire manufacturing facility (*2*), coal-fired thermal electrical generating station (*3*)). The length of each radial spoke represents the relative frequency of wind direction (©Google Earth)

level of compliance in atmospheric emissions, but when compliance targets were exceeded, there were inconsistent regulatory enforcement (Hoffman et al. 2015). The mill is required to report emissions to NPRI: conduct third-party stack testing, continuous emission monitoring of total reduced sulfur (TRS), and ambient air monitoring for pollutants found in the Nova Scotia Air Quality Regulations pursuant to the *Environment Act* (NSE 2015). The mill's air emission monitoring data are reviewed by provincial and federal regulators to ensure compliance with applicable environmental permits and air quality objectives (ECCC 2014). Hoffman et al. (2015) provided detailed information on new and existing environmental policies that impose pollution abatement in the P&P industry in Canada, particularly the PC mill (e.g., 2015 Industrial Approval).

These are critical research gaps both in relation to community exposures to VOCs in P&P communities and in regard to adverse health effects resulting from chronic exposure to P&P emissions which are a concern given the potential adverse health outcomes that VOCs and other P&P air emissions pose. This further justifies the need for more research to characterize air quality in this particular subset of industrial communities, which have often been neglected because of their remote locations.

An intensive study of specific ambient air toxic emissions in PC has not been undertaken. The aim of this pilot study was to assess levels of PC community exposures to VOC air toxics emissions from 2006 to 2013, and to evaluate these data in relation to potential risks suggested by EPA air toxic guidelines. The main objective of this study was to determine whether wind direction correlated with prioritized air toxic ambient VOC concentrations at a nearby NAPS site (Granton). As the Granton NAPS site is positioned southwest of the mill, it was hypothesized that prevailing winds (PW) from northerly and northeasterly directions would

positively correlate with an increase in ambient VOC concentrations, as capturing potential VOCs from the mill's plume would be optimized (Fig. 1).

Materials and methods

Spatial and temporal sampling

Historical meteorological and NAPS data from the Granton NAPS site discrete receptor (ID: 31201) were collected from publically assessable ECCC databases (http://climate.weather.gc.ca/climateData/; http://maps-cartes.ec.gc.ca/rnspa-naps/). Hourly surface wind observations (i.e., speed and direction to the nearest 10°) were obtained from the closest EC meteorological station, Caribou Point (45.767° N; 62.683° W), located ~10 km north of the mill (45.652° N; 62.718° W). Temporal data for ambient VOCs monitored at the Granton NAPS station were limited to 2006 to 2013.

Nova Scotia Environment (NSE) operates both NAPS monitoring stations in PC: (i) downtown Pictou (ID: 30901) located 3.5 km northeast of the mill and (ii) Granton (ID: 31201) located 2.5 km southwest of the mill (Fig. 1). The Pictou NAPS site routinely monitors NO, NO_2, NO_x, O_3, $PM_{2.5}$, TRS (not VOCs), and wind characteristics, whereas the Granton site monitors 36 VOC species. Multi-component VOC monitoring at NAPS sites are conducted using canister sampling and gas chromatography/mass spectrometry (GC/MS) (CCME 2011). Sampling of 24 h (midnight to midnight) cumulative ambient air samples ($\mu g/m^3$) are taken on a 1-in-6-day schedule by pumping ambient air into pressurized stainless steel SUMMA® canisters and analyzed by an EC accredited Laboratory (CCME 2011; Galarneau et al. 2016).

Statistical analyses

Variation of meteorological conditions and VOC concentrations were assessed by conducting a spatiotemporal analysis to characterize ambient air toxics emissions in PC from 2006 to 2013. Various analytical methods can be applied to concentration data to estimate source apportionments of air pollutants to provide additional insights into the source/receptor relationships to guide development of more effective air quality management strategies (Hopke 2016). However, given the limitations of having complete VOC data from only one NAPS monitoring station in the region, a full chemical mass balance analysis to identify and apportion sources of atmospheric contaminants were not conducted in this study.

Wind rose plots were generated with WRPlot View™ (©Lakes Environmental Software) to simulate seasonal and spatial variation of wind direction (°) frequency and wind speed (m/s) with the mill as the focal point. Although simplified, wind rose models have proven utility for estimating spatial gradients for fate and transport of pollutants from emission sources (Gibson et al. 2013). Summer, when local people spend more time outdoors (and more vulnerable to outdoor pollution exposure), was a focus of this study (Figs. 1 and 2).

This pilot study was conducted to determine whether ambient concentrations of VOCs exceeded their EPA-associated cancer and/or noncancer risk thresholds, to help identify potential human health concerns in PC. VOCs selected for analysis were based on EPA's list of 30 urban air toxics (EPA 2015b) and *National Air Toxics Trends Station Work Plan Template* (EPA 2015d). Health Canada and the province of Nova Scotia currently do not have specific guidelines for air toxics exposures. Therefore, EPA thresholds were considered a more acceptable standard for carcinogenic exposures in this study. Cancer risk threshold refers to the probability of contracting cancer if exposed to a substance every day over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity. Noncancer risk threshold is associated with effects other than cancer, based on reference concentrations via the "hazard quotient" ratio (HQ; exposure divided by appropriate chronic or acute value) (EPA 2015c). The HQ should not be interpreted as a probability of adverse effects. Noncancer risk thresholds are typically higher compared to cancer risk thresholds, as lower concentrations can elicit a carcinogenic response, whereas other diseases are not triggered until higher exposure thresholds are reached. US and Canadian method detection limits (MDL) are provided (Health Canada 2010; EPA 2015d) (Table 1).

The mill is located approximately 40° northeast of the Granton NAPS site. The selected PW range expected to result in increased VOC concentrations at the NAPS site (±40° either side of the mill [80° total]). A narrower range may be more accurate; however, due to the sample size of VOC samples, the selected range captured more data. All other wind directions (AOWD) represent ranges outside PW (i.e., >80°, <360°). AOWD represent sampling days when no time PW blew from the selected range (i.e., 0 h). VOC concentrations for AOWD were compared to when PW were present for at least 1 h.

Hourly meteorological data were compiled to correspond with ambient VOC sampling. Hourly wind direction within defined PW range (i.e., 360°–80°) was assigned a value of 1; AOWD were assigned a value of 0. Daily totals represented the proportion of time with PW (i.e., 1–24 h) compared to AOWD. Daily

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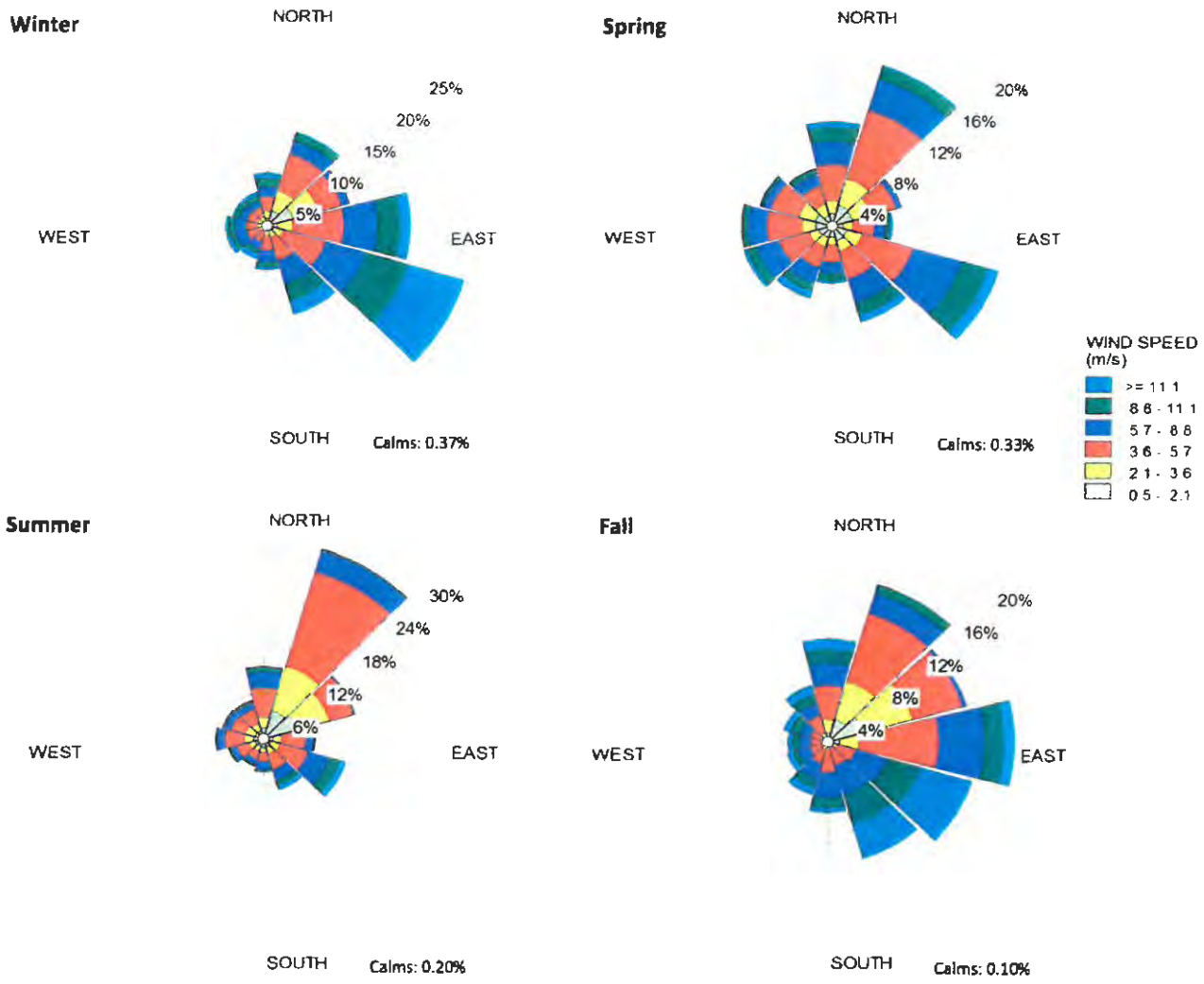

Fig. 2 Seasonal (2006–2013) wind rose simulations using WRPlot View™ (blowing to direction). Percentages represent frequency of wind direction

totals corresponding to VOC sampling were paired. Increasing proportions of PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) categorized VOC concentrations, which were predicted to correlate with higher VOC concentrations. To test the effect of wind direction and season on ambient VOC concentrations, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) were applied in ©R. Due to right-skewed distributions for all VOCs, except for carbon tetrachloride, statistical procedures were performed on both raw and log-transformation of VOC concentrations (Supplementary material Table S1).

Box plots and histograms were used to compare VOC concentrations with PW ≥ 1 h to AOWD on an annual and seasonal basis in relation to their respective cancer and noncancer risk thresholds. See Supplementary material for histograms, and additional box-and-whisker plots illustrating VOC concentrations with increasing time categories with PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) (Figs. S2 and S4). Box plots display the distribution of data based on a five-number summary: minimum, first quartile, median, third quartile, and maximum. The central rectangle ("box") spans the first to the third quartile (i.e., interquartile range [IQR]). The horizontal line segment within the box represents the median, and "whiskers" above and below the box represent the minimum and maximum. Radar plots consist of a sequence of angular spokes, whose length extending from the center along a separate axis is proportional to the magnitude of the variable relative to the magnitude of the variable across all data points. Lines connect the data values for each spoke. Radar plots were used to display seasonal variation of median VOC concentrations for PW ≥ 1 h and AOWD. One-tailed *t* tests, assuming unequal variance, were performed to determine whether seasonal variation associated with increasing proportions of time

Table 1 List of priority air toxics (i.e., VOCs), associated cancer/noncancer risk thresholds (μg/m^3), and method detection limits (MDL) (μg/m^3) (Health Canada 2010; EPA 2015d)

VOC	Cancer risk[a] (μg/m^3)	Noncancer risk at HQ = 0.1[b] (μg/m^3)	MDL[c] (NATS) (μg/m^3)	MDL (Health Canada) (μg/m^3)
Chloroform	–	9.8	0.50	0.089
1,3-Butadiene	0.0300	0.2	0.10	0.055
Vinyl chloride	0.1100	10.0	0.11	0.046
Benzene	0.1300	3.0	0.13	0.038
Carbon tetrachloride	0.1700	19.0	0.17	0.123
Trichloroethylene	0.2083	0.2	0.20	0.190
Tetrachloroethylene	3.8462	4.0	0.17	0.120

[a] Cancer risk threshold: the probability of contracting cancer over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity (EPA 2015c)

[b] Noncancer risk threshold: the risk associated with effects other than cancer, based on the reference concentration via a ratio known as the "hazard quotient" (HQ; the exposure divided by the appropriate chronic or acute value)

[c] MDL: the lowest concentration that can be detected with confidence. NATA and Health Canada's MDLs are listed for comparison (Health Canada 2010; EPA 2015d)

with PW (i.e., ≥1 h, ≥4 h, ≥8 h, ≥12 h) resulted in a significant increase ($p < 0.05$) in VOC concentrations compared to AOWD (see Supplementary material, Table S3).

Quality control

Standard procedures of the Meteorological Service of Canada have been developed in accordance with internationally recommended procedures established by the World Meteorological Organization (ECCC 2013a). As part of the quality assurance and quality control (QA/QC) program, observational meteorological data are subjected to a computer analysis or review to reveal possible errors. EC and the operating agency are jointly responsible for the NAPS network QA/QC program. Elements of the program include site selection, sampling system requirements, instrument calibration and reference standard requirements, and inter-laboratory testing and performance audits. With few exceptions, analyzers are accorded with EPA designation as either a reference or equivalent method for ambient air monitoring (ECCC 2004). ECCC's air quality laboratories use International Organization for Standardization requirements (i.e., ISO 9001:2008 or ISO/IEC 17025:2005) (ECCC 2013b).

Results and discussion

Meteorological observations

Wind rose simulations illustrate seasonal variability with respect to wind direction, with the mill as the focal point (Fig. 2). During summer, wind blew NNE (25.47%) and ENE (11.80%) directions (aggregate range 15°–75°) towards Pictou and Pictou Landing First Nation (PLFN) (Figs. 1 and 2). Wind blew less frequently towards S-NNW (aggregate range 165°–345°) towards the Graton NAPS site. During winter, wind typically prevailed from the north; the highest frequency (21.99%) blowing ESE, followed by E (15.37%) directions (aggregate range 75°–135°) (Fig. 1). Spring and fall have meteorological characteristics that are similar to summer and winter and were considered transitional periods. Pictou, PLFN, Chance Harbour, Trenton and New Glasgow are communities close to the mill that are downwind of annual PW (range 15°–165°). The Granton NAPS site correlates poorly with seasonal or annual wind directions (Fig. 2).

VOC concentrations

Carbon tetrachloride had the highest median concentration (0.5452 μg/m^3) and vinyl chloride had the lowest (0.0014 μg/m^3) (Fig. 3). Carbon tetrachloride concentrations exceeded its EPA cancer risk threshold (0.1700 μg/m^3) for all samples, with maximum and minimum concentrations of 0.7047 and 0.2892 μg/m^3, respectively. Benzene concentrations exceeded its cancer risk threshold (0.1300 μg/m^3) for most samples, with maximum and minimum concentrations of 1.889 and 0.0266 μg/m^3, respectively. Concentrations of 1,3-butadiene concentrations occasionally exceeded its cancer risk threshold (0.0300 μg/m^3), with maximum and minimum concentrations of 0.1062 and 0 μg/m^3, respectively (Fig. 3). Consequently, 1,3-butadiene, benzene, and carbon tetrachloride were air toxics of primary concern in terms of local

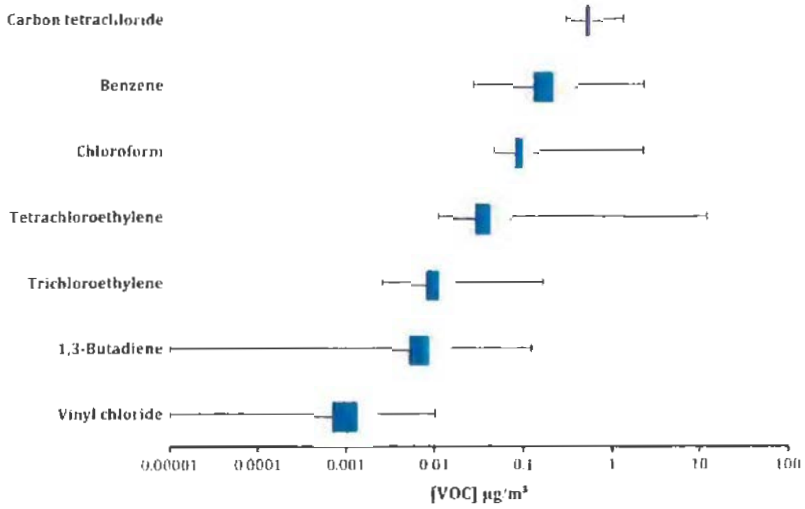

Fig. 3 Relative VOC concentrations (µg/m^3) (2006–2013). Should not be interpreted as orders of magnitude of toxicity. Minimum concentration for 1,3-butadiene and vinyl chloride is 0 µg/m^3 or undetectable

population risk. Other VOCs are presented in Supplementary material (Fig. S5).

ANOVA and MANOVA results revealed that 1,3-butadiene was significantly bigher with the presence of PW ≥ 1 h (p = 0.001and p = 0.01 for raw and log-transformed data, respectively). Tetrachloroethylene was also statistically bigher with the presence of PW ≥ 1 h (p < 0.01) for log-transformed data. Benzene approached significance with the presence of PW ≥ 1 h (p = 0.07) for log-transformed data. Although not statistically significant, median concentrations of other VOCs, except carbon tetrachloride, were equal or marginally higher with presence of PW ≥ 1 h compared to AOWD. Season had a consistent significant effect on VOC concentrations, except chloroform and tetrachloroethylene (Supplementary material Fig. S2 and Table S1).

Box plots combined with radar graphs illustrate seasonal variation of VOC concentrations of primary concern (i.e., 1,3-butadiene, benzene, carbon tetrachloride) under PW ≥ 1 h and AOWD conditions (Figs. 4, 5, and 6). Median VOC concentrations associated with PW ≥ 1 h and AOWD display parallel

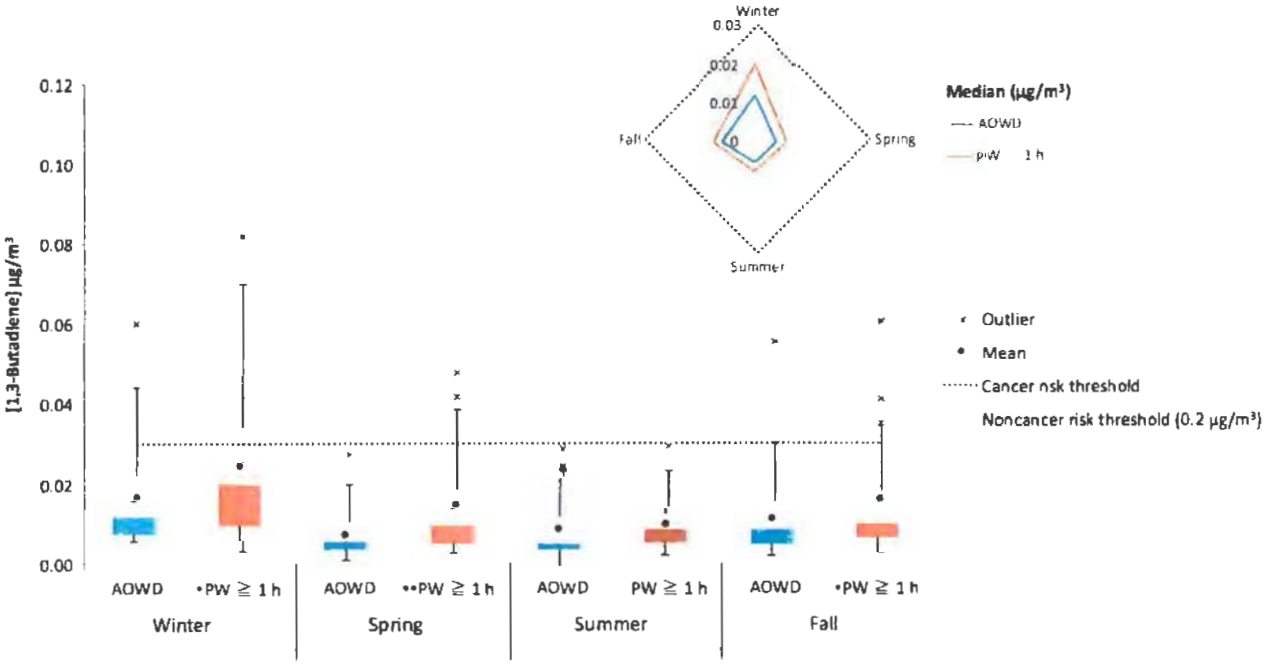

Fig. 4 Seasonal variation (2006–2013) of [1,3-butadiene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° – 80°), relative to associated cancer and noncancer risk thresholds. Minimum concentration is 0 µg/m^3 or undetectable. Significant differences indicated as *<0.05; **<0.01

seasonal trends. Concentrations of 1,3-butadiene (Fig. 4) and benzene (Fig. 5) exhibit seasonal variation. Both have evidently higher concentrations during winter, with summer having overall lowest concentrations. In addition to exceeding cancer risk thresholds, *t* test results revealed that 1,3-butadiene and benzene concentrations were significantly higher with the presence of PW ≥ 1 h compared to AOWD during at least two seasons, including spring and fall. Conversely, median carbon tetrachloride concentrations showed little variation (Fig. 6). Regardless of season or wind direction, all carbon tetrachloride samples exceeded its associated cancer risk.

This pilot study presents findings of a secondary analysis of 8 years of air toxic VOC exposure data associated with ambient air quality in a Canadian P&P town. Concentrations of three ambient outdoor air toxics routinely exceeded EPA air toxics-associated cancer risk thresholds and are consequently of primary health concern in relation to population health risk in PC: 1,3-butadiene, benzene, and carbon tetrachloride. Exceedance in cancer risk thresholds for these air toxics is consistent in the literature (e.g., Morello-Frosch et al. 2000). The extent to which threshold exceedances of 1,3-butadiene adversely affect human health is poorly understood, with little toxicity information available to compare with cancer risk estimates (Morello-Frosch et al. 2000). With respect to benzene exposure, most monitoring data are associated with occupational studies (ATSDR 2007a), where long-term exposure can cause leukemia (ATSDR 2007b). High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage (ATSDR 2005). Combinations of air toxics may have additive or synergistic adverse health effects (Morello-Frosch et al. 2000). Therefore, exposure to mixed VOCs might pose health risks to facility employees and neighboring residents (An et al. 2014; He et al. 2015).

Emission sources within the defined PW range, N to ENE of the Granton NAPS site, may be a causal factor for the increase in VOC concentrations, except carbon tetrachloride. The largest point source emitter within this range is likely the mill; however, the origin(s) of VOCs are inconclusive. According to the mill's most recent substance report submitted to NPRI in 2012, 143.18 t of VOCs were atmospherically emitted on-site (ECCC 2012). An estimated 3.195 t of benzene were released to the air from a stack higher than 50 m and 0.022 t were released within 50 m of the ground. Additionally, benzo(a)anthracene and of benzo(a)phenanthrene were emitted to the air (9.7 and 6.7 kg, respectively) and deposited on-site (0.753 and 0.142 kg, respectively) (ECCC 2012). Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not reported to have been released, they may become airborne through evaporation from P&P wastewater (Soskolne and Sieswerda 2010). Boat Harbour (the mill's effluent treatment facility) may therefore contribute to ambient concentrations of VOCs. Collectively, these emissions may have contributed to the ambient atmospheric levels of VOCs measured at the Granton NAPS site. While

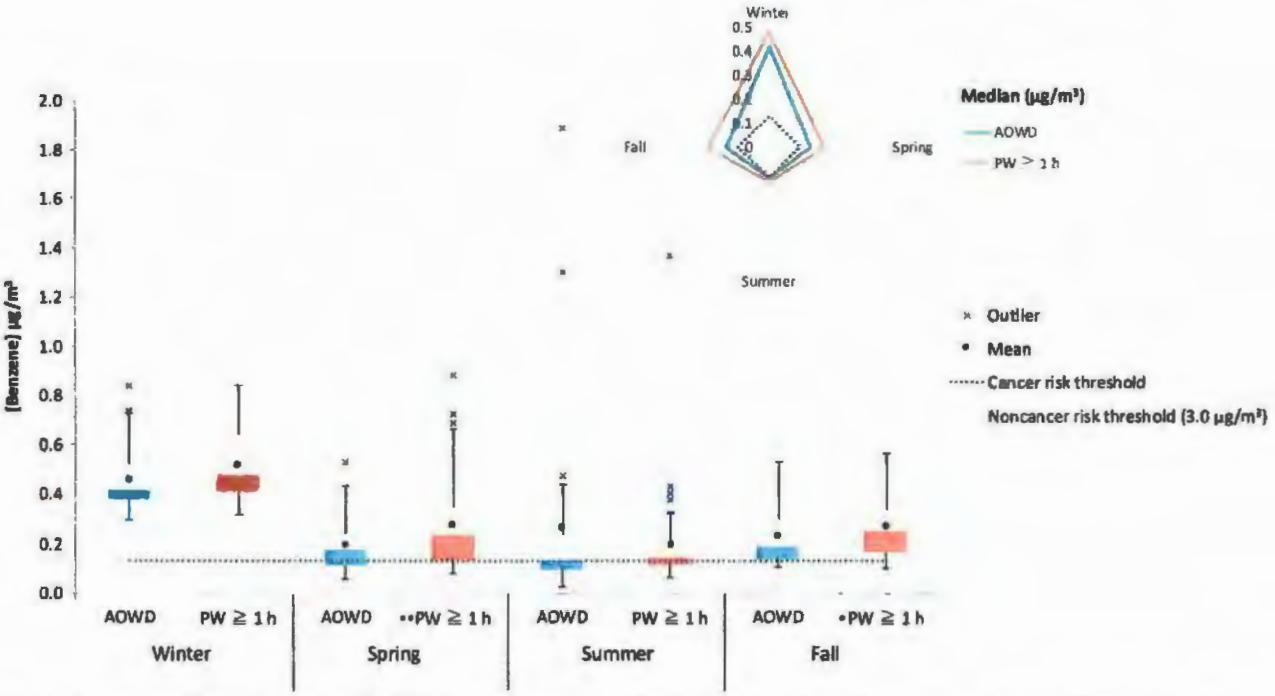

Fig. 5 Seasonal variation (2006–2013) of [benzene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° – 80°), relative to associated cancer and noncancer risk thresholds. Significant differences indicated as *<0.05; **<0.01

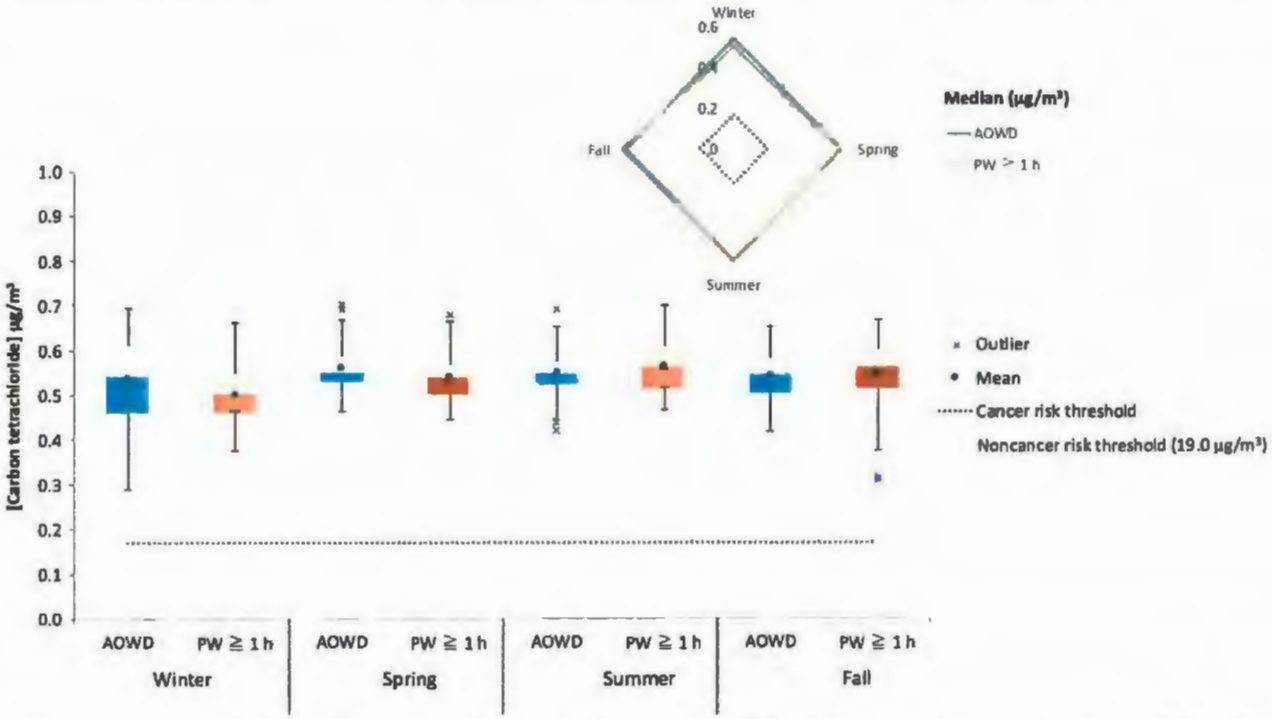

Fig. 6 Seasonal variation (2006–2013) of [carbon tetrachloride] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds

NPRI provides detailed information on pollutant releases, data are self-reported by facilities, with no audits to ensure accuracy. Consequently, data quality may be compromised.

The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane (EPA 1985). Although chloroform is a recognized by-product of the chlorination process in the P&P industry, it has been suggested that up to 90% of total emission sources may be natural in origin and is widely dispersed in marine environments (McCulloch 2003). As PC is located along the coast of the Northumberland Strait, marine environments may have contributed to the observed ambient chloroform concentrations (see Supplementary material).

Results implicate the mill as a source of air toxics (particularly 1,3-butatdiene and tetrachloroethylene); however, other local sources likely contribute to air toxics emissions. Area and mobile sources have been reported to largely contribute to concentrations of 1,3-butadiene (ATSDR 2014b) and benzene (ATSDR 2007a). Because the Granton NAPS site is located near a highway and access roads, vehicle emissions may have contributed to the observed concentrations of these compounds. A coal-fired thermal generating station and a tire manufacturing facility (located 7 km E and 1.5 km S from the Granton NAPS site, respectively) may be other local point source emitters of VOCs (e.g., 1,3-butadiene is used to make synthetic rubber [ATSDR 2014b]) (Fig. 1). According to the latest NPRI substance reports: the tire manufacturing facility released 220 t of atmospheric VOCs, whereas no VOC releases were reported by the thermal generating station (ECCC 2015b), despite that coal combustion is a significant contributor (Chagger et al. 1999). Direct links between 1,3-butdiene and vinyl chloride with P&P industries were not found in the literature.

Major monitored pollutants at the mill include NO_x, sulfur dioxide (SO_2), and total PM ([TPM] upper size limit of 100 µm diameter) (NP 2016a). A 2013 study concluded that $PM_{2.5}$ concentrations were highest (0.88 µg/m^3) downwind from the mill from using an AERMOD atmospheric dispersion model (Gibson et al. 2013), though this investigation used Halifax wind speed and direction meteorological data (130 km to the south). Hoffman et al. (2015) reported an analysis of 2013 data showing that when Pictou is downwind of the mill, average 1 h ambient $PM_{2.5}$ concentrations result in a twofold increase (12.96 µg/m^3), compared to all other wind directions (5.73 µg/m^3), suggesting the mill is likely the primary contributor of ambient $PM_{2.5}$ in the community. Additionally, TRS, TPM, $PM_{2.5}$, and coarse particulate matter ≤10 µm (PM_{10}) emission exceedances at the mill during 2012 were two to three

orders of magnitude higher than five similar Canadian kraft P&P mills; however, VOC emissions were comparable (Hoffman et al. 2015).

A comparable ambient air toxics monitoring study of a P&P community was conducted in the metropolitan Lewiston, Idaho area and the Nez Perce Reservation (STI 2009). Findings revealed that concentrations of formaldehyde and acetaldehyde were much higher than expected relative to Lewiston's size. Chloroform, tetrachloroethylene, and trichloroethylene were highest at monitoring sites nearest the mill, which presumably contributed at least 50% to pollutant concentrations (STI 2009). However, due to insufficient information on local concentrations of anthropogenic and biogenic VOCs, it was inconclusive whether the mill was a causal factor.

Recent (2009–2013) measurements of ambient CEPA-toxic or equivalent agents monitored at NAPS sites revealed that 11 air toxics, including benzene, chloroform, trichloroethylene, and tetrachloroethylene exceeded ambient air quality guidelines set by respective Canadian jurisdictions (Galarneau et al. 2016). An additional 16 air toxics approached guidelines. Although these guidelines are not necessarily enforceable, CEPA outlines provisions for toxic compounds and are thus subject to risk management actions. Air toxics' contribution to poor health on a regional and national scale has not been thoroughly investigated; therefore, calls into question the effectiveness of current toxic substance management in Canada.

Nova Scotia is known as the "tail pipe of North America," due to being within the trajectory of long-range transport of emissions from transboundary sources along the Eastern Seaboard, plus central and eastern Canada (NSE 2014). Background levels of air pollution that originate from resuspension and natural sources has been found to be major contributors to concentrations of carbon tetrachloride and benzene (Morello-Frosch et al. 2000). Background levels, in combination to carbon tetrachloride's capacity to persist in the atmosphere for a least a year, may explain why observed concentrations are consistently above its associated cancer risk threshold at the Granton NAPS site, regardless of wind direction.

Atmosphere circulation plays a complex role in dispersion, transformation, and removal of pollutants. The dispersion of pollutants from source emitters (e.g., smokestacks) is affected by crosswind mixing in both horizontal and vertical directions. Meteorological variables, including wind speed, wind direction, temperature, humidity, precipitation (process of removal), and atmospheric pressure are the main drivers of variation in pollutant concentrations and dispersion (Bates and Caton 2002). Furthermore, gravitational settling is important for pollutants with larger molecular weights (Oliver 2008); heavier particles settle or deposit closer to emission sources (Walker et al. 2003a, 2003b). Gravitational settling may also explain the high concentrations of carbon tetrachloride.

Topography and coastal conditions can affect wind characteristics (e.g., direction, speed) and the behavior of pollutant transport. A sea breeze that is trapped under descending warmer air from land can exaggerate conditions at coastal zones, a phenomenon known as coastal inversion (Bates and Caton 2002). In addition, turbulent winds along the coast may influence wind characteristics at the Caribou Point meteorological station, and the fate and transport of pollutants. Such coastal conditions, in combination with transboundary air pollution, may be occurrences that coastal areas experience in Nova Scotia, including PC.

Seasonal variability

Seasonal variability exists for both meteorological conditions and VOC concentrations. Variations in meteorological conditions, the nature and intensity of emissions from nearby sources, and photochemical activity are factors that could have led to the observed seasonal variability of outdoor VOC levels (Al-Khulaifi et al. 2014). Of the three VOCs considered particular concern in this study, 1,3-butdaiene and benzene exhibited the highest concentrations during winter. Photochemical reactions involved with ground-level O_3 formation are catalyzed by ultraviolet radiation and temperature. Therefore, peak ground-level O_3 levels typically occur during warm days with sufficient sunlight exposure; thus, people are more vulnerable to exposure during summer. The opposite is true during winter, when available light is diminished, and temperatures are colder (ATSDR 2014b).

Demographic behavior and technological improvements that aim to mitigate emissions (e.g., smokestack precipitator installation in 2015) also need to be considered when evaluating pollutant concentrations. For instance, households in the Atlantic provinces are heated primarily with oil, electricity, and wood or wood pellets (Statistics Canada 2011); therefore, as residential heating increases during winter, biogenic VOCs (e.g., benzene [ATSDR 2007a], 1,3-butadiene [ATSDR 2014b]) from wood burning may have contributed to higher concentrations of these compounds observed in this study. As the mill operates on a 24/7 schedule (ECCC 2012), atmospheric VOC emissions were assumed consistent throughout the year.

Implications

Location of ambient air quality monitoring stations has a direct impact on the observed concentrations of pollutants

(Craig et al. 2008). Based on the time series and spatial analyses, wind direction appears to play a key role in the Granton NAPS site's ability to monitor ambient VOCs from the mill. PW ≥ 1 h from the selected range (360°–80°) typically resulted in equal or higher VOC concentrations for all compounds, except carbon tetrachloride, compared to AOWD (Figs. 4, 5, and 6; Supplementary material), suggesting that the mill is likely a causal factor. Furthermore, as there is a higher frequency of northerly winds blowing towards the south during winter (Fig. 2), the Granton NAPS site is more likely to capture ambient pollutants from the mill's atmospheric emissions. Southwest PW blowing towards Pictou dominate during the summer months when people are more vulnerable to ambient air pollution exposure. Due to Pictou's geography, air toxics from the Eastern Seaboard in combination with local emission sources, including the mill, converge there; hence, higher concentrations of VOCs are expected in Pictou during summer. Subsequently, southwest PW are expected to result in lower VOC concentrations at the Granton NAPS site, as capturing the mill's atmospheric emissions would not be optimized. Therefore, VOC concentrations at the Granton NAPS site during winter would likely be representative of ambient VOC concentrations in Pictou during summer. Moreover, Pictou's considerably larger population base compared to the rural area of Granton further confirms that the NAPS site is not strategically positioned to accurately represent ambient levels of air toxics where there is higher residential exposure.

Study limitations

This study only evaluated exposure to ambient VOC air pollutants. Human exposure to air pollution is a combination of both outdoor and indoor environments and varies according to daily activity patterns and the conditions of specific settings. Secondary data analysis was used in this study; therefore, the ecological nature of these findings limit the explicit attribution of ambient air toxic exposures to the risk potential for cancer for community residents. Personal exposure monitoring, more detailed spatial analysis of ambient conditions, and source apportionment studies would be required to establish more explicitly the health risk associated with these exposures. The analysis was limited by the inability to examine the interaction of local meteorological conditions. Meteorological data were retrieved from Caribou Point, located approximately 10 km from the mill; consequently, coastal conditions may cause differences in meteorological measurements between sites.

Future research and monitoring

A *field component* consisting of real-time measurements of ambient air toxics would improve the rigor and validly of the present study. Although labor intensive, air toxics samples can be analyzed with a high degree of accuracy (Craig et al. 2008). Because monitoring stations are typically fixed, government-approved *atmospheric dispersion modeling* that considers landscape dynamics and seasonal meteorological variability (e.g., ©CALPUFF, ©AERMOD) would more accurately estimate spatial patterns of air toxics dispersion, and human exposure at the population or individual level (EPA 2013). This would require numerous stations within the community so would likely only be feasible for a specific research investigation. Further, installation of a new precipitator in 2015 has likely changed in ambient conditions. A follow-up assessment would provide a comparison to these findings to determine if VOC levels have improved. Additional research includes applying a *Conditional Probability Function* to calculate the probability that an air pollution source is located within a particular wind direction sector to help determine direction of a source from a NAPS discrete receptor site, and conducting an analysis of the effect of mixing height on measured VOC concentrations to further investigate seasonal patterns.

Investigation of health outcomes might involve longitudinal epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate consideration for latency of health outcomes, while controlling for indoor and occupational sources and other contextual factors. Several recent Canadian nationwide cohort studies that may provide a foundation for such investigations have been described (e.g., Crouse et al. 2012).

A *comprehensive risk assessment* investigates uncertainties that have implications for risk estimates in the present study, including those surrounding toxicity information (Morello-Frosch et al. 2000). More research is required to determine what cancer and noncancer risks are from ambient air toxics exposure. Further, it is important to consider synergistic effects of a full suite of ambient pollutants, and physical and chemical processes involved in fate and transport of these compounds. Comprehensive emission inventories are necessary to thoroughly address (i.e., characterize, model, and manage) air quality issues (CEC 2009). Collectively, these research efforts aim to better inform air quality management, composed of federal (e.g., ECCC, Health Canada) and provincial (e.g., NSE, Nova Scotia Department of Health and Wellness) government and public health agencies, how best to proceed to ensure the health of residents in industrial communities is prioritized. Implications of the current findings warrant further investigation.

Given the contribution emissions from local sources have to regional, national, and global airsheds, local mitigation initiatives should be an integral part of air quality strategies. There is no common approach to assess health effects of a mixture of pollutants, as they tend to be site specific; hence, an assortment of effective measures may be required. Case studies that provide evidence of effective of air quality

management interventions and guidance documents for risk managers may help inform air quality management for stakeholders (Craig et al. 2008).

To address potential adverse health effects associated with degraded air quality, Health Canada, the Public Health Agency of Canada (PHAC) and provincial partners might work collaboratively with local stakeholders to mitigate health risks and improve efficient industrial technology, while balancing economic, political, and social factors in development and implementation of air quality management. Mitigating industrial emissions has beneficial outcomes for wellbeing (Clougherty 2010); environmental stewardship and governance fosters a more proactive and cleaner environment, while building trusting relationships between industrial stakeholders (Pascal et al. 2013). "A comprehensive enforcement program with mandatory reporting of emissions, [...] and meaningful penalties for noncompliance ensures that emission standards are being met" (Craig et al. 2008), and facility operators are held accountable. Data collected internally by the mill is not readily available. To improve transparency, siting rationale for air quality monitoring stations and accompanying data should be provided as part of a commitment to corporate responsibility of the mill (Hoffman et al. 2015).

To improve air quality conditions, stakeholders could increase the capacity for surveillance, assessment, and response to air quality. Furthermore, evaluation of a wide-suite of air toxics, including NATA compounds not measured by the NAPS network (particularly prioritized air toxics) would contribute to ensuring that air quality in Canada is adequately studied. Therefore, ECCC and NSE should consider implementation of a long-term monitoring program for priority air toxics that is comparable to the NATA network monitored by EPA to characterize air toxics exposure on local, regional, and national scales. Data will be useful to help mitigate emissions and achieve acceptable air quality standards that do not exceed cancer or noncancer risk thresholds.

ECCC should also consider the feasibility of installing and maintaining additional strategically placed NAPS sites to improve air pollution evaluation in both rural and urban areas, as well as in microenvironments (e.g., near point source emitters, high-traffic areas) (Craig et al. 2008). More effective communication of the results is required to increase transparency among stakeholders, including the public (Hoffman et al. 2015). Based on the population's risk of exposure, it is strongly recommended that ambient air toxics monitoring to be incorporated at the established NAPS station in Pictou to optimize capturing of said air toxics, and to best correlate pertinent results. Additionally, atmospheric dispersion modeling should use local meteorological data; therefore, meteorological data should also be collected concurrently at NAPS sites to help identify source emitters.

Measurement of individual VOC compounds is necessary to provide insight into their contribution to $PM_{2.5}$ and ground-level O_3 formation. Data would be useful to help target large source emitters and aid regulatory enforcement. Establishment of stringent and/or adapted air quality standards that encompass more air toxics (e.g., VOCs) fosters strong public support and political engagement to address air quality issues. Moreover, health impacts associated with background air pollution should be estimated. Air quality management programs are human resource intensive; therefore, they must have clear and feasible short- and long-term objectives. These initiatives gain predictive insights on atmospheric chemistry, and engage and support relevant sectors in the development and implementation of policies to reduce health risks associated with air pollution exposure (Craig et al. 2008).

Conclusions

Findings reveal that 1,3-butadiene, benzene, and carbon tetrachloride exceeded their respective cancer risk thresholds and are of primary health concern in terms of population risk. Results highlight associations with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to location of the pulp mill. Compared to AOWD, PW from the selected range (360°–80°) typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations. In addition, there are clear seasonal variations of meteorological conditions and VOC concentrations. Southwest PW blowing towards Pictou dominate during summer months, when people spend more time outdoors, and consequently are exposed to higher concentrations. Due to Pictou's geography, air toxics from transboundary and local sources may converge in summer, resulting in higher VOC concentrations. Findings suggest the Granton NAPS site is not positioned to accurately represent ambient levels of toxicity in PC. Therefore, ECCC and NSE should consider incorporating ambient air toxics (e.g., VOCs) monitoring at the established Pictou NAPS site where there is higher residential exposure.

Future research will provide air quality management with a comprehensive characterization of air toxics to support informed public health decisions. Moreover, this pilot study may serve as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of citizens is safeguarded and prioritized.

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Appendix F

Correspondence on the Matter of the Effluent Treatment Facility Proposal(s).

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December 20, 2017

The Honourable Iain Rankin
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Via Email: minister.environment@novascotia.ca

Dear Minister Rankin;

I am writing on behalf of the Town of Pictou to inform you of a motion passed by Council at its Regular meeting on December 18, 2017.

The motion was passed following presentations made to Council by the **Northumberland Fisherman's Association** and **Friends of the Northumberland** expressing their concerns regarding the plan for effluent treatment at the Northern Pulp, Paper Excellence Facility located at Abercrombie Point in Nova Scotia. More specifically, both groups are against the dispersion of the effluent via pipe, into the Northumberland Strait.

We believe that the motion as passed speaks to the expectations of Pictou Town Council that all aspects of the effluent treatment plan are thoroughly examined by both provincial and federal departments prior to making a decision regarding its construction.

Motion: **It is moved that a letter be written to the Nova Scotia Environment Minister, and the Federal Ministers of the Environment and Climate Change and Fisheries and Oceans, requesting a review of the environmental assessment process being employed to assess the Northern Pulp proposal for effluent treatment. This request supports the completion of an Environmental Assessment Report and the possibility of a Class 2 environmental assessment to insure that the best possible solution for effluent treatment, disposal and monitoring is used and the fishing industry on the Northumberland Strait is not placed at risk.**

town of PICTOU
Birthplace of New Scotland

Thank you for your attention to this important issue.

Sincerely,

James J. Ryan
Mayor

Cc: Hon. Dominic LeBlanc, Federal Minister of Fisheries and Oceans
Hon. Catherine McKenna, Federal Minister of the Environment and Climate Change
Karla MacFarlane, MLA, Pictou West
Pat Dunn, MLA, Pictou Centre
Tim Houston, MLA, Pictou East

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December 20, 2017

COPY

The Honourable Catherine McKenna, P.C., M.P.
Minister of Environment and Climate Change Canada
200 Sacré-Coeur Boulevard
Gatineau QC K1A 0H3

Via Email: min.ste-minister.ec@canada.ca

Dear Minister McKenna:

I am writing on behalf of the Town of Pictou to inform you of a motion passed by Council at its Regular meeting on December 18, 2017.

The motion was passed following presentations made to Council by the **Northumberland Fisherman's Association** and **Friends of the Northumberland** expressing their concerns regarding the plan for effluent treatment at the Northern Pulp, Paper Excellence Facility located at Abercrombie Point in Nova Scotia. More specifically, both groups are against the dispersion of the effluent via pipe, into the Northumberland Strait.

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Thank you for your attention to this important issue.

Yours sincerely,

James J. Ryan

cc *Hon. Dominic LeBlanc, Federal Minister of Fisheries and Oceans*
Hon. Iain Rankin, NS Minister of the Environment
Karla MacFarlane, MLA, Pictou West
Pat Dunn, MLA, Pictou Centre
Tim Houston, MLA, Pictou East

Canadian Environmental Assessment Agency
Agence canadienne d'évaluation environnementale

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March 27, 2018

COPY

James J. Ryan
40 Water Street
PO Box 640
Pictou, NS
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Jim.ryan@townofpictou.ca

Dear Mr. Ryan,

Thank you for your email dated December 18, 2017, expressing concern regarding the Northern Pulp Effluent Treatment Facility Replacement Project proposed by Northern Pulp Nova Scotia Corporation.

The Canadian Environmental Assessment Agency recently received a request for the Minister of Environment and Climate Change Canada to designate the Project for a federal environmental assessment under section 14 of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The Agency is currently assessing the applicability of CEAA 2012 to this Project and is seeking input from other government departments and Indigenous groups on whether the Project should be designated under CEAA 2012. The Agency will reflect the input received in its advice to the Minister.

Further questions regarding the Project and this analysis can be directed to Ms. Melanie Smith, Team Leader, at (902) 426-6623 or by email at Melanie.Smith@ceaa-acee.gc.ca.

Yours Sincerely,

M. J. Atkinson

Mike Atkinson
Regional Director
Atlantic Region

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October 24, 2018.

Mr. Bruce Chapman
General Manager
Northern Pulp Nova Scotia Corporation
260 Granton Abercrombie Branch Road
Abercrombie, NS B2H 5C6

Mr. Chapman:

I have become aware, through media reports, that the draft of a revised proposal by Northern Pulp for the disposal of treated effluent involves the installation of a pipe along TCH 106 to the Caribou Harbour. I am very disappointed that the Town was not consulted, or at least, informed of this potential proposal prior to its release to the media.

Assuming the media reports to be factual, the proposed route for the pipe will not only pass through the Town of Pictou, but will pass directly over the Caribou wellfield which is a major source of domestic drinking water for residents of the Town of Pictou and many residents of Central Caribou.

In light of recent events, I believe the proposed pipeline route will, and should, cause a great deal of concern for all residents of the Town and surrounding area.

As the owners of the Water Utility, the Town of Pictou holds water withdrawal approvals issued by the Nova Scotia Department of Environment for both the Caribou and Pictou wellfields along with the approval to operate a water treatment and distribution system.

In 2002, NSE introduced its Drinking Water Strategy to ensure safe, clean drinking water to its customers. As part of this strategy and the approval process, the town has fulfilled its responsibility to:

1) Form a Source Water Protection Advisory Committee
2) Delineate a Source Water Protection Area Boundary
3) Identify Potential Contaminants and Assess Risk
4) Develop a Source Water Protection Management Plan; and
5) Develop a Monitoring Program to Evaluate the Effectiveness of a Plan.

town of PICTOU
Birthplace of New Scotland

The Caribou/Pictou Source Water Protection Advisory Committee includes representation from both the Town of Pictou and the Municipality of Pictou County. It takes the responsibility to protect our source water for current and future generations very seriously and will continue to do so.

In conclusion, I am requesting that any future consideration of proposals that could have implications for the Town and its residents be communicated directly as part of your due diligence.

Sincerely,

James Ryan

c.c. *Hon. Margaret Miller, NS Minister of Environment*
Karla MacFarlane, MLA, Pictou West
Robert Parker, Warden, Municipality of Pictou County

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

October 26, 2018

His Worship James Ryan
Town of Pictou
40 Water Street
Pictou, NB B0K 1H0

Dear Mayor Ryan:

Thank you for your letter of October 24th and for the opportunity to speak with you that same day regarding the additional proposed route for an effluent pipeline.

Northern Pulp's effluent treatment facility (ETF) replacement project is a major undertaking. With work being carried out simultaneously on many files, timely communication with all stakeholders can be challenging. Unfortunately, due to unexpected circumstances, the past few days did not unfold as planned. Once again, please accept my apologies for not contacting you earlier.

Work on the Environmental Assessment (EA) submission documents for the ETF replacement project is still in progress. An important part of finalizing those documents is a feasibility study of the additional proposed pipeline route. Please understand that discovery on this additional proposed route is in its very early stages – there is much work yet to be done.

Northern Pulp acknowledges the Town of Pictou's responsibilities and interests in this matter. As part of our due diligence we will continue to engage and consult with all stakeholders, and look forward to those discussions, as we prepare to register for an EA.

I would welcome your call at any time throughout this process.

Sincerely,

Bruce Chapman
General Manager

Copy to: The Honourable Margaret Miller, Nova Scotia Minister of Environment
Karla MacFarlane, MLA, Pictou West
Robert Parker, Warden, Municipality of Pictou County

Northern Pulp Nova Scotia Corporation, a Paper Excellence Company
P.O. Box 549, Station Main, New Glasgow, NS B2H 5E8
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town of PICTOU
Birthplace of New Scotland

Office of the Mayor
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T 902.485.4372
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jim.ryan@townofpictou.ca

www.townofpictou.ca

November 2, 2018.

Mr. Bruce Chapman
General Manager
Northern Pulp Nova Scotia Corporation
260 Granton Abercrombie Branch Road
Abercrombie, NS B2H 5C6

Via Email: Bruce.Chapman@northernpulp.com

Mr. Chapman;

Thank you for your prompt response to my letter of October 24th.

I appreciate that you are in the 'very early stages' of a feasibility study of proposed route(s) for an effluent pipe as part of the effluent treatment process.

Following consultation with Town Councillors, I believe it is a good time to inform you that any plans to install the pipe across the Town of Pictou watershed would be unacceptable.

As a stakeholder in the recently proposed plan, we look forward to future communications.

Sincerely,

James Ryan

c.c. *Hon. Margaret Miller, NS Minister of Environment*
Karla MacFarlane, MLA, Pictou West
Robert Parker, Warden, Municipality of Pictou County

town of PICTOU
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Ms. Melanie Smith, Team Leader
Canadian Environmental Assessment Agency
1801 Hollis St., Suite 200
Halifax, NS B3J 3N4

February 24, 2019.

Re: Northern Pulp Effluent Treatment Facility
Environmental Assessment

In November 2017, the Town of Pictou passed a resolution calling for letters to be written to the Nova Scotia Minister of Environment, the Federal Minister of Environment and Climate Change and the Minister of Fisheries and Oceans supporting 'the completion of an Environmental Assessment Report and the possibility of a Class 2 Environmental Assessment' and that the 'fishing industry on the Northumberland Strait is not placed at risk'. It is my understanding, from the correspondence I received from Mr. Mike Atkinson dated March 27, 2018, that the information (letter) to the Hon. Catherine McKenna was forwarded to CEAA for consideration. This is greatly appreciated.

Since that letter was written in 2017, a great deal has transpired with respect to the proposed Northern Pulp Treatment Facility including a modified plan for effluent disposal and consideration of a possible review of the project by CEAA.

At this time, I feel it to be prudent, as Mayor of the Town of Pictou, to elaborate on our original position and comment on additional concerns regarding the modified plan.

We, the Town, remain firm in our position that Federal oversight of this project would provide the most comprehensive assessment of 'risk' to the Northumberland Strait fishery. Due to the financial and regulatory relationship between the mill and the Province, and the potential effects of the project on a lucrative and sensitive marine environment shared by multiple provinces, trust can only be restored with a full Environmental Assessment.

In addition to our originally stated concerns, the modified proposed route for the pipe carrying treated effluent will pass directly over the Caribou/Pictou Watershed. As you can imagine, in light of recent breaks in the current system feeding the Boat Harbour Effluent Treatment Facility (ETF), this causes concern for residents of our Town. Recognizing that water is a Provincially regulated resource the contents of the treated effluent and the security of the transmission system must be adequately addressed within the scientific studies to ensure safety of our water supply.

The Town also has concerns about any potential for increased odour produced by the re-location of the AST (Activated Sludge Treatment) process and risks associated with the emissions from the power boiler when the sludge is burned. We do not have in-house expertise to adequately assess potential effects and how they might affect air quality (safety), but believe the EA Proposal submitted by Northern Pulp may not fully address these concerns.

Thank you for your consideration of this matter.

Sincerely,

James Ryan, Mayor

c.c. *Hon. Catherine Miller, Min. of Environment, Province of Nova Scotia*
Dan Troke, CAO, Town of Pictou

Attachments: *Letter to Hon. Catherine McKenna -December 20, 2017*
Letter from Mike Atkinson, CEAA March 27, 2018

NOVA SCOTIA

Communities, Culture & Heritage

1741 Brunswick Street
3rd Floor
P.O. Box 456
Halifax, NS
B3J 2R5

Tel: (902) 424-6475
Fax: (902) 424-0560

TO: Helen Yeh

FROM: Sean Weseloh McKeane DATE: March 8, 2019

RE: **Environmental Registration**
EA 19-02-07 Northern Pulp Effluent Treatment Facility

Staff of the Department of Communities, Culture and Heritage has reviewed the EA document for the Northern Pulp Effluent Treatment Facility and have provided the following comments:

Archaeology

Staff reviewed the Registration Document and the sections particular to archaeology. There is considerable archaeological content. The sections that cover both marine and terrestrial archaeology (8.16 and 8.17), clearly indicate that work has been completed, but there is more work to be done including a marine Archaeological Resource Impact Assessment and monitoring during construction, possible shovel testing, and contingency planning; see section 8.16.3.2 for all recommendations for marine archaeology mitigation and section 8.17.3.2 for all recommendations for terrestrial archaeology mitigation. The ARIA by CRM Group Ltd. for terrestrial resources is noted, as well as the list of recommendations.

CCH has no additional comments at this time. However, this project will be followed to ensure future archaeological work and planning as noted in the EA document is conducted.

Botany

Staff reviewed the Registration Document and the sections particular to botany. The data and analysis completed to date are mostly reasonable. As noted in the document some key surveys for terrestrial plants and marine biota have not been completed.

Table E.1.1-1 lists all project-related residual environmental effects as NS, no significant residual environmental effects predicted. However, some key surveys for terrestrial plants and marine biota have not been completed. It is recommended that this table be revised once these surveys have been completed and the proponent can assess the residual environmental effects on the terrestrial plants and marine biota that are present in the study area.

Table 3.1-1 the federal Species at Risk Act should be included in this table. Until the additional botanical surveys are completed it is unknown if a species protected under SARA is present in the study area.

Section 8.7.2.4 notes that "The overstory (trees) within the wetland was dominated by white pine (*Picea glauca*) and American mountain-ash (*Sorbus americana*); as well, the overstory also consisted of red maple (*Acer rubrum*). The shrub layer was dominated by broadleaf cattail (*Typha latfolia*) and also contained field horsetail (*Equisetum arvense*), woolgrass (*Scirpus cyperinus*), cinnamon fern (*Osmunda cinnamomea*), sweet pea (*Lathyrus* sp.), Valerian (*Valeriana officinalis*), and common marsh bedstraw (*Galium palustre*)." Please note there are several errors of the Latin species names. The Latin name for eastern white pine is *Pinus strobus*. *Picea glauca* is the Latin name for white spruce. The currently accepted Latin name for cinnamon fern is *Osmundastrum cinnamomeum* (L.) C. Presl. It is unlikely that the canopy found in a natural swamp is white pine or white spruce. It is recommended that this be clarified through subsequent plant surveys. It is recommended that the proponent refer to and cite the Canadian Wetland Classification system in these descriptions (National Wetlands Working Group 1997).

Section 8.8.2.2 states that Jelly lichen (*Collex tenax*) "are typically calciphiles however salt from the ocean would increase the pH of coastal soils allowing them to thrive." Increases in pH due to excessive sodium are not the same as a calcium-rich habitat for plants. The reference that supports this statement should be cited.

The plant species list in Appendix P should include the subspecific designations where possible. E.g., *Phragmites australis*: one subspecies is an exotic invasive, while the other is not. Exotic & invasive species should be controlled, where possible, to prevent spread into surrounding habitats.

Palaeontology

Staff have reviewed the Registration Document, and sections particular to geology and paleontology resources and do not see any omissions or errors in the characterization of the risk to paleontology heritage resources within the project zone. The document notes that no disruption of bedrock geology is planned, so there appears to be little or no risk of damage to potential fossil sites in the area.

Zoology

Staff have reviewed the Registration Document, and sections particular to zoology. The VEC approach has been used for this review. This project has a potential wider ecological impact and perhaps should have used a different approach, since potential mitigation for rare species may not necessarily be consistent with the maintenance of ecological integrity (depending on the basis for designation of the species at risk).

Within the broader context of the project, it should be noted that there are relatively recent reports in the public media concerning the occurrences and changes of abundances of some "priority" fish and mammal species (Blue Whales, Striped Bass). It is recognized that the registration document reflects the state of knowledge at a given time and may not capture more-current events. It is expected that the review by the pertinent Regulatory agency (Fisheries and Oceans Canada) will capture those comments (especially the SARA-listed species).

NOVA SCOTIA

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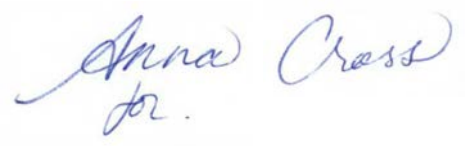
Sincerely,



Sean Weseloh McKeane
Coordinator, Special Places

Environmental Assessment Review-

March 8, 2019

NSE Engineers and ICE Review

PLANNING /DESIGN ISSUES

EFFLUENT FLOWS

1. FLOW DATA TO SUPPORT DESIGN FLOWS MUST BE PROVIDED.
    - The proposed treatment facility and accompanying receiving water study are based on an annual average flow rate of 62,000 m^3/day and a maximum daily flow rate of 85,000 m^3/day. No data has been provided to support the basis of the design. Appendix C of the Registration Document states the average flow is 70,000 to 75,000 m^3/day, not 62,000 m^3/day.
    - The EA submission does not provide an explanation of how flows will be reduced to achieve an annual average flow rate of 62,000 m^3/day (a reduction of 8,000 to 13,000 m^3/day by the data provided in the EARD). NPNS is required under their current IA (Conditions 5f) to submit a plan, including modelling, 1 year prior to proposed implementation of projects. To date, NPNS has not submitted any planned water/wastewater reductions.
    - Unclear if design flows presented were based on Point A or Point C flows. Flow measurements from Point C of the BHTF may not be representative of the actual peak flows which will be experienced by the new ETF. The BHTF has the ability to buffer flows due to it's sheer size (days retention), the new ETF will not have the capacity to do so (hours retention). Water usage data for 2017 from Internal Services indicates the Facility used more than 85,000 m^3 23.85% of the year, (83 days of the 348 operational days) and the data submitted monthly by NP indicates more than 85,000 m^3 27.9% of the year (97 days). The table below represents the number of days each month that 85,000 m^3 was exceeded in 2017 and the maximum volume withdrawn on a single day during each month:

MONTH	# DAYS >85,000 m3	MAXIMUM 1 DAY WATER USE
January	1	94,029 m^3
February	1	92,023 m^3
March	3	90,275 m^3
April	3	99,306 m^3
May	1	86,951 m^3
June	9	91,054 m^3
July	21	94,495 m^3
August	17	120,731 m^3
September	16	109,716 m^3
October	4	99,185 m^3

November	3	96,350 m^3
December	4	97,031 m^3

Please note any influent volumes to the new ETF or discharge from the proposed outfall pipe in excess of 85,000 m^3/day would invalidate the ETF design and the receiving water study results.

INFLUENT/EFFLUENT PARAMETERS

2. COMPLETE CHARACTERIZATION OF INFLUENT (AT POINT A) HAS NOT BEEN PROVIDED TO ASSESS THE APPROPRIATENESS OF THE PROPOSED TREATMENT TECHNOLOGY.
3. RATIONALE FOR THE INCREASE IN NUTRIENT LOADING MUST BE PROVIDED.

   The receiving water study undertaken for the Pictou Road discharge location proposed a daily maximum total nitrogen concentration of 3.0 mg/L. The revised receiving water study included in the EARD indicates a daily maximum of 6.0 mg/L. No explanation has been provided with respect to increase in total nitrogen.

4. DATA TO SUPPORT COD REDUCTIONS (TOTAL AND SOLUABLE) AS WELL AS FRACTIONIZATION OF COD IN NPNS INFLUENT IS REQUIRED TO DETERMINE IF THE PROPOSED TREATMENT TECHNOLOGY IS APPROPRIATE.
   - Under the current IA (Condition 6(e)), NPNS must achieve a 50% reduction from the benchmark total COD concentration of 1900 mg/L on the influent to the ETF by January 31, 2020. This means the influent total COD to the new ETF must not exceed 950 mg/L.
   - The receiving water study proposes a COD effluent limit from the ETF of 725 mg/L.
   - The EARD Section 5.2.2.6 indicates the ANOXKALDNES BAS™ system will reduce soluble COD by approximately 70% and the MBBR should be capable of removing approximately 40% of the easily biodegradable soluble COD. There is no data provided to support these assertions.
   - The EARD does not provide data on current influent COD fractionization (i.e. what portion of NPNS' influent at Point A is readily biodegradable, slowly biodegradable, soluble non-biodegradable and particulate non-biodegradable) in order to understand the treatment efficiency of the proposed ETF with respect to total COD. In the absence of this information, an assessment of the new ETF's ability to achieve compliance can not be completed.

ETF TECHNOLOGY

5. TREATMENT TECHNOLOGY SPCEIFICATIONS WERE NOT PROVIDED TO ASSESS THE EFFICACY OF THE TECHNOLOGY
6. MITIGATION OF MEDIA LOSS.
   - Table 4.2-1 indicates MBBRs are sensitive to risk of loss of media and the technology has a limited degree of process automation. The EARD does not address how these highlighted drawbacks will be mitigated by NPNS. Please note, under-design of the system in terms of flows could increase the risk of media loss.
7. OPTIMUM TEMPERATURE OPERATING RANGES FOR THE ETF HAVE NOT BEEN PROVIDED.

- The temperatures indicated are above the range of optimum treatability, generally accepted to be between 25 to 35. °C The highest temperatures and highest flows will occur simultaneously during the summer months. What effect will these facts have on the ability of ETF to consistently meet and not exceed effluent limits?

SPILL BASIN

8. INSUFFICIENT INFORMATION TO ASSESS THE SIZING AND APPROPRIATENESS OF THE DESIGN OF THE SPILL BASIN.
    - The EARD indicates a retention time of 10-13 hours at a design capacity of 35,000 m^3. The basis of this design has not been provided therefore there is insufficient information to assess the appropriateness of the design.
    - If flows exceed 85,000m3 per day on a consistent basis (77 out of 92 days for 3 consecutive months in the summer where daily water use is >85,000 m3), there will not be sufficient recovery time in ETF to empty the basin before it is required.
    - There is only a mention of a "the standard operating procedure will be to keep the spill basin nearly empty so the full volume is available when needed" the document does not discuss how this will be accomplished.
    - Is there an overflow? If so, where will the overflow be directed?

RECEIVING WATER STUDY

9. BASELINE DATA USED FOR THE UPDATED RECEIVING WATER STUDY DOES NOT REFLECT THE NEW LOCATION. BASELINE WATER QUALITY STUDIES ALONG WITH ADJUSTMENT TO THE MODEL ARE REQUIRED.
10. IT IS NOT CLEAR THAT THE SALINITY AND TEMPERATURE DIFFERENTIAL OF THE EFFLUENT HAS BEEN ACCOUNTED FOR IN THE MODELING.
    - Regardless of allowable dimensions for mixing zones indicated by CCME, effluent plumes shall not create changes to aesthetics or use at the water's surface. The study indicates color will reach background and not be visible at surface. When buoyancy differences are greater in winter, it results in a faster rising plume. Has this been accounted for?
11. 2 PORT DIFFUSER MODELING WAS NOT PROVIDED.
    - A 1-port and 3-port diffuser were modeled. The modeling indicates the plume will touch the seabed at 200 m and 10 m respectively. This is a large difference. Was a 2-port diffuser modeled? If so, at what distance does the plume interact with the seabed and what are the dilution factors?
12. DATA FROM LAB TRIALS ON NPNS RAW WASTEWATER AT SIMILAR FACILITIES NOR MODELLING OF NPNS RAW WASTEWATER PARAMETERS WERE NOT PROVIDED TO ASSESS THE EFFICACY OF THE PROPOSED TECHNOLOGY.

PIPELINE

13. DETAILS OF TRENCH LINING AS SECONDARY CONTAINMENT WERE NOT PROVIDED.
    - Trench lining as secondary containment could divert shallow groundwater and change flow regimes. This would be of greater concern within the Town of Pictou Watershed.

14. DETAILS OF LEAK DETECTION WERE NOT PROVIDED IN THE EARD.

- Insufficient information was provided in the EARDregarding the proponent's plan for monitoring and mitigating potential leaks along the pipeline route. Detailed plans regarding monitoring and mitigation measures for the prevention/containment of potential pipeline leaks should be provided for further evaluation. This is particularly important in sensitive areas, such as the Town of Pictou's Source Water Protection Area and areas in proximity to private water supply wells, watercourses, and wetlands.
- Viable options for leak detection technologies and inspection methodologies should be provided.

OPERATIONAL ISSUES/OTHER PERMITTING PROCESSES

SPILL BASIN

1. DANGEROUS GOODS/WASTE DANGEROUS GOODS SPILL CONTAINMENT WHICH IS COMPLIANT WITH THE DANGEROUS GOODS MANAGEMENT REGULATIONS HAS NOT BEEN ADDRESSED.
    - The EARD proposes a spill basin for "excess process flows that are outside the tolerances of the ETF to handle". Current, any spills of dangerous goods from within the Facility go directly to the settling basins at BHETF. NPNS is currently not in compliance with the Dangerous Goods Management Regulations as the BHETF is not Approved to accept and/or treat dangerous or waste dangerous goods. NPNS has indicated since 2015 that spill containment would have to be addressed when a new ETF is proposed. NPNS has not provided details on spill containment for dangerous goods in accordance with the Dangerous Goods Management Regulations nor does the EARD address treatment of dangerous or waste dangerous goods within the new ETF.

TOWN OF PICTOU WATERSHED

2. CONSULTATION WITH THE TOWN OF PICTOU SHOULD BE REQUIRED.
    - The proposed pipeline location passes through the Town of Pictou watershed. The aquifer serving the Town is a shallow, sand and gravel aquifer. It is unclear in the EARD if NPNS consulted directly with the Town on potential concerns and mitigation measures.

ETF

3. TRAINED OPERATOR FOR THE NEW ETF.
    - The AnoxKaldnes BAS^{TM} process is more complex than the existing lagoon based system with significantly less retention time available. Treatment systems only perform well when they are operated well. The submission does not comment on the specific training and experience of the proposed operator. Due to the complexity of the system and the importance of precise operation in order to achieve regulatory compliance, the system should be operated by an individual with education and experience necessary to operate the new ETF such as an individual who has achieved minimum of a Level 4 Operator Certification. These qualifications should be demonstrated to the Department. This individual would also be in direct responsible charge of the operation of the ETF.

COLOUR

4. O2 DELIGNIFICATION REQUIRED.

- The receiving water study indicates the colour of the effluent will be 750 TCU at the point of discharge. Although background samples were not collected at the proposed discharge location, colour at the previously proposed Pictou Road discharge location was measured at an average value of 10.8 TCU. A BC Government document entitled "Ambient Water Quality Criteria for Colour in British Columbia" (https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/approved-wqgs/colour-tech.pdf) indicates colour is an issue for several Mills in BC who discharge freshwater effluent to freshwater receiving bodies, including some with diffusers. There is insufficient information and data provided to assess if temperature and salinity differential will have an effect on the visibility of the effluent.
- Alberta Environment regulate colour discharges at the Weyerhaeuser Grande Prairie kraft pulp mill.
- Dark coloured effluents could create a visual barrier for aquatic species to find food sources and also prevent/restrict light penetration, necessary for the growth of aquatic plants.
- The EARD Appendix C states O_2 delignification has many benefits to the process and the environment. NPNS does not commit firmly to an installation date for O_2 delignification.
- O_2 delignification will significantly reduce colour and COD to the influent of the new ETF.
- O_2 delignification would generate cost savings to the Mill in reduced chemical demands.
- A study entitled "Marine Pollution Effects of Pulp and Paper Wastes" by T.H. Pearson indicates the ferric oxides in mill effluent impart a yellow/orange colour to the marine sediments, becoming progressively black as the ferric compounds are reduced to ferrous compounds, nitrates are reduced to nitrites and ammonia, which have a negative influence on the macrobiology of the sediments. With the employment of O_2 Delignification, the management of transition metals, such as ferric oxides, is very important for the selectivity of oxygen delignification (Gullichsen and Fogelholm, 2000). Therefore removing transition metals by prior acid washing and/or chelation and stabilizing the transition metals by adding magnesium salts and silicates not only helps maintain pulp strength but also reduce the oxide redox reactions at the point of discharge.

ODOURS

5. ODOUR ISSUES AT THE NEW ETF LOCATION HAVE NOT BEEN FULLY DISCUSSED.
    - The EARD does not discuss measures to control odours from the new treatment system during times of upset conditions.

STUDIES

6. SITE SPECIFIC PRE-DISCHARGE STUDIES OF THE POTENTIAL EFFECTS ON THE MARINE ECOSYSTEM.
    - The submitted Scientific Literature Effect of BKME on Lobster report recommends site specific studies using actual Mill effluent to more accurately assess the potential for impact to adult lobsters including lethality, behavior, and sublethal impacts. The EARD proposes a post discharge survey within 24 months of the initiation of discharge from

the new outfall location. This study should be conducted before the discharge location is approved as there is insufficient information in the EARD to assess the appropriateness of the proposed discharge location in relation to the effects of BKME on the lobster population.

7. MARINE GEOTECHNICAL SURVEYS NEED TO BE COMPLETED.
    - Insufficient information has been provided in the EARD to determine if the proposed discharge location is acceptable. Marine geotechnical surveys are required to determine the exact scour range the pipeline needs to be protected against.
8. DOMESTIC WELL SURVEY
    - A pre-construction domestic well survey along the pipeline route would be beneficial as a means of collecting baseline data from nearby private water supply wells. Typical domestic well surveys include wells within a 500 m radius of the proposed activity and involve both water quality sampling and water level measurements. It is important to verify the number and location of wells to include in the survey in the field rather than relying on NSE's Well Logs Database.
9. SEASONAL ASSESSMENTS ARE REQUIRED FOR WETLAND ALTERATIONS AS WELL AS FOR GEOTECHNICAL ASSESSMENTS IN WATERCOURSES.
    - Methods and locations for watercourse and wetland crossings have not been confirmed therefore additional information is required to assess the potential environmental impacts.
10. GROUNDWATER AND SURFACE WATER MONITORING (ETF SITE).
    - There is an existing groundwater and surface water monitoring program at the mill site, which would have to be modified to accommodate the proposed project. Changes to the current monitoring locations, parameters, and frequency would be based on the proposed new infrastructure, such as the spill basin, clarifiers, and chemical storage, and effluent quality. Additional baseline data would also have to be collected.
11. GROUNDWATER MONITORING (PIPELINE ROUTE).
    - The EARD suggests pre- and post-construction groundwater monitoring along the pipeline route to ensure no alterations to groundwater from the construction process. Details of this proposed monitoring program were not provided, and the EARD did not discuss the potential for impacts to groundwater associated with the operation of the pipeline. The potential for impacts to groundwater associated with the operation of the pipeline and should be evaluated along with the need for groundwater monitoring along the pipeline route. This is particularly important in sensitive areas, such as the Town's Source Water Protection Area, areas in proximity to private water supply wells, and locations where the proposed pipeline location is below the water table.
12. SURFACE WATER MONITORING (PIPELINE ROUTE).
    - Surface water quality along the pipeline route was assessed in December 2018, including both field measurements and water quality samples. The EARD indicated that baseline surface water monitoring along the pipeline route would include, at a minimum, collection of water quality data over three seasons. It would also be beneficial to conduct post-construction water quality sampling for comparison to baseline to evaluate potential impacts to water quality associated with construction activities.
13. EXCAVATION BELOW THE WATER TABLE.

- According to the EARD, there is potential for some of the infrastructure associated with the project to be installed below the local groundwater table, e.g., clarifiers at the ETF site. The report indicates that water removed from the excavation(s) will be tested and released appropriately; however, no details were provided. Typically, such plans would be reviewed and approved by NSE prior to construction.

14. PILOT SCALE TESTING OF THE PROPOSED ETF TO CONFIRM ASSUMPTIONS.
    - Pilot scale testing of treatment technology at the Facility on the actual effluent would provide confirmation that the technology can consistently achieve the effluent discharge concentrations outlined in the EARD.
15. POTENTIAL FOR CONTAMINATION
    - Given the location of the proposed project, i.e., on an existing industrial site and within the highway right of way, there would be potential for contamination to be encountered during the construction phase of the project. NPNS committed to developing a contingency plan for managing any contamination that is encountered during construction. Typically, such plans are reviewed and approved by NSE.
    - The EARD mentions the potential for encountering contaminants from the adjacent Canso Chemical site, however there is no specific plan for the management of the potentially encountered soil and groundwater. It is important to have a plan prepared prior to encountering materials.
16. CHEMICAL STORAGE (ETF SITE)
    - The EARD states the ETF will require several chemical inputs, which will be stored on site. The proposed location of the chemical storage area(s) should be identified.
17. BASELINE STUDIES
    - Many baseline studies have yet to be completed. These studies should be completed in order to assess the appropriateness of the proposed pipeline location.

TEMPERATURE

18. MITIGATION MEASURES FOR THE PROTECTION OF AQUATIC LIFE NEAR THE DIFFUSERS SHOULD BE REQUIRED.
    - Temperatures could be as high as 37 ^{o}C (summer) and 25 ^{o}C above background (winter).

PIPELINE

19. PIPELINE INSTALLATION METHODS SHOULD BE PROVIDED.
    - Several land-based installation options have been provided however the location where each option is proposed has not therefore there is insufficient information to provide comment.
    - Detailed plans regarding directional drilling should be provided.
20. PERMISSIONS FROM TIR OPERATIONS AND TRANSPORT CANADA HAVE NOT BEEN OBTAINED.
    - Based on previously reviewed projects proposed for installation within the TIR RoW, such installations have not been approved by TIR Operations. It is important for NPNS to obtain approval prior to EA approval as if the pipeline installation proposal changes to include widening of the shoulder of the road, an alteration of a wetland or wetland complex greater than 4 hectares may be triggered.

21. ADDITIONAL INFORMATION IS REQUIRED TO ASSESS THE POTENTIAL ENVIRONMENTAL IMPACTS OF BLASTING.
    - Blasting has not been excluded as an option and could have significant impacts on the aquatic environment.

OPERATION & MAINTENANCE

22. DETAILS OF AND SCHEDULES FOR MAINTENANCE AND INSPECTION SHOULD BE PROVIDED.
    - Operation and maintenance procedures for the spill basin should been provided.
    - The diffusers are an integral component for NPNS to achieve water quality requirements.
    - Pipeline operation 5.3.2.4 indicates that incremental replacement of components may be required, however, a maintenance and monitoring schedule based on the industry standards was not provided.
23. SPILL RESPONSE PLAN SHOULD BE PROVIDED.
    - The document does not discuss in detail a coastal response plan for release from either the proposed new system or the pipeline.

OTHER OBSERVATIONS

1. Town of Pictou Source Water Protection Area: further delineation of the wellhead protection areas, i.e., 5, 10, and 25-year time of travel zones, would be beneficial in assessing the potential impacts to the municipal wells associated with operation of the proposed pipeline.
2. Existing Monitoring Well Network (ETF Site): as stated in the EARD, the existing monitoring well network should be protected during construction activities. As with all industrial sites, NSE requires any monitoring wells that are destroyed or damaged be decommissioned and replaced or repaired. Any change to the existing monitoring well network will trigger a change to the groundwater monitoring program for the mill site.
3. Existing Surface Water Monitoring Network (ETF Site): as stated in the EARD, there is one, possibly two, watercourses that fall within the footprint of the proposed project, which may have to be reconfigured. Any watercourse alterations would have to meet NSE requirements. Both watercourses are included in the existing surface water monitoring network for the mill site; therefore, the suggested reconfiguration may trigger a change to the existing surface water monitoring program for the mill site.
4. Comparison of the actual effluent plume travel from Point D into Pictou Road (actual data collected under current seasonal conditions) with the EARD proposed discharge location would have been useful for the public to compare current conditions with anticipated conditions from the new proposed discharge location.
5. 2017 and 2018 data reported for Pt. C indicates 9% and 13.7% of TSS samples had concentrations greater than 48 mg/L (33 of 365 for 2017; 50 of 365 for 2018) and 5% and 9.6% of BOD samples were greater than 48 mg/L (8 of 156 for 2017; 15 of 156 for 2018). Data also indicates 2017 and 2018 discharges into the Northumberland Strait at Pt. D were all below 48 mg/L with the exception of two TSS samples.
6. There was no in-depth discussion or analysis of the use of physico-chemical processes as an option to provide treatment of the effluent. Weyerhaeuser Grand Prairie bleached kraft mill in Alberta compared the efficiencies of ultrafiltration and reverse osmosis in a 1997 study conducted to reduce colour and total organic carbon (Sierka et al.). The study concluded UF and

RO gave excellent results removing 99% of colour and more than 80% of TOC from the effluent tested. Pilot scale studies have been conducted on pulp mill effluent using two-stage membrane filtration, ultrafiltration and reverse osmosis resulting in very high removals of COD, colour and conductivity from the effluents (Koyuncu et al.)

7. Acid Rock Drainage Potential: according to the EARD, it is not anticipated that bedrock with acid producing potential will be encountered during construction. As with all construction projects, any acid producing bedrock that is encountered during construction should be properly managed.
8. EPP and EMP have not been developed and throughout the documentation these future documents are referenced as the guiding principles of a large portion of the mitigation during all construction phase of the project. These are also mentioned as guiding documents for the project.
9. A statement is made in the Vernal Pools section *"Wet areas that are greater than 100 m^2 are not considered wetlands by the Nova Scotia Wetland Conservation Policy, and therefore receive no legal protection",* NSE defines wetlands as follows*: Land commonly referred to as marsh, swamp, fen or bog that either periodically or permanently has a water table at, near or above the land's surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation and biological activities adapted to wet conditions.* Wetland alteration exemptions exist only for certain activities and in specific wetland types.
10. It is important that re-vegetation adjacent to wetlands not introduce alien species into the wetland environment. It was noted that DOT mix was proposed for all revegetation.
11. Based on a compliance history report from 2009 to present ICE 286 complaints about the operation of the mill.
12. Northern Pulp Nova Scotia Corporation has to date complied with all compliance items. Between 2009 to present this included thirteen directives, nine deficiencies, and one warning ticket.
13. Northern Pulp Nova Scotia Corporation received one Summary Offence Ticket.

From: Peveril, Michele
To: Yeh, Helen X
Cc: Tan, Minh
Subject: DoB EA comments
Date: March 11, 2019 5:31:23 PM

Northern Pulp EA Comments from DoB:

The Nova Scotia Department of Business has reviewed the January 2019 Environmental Assessment Registration Document for the Replacement Effluent Treatment Facility as provided by Northern Pulp Nova Scotia Corporation in the context of the Department's mandate to lead and align government efforts behind a common agenda for inclusive economic growth. That means ensuring we have the economic conditions so businesses can thrive and all Nova Scotians can participate and benefit. The department focuses on strategic priorities and opportunities that encourage Nova Scotia's innovation, competitiveness, entrepreneurship, and export orientation. In particular, the department concentrates on key sectors that represent a competitive or comparative advantage for Nova Scotia that will create opportunities for enterprises and entrepreneurship to thrive and lead to the export of more products and services. That includes private businesses, social enterprises, and institutions, working together in clusters in all regions of the province. To achieve government's mandate, the department works collaboratively with our Crown corporations (Develop Nova Scotia, Halifax Convention Centre Corporation (Events East Group), Innovacorp, Invest Nova Scotia, Nova Scotia Business Inc. and Tourism Nova Scotia), key partners in other levels of government, entrepreneurs, large businesses, post-secondary institutions, venture capital investors and Nova Scotians to create a dynamic environment for businesses to succeed. Working together, reinforcing each other's activities, creates a stronger, collective impact that can realize the province's inclusive economic growth objectives.

The Environmental Assessment Registration Document for the Replacement Effluent Treatment Facility section 8.14 "Socio-Economic Environment" (page 431) states that "The Valued Environmental Components (VECs) identified for the project include plants and wildlife on land and in the water – all of which directly or indirectly support coastal fisheries, aquaculture, tourism and recreation in the region and in the Northumberland Strait. Cultural heritage and other direct interactions with residents' health are also VECs." Each of these VECs is discussed subsequently in the Registration Document. The existing environment, potential effects, residual effects and mitigation during the construction phase and operation/maintenance phase were outlined. A listing of the VECs interdependent to the socio-economic environment and a summary was provided in the Registration Document to address residual environmental effects to the socio-economic environment. The activities, effects, mitigative factors/measures and residual effects were each characterized as "Not Significant – Adverse" in summarizing the significance of the residual effects. There is insufficient evidence presented in the Registration Documents to support the proponent's conclusions that the impacts are "Not Significant-Adverse". For instance, impact ranges were not estimated in quantified terms to fully address the various VECs identified.

Michele Peveril
Managing Director, Special Projects (Policy & Program Initiatives)
Department of Business
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T (902) 424-4165
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Environmental Stewardship Branch
16th Floor Queen Square
45 Alderney Drive
Dartmouth, NS B2Y 2N6

March 18, 2019

Helen Yeh
Environmental Assessment Officer
Nova Scotia Environment
1902 Barrington Street, Suite 2085
Halifax, NS B3J 2P8

Dear Ms. Yeh:

Re: Northern Pulp Effluent Treatment Facility Replacement Project Environmental Assessment Registration

Environment and Climate Change Canada (ECCC) has reviewed the Environmental Assessment Registration (submitted February 7, 2019) for the above-noted project proposal.

ECCC's review of the project is based on the department's mandate and responsibilities under the *Canadian Environmental Protection Act*, *Fisheries Act* (Section 36 and the Pulp and Paper Effluent Regulations), *Species at Risk Act*, and the *Migratory Birds Convention Act.* Stemming from this, ECCC has identified a number of requirements for regulatory compliance the proponent will have to meet should it proceed to construct and operate the proposed facility.

For other matters, the level of information in the EA Registration is not sufficient for ECCC to determine that the project will conform to all applicable legislation or to understand the magnitude of impacts to environmental features of concern to the department. ECCC is prepared to work with Nova Scotia Environment and other regulatory departments and agencies to identify the timing and mechanisms to address these issues.

Please feel free to contact me or Stephen Zwicker at (902) 426-0992 / Stephen.Zwicker@canada.ca who is coordinating ECCC's review of this project if you have any questions or concerns.

Yours truly,

for Jeffrey Corkum
Regional Director
Environmental Protection Operations Directorate, Atlantic

cc: M. Hingston M. Dober MT Grant H. Dupuis F. Boisvert R. Gautreau

Northern Pulp Replacement Effluent Treatment Facility Project – Environment and Climate Change Comments, March 18, 2019

Applicable Legislation

The proponent should be made aware of federal legislation described in the following sections that falls under the mandate of Environment and Climate Change Canada (ECCC), and could be applicable to this project.

Effluent Discharges

The deposit of effluent from the facility would be subject to the *Pulp & Paper Effluent Regulations* https://laws-lois.justice.gc.ca/eng/regulations/SOR-92-269/ (under the *Fisheries Act*), which prescribe certain deleterious substances related to the effluent from Pulp & Paper Mills, and authorizes the deposit of limited quantities of those deleterious substances under certain conditions. These regulations include a requirement to conduct environmental effects monitoring studies of the potential effects of effluent on fish, fish usability by humans and fish habitat. The facility would also be subject to the *Pulp & Paper Mill Effluent Dioxin and Furan Regulations* https://laws-lois.justice.gc.ca/eng/regulations/SOR-92-267/, and the *Pulp and Paper Mill Defoamer and Wood Chip Regulations* https://laws-lois.justice.gc.ca/eng/regulations/SOR-92-268/, (both under the *Canadian Environmental Protection Act*).

ECCC has been consulting with interested parties including industry, the provinces and territories, and Indigenous groups regarding the Modernization of the *Pulp & Paper Effluent Regulations*. Public consultation documents prepared to date include:

- *Proposed Modernization of the Pulp and Paper Effluent Regulations – Consultation Document September 2017*

Further information on the regulatory approach and/or status of the regulatory development process can be obtained from:

Bernard Lupien, Manager EEM and Forest Products
Forest Products and Fisheries Act Division – PPER Modernization
351 Boulevard Saint-Joseph – 19th Floor
Gatineau, Quebec K1A 0H3
E-mail: ec.refpppper.ec@canada.ca

Marine Pipeline Construction

In Table 3.1.1 and on page 21, the potential need for a Disposal at Sea Permit in relation to possible “ocean based disposal of dredged material” is acknowledged. To be clear, Disposal at Sea of dredged material would include any permanent sidecasting of sediment during the trenching of the pipeline route. ECCC will also need to determine the applicability of CEPA 122(1)(i) which speaks to “the placement of a substance for a purpose other than its mere

disposal…". This permit exemption may potentially apply to any planned backfilling of the pipeline trench using sidecast material. If it is determined however, that the criteria for CEPA 122(1)(i) has not been met, then a Disposal at Sea permit would be required.

Page 20 of Appendix F states that the pipeline route will be verified with marine surveying and soil testing. Given that activities related to the pipeline installation may require a Disposal at Sea permit, it is strongly recommended that the proponent take that opportunity to characterize the sediment in a manner that meets ECCC's requirements for a Disposal at Sea permit application.

The proponent is encouraged to contact ECCC directly to discuss minimum sampling requirements as well as evaluation criteria regarding CEPA 122(1)(i).

ECCC administers and enforces Subsections 36(3) to (6) of the *Fisheries Act*, which prohibits anyone from depositing or permitting "*the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance may enter such water*". Consideration of this must be given to all aspects of the project, including but not limited to on-land pipeline construction.

Wildlife and Wildlife Habitat

Migratory birds, their eggs, nests, and young are protected under the *Migratory Birds Convention Act* (MBCA). Migratory birds protected by the MBCA generally include all seabirds (except cormorants and pelicans), all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles). The list of species protected by the MBCA can be found at: https://www.ec.gc.ca/nature/default.asp?lang=En&n=496E2702-1. Bird species not listed may be protected under other legislation.

Under Section 6 of the *Migratory Birds Regulations* (MBR), it is forbidden to disturb, destroy, or take a nest or egg of a migratory bird; or to be in possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit.

Furthermore, Section 5.1 of the MBCA describes prohibitions related to deposit of substances harmful to migratory birds:

> "5.1 (1) No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area.
>
> (2) No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance — in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area — that is harmful to migratory birds."

Information Required to Support EA Conclusions

The following sections relate to information that would be required to support EA conclusions about the nature and magnitude of potential environmental effects that, in ECCC's view are not adequately described in the EA Registration Document.

Effluent Treatment and Discharges

- Without empirical baseline information on the Caribou Harbour area associated with the proposed outfall location, ECCC is not in a position to assess the predictions made in the report, nor to evaluate the potential environmental impacts related to that aspect of the project.

- Mixing Zone as defined in the report glossary in the context of this project, refers to the marine area within a 100 m distance from the termination of the effluent pipeline (page xxviii). However, several of the effluent plume figures refer to a "regulatory mixing zone." There is no federal regulatory mixing zone, however effluent concentration at fixed distances from discharge are relevant to determining EEM requirements. Clarification on what is intended by the term "regulatory mixing zone", and what regulations might be referred to here is needed.

- Table 3.1.1, p.17
    - *Fisheries Act* Section 36 is referenced in the "Summary of Applicability" column and then states no permit or approval is required. While there is no approval required, it should be clear that all activities must be carried out in compliance with Section 36(3)
    - *The Pulp and Paper Mill Effluent Dioxin and Furan Regulations* and *the Pulp and Paper Mill Defoamer and Wood Chip Regulations* (both under CEPA) have not been identified. The proponent currently submits information under these regulations and this would be expected to continue with a new treatment facility.

- Table 4.2.1, p.28
    - In reference to tertiary treatment, it is stated under the advantages: "Used when conventional treatment cannot remove a specific contaminant that is found harmful to a specific local ecosystem". Tertiary treatment is considered a general term rather than a process, so any "Tertiary Process" being referred to should be identified along with the parameter(s) that may require such treatment.

- Section 5.2.2.3, p.42. A discussion on the potential need and options for leak detection should be included as part of the Spill Collection System.

- Section 5.3.1.6, p.54. While it is stated effluent from the ETF will meet NSE requirements, it should be noted that the effluent discharged must also be in compliance with the *Pulp and Paper Effluent Regulations* (under the Fisheries Act) and the *Pulp and Paper Mill Effluent Dioxin and Furan Regulations* (under CEPA). The mill must also comply with the *Pulp and Paper Mill Defoamer and Wood Chip Regulations (under CEPA)*.

- Section 5.6.1, p.83. It is stated "The PPER, and those regulations cited by the PPER, regulate the quality of effluent and remain under the jurisdiction of ECCC." Similar statements are made in other sections. Any regulations, other than the PPER, that are being referenced should be specified.

- Section 8.4.1, p.168. This section references the *Fisheries Act* – Deleterious Substance Provisions (Section 36), as a guideline, standard or regulatory requirement related to surface water that may apply to the project. It should be clear that Section 36 of the *Fisheries Act* does apply to activities related to the project and any references to this section should be consistent with the specific regulatory language.

- Section 8.11.2.4, p.343. It is stated: "Pictou Harbour is used as a proxy for Caribou Harbour with respect to water quality, in the absence of available water quality data for Caribou Harbour. Pictou Harbour is similar to Caribou Harbour in terms of depth and geography, but likely has greater freshwater influence." Without empirical baseline data from the actual discharge location, it is not possible to assess such statements or to evaluate the potential environmental impacts of the effluent discharge.

- Section 8.11.3.1, p.346. This section summarises the predicted residual effects on the physical environment of Caribou Harbour (sediment and water quality) despite the absence of baseline information on water and sediment quality in the assessment area.

  No information has been provided with respect to the physical and chemical characteristics of the sediments to be excavated to install the pipeline. Conclusions on environmental quality resulting from the project are presented after extrapolating from data from Pictou Road.

  Empirical baseline information on the Caribou Harbour and Caribou Point area of Northumberland Strait is necessary to estimate with some confidence the direction and impact of residual effects on the physical environment within the marine assessment area.

  The follow-up and monitoring program outlined in Appendix H should be considered preliminary only, subject to modification once predictions, conclusions and decisions based on site specific data are made regarding the project.

- Appendix E1, Section 2.0. It appears that the Far-Field model simulations were run before the Near-Field model. One could expect that the behavior of the plume further afield depends to a large extent on how it behaved at the diffuser, i.e. how quickly it mixed and spread and rose to the surface. It should be explained how the initial mixing and dispersal of the plume was taken into account when simulating Far-Field extent and concentrations of effluent in Section 3.

- References should be provided to support the arguments on page 3. An alternative would be to provide the equivalent plume simulation during winter conditions to compare to the summer modelling results.
- Appendix E1, Table 2.1. The table identifies the simulation time step as 60 seconds. Is this correct? An explanation on the step interval used for the plume simulation should be provided.

- Appendix E1, p.6 and Figures 2.5 to 2.13. The explanatory details provided on far-field simulations are very brief and do not permit a full appreciation of the model's robustness or the credibility of its results.

  Figure 2.13 shows the final state of the plume at the end of one month, more than 9 days after the tidal phase depicted by the preceding Figure 2.12. It is not specified whether any of these figures depict the maximum extent of the simulated plume, nor how isolated effluent patches form, nor why the final plume at the end of the month is further south-east than any of the preceding snapshots provided.

  Given that EA predictions for the aquatic environment are based on the premise that simulated conditions return to surrogate (Pictou area) background levels within 2- to 100 m from the diffuser depending on the parameter in question, it is important to establish a high degree of confidence in the model simulation and input parameters.

  It would be helpful in understanding the simulation to see how the isolated patches form and disintegrate, as well as an animation of the plume for the few days leading to the final state of the plume in Figure 2.13. The maximum extent of the modelled plume should have been provided, if it is not depicted in one of the figures.

- Appendix E1, p. 16. The report indicates that higher background level of contaminants from the Pictou area of the Strait were used as input parameters for background water quality, (due to a lack of data from the Caribou area), and as such can be considered more conservative. This may not be accurate: the Caribou Harbour area is expected to be less contaminated than Pictou Harbour, such that the effluent being discharged near Caribou would in reality be more concentrated relative to receiving water than what is suggested by the simulation based on Pictou baseline data. In other words, it would require greater dilution than estimated based on Pictou data to achieve a return to the levels theoretically prevailing in the Caribou area. To use an example from page 24, where TN is taken to be 0.24 mg/L (as in Pictou Road), a 1:25 dilution of effluent is needed to return TN levels to "background". But if TN in Caribou area were, say, 0.1 mg/L, then a 1:60 dilution would be required to return TN concentrations to ambient levels. The dilution ratios and distances required to achieve background levels for most other water-quality parameters may also be underestimated on page 24-25.

- Appendix E1, Table 3.1. The table presents some water-quality parameters used as background conditions for Caribou Harbour. The title of the table should have identified the source of the samples as being from Pictou rather than Caribou area. As well, the depth in the water column at which samples were collected to obtain these averages was not provided.

- Appendix E1, Figure 3.2. The figure shows the frequency and force of prevailing currents derived from the MIKE 21 model. A more intuitive representation of current directions and speeds would be a current "rose" as is commonly done with winds. The figure's title should have specified that these are depth-averaged speeds and directions. Their pertinence to effluent mixing and entrainment at the discharge point near the bottom is not obvious.

  Current directions should have been provided to aid in the visualization of prevailing currents. A rationale for the use of depth-averaged currents instead of near-bottom currents when simulating effluent mixing and entrainment at the diffuser should also be presented.

- Appendix E1, p.25. The dilution ratio required (1:7) to return salinity to ambient levels appears to be underestimated, as ambient salinity is being *reduced*, not increased, by mixing with freshwater effluent. The correct dilution and distance estimates for the return to ambient salinity should be provided. A discussion on how the adjustments affect all conclusions based on dilution throughout the EA registration document should also be provided.

- Appendix G, p.2.2. The proponent proposes to confirm the spatial extent of the effluent plume empirically with the use of a tracer dye once the project is operational.

  Empirical verification of the plume will be important not only for validating the simulations but also for confirming the location of the exposure area(s) for EEM studies.

- Appendix G, p.2.8. The proponent plans to execute the fish-population component of the EEM study by deploying caged mussels in exposure and reference areas from early April to end of June. The overall approach for the fish population study appears sound, but ice conditions in early April could interfere with the deployment schedule.

  The design for such a study should consider and plan for the possibility of the field schedule being delayed. Study designs must be submitted to ECCC at least 6 months before the beginning of sampling (subsection 4(1) of Schedule IV.1 of the Pulp and Paper Effluent Regulations).

- Appendix G, p.3.1. Although no sampling areas are specifically identified in Appendix G, the proposal to measure, using recommended methods for EEM, the baseline conditions in both the future exposure and reference areas before the new effluent outfall becomes operational is strongly supported by ECCC. Such a BACI (Before-After/Control-Impact) design can be very useful for distinguishing effluent effects from natural differences between reference and exposure areas that may have existed before the discharge of effluent. It is crucial, as with any EEM study, that a suitable reference area(s) with similar characteristics and habitat to the exposure area(s) be selected so that any future effects observed in the effluent exposure area(s) are not confounded by other factors.

The proposal of collecting baseline EEM information at the project site's future exposure and reference areas is supported by ECCC. The reference area(s) should match the characteristics of the exposure area as closely as possible.

- Appendix H, Section 2.0. The proponent proposes to monitor several ecosystem components, beginning with baseline (pre-operational) data and continuing once the effluent discharges from its new location. Vertical tows for phytoplankton and zooplankton, as well as more intensive horizontal tows targeting specifically fish larvae and emerging lobster larvae, benthic community along the pipeline corridor, and fisheries-resources tissue analyses for various chemicals will all contribute to filling the current information gaps and improve the understanding of the area.

  The absence of substantive baseline information specific to the Caribou area of the Strait is a significant gap in the EA that makes evaluating potential environmental effects of the project difficult as well as developing a representative monitoring program.

- Appendix H, Section 2.2. The proposed sub-lethal toxicity tests on lobster larvae and herring eggs are scheduled to begin only once the new treatment facility and effluent outfall are operational.

  According to the Registration document, the current and future mill effluents are not expected to be identical, while the mill's process is expected to remain unchanged. It is further stated that testing the current effluent's toxicity to lobster and herring could therefore provide invaluable baseline information to inform a decision regarding the potential toxicity of mill effluent to major fisheries resources in the Caribou area of Northumberland Strait.

  In ECCC's view, toxicity testing on lobster larvae and herring eggs with current NPNS effluent would not provide baseline effluent toxicity information for the future effluent.

- Appendix J. While not directly applicable to the project's future effluent quality and discharge location, the Cycle 7 EEM interpretive report provides a useful summary of effects seen previously in the aquatic receiving environment for the mill's current effluent and of the mill's subsequent investigations into their likely causes.

<u>Wildlife and Wildlife Habitat</u>

Barrow's Goldeneye

For federal environmental assessments, ss. 79(2) of the Species at Risk Act requires that persons responsible for an environmental assessment "must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them." These measures must:

- be consistent with best available information including any Recovery Strategy, Action Plan or Management Plan in a final or proposed version; and

- respect the terms and conditions of the SARA regarding protection of individuals, residences, and critical habitat of Extirpated, Endangered, or Threatened species.

Environment and Climate Change Canada is the lead jurisdiction for birds, including SAR, protected under the MBCA, and offers the information, expertise and advice below as the primary management jurisdiction:

Barrow's Goldeneye, a species of Special Concern, is listed on Schedule 1 of SARA. Barrow's Goldeneye and other waterfowl are known to winter in ice-free areas near the Venoit Causeway. The proponent indicates that "Several Barrow's goldeneye were observed during the January 2018 surveys west of the ETF site and along the shores of Pictou Harbour from Highway 106" (Section8.10.2.4). However, potential adverse effects of this project on Barrow's Goldeneye are not clearly identified, nor mitigation measures identified. For instance, when referring to blasting and other obtrusive activities related to the construction of the Pictou Causeway crossing of the pipeline, adverse effects to birds during the breeding season are considered, but no such consideration is given to avoidance of adverse effects to Barrow's Goldeneye and other staging/wintering waterfowl.

The proponent should clearly identify the potential adverse effects of project-related activities, including cumulative effects and effects of accidents, on Barrow's Goldeneye, as well as measures to avoid or minimize those effects, and to monitor them.

Migratory Bird Surveys along the Proposed Pipeline Route

Section 8.10.2.3. It is indicated that bird surveys in the vicinity of the proposed pipeline have not yet been conducted due to a change in design and location of the proposed pipeline, and surveys are planned for spring and summer 2019. Due to this lack of data, ECCC is not position to assess the predictions made in the report, nor to evaluate the potential environmental impacts related to that aspect of the project.

Migratory Birds and the Proposed ETF

Section 8.10.3.1. It is acknowledged that "The spill basin may attract birds, especially waterbirds and waterfowl" and that "Waterfowl may use open clarifiers as foraging or migratory habitat". However, the potential effects of bird use of these project components have not been identified. Measures to deter birds from using these project components have also not been described.

The Registration Document refers to bird deterrent devices to be used prior to blasting activities. The devices to be used should be identified.

The Registration Document states that the existing NPNS wildlife policies will be enforced, however they have not been provided or described.

Some aspects of the proposed project involve relatively standard activities typical to many project types. For these activities, ECCC recommends that the proponent undertake appropriate mitigation and project design including in the following areas:

Migratory Bird Interactions with Lighting

Birds may be attracted to lights at on-land coastal construction sites or on the vessels involved in the placement of the pipeline, even with the mitigation measures proposed by the proponent (e.g. reducing deck lighting on project vessels wherever practical).

On page 419, the proponent proposes to do routine checks of project vessels for stranded birds, and refers to the protocol described in Williams and Chardine's 1999 document entitled, *The Leach's Storm-Petrel: General information and handling instruction.* Williams and Chardine (1999) is specific to storm-petrels, and due to a better understanding of bird strandings at sea since 1999, ECCC's Canadian Wildlife Service (CWS) now expects proponents to implement protocols that are also applicable for other species of seabirds and for other bird groups, as in the CWS document *Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada* (2017).

The proponent should therefore be prepared to conduct systematic checks for stranded birds, rather than only conducting routine checks, whereby designated crew members record search effort (even when no birds are found). Should storm-petrels or other species become stranded on vessels or on land, the proponent is expected to adhere to the attached *Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada* (2017), which provides safe and effective procedures for dealing with and documenting live and stranded birds. A permit is required to implement this protocol. The proponent should be advised that it is required to complete a permit application form prior to proposed activities. Permit application forms can be obtained by contacting ECCC's Canadian Wildlife Service (CWS) via email at ec.scfatlpermis-cwsatlpermits.ec@canada.ca .

The proponent should also be advised that any storm-petrels that are found dead should be collected and sent to CWS. This is not a requirement that is mentioned in the Procedures document, but is a current requirement of permittees.

Also, as is mentioned in the Procedures document, CWS expects to be contacted within 24 hours in the event of mortality of an individual migratory bird species at risk or 10 or more migratory birds in one event or night.

Bird collisions at lit and floodlit structures are a known problem. In coastal area, nocturnal migrants and night-flying seabirds (e.g. storm-petrels) are the birds most at risk of attraction to lights and lit structures. Attraction to lights may result in collision with lit structures or their support structures, or with other birds. Disoriented birds are prone to circling a light source and may deplete their energy reserves and either die of exhaustion or drop to the ground where they are at risk of depredation.

It is recommended that proponents avoid or restrict the time of operation of exterior decorative lights such as spotlights and floodlights whose function is to highlight features of buildings, or to illuminate an entire building. Especially on humid, foggy or rainy nights, their glow can draw birds from far away. It would be best for the birds if these lights were turned off, at least during the migratory season, when the risk to birds is greatest and also during periods when Leach's storm-petrels would be dispersing from their colonies.

Lighting for the safety of the employees should be shielded to shine down and only to where it is needed, without compromising safety.

Street and parking lot lighting should also be shielded so that little escapes into the sky and it is directed where required. LED lighting fixtures are generally less prone to light trespass and should be considered.

Spills and Releases

It is not clear what measures would be taken to protect birds (including avian species at risk) or sensitive habitats in the event of a spill of a substance harmful to birds. Even a small spill could be significant if it were to impact avian species at risk, sensitive habitats, or large numbers of birds. A spill response plan for the project should be prepared, for each phase of the project, and which includes a response plan for environmental emergencies that involve wildlife, and including detailed information regarding:

- measures to be taken to contain a spill and to clean up an area;
- individuals/groups responsible for the cleanup;
- equipment to be available to contain spills;
- measures to be taken to prevent birds from becoming oiled (i.e. deterrents/measures to get oil off the water or land);
- wildlife monitoring in the area (i.e. surveys)
- a strategy to deal with accidents where birds were oiled (i.e. discussion of rehabilitation or euthanization) and/or sensitive habitat(s) was(were) contaminated.

In order to assist proponents in preparing a plan for dealing with an oil spill which would potentially threaten birds, CWS has prepared the attached draft guidance document.

Site Rehabilitation

If there is ultimately a need to decommission a building or structure used for nesting by gulls, swallows, or other species of migratory birds, Environment Canada's Canadian Wildlife Service (CWS) should be consulted in a timely manner in advance of any proposed decommissioning activities for species-specific considerations including potential permitting requirements.

A variety of species of plants native to the general project area should be used in revegetation efforts. Should seed mixes for herbaceous native species for the area not be available, it should be ensured that plants used in revegetation efforts are not known to be invasive.

Measures to diminish the risk of introducing invasive species be developed and implemented during all project phases. These measures could include:

- cleaning and inspecting construction equipment prior to transport from elsewhere to ensure that no matter is attached to the machinery (e.g., use of pressure water hose to clean vehicles prior to transport); and

- regularly inspecting equipment prior to, during and immediately following construction in areas found to support Purple Loosestrife to ensure that vegetative matter is not transported from one construction area to another.

Compliance with the MBCA

It is the responsibility of the proponent to ensure that activities comply with the MBCA and regulations. In fulfilling its responsibility for MBCA compliance, the proponent should take the following points into consideration:

- Information regarding regional nesting periods can be found at http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1 . Some species protected under the MBCA may nest outside these timeframes.

- Most migratory bird species construct nests in trees (sometimes in tree cavities) and shrubs, but several species nest at ground level (e.g., Common Nighthawk, Killdeer, sandpipers), in hay fields, pastures or in burrows. Some bird species may nest on cliffs or in stockpiles of overburden material from mines or the banks of quarries. Some migratory birds (including certain waterfowl species) may nest in head ponds created by beaver dams. Some migratory birds (e.g., Barn Swallow, Cliff Swallow, Eastern Phoebe) may build their nests on structures such as bridges, ledges or gutters.

- One method frequently used to minimize the risk of destroying bird nests consists of avoiding certain activities, such as clearing, during the regional nesting period for migratory birds.

- The risk of impacting active nests or birds caring for pre-fledged chicks, discovered during project activities outside the regional nesting period, can be minimized by measures such as the establishment of vegetated buffer zones around nests, and minimization of activities in the immediate area until nesting is complete and chicks have naturally migrated from the area. It is incumbent on the proponent to identify the best approach, based on the circumstances, to complying with the MBCA.

Further information can be found at http://www.ec.gc.ca/paomitmb/default.asp?lang=En&n=C51C415F-1

The proponent should also be reminded that the prohibitions under the *Species at Risk Act* (SARA) are now in force. The complete text of SARA, including prohibitions, is available at www.sararegistry.gc.ca .

McKiggan Hebert
LAWYERS

March 9, 2018 File No. 8463-019

The Honourable Margaret Miller
Minister of Environment
Barrington Tower
1894 Barrington Street, Suite 1800
P.O. Box 442
Halifax, NS
B3J 2P8

Dear Ms. Miller,

Re: Consultation with Pictou Landing First Nation on an Application by Northern Pulp Nova Scotia Corporation for Approval of a Replacement Effluent Treatment Facility at Abercrombie Point and Pipeline to Caribou Harbour pursuant to the Environment Act.

Introduction

We understand that your department is currently the lead department on the formal consultation between the Crown and Pictou Landing First Nation with respect to the proposed replacement effluent treatment facility and pipeline for Northern Pulp's mill at Abercrombie Point, Nova Scotia (the "Project").

Pictou Landing First Nation was advised by letter dated February 6, 2019 from Lynn Bowen of your department that the Project would be registered pursuant to the ***Environment Act*** the following day (February 7, 2019) and that Pictou Landing First Nation would have until March 9, 2019 to provide written comments on the Project. In a subsequent exchange of correspondence with Ms. Bowen, she confirmed that the Crown intended to rely on the environmental assessment process to fulfil, in part, its s. 35 duty to consult.

Pending Decision

The decision currently before you is whether to approve the Project, reject the Project or require further steps be taken or other information provided before a final decision on the Project is made: ***Environment Act*** (the "***Act***"), s. 34(1).

In ***Pictou Landing First Nation v. Nova Scotia***, 2018 NSSC 306, Justice Timothy Gabriel ruled that the Province has a duty to consult with Pictou Landing First Nation in respect of the pending decision as to whether or not to fund the Project. While the Province has appealed that decision, the decision stands as good law until such time as the Court of Appeal rules otherwise. In light of this, we must make it clear that the comments which follow are restricted

to the decision whether to approve the Project under the ***Environment Act*** and are not intended to constitute the comments of the Pictou Landing First Nation on the impending decision whether to fund the Project.

Summary of PLFN Position

Pictou Landing First Nation urges you to exercise your discretion to require an environmental-assessment report pursuant to s. 34(1)(c) of the ***Act***. The environmental assessment registration document ("EARD") filed by Northern Pulp establishes that there are a number of studies that are missing, not complete or require additional data collection before a full assessment of the impacts of the Project on the environment can be undertaken. In short, baseline information is lacking. There is no doubt that the Project will lead to the discharge of known contaminants into the waters of the Northumberland Strait and that the adverse impacts of those substances are not fully understood at this time. The same is true of the impacts of burning sludge in the power boiler – this will certainly lead to the emission of contaminants into the air, but these too are not fully understood at this time. For the reasons that follow, the only approach that respects the significance of the risks to Pictou Landing First Nation Aboriginal and Treaty tights is a full environmental assessment report.

Factors to Consider

The ***Environmental Assessment Regulations***, N.S. Reg. 26/1995 as amended, set out the factors to be taken into account in making a determination under s.34(1) of the ***Act***.

> 12 All of the following information shall be considered by the Minister in formulating a decision under subsection 34(1) of the Act:
>
> (a) the location of the proposed undertaking and the nature and sensitivity of the surrounding area;
>
> (b) the size, scope and complexity of the proposed undertaking;
>
> (c) concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking;
>
> (d) steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people;
>
> (da) whether environmental baseline information submitted under subclause 9(1A)(b)(x) for the undertaking is sufficient for predicting adverse effects or environmental effects related to the undertaking;

(e) potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitats;

(f) project schedules where applicable;

(g) planned or existing land use in the area of the undertaking;

(h) other undertakings in the area;

(ha) whether compliance with licences, certificates, permits, approvals or other documents of authorization required by law will mitigate the environmental effects;

(i) such other information as the Minister may require.

These submissions will address the factors relevant to this assessment in order.

Location of Project

Effluent

The proposed effluent treatment facility would be located next to the mill at Abercrombie Point. The proposed pipeline would be buried along an overland route from Abercrombie Point to Caribou, Nova Scotia where it would continue as a subsea pipeline buried under the bottom of the Northumberland Strait for 4 kilometers where it would rise out of the seabed and terminate at a diffuser. Effluent will flow through the pipeline from effluent treatment facility to the diffuser where it will be discharged into the waters of the Northumberland Strait.

The Northumberland Strait, and in particular, the area surrounding the proposed discharge point, is part of the traditional fishing territory of the Mi'kmaq, and Pictou Landing First Nation commercial, food and ceremonial fishers in particular. The diffuser is located in DFO Lobster Fishing Area 26A where many PLFN fishers participate in the lobster fishery pursuant to private and communal commercial lobster licenses. The Pictou Landing First Nation commercial fishery is the single biggest industry within the community employing 100 people each year out of a population of 280 working age members: EARD, p. 450. Species that are fished within the vicinity of the proposed diffuser are rock crab, lobster, scallops, herring, mackerel and tuna.

The unique characteristics of the Northumberland Strait are described in other submissions and will not be repeated here.

Air

The mill at Abercrombie Point is located approximately 6 kilometers Southwest of IR 24 where the Pictou Landing First Nation makes its home. The prevailing winds blow from the mill in the direction of the Pictou Landing First Nation: EARD, Appendix K, pp. 9-12.

Size, Scope and Complexity of the Project

Effluent

The effluent treatment facility is designed to discharge up to 85 million litres of effluent each day into the Northumberland Strait, although the anticipated daily average is predicted to be 63.6 million litres. The operations are projected to continue 24 hours per day, seven days per week non-stop for several decades.

Adding to the complexity of the Project is the fact that Northern Pulp is unable to identify what chemicals and other substances may be in the treated effluent: EARD, pp. 489, 493, 506.

Further adding to the complexity of the Project is that the interaction of the chemicals in the proposed effluent, even if they are known, with living organisms is species dependent and cannot be extrapolated from one species to another: EARD, Appendix R, p. 1.

The complexity of the Northumberland Strait makes it difficult to model and predict water movement: EARD, Appendix R, p. 11. In addition the effects of climate change and acidification further complicate the predictive value of any modelling: *ibid*. The Stantec Receiving Water Study was not supported by actual sampling and could be wrong: *ibid*, pp. 1-2.

Air

Sludge collected from the effluent treatment process is proposed to be burned as fuel in the power boiler of the mill: EARD, p. 45. The EARD does not indicate the volume of sludge to be burned but does indicate that it will be burned with the existing hog fuel in a ratio of 7 parts hog fuel to 1 part sludge: EARD, Appendix K, p. 7. In terms of rate of total particulate matter (TSP) emitted into the air during operations, Stantec predicts this to be 8.38 grams/second: Appendix K, p. 7. This equates to 257,755 kilograms per year. Not all of the anticipated emitted TSP will be attributable to the burning of sludge, but this gives an idea of the volumes emitted by the mill. They are not insignificant.

Adding to the complexity of the Project is the fact that the composition of the sludge is unknown at present: EARD, Appendix K, p. 6.

Predictive Value of Environmental Baseline Information

Effluent

As noted above, the effluent will contain chemicals and substances that are harmful to living organisms in the Northumberland Strait. In the EARD, Northern Pulp acknowledges that there are gaps in the information needed for an environmental assessment.

Pictou Landing First Nation retained the services of Exp Services Inc. to review the EARD and provide a summary of the information gaps, both those acknowledged by Northern Pulp in the

EARD itself, and those identified by Exp. In a letter dated March 8, 2019 to Chief Andrea Paul (enclosed), Exp listed the following deficiencies in the environmental information and studies:

1. Marine Benthic Habitat Studies

No study of the marine benthic habitat has been undertaken along the proposed pipeline route although it is suggested that one will be conducted as part of the design and to facilitate a request for review by DFO: EARD, p. 21. It does not appear that a benthic habitat study within the mixing area (100 metres from the diffuser) is being considered. There is no mention that any baseline studies have been undertaken to date either along the proposed pipeline route or in the mixing area. Once the seabed has been disturbed by trenching for the pipeline, no pre-Project baseline will be available. The same can be said of the mixing area – once it begins to be impacted there is no possibility of obtaining baseline information. Marine benthic habitat studies are carried out over a yearlong cycle.

2. Geotechnical Studies along Proposed Pipeline Route

No geotechnical studies have been carried out on the seabed along the proposed pipeline route: EARD, p. 21. Information from the geotechnical study would allow a determination as to whether the proposed route will support the pipeline without risk to the integrity of the pipeline from future geological events.

3. Harmful Alteration, Disruption or Destruction (HADD) of Fish Habitat Assessment

The Project has not been assessed from the point of view of impacts on fish and fish habitats. It is said that these studies will be developed later to support a Request for Review from DFO: EARD, p. 21. Given the potential for serious harm to the Pictou Landing First Nation commercial, food and ceremonial fisheries from the chemicals contained in the effluent, this is a glaring omission from the EARD.

4. Lethal and Sub-lethal Effect of Effluent on Lobsters (and Other Species)

The EARD contains a summary of existing research on the effects of bleached Kraft mill effluent on lobster prepared by Fraser Clark: EARD, Appendix R. While the conclusions of the research summary are based on the Receiving Water Study modelled by Stantec, the existing literature seems sparse and the author himself recommends further study on lethal and sub-lethal effects of bleached Kraft mill effluent on adult lobster and lobster larvae using current effluent. Exp makes a similar recommendation. In addition, Exp notes that the same testing should be carried out on other species of fish in the affected area. While Exp notes that testing ideally would be carried out with the actual effluent being produced, the studies could, and should, have been done using the current treated effluent in the meantime.

5. Mi'kmaq Ecological Knowledge (MEK)

No MEK has been obtained regarding the current proposed pipeline route: EARD, p. 451. No assessment has been made of the Pictou Landing First Nation's interactions with the marine environment: EARD, p. 490.

6. Human Health Risk Assessment

No human health risk assessment has been completed: EARD, p. 490. This is said to be due to in part from the lack of information concerning the chemical composition of the effluent after treatment. However, Exp points out that while it is impossible to know now what the final composition of the *treated* effluent will be, the current *untreated* effluent will not change with the proposed effluent treatment facility. Therefore it is, and has been, possible to analyze the current *untreated* effluent for the presence of various chemicals of interest. This would serve to identify any potential chemicals of concern that may find their way into the treated effluent. If this has been done, it has not been reported in the EARD and the results of the analysis have not been considered.

Exp notes that there are official sources which identify a number of contaminants of potential concern that are relevant and could be tested for in the current untreated effluent: *Nova Scotia Environment Contaminated Sites Regulation, Tier 1 Environmental Quality Standards Surface Water Parameters for Fresh Water and Marine Environments* and the *Halifax Regional Municipality Construction Dewatering Assessment Parameters*: Exp., pp. 5-7. Exp has set out the chemicals in two tables. There is considerable overlap in these tables. The current untreated effluent can be tested to determine which of these chemicals of concern are present in the untreated effluent and could therefor find their way into the treated effluent. This has apparently not been done.

This is particularly appropriate because some of the claims being made about the anticipated *treated* effluent in the EARD are based on the characteristics of the untreated effluent. For example, the presence of dioxins and furans was ruled out because these are not expected in the elemental chlorine free bleaching process: EARD, p. 509. Yet the analysis of water following the recent escape of untreated effluent from the existing pipeline did show elevated levels of dioxins and furans, according to your department's own records. Accordingly, rather than relying on assumptions about the characterization of the effluent, the actual untreated effluent should be analyzed before any decision is made.

Another flaw in the EARD analysis is that it focuses only on the regulated chemicals of interest, primarily those regulated under the federal *Pulp and Paper Effluent Regulations*. Presumably this would carry through to a future human health risk assessment. Exp recommends characterizing the effluent by testing for the chemicals of concern noted above rather nthan restricting the analysis to regulated chemicals.

Current effluent could be analyzed for those parameters recommended by Exp at two accredited laboratories in Nova Scotia - Maxxam Analytics Inc. and Agat Laboratories - both of

which are accredited by both the Canadian Association for Laboratory Accreditation (CALA) and Standards Council of Canada (SCC).

The human health risk assessment should be completed before any decision is made and should follow the guidelines contained in *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA)*, Version 2.0, 2010, Revised 2012.

Air

As noted above, burning of sludge could have an adverse impact on the air quality as it will be burned in the power boiler and existing prevailing winds will carry emissions towards Pictou Landing First Nation.

Exp notes that the 2019 Stantec air modelling report limited itself to an analysis of those few contaminants currently regulated in Nova Scotia either under the *Air Quality Regulations* or under the existing industrial approval applicable to Northern Pulp's operations: EARD, Appendix K, pp. i and ii. However, there is no reason to limit the analysis to those contaminants. For one thing, the present operation does not burn effluent sludge, whereas the proposed Project contemplates that 1/7 of the fuel burned in the power boiler will be sludge. As a result one cannot rely on the existing Industrial Approval to address contaminants that may be emitted from the burning of sludge.

In fact, Exp notes that it is well recognized that pulp and paper mills and their effluent treatment processes emit more air contaminants than those identified in the Stantec report. These include: volatile organic compounds (VOCs) and total reduced Sulphur (TRS) compounds consisting of H_2S, methyl mercaptan, dimethyl sulphide, dimethyl disulphide as well as chlorinated compounds.

There are existing guidelines on the contaminants released by the burning of effluent sludge. These are found in *AP-42 Chapter 1.6 Wood Residue Combustion in Boilers*, *AP-42 Chapter 2.2 Sewage Sludge Incineration* and *AP-42 Chapter 10.2 Chemical Wood Pulping*. Stantec was obviously aware of those guidelines: EARD, Appendix K, p. 6. These guidelines identify contaminants of concern. These contaminants were not addressed by Stantec.

Exp notes that the *Air Dispersion Modelling Guideline for Ontario, 2017* (ADMGO) lays out a procedure for modelling the dispersion of air contaminants. ADMGO is also cited by Stantec in its report: EARD, Appendix K, p. iii.

ADMGO requires, as a first step in the air modelling process, a source summary table for all contaminants emitted including a full rationale for any contaminants deemed insignificant. This was not done in the Stantec analysis and is a serious omission. As noted above, Stantec focused only on regulated contaminants. As such the analysis did not conform to ADMGO standards.

As part of a comprehensive environmental assessment report, Northern Pulp should provide a source summary table of all contaminants of interest.

ADMGO lays out an emission summary and dispersion modelling (ESDM) procedure to be followed. This requires that sample calculations be provided detailing emission rates determined, significance of each possible contaminant and emission factor ratings assigned to all possible contaminants. Again this is not contained in the Stantec report and is a major omission. It should be part of a required environmental assessment report.

The analysis should take into account future changes. For example in Ontario, sulphur dioxide will be reduced from 275 µg/m3 (1- hour) and 690 µg/m3 (24-hour) to 100 µg/m3 (1 -hour) and 10 µg/m3 (annual) in the year 2023. This not discussed in the EARD.

Finally, Exp notes that emissions of odorous contaminants should be assessed based on the criteria in the *Ontario Air Contaminants Benchmark* (ACB) list.

Given these gaps, it is difficult to see how the Project can be approved at this time. More information is required. The predicative value of the environmental baseline provided in the EARD is severely restricted due to the absence of baselines in key areas.

Potential and Known Adverse Effects

Effluent and Air

There are clearly contaminants of concern in the effluent: EARD, p. 503-504. Likewise, as noted above, there are contaminants of concern that will be released by burning sludge. The EARD is silent on the potential effects of each of these contaminants as they were not fully listed in the EARD.

The lack of information on the environmental and health impacts of these chemicals of concern is a major deficiency in the EARD.

Mitigation Effects of Permits, etc.

While the operations of the mill and the effluent treatment facility will require an Industrial Approval under the Nova Scotia ***Environment Act***, the terms of the industrial approval are unknown at this time as the existing Industrial Approval will expire on January 31, 2020 before the new treatment facility begins operation.

Without knowing the terms of a new Industrial Approval, it is impossible to know what mitigating impacts the Industrial Approval may have on the potential adverse impacts from contaminants in the effluent and air emissions.

Since your department is involved in both this environmental assessment and the presumed application for a new Industrial Approval, it makes sense that a full environmental assessment

report be required at this time so that the two processes can work together based on a full understanding of the environmental impacts of the Project. It makes little sense to approve a project only to have it come to a halt by the terms of an Industrial Approval. Conversely, if adverse impacts are not addressed at this stage, we should not rely on the Industrial Approval process to correct fill in the blanks.

The effluent must also met the standards set out in the federal ***Pulp and Paper Effluent Regulations.*** As Exp notes, the ***PPER*** are under review and will likely change given that they have been in place since 1992. Further, the ***PPER*** only address a handful of parameters: EARD, Appendix E, p. 16. As noted above, there are many more chemicals of concern that are in the effluent.

The EARD notes that DFO will be asked to provide comments. Because of the ***PPER***, DFO's role in reviewing the Project will be limited to considering the impacts of the construction phase only. DFO will not be independently assessing the effects of effluent on the marine fish habitat or fish themselves. A pulp mill is allowed to discharge effluent into the marine environment as long as it complies with the PPER, whether or not the effluent is a deleterious substance. Thus Pictou Landing First Nation's concerns about the adverse impacts of effluent on its fishery will not be addressed by DFO above and DFO's inquiry will be limited to the impacts of the pipeline construction. Pictou Landing First Nation's concerns will only be addressed in this environmental approval process.

Air quality standards are governed by the Nova Scotia ***Air Quality Regulations***: EARD, p. 135. However, as noted above, the contaminants regulated under those regulations are limited in scope compared to the potential contaminants known to be generated in the pulp and paper industry and from burning sludge. Compliance with the ***Air Quality Regulations*** will not mitigate the adverse impacts of other contaminants.

Other Information

History of Government Failing to act Honourable

In making a determination under s. 34(1), it is important to consider the Honour of Crown vis-à-vis Indigenous peoples potentially impacted by the pending Project. In this case, the Project will be a component of the pulp mill. Since 1967, effluent from the mill has been discharged into Boat Harbour and this has had a significant and life altering adverse impact on the Pictou Landing First Nation.

The members of Pictou Landing First Nation are asking for a full environmental assessment report of the new treatment facility. There is good reason for this. In addition to the deficiencies in the EARD noted above, it must be remembered that the members of the Pictou Landing First Nation were lied to by representatives of the Provincial Water Authority about the potential impacts of treating effluent at Boat Harbour. They were advised there would be no odor problems associated with the facility. To further this deception, the Chief and one Council member were taken to Saint John, New Brunswick and shown a residential wastewater

treatment facility that had not yet begun to receive any wastewater. The Chief and Councillor were told that the Boat Harbour waters would be just as clean. The sad part is that when deciding to accept the mill, the Chief and Council of the day were acting in the best interests of all of Pictou County with the Chief writing that "it would be good for the whole area".

Pictou Landing First Nation knew that they had been deceived immediately after the dark brown effluent began to flow into Boat Harbour. Fish were killed en masse as community members watched them trying to escape from the water onto the shores of Boat Harbour. This was soon followed by the putrid stench of Sulphur. The community protested to the Province and despite the Province's commitment to the federal government, as owner of the Reserve, the Province took several years to acknowledge the problem. It added infrastructure to aid in the treatment of the effluent. However, the odours remained and the fish did not come back. The effluent flowed out of Boat Harbour and affected Lighthouse Beach, with piles of brown foam constantly visible. Chemicals in the air, which could not be seen, reacted to the paint on people's houses, turning them black.

It was not until a lawsuit against the federal government was started in 1986, that the Province took Pictou Landing First Nation's demands to close Boat Harbour seriously. By 1992 the Province promised to close Boat Harbour at the end of 1995 when its agreement to treat the effluent would expire. However, that didn't happen. Instead the treatment facility was leased to the owners of the mill for a 10 year period to the end of 2005. Then in 2002 the Province extended the lease to 2030 based on a promise by the mill owner to build a by-pass pipeline within Boat Harbour which it represented would allow the Province to remediate most of Boat Harbour after 2005. The by-pass pipeline was not built and at the end of 2005 the Province asked Pictou Landing First Nation for a three-year extension which the community granted. When the extension was about to expire Pictou Landing First Nation announced that it would not grant a further extension.

In light of this the Province agreed in writing that it would close the treatment facility as soon as a new facility was built. However, within 6 months a new provincial government changed its mind and decided to study the problem. Over a year later the Province decided to renege on its commitment to close the Boat Harbour treatment facility.

It was not until the existing pipeline broke and the Pictou Landing First Nation refused to allow representatives of Northern Pulp onto its burial grounds at Indian Cross Point to fix the pipeline that the Province once again agreed to close the Boat Harbour treatment facility. This of course led to the ***Boat Harbour Act***.

The past 5 decades of deceit and indifference coupled with the Province's financial interest in the Project, have left the people of Pictou Landing First Nation very skeptical of the provincial government when it comes to environmental impacts associated with the Northern Pulp mill. This was recognized by Justice Gabriel in ***Pictou Landing First Nation v. Nova Scotia***, *supra*, at paragraph 74:

> This will do nothing to assuage whatever cynicism has been engendered in the past by the already significant environmental impact which has been visited upon Treaty lands and environs by the mill and its facilities to date.

While the Province has appealed Justice Gabriel's decision that the Province has a duty to consult with Pictou Landing First Nation regarding the funding of the Project, his words should be weighed carefully in the disposition of this application for environmental approval of the Project.

Justice must not only be done, but must be seen to be done. Having rejected a Class II environmental assessment, Pictou Landing First Nation now asks for a full environmental assessment report. The Honour of Crown requires it in light of the cruel treatment of Pictou Landing First Nation by successive provincial governments. Now is the time to do the right thing. Pictou Landing First Nation deserves a high level of assurance that their Aboriginal and Treaty rights to fish in the Northumberland Strait and to reside on Reserve lands free of airborne contaminants are not impacted by the Project.

PLFN Limited Time to Respond

PLFN has had an inadequate amount of time in which to respond to the 2,000 page EARD.

It appears even from the EARD itself, that further studies and investigations are required. These will take time in any event. Pictou Landing First Nation urges you to require the completion of these studies as part of a full environmental assessment report pursuant to section 34(1)(c) of the ***Act***. This will allow fuller participation by Pictou Landing Frist Nation.

Exp Comments

Exp has provided comments on other aspects of the EARD which are relevant if the Project is approved. We include portions of a Review Document that Exp prepared for Pictou Landing First Nation for your review. If the Project is approved Pictou Landing First Nation respectfully requests that these issues be considered and addressed in the conditions to the approval where appropriate. Further, Pictou Landing First Nation expects that consultation would continue on the terms of any environmental effects monitoring program that is established.

Tertiary Treatment

In 2011 Pictou Landing First Nation requisitioned a report from Exp. Exp was asked to review a 2010 report from Amec (now Wood) setting out options for the treatment of effluent from the Northern Pulp mill and in particular one option that was very similar to the Project under consideration. That option involved an AST system located adjacent to the mill much like the present Project. Exp was asked to report on feasible enhancements to the proposed treatment system that would allow the effluent to meet the same standards as the Town of Pictou would need to meet under the anticipated federal municipal waste water regulations. The resulting report is enclosed. Essentially Exp identified three options for a tertiary level of treatment to allow the pulp effluent to meet the federal municipal wastewater standards. The costs of these additional treatment modalities at the time ranged from $7 million to $12 million. While the

EARD suggests that tertiary treatment was considered, no detailed analysis is provided as to why these tertiary treatment options were ruled out.

Pictou Landing First Nation urges you to require a tertiary treatment system for the Project if it is approved.

Summary

Pictou Landing First Nation is concerned primarily about the impacts of the proposed Project on its fisheries and on its air quality on Reserve. There are significant gaps in the baseline information provided in the EARD and it would be difficult for Pictou Landing First Nation to understand how, in light of the decades-long history of environmental harm caused by the existing effluent treatment system, the Project could be allowed to proceed without a full environmental assessment report. The Honour of Crown requires it. If the Project is allowed to proceed, then conditions will be required to address the gaps identified herein as well as the additional comments of Exp in the documents enclosed. A tertiary treatment system should be mandated.

Yours very truly,

March 8, 2019 HFX-00247484-A0/60.2

C/O McKiggan Hebert Lawyers
502-1959 Upper Water Street
Halifax, Nova Scotia, B3J 3N2

Re: Northern Pulp Nova Scotia Replacement Effluent Treatment Facility Environmental Assessment Registration Document
Follow Up Studies and Further Assessment Required

EXP Services Inc. (EXP) is providing the following list of follow up studies and areas of further assessment based upon our review of the "Northern Pulp Nova Scotia Replacement Effluent Treatment Facility Environmental Assessment Registration Document (EARD), January 31, 2019".

This list is being provided in two sections; follow up studies as identified by the proponent (Northern Pulp Nova Scotia) and recommended follow up studies as identified by EXP.

1 Proponent Identified Follow Up Studies

The following reports and studies have been identified in the EARD by the proponent as either requiring further work or have yet to be completed.

1. Marine Benthic Habitat Study Along the Proposed Pipe Line Route
    a. EXP notes that the study should also include the 100 metre radius at the discharge point.
    b. EXP notes that the Metal Mining Technical Guidance for Environmental Effects Monitoring, Chapter 4, Effects on Fish Habitat: Benthic Invertebrate Community Survey offers a solid framework for establishing the scope of the Benthic Habitat Study.
    c. EXP notes that the study should be completed at a minimum of four sites along the proposed pipeline route, before construction.

   d. EXP anticipates that this study would require 2 days in the field to complete the sampling followed by a six week period for development of the report.

2. Geotechnical Assessment along the land and underwater pipeline route.

   a. EXP notes that the sediments along the underwater pipe route should also be assessed for chemicals of concern which could include, at a minimum, metals, Polycyclic Aromatic Hydrocarbons (PAH) and Petroleum hydrocarbons (PHC).

   b. DFO may supply additional parameters to be analyzed once they review the application to dredge along the proposed route.

   c. The program should include assessment for the presence of unique habitats associated with submarine groundwater discharge sites.

   d. The Geotechnical assessment would be estimated to be completed within a two month window.

3. Harmful Alteration, Disruption or Destruction (HADD) of Fish Habitat Assessment for the Pipe Line and Water Crossings

   a. Preliminary assessment of fish habitat along the pipeline route was done in December 2018 and is to be supplemented with habitat assessment at a more appropriate time (early summer). It is incumbent on the project to avoid, mitigate or offset the harmful alteration, disruption or destruction of fish habitat. This work needs to be addressed in consultation with Fisheries and Oceans. It is EXPs experience that between the field work, submittal and approval there is a two to three month turnaround time.

4. Further assessment on Species At Risk (SAR) due to the Wetland Survey being completed in December 2018.

   a. EXP notes that wetland surveys for SAR should be completed at least twice during the plant growing season. Once in June (late spring) and secondly in September (early fall).

5. The construction phase environmental management plan

6. The construction phase environmental protection plan

7. Final reporting on the Mi'kmaq Ecological Knowledge (MEK)

   a. Has the MEK been resubmitted with the new pipeline route included?

8. Archaeological Assessments along the New Route

   a. This ties in with the MEK.

9. Human Health Risk Assessment (HHRA)

a. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0, 2010, Revised 2012.

10. Follow Up work on the Pipeline Preliminary Assessment completed in Fall 2018.

    a. Nova Scotia Transportation and Infrastructure Renewal (NSTIR) right of way access permission for placement of the effluent pipeline.

    b. Discussions should be held with the Town of Pictou to assess potential impacts of pipeline routing as it passes through their well head protection areas. Formal discussions with the Town of Pictou should be undertaken to ensure proper mitigative methods are employed for this section of pipeline that is acceptable to the Town of Pictou.

    c. In field inspections for nearby potable water wells

    d. Preparation of design and request for permitting associated with wetlands and other water crossings

11. The EARD indicated that a detailed response plan will be developed to manage malfunctions and accidents.

12. The EARD indicates aggregate will be required for the construction of the pipeline. It will be necessary to identify the source aggregate pits to ensure they are permitted and any quality issues pertaining to acid drainage or natural mineralization are accounted for.

2 EXP Identified Areas of Further Study

1. Studies to date have been deficient when examining the lethal and sub lethal effects of the proposed treated effluent on the various life stages of Lobster. It is recommended that both the larval and adult stages be assessed with the proposed treated effluent. The timeline for completion of this type of test is contingent on the availability of the new treated effluent. This is the difficulty with this study, in that it cannot be completed until after a new treatment system is in place. In terms of timing, it can be completed at anytime as it is a laboratory study, once the proposed effluent is available. This type of assessment could also be completed on any larval or adult species that is commercially fished in the Northumberland Strait.

2. Development of the Sediment and Erosion Control Plan for the Construction Phase.

3. Development of a monitoring plan for the Construction Phase to meet regulatory stipulations.

4. Details of the design storm (i.e. 1 in 100 year storm with a 24 hour duration) for the spill collection system basin should be provided.

5. What project bonding will be required for the proponent.
6. Nova Scotia Environment should be requested to identify how they will manage the project – with First Nations – to ensure design plans are followed in the field and monitoring meets stipulations.
7. Based on EXPs review of the Stantec 2019 Ari Modeling Study the following areas for consideration were identified:
    a) It is well recognized that pulp and paper facility and ETF process operations emit more air contaminants than the priority pollutants assessed. Volatile organic compounds (VOCs) and total reduced Sulphur (TRS) compounds consisting of H_2S, methyl mercaptan (CH3SH), dimethyl sulphide ($CH_3)2_S$), dimethyl disulphide ($(CH_3)_2S_2$), and chlorinated compounds are potentially emitted by the kraft (bleached) pulping process. Established emission factors for additional contaminants than assessed from the pulp and paper making processes, co-combustion of hog fuel, and wastewater sludge incineration are available in the reference chosen (AP-42 Chapter 1.6 Wood Residue Combustion in Boilers, Sewage Sludge Incineration AP-42 Chapter 2.2) as well as within AP-42 Chapter 10.2 Chemical Wood Pulping.
        i. Provide a source summary table for all contaminants emitted from the ETF and the Kraft Pulp Mill facility in accordance with the ADMGO, including a full rationale for justification of any contaminants deemed insignificant.
        ii. Identify emission factors representative of the processes to assess potential contaminants of interest not included in priority contaminants assessed. (e.g. AP-42 Chapter 10.2 Chemical Wood Pulping, Table 10.2-1 lists Methyl mercaptan, Dimethyl sulfide and Dimethyl disulfide emissions (Emission Factor Rating: A); AP-42 Chapter 1.6 Wood Residue Combustion in Boilers; and AP-42 Sewage Sludge Incineration Chapter 2.2, Table 2.2-3.)
        iii. Assess emissions of odourous contaminants at 10- minute time interval based on criteria in Ontario Air Contaminants Benchmark (ACB) list.
        iv. Consideration should be given to the potential of changes in regulatory criteria, in particular sulphur dioxide, in the assessment of future operations scenario.
    b) The assessment of future operations should also consider the potential of changes in regulatory criteria. In particular, sulphur dioxide which in Ontario will be reduced from 275 µg/m3 (1- hour) and 690 µg/m3 (24-hour) to 100 µg/m3 (1 -hour) and 10 µg/m3 (annual) in 2023.

c) Emission factors used, for burning of sludge, by Stantec were US EPA AP-42 Chapter 2.2 Sewage Sludge Incineration for CO, SO2, NOx, TSP, and PM2.5. Both this reference and AP-42 Chapter 1.6 Wood Residue Combustion in Boilers lists other contaminants of interest that were not included in the assessment. Regardless of emission factor reference consideration should be given to assess all contaminants of interest within the reference chosen. EXP recommends:

   i. Provide a source summary table for all contaminants emitted from the ETF and the Kraft Pulp Mill facility in accordance with the ADMGO.

   ii. Provide sample calculations detailing emission rates determined, significance of contaminant, and emission factor rating in accordance with the ESDM Procedure.

   iii. Include assessment of emissions of potential contaminants from co-combustion of sludge and hog fuel in addition to priority contaminants.

8. Human Health Risk Assessment (HHRA) – The proponent has noted that the HHRA will look to exclude many parameters from the assessment based on prior studies and based on what is required under the PPER.

   The Pulp and Paper Effluent Regulations, Current to February 14, 2019 list only the following minimum parameters for effluent monitoring:

   a) Acute Lethality and Effect on *Daphnia magna*;

   b) Biological Oxygen Demand;

   c) Total Suspended Solids;

   d) Volume;

   e) pH; and

   f) Electrical Conductivity.

   Since the PPER are presently under evaluation, with an update pending, and likely additional parameters being added. EXP is proposing that chemical analysis on the untreated effluent be conducted for the following parameters listed in Table 1 and Table 2 below. These parameters have been selected based on present existing guideline information pertaining to protection of drinking water, marine aquatic life and fresh water aquatic life.

   Table 1 shows the parameters that are regulated in Nova Scotia under the Contaminated Sites Regulations.

Table 1: Nova Scotia Environment Surface Water Parameters for Fresh Water and Marine Environments

Nova Scotia Environment Surface Water Parameters for Fresh Water and Marine Environments				
Aluminum	Zinc	Bromoform	Vinyl Chloride	Lindane
Antimony	Benzene	Bromomethane	Aldicarb	Linuron
Arsenic	Toluene	Carbon Tetrachloride (Tetrachloromethane)	Aldrin	Malathion
Barium	Ethylbenzene	Chlorobenzene	Atrazine	MCPA
Beryllium	Xylene	Chloroethane	Azinphos-methyl	Methoxychlor
Boron	Modified TPH	Chloroform	Bendiocarb	Metolachlor
Cadmium	MTBE	Chloromethane	Bromoxynil	Metribuzin
Chromium (hexavalent)	Naphthalene	Dibromochloromethane	Carbaryl	Paraquat
Chromium (total)	1 - Methylnaphthalene	1,2-Dichlorobenzene	Carbofuran	Parathion
Cobalt	2 - Methylnaphthalene	1,3-Dichlorobenzene	Chlorothalonil	Phorate
Copper	Acenapthene	1,4-Dichlorobenzene	Chlorpyrifos	Picloram
Cyanide	Acenapthylene	1,1-Dichloroethane	Cyanazine	Simazine
Iron	Anthracene	1,2-Dichloroethane	2,4-D	Tebuthiuron
Lead	Fluoranthene	1,1-Dichloroethylene	DDT	Terbufos
Manganese	Fluorene	cis-1,2-Dichloroethylene	Diazinon	Toxaphene
Mercury (total)	Phenanthrene	trans-1,2-Dichloroethylene	Dicamba	Triallate
Methylmercury	Pyrene	1,2-Dichloropropane	Dichlorfop-methyl	Trifluralin
Molybdenum	BaP Total Potency Equivalents	1,3-Dichloropropene	Dieldrin	Polychlorinated Biphenyl (Total PCB)
Nickel	Benz[a]anthracene	Ethylene Dibromide	Dimethoate	Dioxins and Furans (TEQ)
Selenium	Benzo[a]pyrene	Methylene Chloride (Dichloromethane)	Dinoseb	Pentachlorophenol (PCP)
Silver	Benzo[b,j,k]fluoranthene isomers	Styrene	Diquat	Organotins - Tributyltin
Strontium	Benzo[g,h,i]perylene	1,1,2,2-Tetrachloroethane	Diuron	Ethylene Glycol
Thallium	Chrysene	Tetrachloroethylene	Endosulfan	Propylene Glycol
Tin	Dibenz[a.h]anthracene	1,1,1-Trichloroethane	Endrin	Phenol
Uranium	Indeno[1,2,3-c,d]pyrene	1,1,2-Trichloroethane	Glyphosate	
Vanadium	Bromodichloromethane	Trichloroethylene	Heptachlor	

As an example of what would be required for discharge to a storm sewer from a routine construction project, EXP has presented the HRM's list of minimum parameters to be assessed in Table 2.

Table 2: HRM Construction Dewatering Assessment Parameters

HRM Construction Dewatering Assessment Parameters				
Arsenic, Total	Copper, Total	Nickel, Total	Toluene	trans -1,3 - Dichloropropylene
Benzene	Cyanide, Total	Phenols	1,1,2 -Trichloroethylene	Methylene chloride
Biochemical Oxygen Demand	Ethylbenzene	Phosphorus, Total	Xylene, Total	1,1,2,2 - Tetrachloroethane
Cadmium, Total	Fluoride	Selenium, Total	Zinc, Total	1,1,2,2 - Tetrachloroethylene

HRM Construction Dewatering Assessment Parameters				
Carbon tetrachloride	Lead, Total	Silver, Total	1,2 - Dichlorobenzene	Di-n-butyl phthalate
Chloroform	Mercury, Total	Suspended Solids, Total	1,4 - Dichlorobenzene	Bis (2-ethylhexyl) phthalate
Chromium, Total	Nickel, Total	Total Thallium	cis -1,2 - Dichloroethylene	PAHs

The parameters listed in Tables 1 and 2 are both available for analysis from two Canadian Association for Laboratory Accreditation (CALA) and Standards Council of Canada (SCC) accredited laboratories in HRM; Maxxam Analytics Inc. and Agat Laboratories.

While it is obviously not possible to test what the effluent would be from the new treatment system, it is possible to have the untreated effluent tested for the parameters listed in Table 1 and Table 2 to assess what chemicals of concern could be added to the list for assessment under the HHRA.

3 Standard Limitations

The information presented in this report is based on information provided by others and observations designed to provide a peer review of the reports provided.

Achieving the objectives of this report has required us to arrive at conclusions based upon the best information presently known to us. No investigative method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level. Professional judgment was exercised in gathering and analyzing the information obtained and in the formulation of the conclusions. Like all professional persons rendering advice, we do not act as absolute insurers of the conclusions we reach, but we commit ourselves to care and competence in reaching those conclusions.

Our undertaking at EXP, therefore, has been to perform our work within the limits prescribed by our clients.

4 Closure

We trust this summary report is satisfactory for your purposes. If you have any questions regarding our review, please do not hesitate to contact this office.

Sincerely,

Project Manager
EXP Services Inc.

Pictou Landing First Nation

Document Review

Northern Pulp Nova Scotia Corporation – Existing and Proposed Effluent Treatment Plant

Revision 3

Project Number: HFX-00247484-A0

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Date Submitted: March 2019

quality system checks

project number:

HFX-00247484-A0

document type:

Final

date:

March 5, 2019

revision No.:

3

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List of Acronyms

ABL	ABL Environmental Consultants Limited
ARD	Acid Rock Drainage
ASB	aerated stabilization basin
AST	activated sludge treatment
AOX	absorbed organic halogens
BCTMP	Bleached Chemi-Thermo-Mechanical Pulp
BMA	Brian McClay & Associates Inc.
BOD	biochemical oxygen demand
CEAA	Canadian Environmental Assessment Agency
C:N	Carbon-Nitrogen Ratios
DFO	Department of Fisheries and Oceans
Dillon	Dillon Consultants Limited
DNR	Department of Natural Resources
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EEM	Ecological Effects Monitoring
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ESA	Environmental Site Assessment
ERINS	Ecosystem Research Initiative for the Northumberland Strait
ETF	Effluent Treatment Facility
ETP	Effluent Treatment Plant
EXP	EXP Services Inc.
FOTNS	Friends of the Northumberland Strait
HADD	Harmful Alteration, Disruption or Destruction
HHE	Human Health Evaluation

HHRA	Human Health Risk Assessment
km	kilometre
KSH	KSH Consulting
m	metres
m^2	square metres
m^3	cubic metres
m^3/d	cubic metres per day
m^3/sec	cubic metres per second
McKiggan Hebert	McKiggan Hebert Lawyers
MEKS	Mi'kmaq Ecological Knowledge Study
NAPS	National Air Pollution Surveillance Sites
NCASI	National Council for Air Stream Improvements Inc.
NBSK	Northern Bleached Softwood Kraft
NPNS	Northern Pulp Nova Scotia Corporation
NS	Nova Scotia
NSE	Nova Scotia Environment
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
OME	Ontario Ministry of the Environment
PLFN	Pictou Landing First Nation
PPER	Pulp and Paper Effluent Regulations
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RWS	Receiving Water Study
SGD	Submarine Groundwater Discharge
Stantec	Stantec Consulting Ltd.
TC	Transport Canada
TRS	total reduced sulfur
TSS	total suspended solids

UKP	Unbleached Kraft Pulp
VECs	Valued Environmental Components
VOCs	volatile organic compounds

Introduction

EXP Services Inc. (EXP) has been retained through McKiggan Hebert Lawyers (McKiggan Hebert) on behalf of the Pictou Landing First Nation (PLFN) to provide document review and advisory services as it pertains to the Northern Pulp Nova Scotia Corporation's (NPNS) bid to replace their existing effluent treatment facility (ETF).

The document review is based on information provided through McKiggan Hebert as it pertains to the existing effluent treatment system at the NPNS facility; the mechanical design of the proposed new ETF; the environmental studies and approvals associated with both the existing and approved ETF.

The document review will be provided in Chapters in this "living" document. As documents for review are added to EXP's mandate, they will be registered in this Introduction Section under the Document Register and a new Chapter will be added and referenced in the Document Register.

1.0 Reviewer Scope

EXP's mandate is to provide technical advice on the engineering, environmental and other technical aspects of the proposed ETF replacement project. EXP's reviewers are to examine each document provided by McKiggan Hebert and provide a brief, plain language synopsis of the report and outline any key deficiencies; errors and omissions; bias; applicable science; key findings; and any other points of interest. Some document reviews may be focused on a specific request or assignment from PLFN or McKiggan Hebert.

2.0 Reviewers

Redacted as per Section 20(1) of the FOIPOP Act

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Redacted as per Section 20(1) of the FOIPOP Act

Chapter 6 - Context for 2016 EEM Report

The "Context for 2016 EEM Report" is a one page cover letter that accompanied the 2016 EEM Cycle 7 report prepared by Dillon for NPNS. The purpose of the cover letter is to ensure that reviewers of the EEM Cycle 7 report understand that the monitoring report applies to the existing ETF System and not the proposed replacement.

The cover letter notes that while the EEM presented in the Cycle 7 report would be similar, it will not be the same. The new EEM will require to take into account any findings or actions from the EA report; will need to have new benthic and fish surveys completed; a new plume delineation study will be required; and will require new sampling locations to be defined. Overall, Dillon is noting that there will be significant due diligence required to properly update the EEM program should the proposed treatment facility move forward.

Chapter 7 - EEM Cycle 7 Interpretive Report for the Northern Pulp Nova Scotia Corp. Facility Near Pictou, Nova Scotia

The "EEM Cycle 7 Interpretive Report for the Northern Pulp Nova Scotia Corp. Facility Near Pictou, Nova Scotia" prepared by EcoMetrix Incorporated for NPNS in March 2016. This is a comprehensive review/summary of the Ecological Effects Monitoring (EEM) of the existing ETF at Boat Harbour from EEM Cycles 1 to 7. It gives a summary of work done and findings from EEM's 1 to 6 (1996 onward) and then the methods and results from the EEM Cycle 7 (2014 to 2015).

Work done is essentially limited to the PPER regulatory requirements and then, sometimes, modified from the results of prior years.

There is an Executive Summary that describes a bit of the history of the Plant and how the effluent is handled – noting that the 1% effluent concentration is highly variable in the receiving environment from many variables such as wind and tides. The summary then focuses on the EEM Cycle 7 dealing with:

- Sub-lethal toxicity of the effluent – concludes that even though effects (sea urchins and algae) are measured, what causes them is not clear.
- Benthic (Bottom) Macroinvertebrates (worms, snails, clams) – the Invertebrate Community Survey (ICS) showed variation, but not readily explainable – some exposure areas showed greater diversity and density, likely due to habitat variation as opposed to effluent discharge. They note that effluent is buoyant and so does not impact the bottom community easily.
- Fish – tries to answer two things noted in earlier EEM cycles:
    - Why the fish in Boat Harbour appear to be older than in reference areas – sampling gear? oxygen levels?
    - Why the fish in Boat Harbour have larger livers and higher lipid content – not diet?
- Supporting Environmental variables measured as other studies were carried out – chemical and physical aspects of the waters. Water chemistry from the mill (Boat Harbour) is measurable.
- Sediment Chemistry – as seen in other EEM studies, decreases in sulphide and higher C:N ratios were positive.

There is a lot of detail on each of these areas. All data from EEM 1 to 6 are summarized. The science looks as good as can be expected.

EXP concludes that, although there are measurable differences between exposed and reference sites, sometimes the differences are not what you would expect, and the reasons are usually unexplainable. Boat Harbour is essentially a treatment lagoon, but after the effluent is discharged, the differences are not clear nor dramatic. They conclude that it is not clear that the effluent is having any discrete effect, it is just suggestive and needs more monitoring.

1.0 Applicability to the Proposed Treatment System

Dillon goes out of its way with the "Context" page, before the main report, to make sure the reader does not confuse what they looked at for Cycles 1 to 7 as opposed to what type of EEM studies will be required with the new effluent discharge facility.

As Dillon noted, and EXP agrees, the discharge will happen in a much different place (at the bottom of the Northumberland Strait versus at the surface outlet from Boat Harbour) and will likely have a different chemical nature as it meets the receiving waters.

However, the EEM for the new system will have similarities to this methodology.

Discharge from plants such as NPNS will require a monitoring program with many of the same elements as in these studies (e.g., sub-lethal toxicity tests, benthic invertebrate community studies and water chemistry sampling).

The sampling program that will be laid out by ECCC will want to answer the question "Is the discharge having any effects on the receiving environment?" and, getting to your question...what they have been doing, in terms of approach, is what "they typically do".

This will involve a measure of how toxic the discharge is using standard toxicity testing of different concentrations on specific species, both animal and plant. This is also known as the "acute lethality of the discharge".

The impact zone is set at "where the effluent concentration has been diluted to 1%" and so they should measure where that zone is and sample for organisms and water chemistry inside and outside that zone.

Without getting into a detailed EEM plan, it should look at the chemical nature of the effluent, the benthic (bottom) communities around the discharge area, the potential effects on finfish moving through the area, and the impact on crab, lobster and scallop distribution.

There will likely be an amended version of the PPER created by ECCC and DFO for the new effluent facility with regulations for maximum levels of certain parameters in the effluent itself (e.g., total suspended solids (TSS), biochemical oxygen demand (BOD), acute lethality, sub-lethal effects, as well as the other potential impacts already mentioned).

Any proposed EEM program for the new system should also be available for review before it is implemented and will likely be included in the Provincial EA.

Chapter 9 - Preliminary Engineering for ETP Replacement Technology Selection Summary

The *"Preliminary Engineering for ETP Replacement Technology Selection Summary"* document was prepared by KSH for NPNS in July 2017.

General comments taken from the report are as follows.

1. Overall the report appears to have been developed as a PowerPoint presentation as opposed to a traditional Engineering report. A report of this significance (i.e. the main treatment technology review and selection) would benefit from a better overall structure with more defined sections including recommendations and conclusions. The report should also include some references where appropriate for some of the industry specific statistics that are provided.
2. Parameters such as flow, BOD, TSS and absorbed organic halogens (AOX) in the effluent per tonne of final product in the existing ETF system has improved from 2012 to 2016; in some cases, dramatically.
3. Current mill effluent flow ranges from 70,000 to 75,000 cubic metres per day (m^3/d). The report goes on to recommend a design flow for the plant of 85,000 m^3/d. It is not indicated whether this is an average daily flow, peak daily flow, or peak instantaneous flow – typically it would be recommend values for all of these flow capacities be defined. It also provides no description as to how this capacity was selected (i.e. was any future growth taken into account, how were ongoing water reduction efforts factored in, etc). Additional calculations should be provided to support the selection of this capacity.
4. Options for ETF included: aerated stabilization basin (ASB), activated sludge treatment (AST), and AST-like "high rate" systems, anaerobic treatment and tertiary treatment.
5. The use of moving bed bioreactor followed by activated sludge treatment seems to be a reasonable concept.
6. Selection of treatment technologies consisted of comparison between ASB and AST advantages and disadvantages. This selection was not guided by assessment of receiving water or environmental impact.
7. There is only one treatment process train so that if/when a treatment component is down for servicing, the process is either shut down or bypassed. This configuration seems to add a bit of risk for extended untreated by pass discharges. There should be multiple treatment trains.
8. Very little data is presented from the existing plant operations. Some average flows and contaminant loadings are provided in charts per metric tonne of final product. EXP would recommend that a summary table be provided to clearly define the effluent flow rate and the relevant contaminant concentrations in mg/L or similar applicable units.
9. The discharge limits or treatment objectives for the effluent treatment system are not given in the report. A summary of these limits should be provided.

10. The report summarizes two options for treating the D0 and E1 filtrate streams separately but neither are recommended.
11. The report discusses two options for modifications to the pulp making process that could reduce the downstream loading to the treatment system: extended delignification and oxygen delignification. The report rejects extended delignification outright but does not appear to reject oxygen delignification, however, nor does it specifically recommend it. If oxygen delignification is recommended, this needs to be clearly stated in the report as well as the impacts/benefits it might have on reduced loading to the downstream treatment system.
12. The report clearly identifies aerated stabilization basins (ASB), also known as an aerated lagoon) and the conventional activated sludge process as the two most prevalent treatment processes in the industry. The report does a good job of summarizing the key points of each treatment technology including the benefits and drawbacks. In general EXP is in agreement on the comments although detailed verification on the statistics given for the pulp industry was not completed and no references were provided. There are several reasons given for why ASB was ruled out and these seem reasonable. It is assumed that some investigation was done to determine that land availability would be an issue as no background was provided such as a site plan or property map.
13. The report goes on to briefly identify other technologies including several variations on the activated sludge process as well as anaerobic treatment. There is very little discussion other than a couple of bullets for each of these technologies with a bullet to state that conventional activated sludge process is the preferred technology. While EXP would not disagree that the final technology selection is potentially valid, this section would benefit from some significant discussion as to why these other technologies were rejected.
14. There is a final summary of potential tertiary treatment objectives and the recommendation is not to include tertiary treatment unless there is a very specific reason to do so. EXP would agree with this as a rule of thumb but the report does not provide enough information to independently draw conclusions as to whether tertiary treatment may be required in this case. Reasons could include specific contaminants that are untreatable by the activated sludge process or overly stringent discharge limits. With no summary of the contaminant concentrations or the effluent treatment objectives, it is difficult to comment on whether tertiary treatment might be required.
15. Some preliminary capital cost estimates may have helped justify any technology selections made.
16. The report would benefit from some basic process flow block diagrams to better illustrate the processes.

Chapter 17 - Draft and Final EEM Program

The "Environmental Effects Monitoring Program Investigations Associated with The New Proposed Treated Effluent Discharge Configuration at The Northern Pulp Nova Scotia Corporation Mill" was prepared by EcoMetrix Incorporated. The draft version was completed in August 2018 while the final version was issued in January 2019.

This review was based on the draft versions of the documents and amended where applicable based on EXPs review of the final document issued in January 2019.

This document was reviewed by Jim Foulds, Ph.D., EP and Steven Schaller, B.Tech., EP. Generally speaking this document contains the monitoring regimes that are being proposed for after the completion of the replacement ETF. One of the underlying comments that EXP noted is that it is suggested that any of the monitoring programs do not have to be completed for up to 24 months after commencement of discharge from the ETF. It would be expected that any discharge from the Plant would need to be tested prior to discharge into the environment. If this is going to be conducted, it was not discussed in this document.

It would be expected that a second version of this document would be created following the completion of the EA and will take into account any new regulatory requirements that are in place at that time.

1. The draft report describes the work that will be part of an EEM program if the EA is approved and the proposed outfall (12 km out) goes ahead as proposed. The final report was based on the revised outfall location that requires 11 km overland and 4km under water.
2. The report summarizes the many years of previous EEM studies to date – not sure of the relevance of that history since the effluent is being treated differently and discharged in a different manner. It I noted that both the draft and final documents nit that empirical confirmation of the predicted spatial extent of the effluent plume (as documented by Stantec in the RWS 2017 and RWS Addendum 2018) will be needed to support the EEM program design.
3. The work described has been derived from the PPER requirements as well as the EEM's technical guidance document from Environment Canada, i.e., it is designed to meet the requirements for effluent discharge for Pulp and Paper Mills in Canada.
4. This work will comprise a "first" program or cycle for the new effluent treatment and discharge location.
5. Elements of the work to include:
    a. Treated Effluent Plume Delineation – to verify the theoretical studies predicting certain dilution rates at 100 m from the diffuser – the "mixing zone".
    b. Biological monitoring of:
        i. benthic community "condition";
        ii. fish population health; and

iii. dioxins and furans levels in fish.

6. Page 14 - Plume delineation defines the "exposure area" to be where the concentration of effluent to seawater is periodically 1% or greater. They also define long-term conditions for this zone, but the definition is incoherent. Viz. …. "the zone within which effluent concentrations of 1% or greater, and 0.1% or greater would be regularly detectable."
7. Page 16 noted that the PPER state that monitoring of Benthic Communities is not required if the dilution from the diffuser is down to 1% within 100 m and Fish Population studies are not required if the dilution is down to 1% within 250 m of the diffuser.
8. The dioxins and furans sampling in fish tissues are also not required if the levels of dioxins and furans are below a defined amount in the raw effluent. Since these two groups have been below the defined PPER level for a number of years, the authors concluded that testing for dioxins and furans in fish tissue is not likely to be required. The final version of the document updated this section to note that annual testing for dioxins and furans would continue to be performed on the treated effluent.
9. The report describes, generally, the approach to be taken to monitoring if these studies are required. They give general approaches and state that detailed study plans will be developed as needed.
10. Fish population health is proposed to be measured by the effect on mussels. This has been done earlier and seems a reasonable alternative to assessing fish populations themselves, in Control and Exposed areas….. they move around too much!
11. In terms of a Work Schedule, they recommend doing a survey for the Benthic Community and the Fish Population health before any effluent is discharged as a baseline. The EEM from PPER does not require that any of this start before discharge of effluent begins. It will allow for more statistical analyses along a time axis, as well as a spatial one.

Chapter 18 - Draft and Final Follow-Up Studies

The "Follow-Up Studies Associated with The Environmental Assessment Process for The New Treated Effluent Discharge Configuration at The Northern Pulp Nova Scotia Corporation Mill" prepared by EcoMetrix Incorporated. The draft version was completed in August 2018 while the final was completed in January 2019.

The main difference between the draft and the final document is the reference to the change in the discharge point from the ETF from the initial option of a 12 km offshore pipeline to a 11km over land pipeline with 4 km in the water.

This document was reviewed by Jim Foulds, Ph.D., EP and Steven Schaller, B.Tech., EP. Generally speaking this document contains the proposed monitoring regimes that are being contemplated for after the completion of the replacement ETF. One of the underlying comments that EXP noted is that it is suggested that any of the monitoring programs do not have to be completed for up to 24 months after commencement of discharge from the ETF. It would be expected that any discharge from the Plant would need to be tested prior to discharge into the environment. If this is going to be conducted, it was not discussed in this document.

It would be expected that a second version of this document would be created following the completion of the EA and will take into account any new regulatory requirements that are in place at that time.

The document describes the proposed follow-up monitoring program to be completed following the Environmental Assessment process and commencement of the ETF Plant. The proposed monitoring plans include options for both baseline (preconstruction) monitoring and performance monitoring. The objective of the monitoring programs is to be able to evaluate the effectiveness of the new ETF by measuring its effect on the receiving environment.

1. The document notes that the proposed monitoring programs are considered provisional and may be revised based on feedback during the EA process.
2. Toxicity testing of treated effluent on lobster larvae and herring eggs looks good. Something similar will also be part of any required monitoring in the EEM program mandated by the PPER.
3. Baseline phytoplankton and zooplankton sampling not spelled out in terms of time should be done for 1 year before construction. There is so much patchiness and seasonal changes in these planktonic communities that any effect of the ETF will be undetectable. Seems to be work that we know will not yield useful data.
4. Why would vertical tows for zooplankton be restricted to the photic zone?
5. A focus on zooplanktonic lobster sampling seems like it is trying to assure fishers that they are looking after lobsters, but it really will not show anything better than the toxicity testing of the effluent.
6. Benthic community to be sampled every 500 m along outfall pipe corridor with a small bottom grab. This approach seems acceptable, but other aspects of benthic community structure will also be covered by the EEM program. The number of sample stations in the draft report was noted at 24 based on the length of

marine pipe, however the final document notes that there will be only 8 sample stations. The reduction in sample stations is only because of the reduction in the length of pipe required to traverse under water.

7. On Page 2.5, Section 2.5 there is a reference to a footnote "[4]" next to sediment sample analysis for acid-volatile sulphide and low level mercury however there is no foot note corresponding in the document.
8. Supporting Environmental Data: Long list of other parameters to be measured, but no rationale provided. Suspect these parameters will be refined through the EA process.
9. Water Quality Samples: There was no details on where these samples are to be taken in the water column. A rationale for these parameters would make a stronger case for the time and expense. It would be expected that water quality samples would accompany any toxicity testing samples, but this was not defined.
10. Fish Community and Fisheries Resource Characterization: The document notes that this type of study will not be completed and concludes that there is sufficient data from existing information.
11. Tissue Chemistry Testing: Done on a wide range of species found in the area, mostly those that are associated with the fishing industry. Need to sharpen that list of species and give a rationale for the items being measured.
12. The Proposed Schedule is overly simplistic and does not contain significant information.

Chapter 19 – Addendum Receiving Water Study

The "Addendum Receiving Water Study for Northern Pulp Effluent Treatment Facility Replacement Project – Additional Outfall Location CH-B, Caribou Point, Nova Scotia" prepared by Stantec in 19 December 2018 was reviewed by EXP.

This document was reviewed by Jim Foulds, Ph.D., EP and Fred Baechler, M.Sc., P.Geo.

Stated Rationale: Earlier study for effluent outfall indicated that a site, Alt-D, in the Northumberland Strait, was the preferred outfall location. Subsequent field investigations of the Alt-D location indicated that ice scour at that depth (11 m) would preclude that site and so alternate sites were required – at greater depths. This report attempts to do this and is an Addendum to the Stantec (2017) document[1].

Stantec identified (but don't explain how or why) a new alternative outfall location - offshore of Caribou Harbour, off Caribou Point. They picked 2 locations, CH-A and CH-B at 25 and 20 m depths respectively.

They applied the same modelling (MIKE 21 and CORMIX) as was done for the earlier study (Stantec, 2017). These models are industry standards for this type of assessment. The approach Stantec has taken – with conservative assumptions for dilution and dispersion (Table 2.1) – is well-founded.

Stantec conclude that dilution, dispersion and meeting compliance levels of discharge elements (parameters of concern) would be achieved by a 3-port diffuser at CH-B. Modelling results also suggest this design would be better than the 6-port diffuser at Alt-D and a 3-port diffuser would take up less space on the bottom of the ocean.

Far-Field Modelling:

Modeling of far-field dispersion characteristics indicated that CH-B was better at dispersing the discharge. Results under various tidal conditions in Figures 2.5 to 2.13 seem to indicate concentrations in surface waters but they only demonstrate the concentrations from the CH-B model. For comparison, CH-A should also be shown. Further, the locations of CH-A and CH-B should be shown on each of these Figures for relative notation of the predicted concentrations shown. There is no figure to show dispersion throughout the water column, ie a cross section.

Near-Field Modelling:

Used the same approach (CORMIX model) as in the 2017 study. They compare a one port and three port diffuser design and conclude that a 3-port diffuser at CH-B would be better than at the Alt-D location and without the issue of ice scour.

Ultimate Recommendation from this report:

Change the design and location of the diffuser – i.e. a 3-port diffuser at CH-B.

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[1] Stantec Consulting Ltd. (Stantec). 2017. Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement, Pictou Harbour, Nova Scotia. August 2017.

EXP commentary:

1. The Alt-D site has received an enormous negative public response – especially from the fishing community. This new site for the diffuser/outfall takes it away from "highly valued" fishing grounds and puts it beside the ferry routing between Caribou, NS and Wood Islands, PEI. It also reduces the length of the underwater transmission footprint.
2. The report does briefly discuss the role of ice conditions by saying more dilution/dispersion is expected under winter ice regimes. However, Table 2.1, which summarizes conditions and assumptions used in hydrodynamic modelling, doesn't outline how ice is modelled e.g. extent, thickness, type.
3. There is no mention of sea level rise in this or the main report of the engineered life time of the facility. This becomes important in addressing the impact/adaptation strategies required for handling changing climate; in particular sea level rise for this assignment. There is no indication in either report of how the modelling results would differ with rising sea level.
4. The modelling exercise appears to focus on dilution/dispersion of the effluent as dissolved load within the water column. EXP hasn't noted anything in either report on the impact of natural suspended sediment loads in the Northumberland straits after large storm events. This suspended sediment may act on the positive side to ad/absorb contaminants. However, the key for impacts is then to determine where this sediment would settle out, which maybe much farther away than 100 m discussed in the report. Assessing this transport method would also require:
    a. sedimentological transport modelling;
    b. an assessment of natural concentrations for the COCs in existing fine grained sediment deposition areas; and
    c. biological assessment of what is present in those deposition areas.
5. Sub-marine Groundwater Discharge (SGDs) are becoming more important worldwide in understanding the interaction between fresh terrestrial and saline marine waters. Freshwater sub-marine springs can be critical in supporting local, diverse biological communities on the sea floor. There is no discussion on whether such ecosystems are present at the diffuser site locations.

3.3 Section 3.0 Regulatory Environment

The Federal Agencies and Departments have been waiting for the submission of the EARD to make their decision as to whether a Federal CEAA will be required. The EARD references that several consultations have been made with Federal regulators. Copies of these correspondence should be made available to PLFN.

This Section also identifies the following studies, which EXP would consider significant to the EA, that need to be completed:

1. Marine benthic habitat study along the proposed pipe line route.
2. Geotechnical Assessment.
3. Harmful Alteration, Disruption or Destruction (HADD) of Fish Habitat Assessment for the Pipeline and the water crossings.
4. Archeological Assessments along the new route, to be started in 2019.

Risk that a "listed species" was not seen because of the wetland survey was done in December.

Section 3.4 Other Relevant Guidance notes the guidelines being looked at as it pertains to the project. Omitted from the list is the Federal Wastewater System Effluent Regulations.

3.4 Section 4.0 Project Justification and Alternatives Considered

This section presents the project alternatives, but EXP is of the opinion that the section has a slight bias towards the chosen project option.

The original outfall location was abandoned ostensibly because of the potential for ice scour and yet the design of the new outfall location will be engineered to resist ice scour damage.

The section does present some information on the performance of the chosen system in an existing application in the United States where the effluent discharge is to a fresh water stream. EXP recommends that the Environmental Effects Monitoring that has been completed on similar facilities be reviewed as a comparison of similar installations from around the world.

3.5 Section 5.0: Project Description:

Section 5.2.2: It is noteworthy that the regulatory compliance point is positioned before the effluent enters the transmission pipeline and so the regulators are not including natural attenuation in the Strait as part of the treatment chain.

Section 5.2.2.3: Discussion on the Spill Effluent Basin that will be used to add retention time of 10 to 13 hours of effluent diversion if needed. The EARD notes that the basin should never be full but there is no mention of what controls will be in place to monitor the ponds level and prevent overfilling. This basin will be located between 80 to 100 metres from the Harbour with only an elevation change of 5 to 6 metres.

Section 5.2.3: While the report identifies that the spill collection system basin will be lined. However, since the basin is apparently open to precipitation what is the design storm for the basin so that it doesn't overflow? What happens if the effluent still doesn't meet specs prior to overflow?

Section 5.2.2.8: Appropriate to see that the sludge management system allows for burning to create energy.

Section 5.3.1.10: Pipe Installation – Marine Portion. This section notes that the trench will be 3 metres deep and will affect a 13 m wide swath. Further details on the pipe installation we presented in Appendix F.

Appendix F contains the Pipeline Conceptual Design and Construction Methodology Report prepared by Makai Ocean Engineering Inc. EXP's review of this report revealed the following:

1. Pages 14-15. The proposed trench cross section is approximately 3 m deep and 13 m wide and almost 4 km long. Per kilometer, the estimation is approximately 13,500 m^3 of material that needs to be removed for the trench. 156,000 m^2 of sea bed will be disturbed without considering additional area from over-excavation. If the side-casting method for dredged material is used, that could affect twice that area of sea bed.

   The report should mention considerations from an environmental/resource perspective looking to either minimize habitat destruction or establish a zone of ground fish/shellfish over fishing in an effort to harvest existing resources there instead of simply mulching it up and burying it. Perhaps this will follow with some of the further assessment work to be completed in 2019.

   Page 21. In three instances, utilizing a grading beam to regrade the trench backfill, after pipe installation is complete, was mentioned. Pulling a submerged bar blindly through possibly turbid water while trying to follow the previously dug trench, that is not visible from the surface, seems quite difficult to ensure quality and effectiveness of the backfilling procedures without doubling or tripling the impact on the adjacent ecosystem. What considerations are in place to ensure the grading beam stays within the trenches foot print and what tolerances are expected under normal operation conditions with the grading beam method?

2. Understanding the sea floor soil conditions will guide the proponent on how to handle the dredged materials. This is an unknown variable at this point but in a theoretical situation where a large quantity of the dredged material is classified as contaminated, what method of trench development would be most cost effective? There was a brief mention in the document about NSE Guidelines for Disposal of Contaminated Solids in Landfills. There is a large cost associated with transporting contaminated materials to a landfill facility capable of accepting the materials. Would a method such as the ploughing method, where sea soil material is displaced then reinstated almost immediately while burying the pipe at the same time, provide economic and environmental incentives? If so, it would be a good idea to include something in the literature to identify whether it as a viable option.

Will there been any chemical testing along the trench to assess the types and concentrations of contaminants that may be disturbed as a result of the dredge?

Section 5.3.2 Operation and Maintenance Phase: notes that through the NPNS O&M manuals there are already existing EMP provisions. If they have an existing EMP manual for their current ETF then it would be appropriate to request a copy of this document for review to assess what potential care for the environment will be employed with any future EMP or EPPs developed.

Ongoing maintenance issue: What materials are used to clean the effluent pipe along its length? Would there be caustic chemicals that are discharged into the Northumberland Strait?

Section 5.6.5: How will heavy equipment be fueled up - on-site at specially designed locations?

Section 5.6.6 Surface Run-off and Sedimentation. Noted in this section and elsewhere in the EARD the proposed pipe line will follow along the existing roadways and make use of the shoulder for the installation of the pipe. There are several drawings and schematics that show the route. On these schematics it shows that the shoulder will be expanded in most cases to accommodate the pipe installation. The EARD seems to rely heavily on the fact that this is an existing roadway as the mitigation factor for potential risk (surface run ff and sedimentation). As a result EXP has identified the following points to consider:

1. Has NSTIR approved the use of their road system?
2. There will still be a requirement for water crossings with the most significant being across the causeway through the harbour.

Section 5.7.2.3: provides just general comments on sediment erosion control plans. EXP trusts that regulatory stipulations applied to permits will required detailed plans for review, including monitoring and compliance points/parameters/concentrations.

Section 5.7.2.4: How and where will grubbings be disposed of?

Section 5.7.2.6: provides general comments on water crossings. EXP trusts that the detailed plans required as a results of regulatory stipulations applied to water crossing permit application, will be provided for review.

Section 5.7 general: What quarries will provide aggregate and fill materials? Do they have permits? Has the quality of the aggregate been tested for sulfide bearing capacity and/or acid rock drainage (ARD) potential.

3.6 Section 7.0: Environmental Scope and Methods

Acceptable approach to defining Valued Environmental Components (VEC's) and their boundary conditions.

To better define temporal boundaries they should identify what is the expected life time of the facility.

Table 7.4-1 doesn't include:

1. No mention of odour from the new ETF;
2. Continued impact to PLFN, Town of Pictou or tourism industry as a result of odours.
3. Springs, Pictou well field and domestic wells not included under groundwater
4. Submarine groundwater discharge zones not included under Harbour physical Environment

3.7 Section 8.0: Environmental Effects Assessment

Section 8.3.2 Discussion of surficial geology doesn't include:

1. sand/gravel outwash plain which forms one of the aquifers from which town Pictou draws water from
2. natural geochemistry of overburden materials.
3. Discussion of erosion potential doesn't identify natural inherent erodibility factor of soils and glacial materials

Section 8.3.2 Discussion of bedrock geology doesn't include a discussion of any natural mineralization.

Section 8.3.3.3 Discussion of characterization of residual effects during construction phase doesn't discuss where grubbing materials will be disposed of and how.

Section 8.4.1.2 It was indicated that no watercourses were identified as potable water sources- but did they check in the field and talk with residents? How did they define watercourses – from existing mapping or in the field?

Section 8.4.2.2: Did water quality monitoring between 2012 and 2017 include discharge and stream sediment geochemistry? Where the analyses on filtered and/or non-filtered samples? Based upon the program what statistics were applied to determine "background" conditions and identify anomalous situations? Any monitoring of where grubbed materials placed?

Section 8.5.1: Groundwater VEC – scope doesn't include the well head protection area for the Town of Pictou's Caribou well field; although it is mentioned later.

Section 8.5.2: Did they augment the well log data base search with field inspections?

Section 8.5.3.2: Appropriate to see that where the pipeline route crosses the Town of Pictou's source water protection area that additional mitigative measures will include lining the trench with an impermeable material to contain any leak and a leak detection system. However, a review of the details of that design should be undertaken by at least Town of Pictou personnel prior to construction.

Section 8.7.2.3: Text notes that as an alternate pipeline route was selected in fall 2018 only preliminary recon visits of the new pipeline footprint area undertaken in late fall. The text Indicates follow up work to be undertaken in spring summer 2019. The resultant report should be reviewed.

Section 8.11.2: Submarine groundwater springs are not included in Harbour physical environment.

Section 8.18: The impact of sea level rise is not included in the effects of the environment on the project

Section 8.18.4.1: Why use wind data from Halifax Airport – nothing closer?

Section 8.18.4.2 Discussion of seismicity doesn't include discussion of related tsunami events from submarine landslides

Section 8.18.6: Appropriate that the project should be designed to 1:100 - 24 hr duration flood event during construction period. Will require review of that design prior to construction

3.8 Section 9: Human Health Evaluation

The Human Health Evaluation (HHE) section is presented primarily as a scoping exercise to define what NPNS will assess should they be regulated to complete a Human Health Risk Assessment (HHRA).

The HHE notes that PLFN will be a key receptor but they note that it would not be feasible to have health surveys completed in the FN community. It is noted that data will be based on existing studies and literature, if they are not able to complete the Surveys.

The HHE notes that "many" if the chemicals in treated effluent and air emissions will be treated as COPC. They note the limitations associated with not having the actual effluent available to analyze as well as not having the completed ETF design to fully develop the COPCs. The HHE also notes that there will be an effort to utilize screening approaches to reduce the lists for COPC down to a reasonable and representative list. It would be suggested by EXP that if the engineering design is not able to clearly define what will be in the effluent, than caution should be employed as it pertains to how many elements are screened out of the list of COPCs.

The Air emission COPCs are being restricted to only those that are regulated or stimulated in the existing environmental approval.

The HHE section reviews the Air Dispersion Modeling study (also reviewed in this Document, Chapter 12) and basically refutes the claim that VOCs are associated with NPNS and further note that VOCs will not be considered any further at this time.

The HHE notes that AOX will likely be omitted from any future HHRA as AOX is type of analysis that covers a multitude of compounds. This does not mean it should not be assessed or included in any monitoring.

They will be looking to use some of the data and concentrations from the Toxikos HHRA to serve as an indication of what the NPNS plant might produce.

- The HHE notes that there were at least four (4) previous HHRA associated with the Boat Harbour Site. It noted that there were not reviewed in detail but that they contained conclusion that there were no risk to human health under reasonable or realistic exposure scenarios for the COPCs.
- There was a sample collected in 2018 of the raw effluent that was found to contain: "hydrocarbons, toluene, cyanide, metals and metalloids, phenol, o-cresol, a phthalate ester compound (likely from pipe materials rather than due to mill processes), chloroform, total trihalomethanes, and trace PAHs (phenanthrene and pyrene only)". There was no note how these parameters and concentration compared to any guidelines, jus that they were detected in the sample.

A review of the sediments from the existing Boat Harbour settling pond may provide useful insight into some of the expected chemicals of concern. This information should be publicly available as part of the Boat Harbour Remediation Project.

3.9 Section 10.0: Accidents, Malfunctions and Unplanned Events

Risk of pipeline break/leak. Dealt with in Chapter 10. E.g., What would be the effect of a break in the well field for Pictou or Caribou?

Risk of diffuser caught in a bottom trawl.

Risk of the diffuser being fouled by an anchor.

Risk of ice scour.

Risk of the berm forming the walls of the spill basin having a failure resulting in a spill or release of contained effluent. Not mentioned was an overfill of the spill basin resulting in an overflow.

Domestic wells may be impacted by a pipeline spill. Is there a contingency plan for a compromised water supply?

Surface water might be threatened by a spill during the operational phase but is not addressed in Section 8. Not mentioned for the Groundwater section either.

Risk of pipeline spill from road accidents on bridge.

Section 10.2.7: Vehicle accident – no discussion of spill during fueling heavy equipment

Section 10.5: The text notes that an EPP for management and prevention of such accidents will be developed. It will also develop effective response mechanisms for accident, malfunctions or unplanned events. This will require review.

3.10 Section 12.0: Cumulative Environmental Effects Assessment

Table 12.1-2 identifies activities with environmental effects that might overlap those of the proposed project. There is no discussion of tourism, increased traffic on road to Ferry terminal, road wash runoff.

Section 12.3.10.3: The EIA quite rightly focuses on significant negative impacts. Perhaps it should also provide a discussion of significant positive impacts of the proposed work.

3.11 Section 13.0: Follow-up and Monitoring Summary

Follow up and monitoring is critical to ensure that the non-significant impacts stay non-significant. The Environmental Effects Monitoring (EEM) program is entirely compliance driven – as per the PPER and EEM program obligations. The programs should also give consideration to assessment of any collected data to background and baseline conditions, not just stipulated compliance values.

The significance of impacts is compliance driven and, for the marine component, are at 100 m from the diffuser. This means that the baseline assessment area would be a circle of 100 m diameter which would be roughly 31,416 m^2 or 5 football fields to give some perspective.

The text notes that monitoring programs identified are conceptual and presented at a relatively high level. As project advances through detailed design, permitting, construction and into operation and as follow-up or monitoring programs are carried out the methodology for each program will be documented and adjusted as

necessary to meet the environmental protection requirements or commitments. These changes will need to be reviewed not only in their design – but how the data will be utilized – by whom – how often - who will analyze – what are the action levels etc.

3.12 Appendix K

3.12.1 Background

The Stantec report was conducted to support the Environmental Assessment for the replacement of the Effluent Treatment Facility (ETF) owned by the Government of Nova Scotia and operated by the Northern Pulp Nova Scotia Corporation, located at Abercrombi Point, Pictou County, Nova Scotia. The stated objective of the Stantec report is "to assess the potential effects of the existing operation of the Facility with the existing wastewater treatment system in place and the future operation with the new wastewater treatment system in place, on air quality in the region around the pulp mill."

EXP's scope of work is to conduct a peer review of the Stantec report and provide a professional opinion on its suitability as an assessment of the potential effects on air quality in the region around the pulp mill.

The following report reviews the approach, findings, and recommendations of the Stantec report and provides recommendations in regard to an assessment of the potential effects on air quality in the region.

3.12.2 Assessment

3.12.2.1 Documents Reviewed

The following documents were provided for review:

- Dillon Consulting, January 2019. Appendix J2 Environmental Assessment Registration Document Replacement Effluent Treatment Facility.
- Stantec Consulting Inc., Appendix K1, Air Dispersion Modelling Study – Replacement Effluent Treatment Facility. January 21, 2019.
- Stantec Consulting Inc. Comments on Paper – Pilot study investigating ambient emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia by Hoffman et al (2017 a b). June 15, 2018.
- Northern Pulp's Industrial Approval 076657-A01.

3.12.2.2 Assessment of Method

Stantec conducted air dispersion modelling of contaminants regulated by the Government of Nova Scotia under the Air Quality Regulations, as amended on October 12, 2017 as well as fine particulate matter (PM2.5). The air dispersion modelling program used was AERMOD Modelling System promulgated by the US EPA and approved for use by Ontario and Nova Scotia regulatory authorities. The analysis of the modelling results is based on Air Dispersion Modelling Guideline for Ontario [Guideline A-11] (ADMGO) due to the absence of a suitable air dispersion modelling guideline adopted by the Province of Nova Scotia.

3.12.2.3 Choice of Model

The choice of models for a scenario depends on the scale of the sources and complexity of atmospheric and topographical conditions. The U.S EPA AERMOD modelling system is a Gaussian-plume model which accounts for the majority of dispersion modelling scenarios. Gaussian-plume models assume spatial uniformity in meteorology. In situations of complex terrain or near coastal boundaries significant changes in meteorological conditions can occur over short distances. The proposed ETF is located 0.2 km from the coast line with other on-site sources with elevated stacks located within 0.35 km of the shoreline, therefore, special consideration for shoreline fumigation is required (i.e. the use of fumigation option within AERMOD or advanced models e.g. CALPUFF.)

AERMOD requires specific model input data representative of site and source conditions and accurate emissions inventory. It is important to note that the model input and output data files were not provided and therefore cannot be verified.

EXP Review Findings

- Details on calculation of emission rate estimates were not provided.
- Assessment of quality of emission rate factors were not provided.
- The model input and output data files, typically attached as a CD or flash drive, were not provided, therefore, the input and output parameters cannot be verified.
- Modeling results for 10-min averaging time were not assessed.
- Use of fumigation option is not stated.

EXP Review Recommendations

- Provide model input and output electronic files to verify model parameters and model processing.
- Provide details on calculation of emission rates as recommended in the Ontario Procedure for Preparing an Emission Summary and Dispersion Modelling Report version 3.0 PIBs # 3614e03 (ESDM Procedure)
- Provide an assessment of quality of emission rate factors as recommended in the ESDM Procedure.
- Assess for 10-minute time averaging in accordance with ADMGO

3.12.2.4 Air Contaminants of Interest and Assessment Criteria

The following air contaminants of interest were assessed based on those regulated by the Government of Nova Scotia under the Air Quality Regulation, as amended on October 12, 2017, as well as fine particulate matter (PM2.5) as regulated under the Norther Pulp's Industrial Approval # 076657-A01:

- carbon monoxide (CO)
- hydrogen sulphide (H_2S)
- nitrogen dioxide (NO_2)

- sulphur dioxide (SO_2)
- total suspended particulate matter (TSP)
- fine particulate matter ($PM_{2.5}$)

It is well recognized that pulp and paper facility and ETF process operations emit more air contaminants than the priority pollutants assessed. Volatile organic compounds (VOCs) and total reduced Sulphur (TRS) compounds consisting of H_2S, methyl mercaptan (CH_3SH), dimethyl sulphide $(CH_3)_2S$), dimethyl disulphide $(CH_3)_2S_2$), and chlorinated compounds are potentially emitted by the kraft (bleached) pulping process. Established emission factors for additional contaminants than assessed from the pulp and paper making processes, co-combustion of hog fuel, and wastewater sludge incineration are available in the reference chosen (AP-42 Chapter 1.6 Wood Residue Combustion in Boilers, Sewage Sludge Incineration AP-42 Chapter 2.2) as well as within AP-42 Chapter 10.2 Chemical Wood Pulping.

The assessment of future operations should also consider the potential of changes in regulatory criteria in the future. In particular, sulphur dioxide which in Ontario will be reduced from 275 µg/m^3 (1- hour) and 690 µg/m^3 (24-hour) to 100 µg/m^3 (1 -hour) and 10 µg/m^3 (annual) in 2023.

EXP Review Recommendations

- Provide a source summary table for all contaminants emitted from the ETF and the Kraft Pulp Mill facility in accordance with the ADMGO, including a full rationale for justification of any contaminants deemed insignificant.
- Identify emission factors representative of the processes to assess potential contaminants of interest not included in priority contaminants assessed. (e.g. AP-42 Chapter 10.2 Chemical Wood Pulping, Table 10.2-1 lists Methyl mercaptan, Dimethyl sulfide and Dimethyl disulfide emissions (Emission Factor Rating: A); AP-42 Chapter 1.6 Wood Residue Combustion in Boilers; and AP-42 Sewage Sludge Incineration Chapter 2.2, Table 2.2-3.)
- Assess emissions of odourous contaminants at 10- minute time interval based on criteria in Ontario Air Contaminants Benchmark (ACB) list.
- Consideration should be given to the potential of changes in regulatory criteria, in particular sulphur dioxide, in the assessment of future operations scenario.

3.12.2.5 Emission Inventory and Emission Factors

The Facility rates of emissions for CO, NOx, SO_2, TPM were based on Facility stack emission testing reports and H_2S based on Site specific data for TRS. The ETF emission rate was based on site testing at the Boat Harbour ETF in 2012. While the use of source testing data typically has a high emission factor rating (A – high quality) it should be noted that no speciation or details on Total Reduces Sulphur (TRS) monitoring and emission factor rating are provided. It is recognized that the majority of the TRS Compounds emissions (facilities that are part of the class identified by NAICS code 3221 (Pulp, Paper and Paperboard Mills) are Facility emissions, with H2S emissions from

the ETF are less than 1.2% of total H_2S emission, however, the total H_2S emissions for the future operations has increased by more than 3 times.

Emission factors used, for burning of sludge, by Stantec were US EPA AP-42 Chapter 2.2 Sewage Sludge Incineration for CO, SO_2, NOx, TSP, and $PM_{2.5}$. Both this reference and AP-42 Chapter 1.6 Wood Residue Combustion in Boilers lists other contaminants of interest that were not included in the assessment. Regardless of emission factor reference consideration should be given to assess all contaminants of interest within the reference chosen.

EXP Review Recommendations

- Provide a source summary table for all contaminants emitted from the ETF and the Kraft Pulp Mill facility in accordance with the ADMGO.
- Provide sample calculations detailing emission rates determined, significance of contaminant, and emission factor rating in accordance with the ESDM Procedure.
- Include assessment of emissions of potential contaminants from co-combustion of sludge and hog fuel in addition to priority contaminants.

3.12.3 Model Results

Stantec states that based on the modelling results, with the exclusion of meteorological abnormalities, the existing and future operations meet the criteria for carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulate matter (TSP), and fine particulate matter (PM2.5). Modelling was not conducted for TRS species or assessment at 10 min criteria, and wood-sludge co-combustion emissions.

EXP Review Recommendations

- Provide model input and output electronic files to verify model parameters and model processing.

3.12.4 Conclusion

EXP cannot verify Stantec's findings without provision of the model input and output files and supporting calculations for emission rates as identified above. Further the assessment is restricted to priority pollutants regulated (CO, H_2S, NO_2, SO_2, TSP, and $PM_{2.5}$) without consideration of other potential pollutants associated with the pulp and paper process or wood residue combustion in boilers.

3.13 Appendix R

Appendix R is a literature review summarizing what is known about the effects of BKME (Bleached Kraft Mill Effluent) on lobsters. It concludes that any studies done before have used the former effluent - not the new effluent and so there should be studies to look for effects of the new effluent on lobster.

Appendix R also generally concludes that most studies to date all indicate little to no effect on the benthic animal community - including lobsters.

This being stated, EXP identifies the need for an additional study to better delineat the lethal and sub-lethal effects of treated effluent on larval and adult lobsters.

Northern Pulp

Tertiary Treatment Study

Pictou Landing First Nation

DRAFT

ADI Limited

Report: (34) 6716-001.1
Date: March 2011

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ADI Quality System Checks	
Project No.: (34) 6716-001.1	Date: *2011 March 31*
Issue Status: DRAFT	Revision No.: 0
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Executive Summary

Boat Harbour, a small body of water located just to the south of Pictou Landing First Nation that flows into Pictou Road, was incorporated into a wastewater treatment facility in 1967 when the facility was constructed by the Province of Nova Scotia as part of an agreement for the construction of a kraft pulp mill at Abercrombie, NS. Currently, the source of wastewater being treated in the facility is the pulp mill owned and operated by Northern Pulp Nova Scotia (NPNS).

It has been recognized that the use of Boat Harbour as a component of the wastewater treatment facility needs to be re-evaluated. A commitment has been made by the Provincial Government to address the issue of returning Boat Harbour to a natural state and to provide solutions to the decades-long problem. The objectives of this study are:

1. Consider additional effluent tertiary cleaning processes that would be applicable to kraft pulp secondary wastewater treatment systems which could result in improved effluent quality;
2. Evaluate the required level of tertiary treatment required for direct discharge into Pictou Harbour;
3. Summarize the Provincial and Federal permits and water-quality testing and quality requirements for discharging secondary and tertiary treated wastewater;
4. Identify any scheduled or anticipated changes in kraft pulp discharges (both Provincial and Federal);
5. Summarize all Municipal, Provincial and Federal discharge regulations for effluent discharges in Pictou Harbour;
6. Identify potential business opportunities to use the waste heat from the tertiary treated effluent (potential of 15,950 m^3/d at 43^{o}C); and,
7. Provide probable costs (±30%) for additional treatment, outfall options and associated equipment.

Maintaining just a secondary level of wastewater treatment and bypassing Boat Harbour will require that the effluent discharge point be relocated out into the Northumberland Strait. Conversely, if tertiary treatment is added, it may be possible to discharge the effluent into Pictou Harbour resulting in a shorter (and more economical) outfall. Several tertiary treatment systems were investigated for their appropriateness in treating pulp mill wastewater after secondary treatment. They are:

1. clarification
2. ozone addition;
3. engineered wetlands;
4. enhanced filtration; and,
5. membrane filtration.

Of these, the first three are of the most interest from a technical and financial perspective. The last two, while technically feasible, would be significantly more expensive and likely cost prohibitive.

There is also the potential for capturing a quantity of heat that is being released with the wastewater. The secondary treatment system would benefit in its operation if the pulp mill effluent temperature was reduced to less than 30^{o}C. A wastewater temperature any higher than 30^{o}C increases the difficulty of treating the wastewater as well as the operational costs. However, reducing the mill effluent temperature also reduces the amount of thermal energy available for recovery by potential external users as well as the potential uses for such low-grade thermal energy.

The operation of the wastewater treatment system for the pulp mill falls under federal jurisdiction (Pulp and Paper Effluent Regulations (PPER) under the Fisheries Act). While some provinces regulate the wastewater effluent quality generated by pulp and paper mills, Nova Scotia does not. As such, the current quality of the wastewater treatment plant effluent meets the requirements of the PPER.

There are no anticipated changes to the PPER, or any other regulations, that would impact on the current wastewater treatment plant operation. As well, there are no technical or regulatory reasons to prevent discharging the current treatment plant effluent to Pictou Harbour. However, aesthetically, the conditions within the harbour would, in all likelihood, deteriorate due to the size of the harbour and the volume of the effluent. Discharging effluent directly to the harbour would benefit from the addition of a tertiary treatment process following the secondary wastewater treatment system.

Various opportunities have been presented that would benefit from the waste heat being discharged in the treatment plant effluent. All of the opportunities have focussed on the non-contact use of the effluent; the use of the treated effluent in a direct-contact manner is deemed not feasible. In most cases, the quality of the water is not of a major concern; the water should be "clean" enough to be utilized in a heat exchanger with minimal fouling.

The opportunities examined included:

- District heating;
- Lumber drying;
- Power generation;
- Aquaculture; and,
- Agriculture.

As well, the mill could investigate the feasibility of reclaiming the heat to pre-heat the raw water for the appropriate processes requiring "hot" water. Regardless of the end use, the wastewater treatment process would benefit if the heat was removed prior to the wastewater being introduced into the secondary treatment system.

The district heating option, in and of itself, would not be considered feasible since the existing building density/building types in the vicinity of the mill are not conducive to that type of an operation. There may be possibilities within an industrial park complex adjacent to the mill configured to attract a cross-section of businesses that could make use of the waste heat year round.

Using the waste heat for lumber drying, only, particularly with the current state of the lumber industry, may be a difficult opportunity to promote.

Both the aquaculture and agriculture industries are well established in Nova Scotia. Using the waste heat in the agricultural industry, however, may require a different business model than currently practiced. Most greenhouse operations that would benefit from this heat source are seasonal whereas a year-round operation would be better suited to take advantage of this heat source. Conversely, a land-based aquacultural operation would require the heat on a continuous basis throughout the year.

"Green" power generation, on the other hand, could be located at the mill site. The infrastructure is, for the most part, already in place to accept the extra power allowing it to be used at the mill or to be introduced onto the grid.

Various costs have been presented for the three tertiary treatment options deemed most appropriate for treating the pulp mill wastewater prior to discharging to Pictou Harbour, though the costs are, for the most part, for illustration purposes. The costs vary from $ 7.8 M to $ 17.4 M. If effluent from a tertiary treatment plant being discharged to Pictou Harbour appears economically feasible, the process(es) need to be pilot tested to determine design criteria as well as the quality of effluent that could be produced.

Similarly, costs for the two discharge options have been determined. More accurate cost information would be made available once the actual discharge point is chosen, an environmental assessment of the project is undertaken, and preliminary design work is completed. For comparison purposes, the cost of the Pictou Harbour outfall is in the order of $ 7.13 M whereas the Northumberland Strait (MacKenzie Head) outfall is $ 23.76 M. In the event that the discharge point has to be moved further out into the harbour or ocean from the point(s) shown, the additional underwater piping cost will be in the order of $300,000/100m.

1.0 Introduction

1.1 Background

Boat Harbour is a small body of water, located just to the south of Pictou Landing First Nation, that flows into Pictou Road, a bay that connects Pictou Harbour to the Northumberland Strait. Boat Harbour was incorporated into a wastewater treatment facility in 1967 when the facility was constructed by the Province of Nova Scotia as part of an agreement for the construction of a kraft pulp mill at Abercrombie, NS. Currently, the source of wastewater being treated in the facility is the pulp mill now owned and operated by Northern Pulp Nova Scotia (NPNS).

It has been recognized that the use of Boat Harbour as a component of the wastewater treatment facility needs to be re-evaluated; previous studies have examined options for alternative treatment processes and effluent discharge points so Boat Harbour can be returned to a natural state[1,2].

1.2 Objectives of Study

A commitment has been made by the Provincial Government to address this issue and to provide solutions to this decades-long problem. The objectives of this study, as presented to ADI Limited in an RFP dated May 24, 2010, are:

1. Consider additional effluent tertiary cleaning processes that would work on kraft pulp secondary wastewater treatment systems which could result in improved effluent quality;
2. Evaluate the required level of tertiary treatment required for direct discharge into Pictou Harbour;
3. Summarize the Provincial and Federal permits and water-quality testing and quality requirements for discharging secondary and tertiary treated wastewater;
4. Identify any scheduled or anticipated changes in kraft pulp discharges (both Provincial and Federal);
5. Summarize all Municipal, Provincial and Federal discharge regulations for effluent discharges in Pictou Harbour;
6. Identify potential business opportunities to re-use tertiary treated effluent (potential of 15,950 m^3/d at 43°C); and,
7. Provide probable costs (±30%) for additional treatment, outfall options and associated equipment.

It must be noted that any reference to wastewater treatment made in this report focuses on **tertiary** treatment, a treatment process that would follow secondary wastewater treatment. Previous reports[1,2] have addressed the possible secondary wastewater treatment process and their associated costs.

[1] "Evaluation of Effluent Treatment Alternatives", AGRA Simons, Project J632A, Feb 2000
[2] "Boat Harbour: Return to Tidal Re-Evaluation", AMEC, April 2010

2.0 Pulp Mill Wastewater Effluent Treatment

2.1 Secondary Treatment vs. Tertiary Treatment

2.1.1 Secondary Wastewater Treatment

There are varying levels of wastewater treatment available to municipalities and industry to remove pollutants from their wastewaters. Primary or chemically-enhanced primary treatment is used in many municipalities to remove solids, floatables and, to some degree, BOD (organics). A recent strategy proposed by the Canadian Council of Ministers of the Environment (CCME)[3] and currently under review by the Federal Government[4] would require municipal wastewater treatment systems to meet a National Performance Standard. To achieve this, secondary wastewater treatment technology is required; secondary treatment utilizes biological systems to consume the organics followed by solids removal devices (clarifiers, dissolved air flotation units, filters, membranes, etc.) to remove the pollutants allowing the discharged effluent to approach the quality of the receiving stream. The CCME strategy, currently under review by the Federal government, does not include industrial wastewaters directly discharged to the receiving environment.

However, under the Federal Fisheries Act (Chapter F-14), several industries are regulated as to the quality of the effluent they can discharge to the environment, one of which is the pulp and paper industry[5]. In order to meet these regulations, pulp and paper mills generally use a form of secondary wastewater treatment.

2.1.2 Existing Wastewater Treatment

The existing wastewater treatment system for the Northern Pulp mill consists of sedimentation basins followed by a four-cell aerated stabilization basin (ASB) with the effluent being discharged to Boat Harbour then flowing to Pictou Road. If required, nutrients can be added to the wastewater prior to its introduction into the ASB; the nutrients are provided to promote the appropriate biomass growth to consume the organics in the wastewater. There is no active wastewater treatment in Boat Harbour other than providing a degree of suspended solids removal (polishing step).

One aspect of this study is to evaluate options of final effluent discharge and treatment required for eliminating the use of Boat Harbour as part of the wastewater treatment process for the operation of the Northern Pulp mill in Ambercrombie, Nova Scotia. Past study reports (AMEC, 2010; AGRA Simons, 2000) have investigated this issue and two re-occurring options for proceeding toward the final corrective action have been:

[3] "Canada-wide Strategy for the Management of Municipal Wastewater Effluent", CCME, February 2009
[4] "Wastewater Systems Effluent Regulations" Canada Gazette, Volume 144, No. 12, March 20, 2010
[5] "Pulp and Paper Effluent Regulations, SOR/92-269", Minister of Justice, February 26, 2011

1. Construct a treatment plant using an activated sludge process (ASP) on the mill site, construct a storage basin and pumping system for 6hr capacity, discharge the effluent in 6hr (tidal) cycles to a new outfall located at Lighthouse Beach (or other location).
2. Construct a treatment plant using an activated sludge process (ASP) on the mill site, along with a tertiary treatment system and pumping system for a new continuous outfall into Pictou Harbour.

The commonality of these two different plans is the inclusion of an ASP plant located on the current mill site. The new ASP plant will be able to deliver effluent to the same standard, if not better, than the current lagoon system. It is also assumed that an overall plant-wide reduction of wastewater flows will occur and will have the overall flow volume reduced to at least 45,000 m^3/d. It is likely possible to improve on this wastewater reduction, which can result in better effluent quality from the ASP. However, for the evaluation of options for this outfall, the following has been assumed:

1. Effluent quality is equivalent to current discharge at Point "C" and typically includes the characteristics as presented in Table 1 (based on 2010 data).
2. Effluent flow is 45,000 m^3/d and is a combination of process/alkali sewer collection, acid sewer collection and sanitary with expected effluent characteristics as presented in Table 2.

Table 1: Currently Reported Effluent Levels

	UNITS (SI)		Units (kg/ADT)	Units (kg/day)	Effluent Regulation	
					kg/day	mg/L**
Sulfate	308	mg/L	37.0	28,890		
Nitrate-Nitrite	0.05	mg/L	0.0	5		
Ammonia (N)	2.56	mg/L	0.3	240		
Suspended solids	35	mg/L	4.2	3,313	14,268	152
Color	1,450	TCU	174.0	135,914		
Conductivity	1,996	mmho/cm				
pH units	7.8					
Carbonaceous BOD	28	mg/L	3.3	2,606	9,512	101
COD	729	mg/L	87.5	68,348		
Total Phosphorus	1.43	mg/L	0.2	134		
Kjeldhal Njitrogen	7.47	mg/L	0.9	701		
Volitile Suspended Solids	32	mg/L	3.8	2,977		
Hydrogen Sulphide	0.70	mg/L	0.1	66		
Dissolved Organic Carbon	166	mg/L	20.0	15,586		
Ortho Phosphorus	0.48	mg/L	0.1	45		
	**Based On:	781 Adt/d	93,761 m3/d			

Table 2: Future Estimated Effluent Levels (ASP Achieving BOD/TSS of 25/25)

	UNITS (SI)		Units (kg/ADT)	Units (kg/day)	Effluent Regulation	
					kg/day	mg/L**
Sulfate	642	mg/L	37.0	28,890		
Nitrate-Nitrite	0.11	mg/L	0.0	5		
Ammonia (N)	5.33	mg/L	0.3	240		
Suspended solids	35	mg/L	2.0	1,575	14,268	317
Color	3,061	TCU	174.0	135,914		
Conductivity	1,998	mmho/cm				
pH units	7.8					
Carbonaceous BOD	28	mg/L	1.6	1,260	9,512	211
COD	729	mg/L	42.0	32,805		
Total Phosphorus	2.98	mg/L	0.2	134		
Kjeldhal Njitrogen	15.57	mg/L	0.9	701		
Volitile Suspended Solids	32	mg/L	1.8	1,440		
Hydrogen Sulphide	1.46	mg/L	0.1	66		
Dissolved Organic Carbon	200	mg/L	11.5	9,000		
Ortho Phosphorus	1.01	mg/L	0.1	45		
	**Based On:	781 Adt/d	45,000 m3/d			

It should be noted that the existing effluent meets the current federal pulp and paper regulations.

2.1.3 *Tertiary Wastewater Treatment*

By definition, tertiary treatment is applied after a traditional mechanical process. The term tertiary treatment typically applies to reducing the BOD and TSS in the effluent to levels lower than 20 ppm (known as the 20-20 level). This is usually the case when specific issues are present with the receiving water such that lower BOD and TSS concentrations are necessary. Tertiary treatment is also considered as advanced wastewater treatment for specific issues with the effluent. Typically this is not related to BOD and TSS (i.e., an effluent with a BOD and TSS concentration of 20/20 is generally suitable and acceptable for the receiving stream); however, it is related to other detrimental attributes of the effluent. Some examples of this include nutrient removal (nitrogen and phosphorous), hardness removal, reduction of endocrine disrupters or removal of colour from the effluent.

Additional or tertiary treatment for this effluent source is currently not required by the governing regulations of the Pulp and Paper industry. The regulations specify the levels of BOD and TSS only, based on the mill production level, average daily tonnage produced, and on the potential detrimental impact and toxicity to the local environment. However, it has been indicated that the local users of Pictou Harbour and Boat Harbour feel that the current level of treatment is not adequate due to the presence of colour and odour within the treated effluent. This would indicate that an aesthetic improvement in the effluent is desired.

An aesthetic improvement is mainly reflected in improving the appearance and the odour of the effluent, but is not dependant on any improvement of toxicity or contamination of the local environment. The reduction of colour from a pulp mill effluent would be a considerable improvement to the aesthetic qualities of the effluent. One means of colour removal is using a chemical precipitation /oxidation process followed by clarification. That is, the colour causing particles (long organic chains from lignins and tannins in the wood fibre) must be gathered together chemically (coagulation/flocculation) and then removed from the effluent via clarification (settling or flotation). This can be a costly and chemically intensive process when treating large volumes of water with limited amounts of colour after a secondary treatment. An alternative to this would be the isolation of the raw high colour source stream prior to it being blended with all other sewer streams and treating the high colour waste localized, prior to the full treatment system. **This option could potentially be a more cost effective treatment than the full colour removal system for all effluent. Current upgrades being made in the mill (with funding from the federal Green transformation Program) are expected to reduce the wastewater generated within the mill. There may also be a positive impact on the colour of the wastewater generated.**

Additional forms of tertiary treatment can in be in the form of filtration. Filtration covers a wide variety of methods of removing contaminants in effluent. A multi-media sand filter for removal of particulate can be a good "polishing" method for many secondary treatment plants to bring the effluent quality to below 10 ppm TSS and BOD. A more elaborate filtration method would be a membrane filter unit that would concentrate most contaminants and permit virtually zero TSS and reduced colour. This is a very costly option for large volumes, such as is the case for Northern Pulp. Ozonation (the injection of ozone into the wastewater) can also provide colour reduction in the effluent through the oxidation of the colour-causing compounds.

A less complicated approach to tertiary treatment is the use of an engineered wetland. An engineered wetland replicates the filtration, aeration and organic/nutrient consumption of a naturally occurring wetland, with the safeguards of a lining to prevent any unplanned effluent entering the environment. An engineered wetland is a very low maintenance operation with a variety of "bed" designs depending on the treatment that is required. For the flow requirements at Northern Pulp, a wetland area of 15 to 20 acres would be required.

2.2 Appropriate Tertiary Effluent Treatment Systems for Kraft Pulp Mills

With the proposed upgrades at Northern Pulp, it is understood that a significant improvement in the quality of effluent that will require tertiary treatment may occur and significant reduction of the flow of effluent may be realized. Based on the AMEC report (April 2010) primary clarification followed by a secondary aerobic activated sludge process is assumed to be incorporated as the initial wastewater treatment. Based on available information, the TSS and BOD will be reduced to 30mg/L each, but the colour will not be significantly reduced so is assumed to remain at the current 1500 PtCU (mg/L) level.

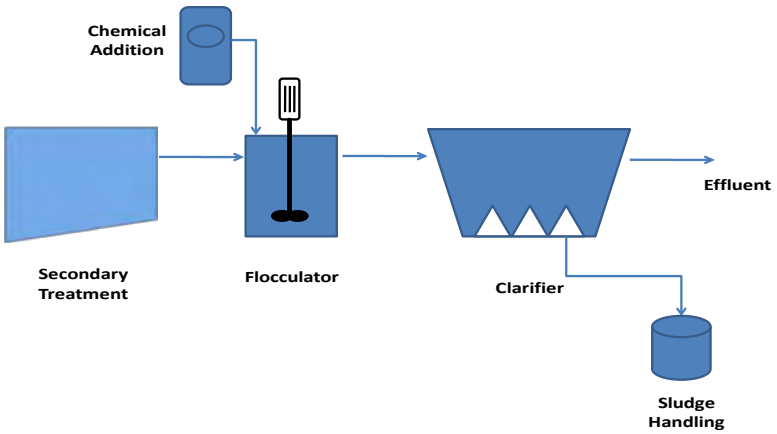
The tertiary treatment designs that are proposed follows up the primary/secondary treatment upgrades that have been undertaken by others. The scope of our investigation will be for the additional treatment required for further reduction of BOD and TSS as well as the reduction of colour in the effluent.

2.2.1 *Clarification*

The clarification process (Figure 2-1) is primarily a chemical treatment stage that forces dissolved colour particles to combine and form a bulky floc (an agglomeration of smaller particles) that can be settled or floated for removal. This chemical treatment will lower colour and COD (Chemical Oxygen Demand) as well as potentially reduce TSS and BOD further. This equipment would be installed inline at the end of the secondary treatment process. The configuration of equipment would include a flocculation tank (gentle mixing) and clarification units. Multiple clarifier units should be installed so that regular maintenance can be performed without completely stopping the flow or bypassing the process.

The clarification technology would likely include a clarifier with lamella plates for enhanced clarification and the reduction of the required footprint. With this technology, the overflow rate can be increased and the final size of the clarifying units can be reduced. The clarification stage will require the addition of chemical for the creation of a settable floc. The chemical design must be done with jar testing that will trial a variety of coagulants and dosages. This chemical addition can then be further controlled in the full-scale system with the use of online analyzers for Turbidity / TOC (Total Organic Carbon) levels and coagulant dosages using streaming current (zeta potential). With a highly automated system, the chemical consumption can be minimized as much as possible. There is potential for a very high level of process control and quality control of the effluent because of the relatively low possibility of upset from the upstream activated sludge process. For cost calculation purposes, a dosage of 150 ppm of an alum-based chemical has been selected but this has not been confirmed by specific analysis or pilot work.

Figure 2-1: Clarification Process

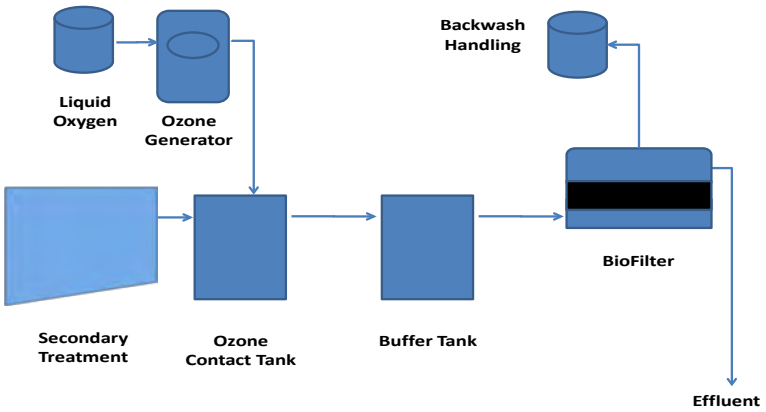


2.2.2 *Ozone Addition*

Tertiary treatment using ozone for the additional removal of colour from the secondary treated effluent would be undertaken using an onsite ozone generation system, an injection system and a reaction tank (Figure 2-2). The ozone would react with the long tannins and lignin organic chains and break them apart. However, it is impossible to predict the effluent characteristics of this reaction with respect to creation of biodegradable matter or any level of harmful bi-product. With this technology, it will require further investigation through a pilot test to determine the bi-product formation and the dosage of ozone required.

The generation of ozone is done onsite with electric-powered ozone generators that are supplied air or oxygen in order to create ozone. For a large application such as this, an onsite oxygen generation system would be required to feed multiple ozone generation units. The dispersion disks used to entrain the ozone in the water should be submerged in at least 5 meters of water to ensure a transfer of at least 75% of the ozone. A recycle system may be employed to "super saturate" the ozone into the water as required. The use of standardized equipment with the feed stream of purified oxygen from an onsite oxygen generation skid would likely be the best application for the supply of oxygen. A biofilter would be used to remove the BOD that would have formed from the conversion of some COD to BOD. It is anticipated that up to 40% of the COD may be converted to BOD and would require further treatment; however, this can only be confirmed with a pilot analysis.

Figure 2-2: Ozone Process

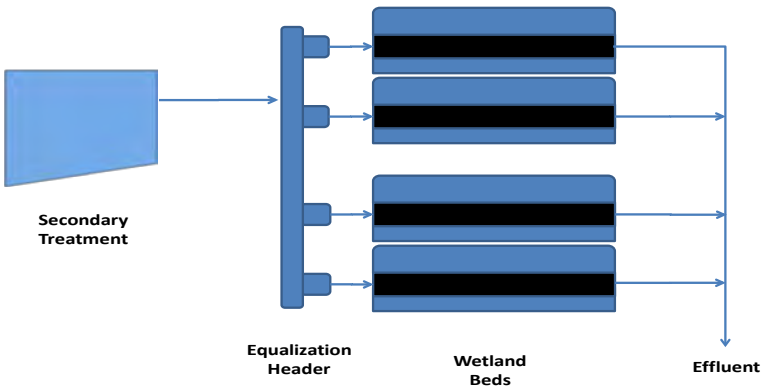


2.2.3 *Engineered Wetland*

Engineered wetlands take advantage of the natural processes that occur for the breakdown of colour-forming constituents (Figure 2-3). They also filter the suspended solids (TSS) and further remove (BOD). A typical engineered wetland would be constructed with a geo-membrane liner that would prevent the effluent from coming in contact with the natural environment. In the lined bed, a configuration of various media types and a piping distribution network would distribute the effluent and treatment will occur with a variety of plant species and micro-organisms that naturally occur in the root structure. This

technology would typically require at least 15 acres of usable area for the potential flows that are predicted from the mill. Given that the design will largely be dominated by the hydraulic requirements of such a large flow (and not the biodegradation capabilities), the use of an engineered wetland could potentially reduce the treatment requirements of secondary treatment or at a minimum, provide additional protection in the event of a process upset in the secondary treatment operation.

Figure 2-3: Engineered Wetland

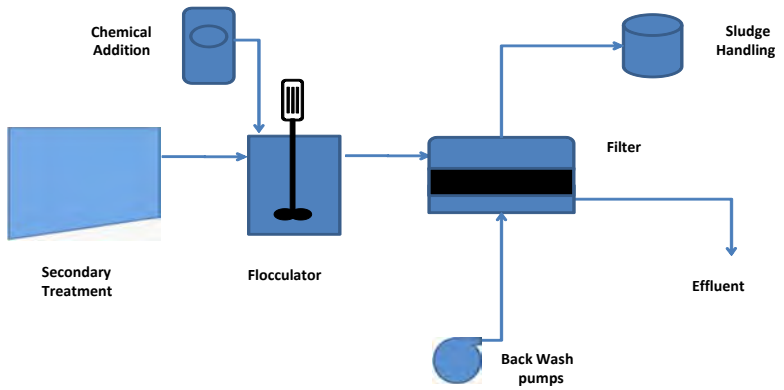


2.2.4 *Enhanced Filtration*

An enhanced filtration technology would utilize the addition of chemicals to aid with conventional filters (Figure 2-4). The use of chemical addition would be very similar to the chemical addition required for clarification, only the resulting floc would not be removed with a settling or floating operation, rather the filters would cause the removal. The additional filters would have to be conservatively designed to accommodate for the higher solids loading that would be provided by the flocculation process. The filters would have to be designed with a minimum of 150% treatment ability and a filter backwash handling system.

With this technology the main drawback would be the requirement for backwashing the filters. The backwash requirements would be considerable from the perspective of the pumping power required as well as the storage of backwash water. Additionally, the handing and treatment of the backwash water is considered problematic because removing the contaminants is more desirable than reintroducing them to the beginning of the treatment system.

Figure 2-4: Enhanced Filtration

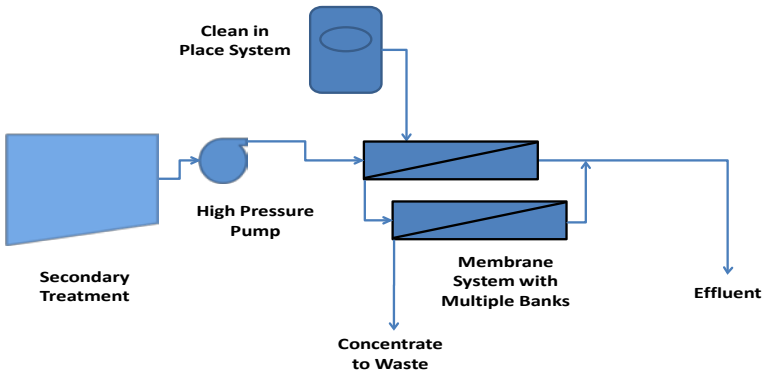


2.2.5 *Membrane Filtration*

The use of membranes for the removal of colour and polishing of suspended solids is an energy intensive operation. The effluent (after secondary treatment) would be pressurized against a microfiltration membrane (Figure 2-5). The clean water would pass through the membrane and the dirty water would be concentrated and have to be further treated. The use of micro filtration is recommended instead of reverse osmosis, as the colour particle is typically 0.45microns in size, so filtration with RO (openings 0.001 microns) would be considered to be in excess.

The use of membrane technology is typically quite costly from the perspective of the pumping power requirements. Additionally, the use of membranes for the removal of colour (although effective) is typically very detrimental to the membranes due to very high organic fouling. This results in an increase in operational cost that would continue to climb as the system aged. Further to this, the handling of the concentrated waste could prove to be problematic. The use of membrane technologies is good for concentrating the particles in the water that are undesirable, however dealing with these after they have been separated is not a straight forward task. Much like the filter backwash, recycling this to the front end of the waste treatment system is undesirable.

Figure 2-5: Membrane Process



2.2.6 *Process Selection*

Moving forward, the most promising opportunities for additional treatment would appear to be in the form of:

- Engineered Wetland
- Clarification
- Ozone Treatment

There are other options for this tertiary treatment; however, these three have the potential to be the most cost effective in terms of improving the effluent from the BOD, TSS and colour perspective.

For any large process application, a significant amount of design must be undertaken prior to implementation and pilot testing of the process should be considered. A pilot plant is essentially a small-scale version of a full-scale treatment plant. Piloting will allow the process to be exposed to the actual wastewater allowing the designers to determine the appropriate criteria for design purposes. Any major process changes are easily implemented so that operational parameters can be well established prior to the design of a new plant. The use of pilot scale testing for wastewater processes is particularly useful because water-quality related issues are location and industry specific.

The scale of a pilot may be in the range of 10-200 Litres per hour (and, on occasion, larger). With the pilot testing, the primary, secondary as well as tertiary treatment processes can all be studied. This additional testing will aid in the final process selection which can be completed with sound economic understanding of reagent chemical cost, vessel sizing and sludge volumes that all greatly effect operational requirements and costs.

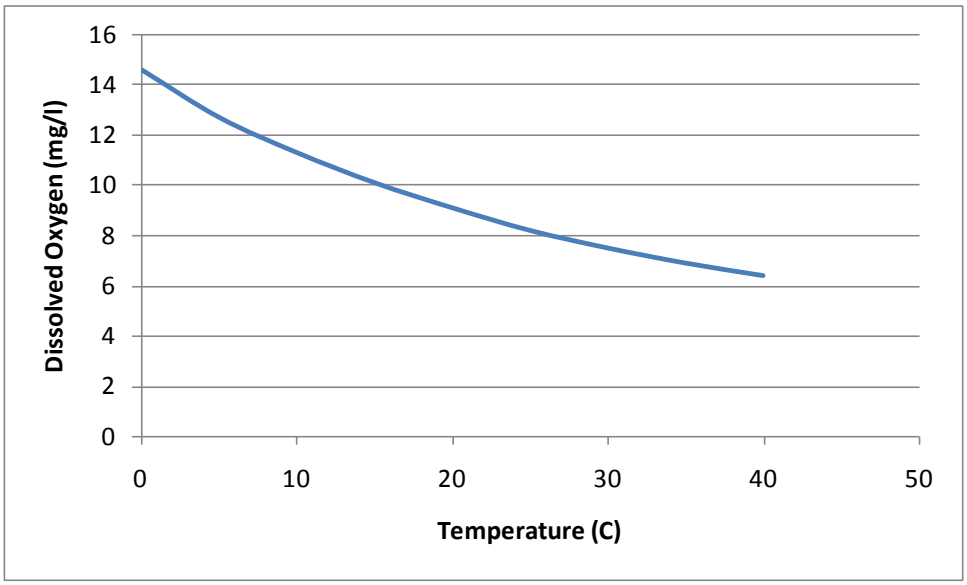
2.3 Heat Re-use and the Impacts of Effluent Treatment

As noted elsewhere in this document, the impacts of temperature of the effluent greatly affect the magnitude of the treatment equipment that will be required. A cooler effluent results in typically lower sizes of many treatment methods. Specifically aeration, ozone and membrane filtration all benefit from

having cooler temperatures. The enhanced filtration and the clarification will not be as greatly affected and having a warmer effluent will assist with the flocculation needed for these treatment types. Additionally (outside the scope of this investigation) there would be significant improvement to the secondary treatment (proposed activated sludge) for two reasons: oxygen transfer rate and biomass. Should there be a decrease in the temperature of the wastewater entering the aeration stage, then the oxygen transfer will greatly increase and thus a reduced energy input for aeration. With a decrease in the temperature, the aerobic micro-organisms associated with the activated sludge wastewater treatment process perform better; ideally, activated sludge systems work best with wastewater temperatures < 30°C.

In the following diagram, it can be observed that more oxygen can be saturated and held in water at a cooler temperature. The difference in temperature from 40° to 10° can be from 6.5 to 11 mg/L of dissolved oxygen. This, in turn, offers a substantial reduction in aeration equipment requirements.

Figure 2-6: Dissolved Oxygen Saturation Curve



Energy recovery scenarios (use of waste heat) can have either the current water as the carrier of the thermal energy or transfer the energy to another media. From the treatment perspective the transfer of energy should occur prior to treatment and transfer the energy to another media. A selection of energy recovery technologies should be considered that would result in the energy removal process (i.e., heat recovery) being applied prior to the secondary and tertiary treatment.

That being said, the use of heat exchangers or any sort of heat pump to compound the energy in the wastewater would likely be subject to fouling when passing a wastewater stream through it. The prevention of fouling in any heat exchanger would be by using the highest quality of effluent possible. This is a balancing act of “treatability” of warm water and “heat potential” for energy recovery. Therefore, likely the best location for heat recovery would be after primary clarification and before the

aeration stages. The primary clarifier(s) would remove a great deal of the suspended solids; however, there may still be some potential "fouling agents" in the effluent. The proposed modifications in the mill should significantly reduce the quantity of fouling agents. The recycled activated sludge from the proposed new secondary treatment stage should be returned to the system downstream of the heat exchanger so that the biomass does not contribute to the fouling in the heat exchanger. With heat being recovered prior to the aeration stage, better oxygen transfer will be achieved in the aeration basin and the secondary clarifier will be sized more conservatively based on the increased density of the micro-organisms in the sludge blanket.

The concept of water re-use from a large effluent stream can be implemented either one of two ways: either a non-contact or a direct-contact application. With a non-contact application for this waste stream, heat is transferred from the effluent to a new media, usually a clean and pristine supply of water that can be used for a variety of uses including aquaculture, agriculture or highly sensitive heating equipment (heat pump or radiant heating). The use of the mill effluent in a direct-contact application is more limited due to the sensitivity to trace pollutants for any sort of food or health-related water use. The use of tertiary treated water for any sort of food-related use is not a standard practice and not generally accepted in industry due to the inherent risks associated with potentially adverse health effects. In many jurisdictions, any form of contact water is strictly used for non-consumable crop irrigation and for some sanitary applications (i.e., grey water uses). There are a variety of applications that use non-contact heated water, and these would appear to be more desirable from the perspective of treatability and public scrutiny.

The other potential use of the non-contact heating system would be for mill reuse potential. The benefit to preheating much of the water for the mill would be seen mainly in the inlet water treatment and chemistry demands. With an elevated temperature, the coagulation and flocculation chemicals used in the raw water treatment would be more effective and likely reduce dosage requirements as well as reduce the mixing energies required. With warmer water, coagulation chemicals are more effectively used and carryover of these chemicals into the final treated product water is minimized. Additionally, this water stream would be preheated for use in boiler applications and other warm water applications. There would still be the need for raw cooling water at a lower temperature particularly in the steam turbine/generator surface condenser; however the treated, warm water could still be used at various processes throughout out the mill.

2.4 Outfall Relocation

2.4.1 *Background*

In order for Boat Harbour to be returned to its natural state, a new effluent discharge location is required for the mill wastewater treatment plant. Two candidate locations (Pictou Harbour, MacKenzie Head*)* have been selected as potential discharge points. Routing plans and budgetary opinions of the probable costs associated with these endeavours (Figure 2-7) have been prepared. Various factors (social, political, technical, financial, etc.) may force a change in the actual location but these locations provide an appropriate level of detail to provide preliminary costs.

To calculate costs, the pipe material, shipping and installation costing were calculated separately. A crew and production quantity was estimated and applied. Costs are based on pricing for high-density polyethylene (HDPE) DR-17, 900mm pipe, which was sized to accommodate a flow of 45,000 m^3/d.

2.4.2 *Site Selections*

The Pictou Harbour effluent main would begin at the new treatment facility location, located southeast of the current Northern Pulp facility. The effluent pipe will run terrestrially underground for 600m from this location to Abercrombie Point, where it would enter the Pictou Harbour. After entering the Harbour, the pipe would then travel underwater for approximately 1100m to the offshore diffuser.

The Mackenzie Head route will begin by travelling the length of the existing effluent main to 150m northeast of Pictou Landing Road, where the installation of the new pipeline will begin. The pipe then would travel along the existing gravel roadway 1150m north-northeast to the west edge of Boat Harbour. At this point, the pipe would cross the most westerly projection of Boat Harbour then head approximately 4575m East through the wooded area, around the Fishers Grant Indian Reserve to Pictou Landing Road. The exact route through the wooded area would be subject to possible land acquisitions. The option has been designed to avoid crossing the Fishers Grant Indian Reserve. The pipe route would then carry 1100m along the Pictou Landing roadway to Macleannans Memorial Camp Road. It would then travel 100m up Macleannans Memorial Camp Road to Cameron Lane, which it would follow until its termination (approximately 950m). A 325m route through the wooded area from the termination of Cameron Lane to the Northumberland Strait would be chosen based on possible land availability. The pipe would finally travel underwater 900m to the offshore diffuser located in the Northumberland Strait.

The two potential locations of the diffusers have been selected solely based on achieving the required depth as identified in the ARGA Simons (2000) Report. Other factors have not been taken into account at this time and will likely impact the final location of the pipe. In the case of the Pictou Harbour option, there could be exclusion zones for fisheries or shipping channels as well as any environmental and social impacts. The Mackenzie Head (Northumberland Strait) location may possibly encounter ice scouring depending on ice flows, fishery and shipping channel exclusions as well as other local environmental (sensitive land impacts) and social impacts. In the event the diffuser has to be placed further offshore in the Strait, a cost-per-100m value has been provided.

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MODEL: Default

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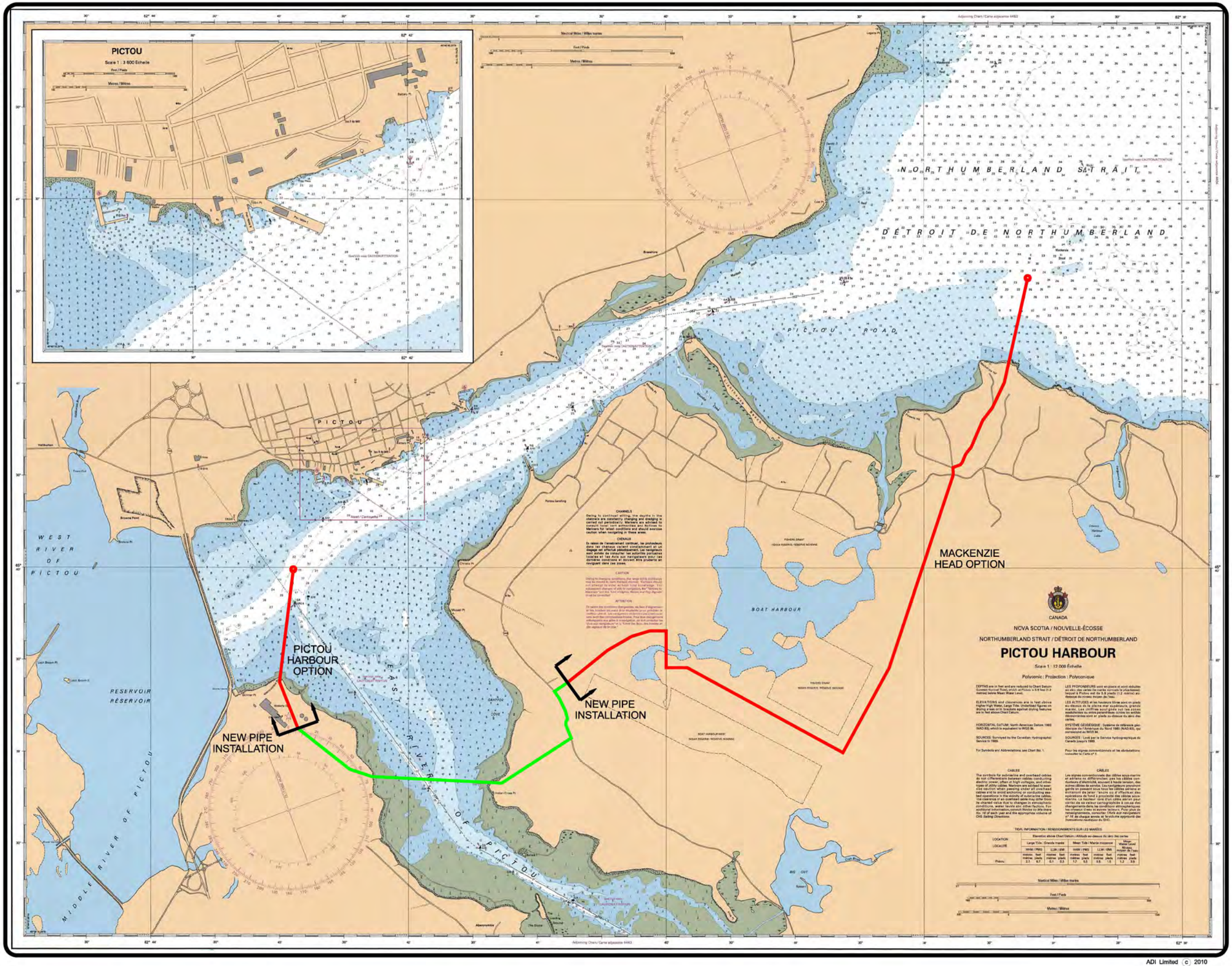

EXISTING EFFLUENT FORCEMAIN

PROPOSED PIPING OPTIONS

PROPOSED DIFFUSER LOCATION

No.	Revision	Ckd. By	Date

FOR INFORMATION ONLY

Const. North

Drawn By: STWD

Dwg. Standards Ckd. By:

Designed By: JCB

Date Printed

Dwg. Design Ckd. By:

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Project Title

NORTHERN PULP TERTIARY STUDY

Dwg. Title

PROPOSED OPTIONS FOR PIPE ROUTING

Project No.	L6716-001.1		
Dwg. No.	**2-7**	Rev. No.	0
Scale	NOT TO SCALE This drawing is not to be scaled		

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3.0 Kraft Pulp Mill Effluent Requirements

3.1 Federal and Provincial Pulp Mill Treatment Requirements

In Canada, both the federal and provincial governments have the power to enact legislation relating to the environment. Federal legislation includes:

- Canadian Environmental Protection Act (CEPA);
- Canadian Environmental Assessment Act (CEAA);
- Pest Control Products Act;
- Canadian Shipping Act;
- Arctic Waters Pollution Prevention Act;
- Fisheries Act; and,
- Transportation of Dangerous Goods Act.

One of the primary federal laws relating to water pollution is the Fisheries Act. This act gives the federal government certain regulatory powers to pass regulations to establish standards for certain industries, one of which is the pulp and paper industry. The Pulp and Paper Effluent Regulations (SOR/92-269) lists the following classes of substances from a mill or an off-site wastewater treatment facility as "deleterious substances" (as defined in the Fisheries Act, subsection 34(1)):

a) acutely lethal effluent;
b) BOD matter; and,
c) suspended solids.

In and of itself, colour is not deemed as a "deleterious substance" and is not listed.

The Pulp and Paper Effluent Regulations (PPER) also includes an Environmental Effects Monitoring (EEM) program which provides Environment Canada with information to help assess the adequacy of the PPER in protecting fish, fish habitat and the use of fisheries resources. The results of the EEM are combined with information from other factors (ecological, economic, social and technical) to determine the adequacy of the regulations.

From a provincial regulatory standpoint, while other provinces (particularly British Columbia and Ontario) have specific regulations for pulp and paper mill effluents, the Province of Nova Scotia does not. The Nova Scotia government has enacted the Environmental Act (1994-1995, c. 1, s. 1) and through it various regulations (e.g., *Activities Designation Regulations* (N.S. Reg. 352/2007), *Environmental Assessment Regulations* (N.S. Reg. 277/2009) and *Air Quality Regulations* (N.S. Reg. 187/2010)) that can be applied to pulp and paper mill operations. However, the Province essentially relies on the PPER to regulate the mill wastewater discharges.

3.2 Potential Changes to Federal and Provincial Discharge Regulations

On March 20, 2010, Environment Canada proposed *Wastewater Systems Effluent Regulations* under the *Fisheries Act* in the *Canada Gazette*, Part I, as the federal government's principal instrument to implement the "Canada-wide Strategy for the Management of Municipal Wastewater Effluents" proposed by the Canadian Council of Ministers of the Environment (CCME) in February 2009. The proposed regulations include baseline effluent quality standards, compliance timelines, and rules for monitoring and reporting. They would apply to municipal, community and federal wastewater systems (treating primarily municipal wastewater that could include an industrial contribution), including those on Aboriginal lands across Canada, except, initially, those in far northern regions. These are still in the proposal stage as what the federal government is proposing differs substantially from what was originally endorsed by the CCME and supported by the provinces.

The objective of the proposed Regulations is to reduce the risks to ecosystem health, fisheries resources and human health by decreasing the level of harmful substances deposited to Canadian surface water from wastewater effluent. To achieve the objective, the proposed Regulations would set national effluent quality standards that would require secondary wastewater treatment, or equivalent, in wastewater systems across Canada[6].

3.3 Treatment Requirements for Direct Discharge to Pictou Harbour

To determine the level of treatment required to discharge a wastewater treatment plant effluent to a receiving stream, several factors must be considered:

1. Location of the receiving stream;
2. Current status of the receiving stream;
3. Physical characteristics of the receiving stream (primarily to determine the configuration of the outfall and diffusers);
4. Flow variations within the stream (this is primarily for freshwater streams/rivers that experience seasonal flows);
5. Downstream uses of the receiving stream (water supply, fishing grounds, recreational purposes, etc.);
6. The assimilative capacity of the receiving stream; and,
7. Other site specific factors.

As mentioned above, CCME has developed the "*Canada-wide Strategy for the Management of Municipal Wastewater Effluent*" (February 2009) that is in the process of being adopted by the Federal Government (Environment Canada) with the Department of Fisheries and Oceans having the statutory authority. It specifically excludes industrial wastewater treatment plants. The strategy outlines two main objectives:

[6] Canada Gazette, Part 1: Notices and Proposed Regulations, March 20, 2010

1. Improved human health and environmental protection.
2. Improved clarity about the way municipal effluent is managed and regulated.

The strategy also specifies effluent discharge criteria identified as the minimum National Performance Standards (NPS). All facilities must meet these standards as a minimum with more stringent requirements being applied on a case-by-case basis by the jurisdiction having authority. The minimum standards from the strategy are:

- Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) ≤ 25 mg/L;
- Total Suspended Solids (TSS) ≤ 25 mg/L; and,
- Total Residual Chlorine ≤ 0.02 mg/L

In addition to the minimum performance standards, plant-specific Effluent Discharge Objectives (EDOs) need to be developed based on a one-year characterization of the plant effluent quality and also taking into consideration the characteristics of the receiving environment (environmental effects monitoring) and mixing that occurs in a defined mixing zone associated with the point of discharge. For any discharged substance that is in excess of safe levels for human health or the environment, a discharge objective will be implemented. This could mean lower values for the minimum performance standards or an additional discharge limit for an entirely different substance.

Keeping in mind that the above only applies to municipal wastewater treatment plants, the process could be followed to determine the level of treatment required to have the mill wastewater treatment plant effluent discharged directly to Pictou Harbour. The current treatment system produces an effluent that is close to meeting the minimum NPS. Proposed changes within the mill that are planned to be completed in 2011 should positively affect the quantity and quality of the raw wastewater leaving the mill allowing a secondary treatment system to produce a better-quality effluent than is currently being produced; unfortunately, the extent of the changes are unknown at this time. It is believed, however, that the volume of raw wastewater flow will be reduced considerably which would have a positive impact on secondary treatment.

Replacing the existing treatment system (settling basins followed by aerated and non-aerated stabilization ponds) with a new secondary treatment system that is designed to provide better control of the effluent total suspended solids may produce an effluent that meets the minimum NPS. Again, with the in-plant changes that are being considered, the colour of the effluent may be improved (it should be noted that colour is not a parameter that is regulated though the reason for the colour may be regulated).

3.4 Federal, Provincial and Municipal Discharge Regulations to Discharge to Pictou Harbour

As stated above, the mill effluent is regulated under the Pulp and Paper Effluent Regulations. However, to change the point of discharge, whether it is to Pictou Harbour or the Northumberland Strait, would

require an Environmental Assessment under the *Canadian Environmental Assessment Act* pertaining to the *Fisheries Act* with reference particularly to the depositing of a deleterious substance. This EA process would preempt any provincial or municipal requirements but would allow any and all stakeholders (provincial, municipal, special interest groups, etc.) to have a part in the process.

Transport Canada would also become involved in the approval process for discharging to either point under the Navigable Waters Protection Program through the administration of the *Navigable Waters Protection Act*[7] (NWPA). This is to ensure that the public can navigate the waters without any obstructions. There is a detailed application process that is required of the proponent that can be viewed at the following transport Canada website: http://www.tc.gc.ca/eng/marinesafety/oep-nwpp-guide-2053.htm.

[7] "Navigable Waters Protection Act, Chapter N-22", Minister of Justice, February 28, 2011

4.0 Market Opportunities – Re-use of Treated Effluent

As described in Section 2.3, the treated effluent can be used either in a direct-contact or a non-contact basis. Given the source of the wastewater, a direct-contact application is not recommended. All the potential opportunities presented below are of a non-contact nature.

4.1 Waste Heat Utilization

Recovering heat or thermal energy from a wastewater stream that is otherwise of no further use and is going to be discharged or discarded and utilizing the recovered energy for a useful purpose is known as waste heat recovery. The higher the temperature of the waste stream from which it is desired to recover heat and the greater the quantity of thermal energy available to recover, the more uses that the recovered heat can be utilized for. This is largely due to the natural laws that govern heat transfer and thermodynamics, the branch of science that deals with the relationship between heat and work.

Waste heat is typically classified as being high, medium or low grade. The classification is based on the temperature of the waste stream. While the boundaries or temperature range for these classifications are not absolute or fixed, it is fairly common practice to regard waste streams at 650^{o}C (1200^{o}F) or hotter to be high-grade waste heat sources. Medium-grade heat includes the temperature range from 121^{o}C (250^{o}F) to 650^{o}C (1200^{o}F) and low-grade waste heat would encompass the range from 20^{o}C (68^{o}F) to 121^{o}C (250^{o}F). Not only is there more energy contained in the higher temperature waste streams per each kilogram (pound) of effluent, but as will be discussed further below, the greater the temperature difference between the waste stream or media from which the thermal energy is to be extracted and the stream or media receiving the thermal energy, the easier the transfer and the greater the amount of energy that can be transferred.

It is apparent from the above paragraph that the tertiary treatment effluent, which is expected to vary in temperature from approximately 43^{o}C (110^{o}F) to 63^{o}C (145^{o}F) during the course of a year, is at the low end of the low-grade heat classification. Existing as a low grade of heat or thermal energy puts limitations on the potential uses for the energy contained in the tertiary treatment effluent as well as the types of equipment that can be used for the energy transfer. Subsequent sections will describe one of the most common types of heat transfer equipment, namely, heat exchangers and the more complex heat pump as well as discuss potential uses for the thermal energy contained in the tertiary treatment effluent.

4.1.1 *Heat Exchangers*

Heat transfer, or more correctly thermal energy transfer, is the exchange of energy from one fluid or media to another. In conventional heat transfer, the direction of the energy transfer must be from the object at the higher temperature or thermal energy level to the object at the lower temperature. Additionally, the lower temperature object cannot be heated to a temperature above that of the higher temperature object. The device or piece of equipment that accomplishes the heat transfer is known as

a “heat exchanger”. One of the most commonly used heat exchangers is the automobile radiator where the engine’s cooling fluid is cooled i.e., transfers thermal energy to the air blown across the finned tubes carrying the engine fluid. The air is simultaneously heated by accepting the thermal energy from the engine cooling fluid. The cooling fluid can never be cooled below the temperature of the air blown through the radiator and the air can never be heated to a temperature above that of the cooling fluid. Similarly to voltage or electrical potential difference being the driving force for current flow in electrical circuits, temperature difference is the driving force for heat or energy transfer in heat exchangers. The greater the temperature difference between the two media, the greater the amount of thermal energy that can be transferred. Expressed in a different manner, for a given size exchanger (amount of transfer surface), the greater the temperature difference, the more thermal energy it can transfer between the two media.

One of the major classification criteria for heat exchangers is whether they are contact or non-contact pieces of equipment. In the contact type of heat exchanger, the two fluids or media which enter the exchanger actually mix with each other and leave as a single stream. In the non-contact heat exchanger, there is a solid physical boundary between the two fluids such as a tube wall or plate. When one of the fluids is a waste stream, particularly if it is toxic or otherwise hazardous, the heat exchanger would normally be of the non-contact type.

While there are some heat exchangers that utilize rotating parts to rotate or move heat from one process fluid or stream to another, the majority of heat exchangers are static, i.e., they contain no moving components. Three common forms of static heat exchangers are the double pipe, the shell and tube and the plate type. In the double pipe exchanger a smaller pipe is located inside a larger pipe. One fluid flows through the inner pipe while the other fluid flows in the annular space created between the two pipes. In the shell and tube exchanger, a series of tubes commonly secured at each end to a plate known as a “tubesheet” are enclosed inside a shell. One fluid flows inside the tubes while the other fluid flows over the outside of the tube bundle and is contained by the outer shell. In the plate type heat exchanger, a series of thin, separated plates are sandwiched together. The plates have large surface areas and narrow fluid flow passages. One of the two fluids flows on each side of the plates.

4.1.2 *Heat Pumps*

A heat pump allows for the normal restrictions of heat transfer to be overcome and for heat energy to be transferred from a source at lower temperature to a source at higher temperature. The most common example of a heat pump is a home refrigerator where heat is removed from the interior of the refrigerator and transferred to the ambient environment of the room containing the refrigerator, even though the refrigerator interior is at a lower temperature than the room in which it is located.

As a device that can transfer and recover energy from a waste stream that would otherwise be considered unusable and non-recoverable, to a higher temperature process where the energy does become usable, the heat pump may seem magical. However, the heat pump cannot achieve this transfer of heat energy without the input of energy from an external source, which typically takes the

form of mechanical energy or thermal energy, which may come from a source that would otherwise be considered unusable or waste. In the case of the home refrigerator, mechanical energy is supplied to the compressor by an electric motor. The goal of a properly selected heat pump application is to achieve the state where the amount of energy recovered from what would otherwise be a waste energy stream exceeds the energy input required by the heat pump.

Although there are several different types of heat pumps, all heat pumps accomplish the following three basic functions[8]:

- Absorb heat from the waste heat source;
- Increase the heat temperature within the delivery fluid; and,
- Delivery of the useful heat at the required elevated temperature.

A key parameter in determining the performance of a heat pump and therefore the energy savings that can be achieved is the temperature lift that the heat pump must produce. The temperature lift is the difference in temperatures between the waste heat source temperature at which the heat pump absorbs thermal energy and the temperature at which the heat pump delivers thermal energy. The lower the temperature lift, the better the performance of the heat pump, i.e., the greater the amount of heat energy transferred for each unit amount of external energy supplied to the heat pump.

The performance of a heat pump is usually expressed as the heat pump Co-efficient of Performance (COP_{HP}). COP_{HP} is defined as:

$$COP_{HP} = Q_{out} / W_{in}$$

where Q_{out} is the heat (thermal energy) delivered by the heat pump and W_{in} is the energy or "work" supplied to the pump driver. As an example, a COP_{HP} of 4 means that the heat pump is delivering four times as much thermal energy to the process it is supplying than the amount of work supplied to the pump driver.

Two major categories of heat pumps are mechanical and closed-cycle absorption. Mechanical heat pumps, which can be either open cycle or closed cycle, use mechanical compression of a fluid to achieve their temperature lift. In the closed-cycle mechanical heat pump (e.g. the household refrigerator) a working fluid is circulated through a closed loop in which it is alternately compressed and condensed. In the open-cycle mechanical heat pump a waste vapour is compressed (pressure increased). These mechanical vapour compression heat pumps are considered to be open cycle because the working fluid is a process stream. Typically, mechanical heat pumps are used in situations with temperature lifts less than 55^{o}C (100 ^{o}F).

[8] U.S. Department of Energy, Industrial Technologies Program, "Industrial Heat Pumps for Steam and Fuel Savings", DOE/GO-102003-1735, June, 2003.

Closed-cycle absorption heat pumps use a dual component working fluid and the fluid properties of boiling point elevation and heat of absorption to accomplish their temperature lift. Advantages of absorption pumps are that they can deliver a higher temperature lift than other types, their energy performance does not degrade rapidly at higher temperature lifts and they can be configured to provide combined heating and cooling. In order to obtain these advantages, however, they are more complicated and require more equipment than the other types of pumps. Typically, four separate heat exchangers are found in an absorption heat pump, designated as the evaporator, condenser, generator, and absorber. In some cases high lift or extended range absorption heat pumps can achieve a temperature lift exceeding 111^{o}C (200 ^{o}F).

4.2 District Heating

One possible use of the recovered energy from the warm tertiary treatment effluent is a district heating scheme. Such schemes have been receiving increasing attention in recent years as fuel cost have risen dramatically and concern for the global warming effects produced by the generation of greenhouse gases has similarly increased. District heating schemes have the potential to produce energy savings and reduce greenhouse emissions, particularly if they include recovery of thermal energy that would otherwise be wasted. Many communities have adopted "sustainability" as a key component in their planning. District heating or energy systems are increasingly being considered a part of the sustainability portion of municipal/community plans, particularly if they can contribute to the reduction of greenhouse gases through the recovery of waste energy or energy production from biomass. However, as will be discussed in more detail below, there can be a large difference between technical feasibility and financial feasibility; thus, even though something may be easy to accomplish from a technical perspective it may not prove to be financially viable.

One of the parameters, normally considered to be critical to achieving a successful district heating project is the population density for the district to be serviced. The population densities of most districts in Europe are larger than those in Canada, particularly rural Canadian villages and towns. The FVB report[9] indicates the following densities for a number of district heating schemes in southern Ontario as tabulated below:

Location	Net Hectares	Units/Net Hectare
Central Pickering – Low Density		25 – 40
Central Pickering – Med. Density		40 – 80
Central Pickering – High Density		140 – 250
Markham Centre	13.5	250
Regent Park	13.4	380
West Don Lands	12.27	470
East Bayfront	21.1	300

[9] FVB Energy Inc., "City of Pickering, District Energy Pre-Feasibility Assessment", January, 2007

Converting the density information provided by Nijjar *et al*[10] for some selected rural Nova Scotian towns to put it on the same land area basis as that utilized above for the southern Ontario district energy projects, produces the following tabulation:

Location	Hectares	Houses/Hectare
Trenton	600	1.85
Middleton	540	1.50
Berwick	680	1.33
Shelburne	900	0.97

It is obvious from a quick inspection of the two tables above that the densities in the rural Nova Scotian communities are more than two orders of magnitude less than for the projects in the greater Toronto area (GTA) (Markham Center, Regent Park, West Don Lands, and East Bayfront). An important reason for the difference in residential unit densities is that as Nijjar *et al* indicates, 96.8% of residential units in rural Nova Scotia are single, detached houses. However, FVB notes that approximately 90% of the residential units in the GTA projects will be apartments or Multiple Unit Residential Buildings (MURBs). It is further noted by FVB that 85% of the residential units in the new neighbourhoods of Central Pickering are expected to be single detached homes. Thus, it can be seen that the unit density in the lower density neighbourhoods of central Pickering are much closer to those for rural Nova Scotia than the projects in the GTA. FVB indicates that it is unlikely that with such densities (25 – 40 units/net hectare), that district energy could be justified on an economic basis. This would suggest that the rural Nova Scotia densities of 0.97- 1.85 houses/hectare would be very economically challenging to operating a district energy project.

FVB Energy indicate in their report that they consider building type to be even more important than housing/building density to a commercially viable district heating scheme. This is due to the ratio between connection cost and thermal energy revenue for the different building types. According to FVB this ratio should be as low as possible, i.e., the connection cost should be low compared to the estimated future revenue from the sale of thermal energy to increase the chance of commercial success due to the shorter payback period that will be realized by the purchaser of the thermal energy. However, this ratio is highest for detached, single family residences. As noted above, almost all housing units in rural Nova Scotia communities are single family, detached residences. FVB state that the preferred type of customers for a district energy project are apartments (MURBs), and commercial and institutional buildings such as shopping centers, office buildings, civic centers, churches and schools. It is expected that such buildings both in terms of number and percentage of total system energy demand would be a minority in rural Nova Scotia.

[10] Jaspreet S. Nijjar et al, "District Heating System Design for Rural Nova Scotian Communities Using Building simulation and Energy Usage Databases", Transactions of Canadian Society of Mechanical engineering, Vol. 33, No. I, pg 51-63.

There are also a number of technical and physical issues with the quality (grade) of waste heat available and its annual variation in quality compared with the requirements of a typical district energy system. Firstly, the waste heat is of a lower grade than is typically utilized for the supply of heat in a district energy system. Church[11] indicates that the hot water supply temperature for conventional district heating schemes is 90°C (194°F) and that many European systems operate with a temperature drop or "DELTA-TEE" of 30°C in the energy transfer station at the customer buildings. The use of higher supply temperatures (and therefore higher grade thermal energy) and higher temperature drops reduces the volume of water that has to be circulated and therefore the size of the piping required. However, the higher temperature drop requires additional heat transfer surfaces in the buildings supplied.

The waste energy available from the mill is expected to range from 43°C (110°F) in the winter to 60°C (140°F) in the summer. To transfer heat from this lower temperature waste water to the higher temperature district heating circulating water would require the use of a heat pump. The use of a water-to-water heat pump in such a situation is certainly technically feasible and it should be expected to achieve a fairly good COP.

The annual variation in waste water quality is the reverse of the annual heating load for a district heating system, i.e., the waste water is hottest in the summer when the load on the district heating system would be the lowest and is at the lowest temperature (grade) when the demand on the district heating system is the largest. Adding a geothermal energy storage component to a district heating scheme where during the summer the hot waste water could be used to store energy in the ground, which would be extracted during the winter heating period is a potential method of bridging the difference in the energy availability and energy demand annual profiles. It would, however, add to the capital cost of the project and requires suitable geology to implement. It is unknown at this time whether the Pictou area would offer suitable geology for geothermal energy storage.

There appears to be more than enough thermal energy in the tertiary treatment effluent to supply a district heating scheme. Based on the town of Berwick, which represents the average Nova Scotia rural town, Nijjar *et al* assumed a hypothetical community with 800 houses. For this hypothetical community they calculated an annual community heat load including losses of 24,880 MWh and a peak heating load of 8,670 kW. These loads included piping losses, which accounted for 6.4% of the total heat load. To meet the peak load would require a temperature drop of approximately 11°C in the tertiary effluent (e.g. enter at 43°C and leave at 32°C) if the transfer of energy from the effluent to the district heating circulating water was completed without loss.

Major commercial decisions that revolve around a proposed district heating project include what entity will own and operate the project and how the project will be funded. FVB Energy state that the most successful district energy projects are those that are municipally owned, which has been for most such

[11] Ken Church, "Is District energy Right for Your community? Part 2: Sizing the system", Municipal World, December, 2007.

projects in Ontario including those in Cornwall, Sudbury, Windsor, Markham and Hamilton. Church[12] indicates that: "The singularly independent nature of district energy development in Canada has led to the creation of a variety of business models, with ownership ranging from 100 percent private to 100 percent public." Church further notes that due to the moderate rate of return produced by most district energy projects the interest shown in such projects by the venture capital sector is limited.

District energy in Canada has been stagnant for some time. A number of proponents feel this is due to the "project" approach that has been utilized in the past where only the most attractive loads have been selected for inclusion in the project and the system has been designed and built to service only these loads. Potential customers (loads) who might want to connect to the system after its original construction are discouraged because of the cost to connect to the system (typically driven by the need to expand the system) and the smaller energy cost savings available when a relatively cheap alternative energy source such as natural gas is available in many jurisdictions. Some suggest that in order for district energy to really expand it needs to change from the project type approach to a "utility" approach where the system would be considered as a continuous and ever expanding entity in which the cost of system expansion should be aggregated and assessed against the levelized cost of heating to the customer base. The province of British Columbia is the first province in Canada to regulate district energy, which requires these systems to behave like a utility.

A district heating/energy scheme would not necessarily be limited to supplying energy to existing communities in the vicinity of the Northern Pulp mill. If other business could be attracted to the industrial park in which the mill is located, there might be a better fit in terms of annual load (energy) requirement than supplying heating to predominantly residential customers during the heating season. The lumber drying, aquaculture and agriculture applications discussed in subsequent sections might be among the possibilities of the types of businesses that could locate to the industrial park.

4.3 Lumber Drying

In order to be used for either construction lumber or wood products, the wood produced by sawmills has to be dried or thermally treated before it can be utilized. Even after a tree has been cut, the wood that is derived from the tree will continue to exchange moisture with the ambient air surrounding the wood until the moisture level in the wood and the moisture level in the air reach an equilibrium. If this equalization of moisture or drying of the wood is allowed to proceed in an uncontrolled manner a number of undesirable consequences such as splitting, checking, and warpage can occur which damage the wood and can render it unsuitable for its desired purpose. Further, natural air drying will take significantly longer than controlled drying in a kiln, and will not typically reach moisture levels low enough for uses such as furniture that will spend its life in climate controlled buildings.

Due to the above reasons, lumber and wood producers typically use kilns to maximize the amount of usable wood produced from the green (wet) wood sawn from trees and to minimize the time required

[12] Ken Church, "Is District energy Right for Your community? Part 3: Supporting Resources", Municipal World, January, 2008.

to dry the wood to the point where it can be utilized. The kilns typically form part of the sawmill plant. The kilns use heated, dry air to perform the wood drying and are also equipped with fans so that the flow of the heated air through the kiln can be controlled, which ensures a more positive and even distribution through the wood stacks located in the Kiln. Achieving a uniform distribution of air through the wood stacked in the kiln is important to ensure a more uniform quality in the dried wood.

The air in conventional kilns is typically heated by finned-tube heat exchangers (coils) through which steam, hot water, or hot oil are circulated. The steam, water or oil are heated in a boiler or heater that was most commonly fired by a fossil fuel but in recent years many sawmills have converted to boilers that burn biomass waste resulting from the sawmill's operation. After passing over the coils, the air flows through the lumber stacks in the kiln. The warm, moisture laden air leaving the lumber stacks is exhausted to atmosphere from the kiln.

A more recent development in wood drying kilns is the dehumidification kiln. The advantage that the dehumidification kiln has over a conventional kiln is that in the dehumidification kiln heat is continuously recycled rather than vented to atmosphere as occurs in the conventional kiln. The device that allows this savings in energy to be accomplished is a closed-cycle mechanical heat pump. The warm, moisture laden air leaving the lumber stacks is passed over a cooling coil, which serves as the closed-cycle heat pump's evaporator. As the air cools it gives up heat to the heat pump working fluid and moisture contained in the air is condensed. The condensed moisture is drained away and the air is then passed over heating coils, which serve as the heat pump's condenser.

In the heating coils, which serve as the heat pump's condenser, the energy which the air previously gave up in the cooling coils is returned to the air through the use of the closed-cycle heat pump. The heated, dehumidified air is then recirculated through the lumber stacks. Each time the air is recirculated through the coils its temperature is increased. The U. S. Department of Energy[13] indicates that the most common industrial application of heat pumping is the dehumidification drying of lumber.

Kilns used to dry softwood, which is the predominant type of wood used for structural or framing purposes, typically operate below 115^{o}C (240^{o}F). Kilns used to dry hardwoods, which are typically used for furniture, flooring, or other wood products, operate at lower temperatures commonly keeping the air temperature below 82^{o}C (180^{o}F). These operating temperature ranges are certainly at a workable level for recovery of waste energy from the tertiary effluent. However, a short search of kiln manufacturers did not find any who supplied kilns that utilized waste heat recovery from a waste liquid stream. Recovery of waste energy could take a number of different forms including using a conventional heat exchanger to preheat the circulating water in a conventional kiln and a boiler or other type of heater to raise the temperature the rest of the way, or utilizing a heat pump to transfer heat from the tertiary treatment effluent to the fluid being circulated through the heating coils. It would

[13] U.S. Department of Energy, Industrial Technologies Program, "Industrial Heat Pumps for Steam and Fuel Savings", DOE/GO-102003-1735, June, 2003.

appear, however, that a customized design would be required to utilize waste heat recovery from the tertiary effluent.

Discussions with a current large operator of lumber drying kilns indicate that the largest single cost of production for lumber is the energy required to dry it. However, to utilize the tertiary treatment effluent as a source of thermal energy for a lumber drying kiln would require that a new kiln be located within a reasonable distance from the source of the effluent since the energy spent pumping the effluent long distances would likely negate the value of the energy recovered. A major financial question for such a new venture would be whether the energy savings available by recovery of waste heat would offer a sufficient return on a fairly significant capital investment required to build a new lumber drying kiln, which typically would form part of a sawmill complex. It is a possibility to locate the kiln on a separate property from the sawmill which produces the wood to be dried; however, this would open the possibility that the energy saving achieved by recovering waste heat from the tertiary effluent was negated by the fuel (energy) cost to transport the lumber from the sawmill to the kiln.

Locating a sawmill complex including drying kiln adjacent to the Northern Pulp Mill could produce a potential business synergy between the two businesses. The sawmill would have an existing and nearby customer for some of its residue. The close proximity of the two mills would reduce transportation cost and would allow the sawmill to sell its residue at a lower cost to the pulp mill compared to more distant sources of wood fibre, which would benefit both parties. This would of course be in addition to the benefit of lower lumber drying costs for the sawmill produced by the energy recovery from the tertiary effluent.

Unfortunately, in recent years the business outlook for sawmills has been quite dark. The softwood lumber dispute with the United States, the significant increase in the value of the Canadian dollar, which hurts all exports including lumber, and most recently the housing crisis in the United States have had quite devastating effects on the commercial viability of sawmills. Indeed, the majority of sawmills in Atlantic Canada that were operating prior to the beginning of the current recession in mid-2008, have since closed. During a visit to the Northern Pulp mill in January, 2011, mill personnel indicated that a local sawmill that had been a source of wood chips for Northern had closed. Any further consideration of this potential usage of waste heat would therefore require a thorough investigation/market analysis of the lumber industry.

4.4 Organic Rankine Cycle Power Generation

A thermodynamic cycle is a sequence of thermodynamic processes that continuously repeat in the same order. A thermodynamic cycle uses a working fluid that changes state as it flows from one process step to another in the cycle returning to its original state at the end of the last process step to begin its flow around the process path again. The repeating nature of the process steps or process path permits continuous operation, which makes the cycle an important concept in thermodynamics.

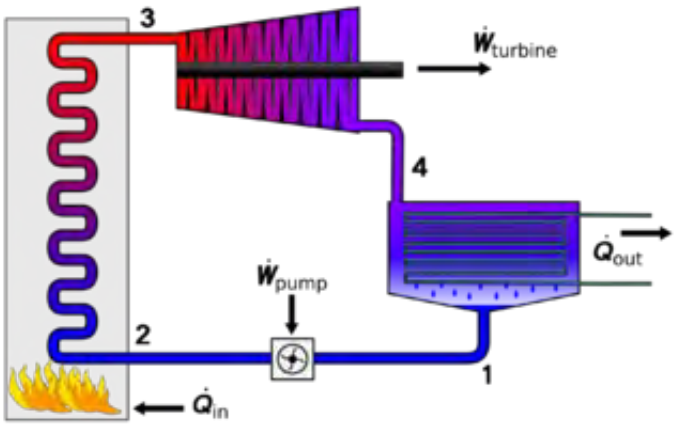
There are two major classifications of thermodynamic cycles, namely power cycles and heat pump cycles. In a power cycle a portion of the heat input to the cycle is converted to mechanical work output from the cycle. In a heat pump cycle, as previously discussed, heat is transferred in the opposite direction from which it would naturally occur, i.e., from low to high temperature media or fluids using mechanical work input.

Power cycles are the basis for the operation of the heat engines that power our cars and generate most of the world's electricity. The ubiquitous gasoline fuelled, spark ignited engine that powers most of the automobiles on the road is known as the "Otto" cycle, named after its German inventor. The heat engine that generates a majority of the world's electrical energy is the steam turbine. Its operation and performance is defined by the power cycle known as the "Rankine" cycle, also commonly known as the steam cycle.

The working fluid in the Rankine cycle is water which is vaporized into steam in the boiler by the addition of heat (the thermodynamic process of heat addition under constant pressure), and transfers thermal energy to the steam turbine in the vapour state. The steam turbine converts the thermal energy into mechanical shaft power or work (through the thermodynamic process of isentropic expansion), which is the input to the generator. The generator in turn converts the shaft work input into electrical energy. After exhausting from the steam turbine, the steam is condensed back into water in the condenser (the thermodynamic process of heat rejection at constant pressure) and starts the cycle over again.

The major components of the conventional Rankine cycle, namely, the boiler, the steam turbine, the condenser and the boiler feedpump are illustrated graphically below:

Rankine Cycle Schematic[14]



[14] http;//www.answers.com/topic/rankine-cycle?&print=true

The Rankine cycle uses heat at much higher temperatures than what is available from the tertiary treatment effluent. In many fossil fuel fired thermal generating stations, steam enters the turbine at 538°C (1000°F). In recent years generating stations known as supercritical Rankine cycle plants have been constructed that operate with steam temperatures in the order of 649°C (1200°C). The higher the steam temperature entering the turbine, the better the thermodynamic efficiency of the plant, i.e., the more electrical energy that is produced from a given amount of fuel (heat) input. The temperature at which most Rankine cycle plants reject heat, typically in the 38°C (100°F) to 43°C (110°C) range, is very close to the expected tertiary effluent temperature range of 43°C (110°C) to 63°C (145°C).

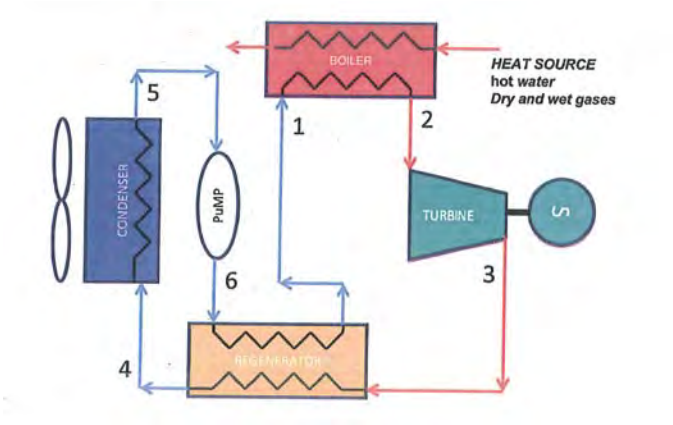
In an "organic" Rankine cycle, water is replaced as a working fluid by another fluid, with a lower boiling temperature than water. Organic refers to the fact that the alternate fluid contains carbon as one of the elements making up the fluid. The benefit of the lower boiling point of the organic Rankine cycle that is relevant to the area of focus for this study is that a lower grade of heat can be used as heat input to the cycle, including low grade industrial waste heat. The organic Rankine cycle is composed of the same four thermodynamic process steps as the conventional Rankine cycle, but operates at lower temperatures and pressures than the conventional cycle.

The selection of fluid is important to the organic Rankine cycle because its physical and thermodynamic properties, particularly its phase change or boiling point, determines what types of heat input to the cycle are viable. While fluids with lower boiling points will allow for lower grades of waste heat to be utilized, this also lowers the achievable thermodynamic efficiency of the cycle. However, if the waste heat would otherwise have to be discarded, the lower efficiency is secondary to the ability to achieve some energy recovery. Common fluids utilized in the organic Rankine cycle are refrigerants and hydrocarbons such as pentane.

A schematic of an organic Rankine Cycle is illustrated below. Instead of a boiler burning a fossil fuel, the boiler in this case is in fact a heat exchanger in which the thermal energy from the waste fluid is transferred to the organic cycle fluid, changing its state (vaporizing it). There is an additional heat exchanger called a "regenerator" utilized to cool the organic fluid being exhausted from the turbine.

Producing power from an organic Rankine cycle plant utilizing a waste industrial heat source as the heat input to the cycle has a number of advantages. Firstly, it eliminates the greenhouse gas generation which would result from producing the power in a conventional Rankine cycle plant where the heat input typically comes from burning a fossil fuel such as coal, oil or natural gas in a boiler. Secondly, it converts the waste heat energy recovered into an energy form, namely, electricity that can be transmitted substantial distances to prospective customers and thirdly, electricity is an energy form that is in constant demand. In a district heating scheme, heat demand is not constant and pumping hot water significant distances can reduce the overall energy savings associated with recovering the waste heat.

Organic Rankine Cycle Schematic[15]



Preliminary inquiries were made to a potential supplier of organic Rankine cycle technology and equipment, namely, Trans-Pacific Energy Inc., to determine if it was feasible to utilize the low grade waste heat contained in the tertiary treatment effluent and, if so, obtain an estimate of the potential electrical energy production. Trans-Pacific have developed a working fluid which is composed of four different refrigerants, which they claim allow it to use lower grade waste heat than most other suppliers of organic Rankine cycle equipment, e.g., down to 27°C (80°F).

With the estimated16,000 m^3per day of 43°C tertiary treatment effluent, Trans-Pacific estimates that a gross electrical power output of 949 kW could be obtained if a water cooled condenser was utilized and a gross electrical power output of 686 kW could be obtained if an air cooled condenser was utilized. It is apparent from the information obtained that water cooling provides a significant improvement in energy recovery. There is a readily available source of cooling water in the form of the treated portion (clarified) of the raw water intake to the mill. Therefore, it would seem most beneficial that if an organic Rankine cycle plant was utilized for energy recovery to locate it on the mill property and utilize the clarified water as the cooling fluid in the condenser before the water continued on to the intended process uses in the mill. Further, locating the equipment on the mill property would minimize piping (and therefore costs) required for the cooling water and the tertiary treatment effluent. Additionally, the mill has an existing connection to the NS Power transmission grid and internal power distribution buses that may have sufficient spare capacity to allow connection of the organic Rankine cycle generator to them. This could potentially eliminate the need for a new transformer and some or all of the switchgear and protective devices that would be required for a generator installation.

A subsequent, more detailed study of this option would be required to determine estimated costs, payback period and return on investment. At a first high level overview, however, this option does look technically feasible and potentially quite attractive. As well, the full wastewater flow could be utilized as a source of heat potentially making this a much larger project; the above is based on a flow approximately ⅓ of the total wastewater flow.

[15] TransPacific Energy Inc., Technical Bulletin

4.5 Aquacultural Applications

Land based aquaculture operations in Canada generally require energy to maintain water temperatures that ensure the health and efficient growth of the various finfish and other aquaculture products. To this end, there may be the potential to utilize waste heat from the Northern Pulp wastewaters to maintain the appropriate water temperatures.

Canada is a major player in the aquaculture industry due to its access to: suitable sources of fresh and sea water, feed, and land. Canada is also well positioned in terms of good access to major markets; particularly the US.

4.5.1 *Canadian Aquaculture Species*

Canadian aquaculture production is dominated by four main categories by volume: salmon 66.7%; mussels 15.8%; oysters 8.7%; trout 3.4%. Other commercial species include: Manila clams, Soft shell clams, Arctic char, Tilapia, Atlantic cod, Sablefish, Geoducks, Atlantic halibut, Quahogs, White Sturgeon and Scallops. Emerging aquaculture species include: Spotted wolffish, American eels, Abalone, Sea cucumbers, Sea urchins, Cockles and Marine plants.

More than 85% of Canadian aquaculture production is exported – the largest export market is the United States.

- **Salmon**

Farmed salmon is by far the most important finfish species grown by Canadian aquaculturists. With a production volume of 118,058 tonnes and a value of $748 million, farmed salmon accounted for ~85% of both the volume and value of finfish produced by Canada's aquaculture industry in 2006.

Canada accounts for 8.2% of global farmed salmon production – and ranks 4th behind Norway, the UK and Chile as a producer of farmed salmon.

British Columbia and New Brunswick are the predominant producers of Canadian farmed salmon. In 2005, British Columbia accounted for 59% of Canada's total farmed salmon production – while New Brunswick accounted for 36%. Farmed salmon is British Columbia's largest agricultural export product - and the largest crop in the New Brunswick agri-food sector.

The United States is Canada's major export market for farmed salmon - accounting for 93% of Canada's farmed salmon exports in 2006. In 2006, the US imported 78,733 tonnes of Canadian farmed salmon worth $505 million.

- **Shellfish**

Canada's total shellfish production in 2006 was 38,676 tonnes with a value of $71 million. By volume, mussels and oysters are the primary shellfish species cultured in Canada: in 2006, mussels accounted for 62% of the total national shellfish production while oysters accounted for an additional 32%. Canada ranks 12th globally in the production of both mussels and oysters.

The United States is Canada's major export market for farmed shellfish. In fact, Canada is the largest supplier of shellfish to the United States.

- **Mussels**

In 2006, Canadian farmed mussel production was 23,822 tonnes valued at over $33 million. Eastern Canada produced 99% of Canada's total production in 2006. Prince Edward Island is the major mussel producing province – followed by Newfoundland, Nova Scotia, Quebec and New Brunswick.

Eastern Canadian mussels are primarily marketed in the northeastern US and the Canadian fresh, live market – these markets consume 97% of the Canadian mussel harvest. In 2006, the value of the Canadian mussel exports to the United States was $23 million.

- **Oysters**

In 2006, Canadian farmed oyster production was 12,488 tonnes valued at $18.5 million. Oyster production is distinctly divided between two Canadian regions: in 2006, 60% of the volume of Canada's oysters were produced in British Columbia; the remainder were produced in Atlantic Canada.

- **Clams**

British Columbia is Canada's largest producer of farmed clams – in 2006, it produced 1,600 tonnes of farmed clams valued at $8.3 million.

- **Scallops**

Canadian production of farmed scallops occurs in British Columbia, Nova Scotia, New Brunswick and Quebec. In 2006, Canada produced 58 tonnes of scallops with a value of $0.5 million. British Columbia accounted for 76% of this volume.

Table 4.1 summarizes the major aquaculture species produced in Atlantic Canada.

Table 4.1

Major Aquaculture Species – Atlantic Canada

	AQUACULTURE SPECIES		
	Finfish	**Shellfish**	Output $ (2009)
New Brunswick	Atlantic Salmon Rainbow Trout Steelhead Trout Cod Halibut	Eastern Oysters Blue Mussels	$164 million
Nova Scotia	Atlantic Salmon Arctic Char Halibut Steelhead Trout Rainbow Trout Tilapia	Eastern Oysters Blue Mussels Clams Quahogs Abalone	$57 million
Newfoundland and Labrador	Atlantic Salmon Steelhead Trout Cod	Mussels Clams	$92 million
Prince Edward Island	Salmon Processing Rainbow Trout Arctic Char	Blue Mussels Eastern Oysters	$31 million

Like most of Canada, NS aquaculture is dominated by salmon production, which is primarily undertaken using ocean cages. However, there are also numerous land-based aquaculture operations raising such species as arctic char, halibut, rainbow trout and tilapia. The land based operations usually require some heating of the water to ensure the survival and growth of the fish. While the heating requirements vary by species and operation, energy for heating the water is considered a significant production cost, particularly for warm water species such as tilapia.

4.5.2 *Aquaculture Feasibility Considerations*

Any potential aquaculture operation looking at using the waste heat available from Northern Pulp will need to examine a number of key considerations.

- **Waste Heat Availability and Cost**

Potential users of the waste heat will need to know the quantity, quality, availability and cost of the waste heat. On the plus side, 16,000 m^3 of 40^o to 50^o C water would clearly meet the heating requirements of several land-based aquaculture operations. Any potential user of the waste heat will need to know the availability, reliability and cost of the waste heat. An aquaculture operation would

also require some form of backup heating system to protect their valuable products. This would be an additional cost.

- **Water Supply**

Water Supply is likely the most critical factor in determining the technical feasibility of an aquaculture operation. Water supply includes quality, quantity, and temperature. Some species require fresh water and others salt water. Fresh water supplies could be groundwater or surface water. Most aquaculture species are very sensitive to water quality and thus water quality has played a significant role in either the success or failure of many operations.

- **Land**

Aquaculture operations, either land-based or marine-based require suitable locations where they can be operated safely, securely and efficiently. In the case of a potential Northern Pulp waste heat operation it would need to be located adjacent to the mill to take advantage of the low-cost waste heat. The available land in the vicinity of the mill will need to be examined to determine its suitability.

- **Technology**

Aquaculture technology continues to evolve to address production challenges. The design of the production facilities and selection of the appropriate technology must match the unique circumstances of each operation.

- **Production and Management Expertise**

Aquaculture operations require a great amount of expertise and experience to address the ongoing production and management challenges. Successful track records in terms of operations and management will be a critical success factor for any operation.

- **Financing, Marketing, Human Resources Etc.**

Like any business operations, the execution of a sound business plan will be critical. Ignoring one factor, such as human resource requirements, can lead to serious problems and business failure.

4.5.3 Existing and Proposed Waste Heat Aquaculture Projects

There are a number of existing and planned aquaculture operations utilizing waste heat from industrial operations or from geothermal resources. The following examples illustrate the potential for a similar operation using the available waste heat from Northern Pulp wastewater.

- **Nofima Recycle Waste Heat Aquaculture Centre (Norway)**

This project entails the use of waste heat for a aquaculture research centre in Sunndalsøra, Norway. The waste heat comes from an aluminum plant. The research centre is focused on re-circulating aquaculture systems for Norwegian land-based aquaculture. Power company Sunndal Energi has laid a 750 m pipeline to connect the waste heat to the centre. The waste heat is used to heat the water in the tanks, the air used in the recirculation process and to heat the buildings. The water has a temperature of 90^{o}C when it reaches the centre, and it goes through two stages of heat exchange so that an optimal temperature of 12 ^{o}C is obtained before it reaches the fish.

- **MinAqua Fisheries – Minnesota (US)**

MinAqua Fisheries has an indoor aquaculture facility that annually produces approximately $1.5 million worth of tilapia. The water and building are heated by waste heat from a nearby sugar beet processing operation.

- **Shrimp Aquaculture with Waste Heat (Rotterdam, Holland)**

This project is located next to the Eon power plant in an industrial park at Rotterdam's port, known as the Maasvlakte. A 2.5-kilometre pipeline was constructed to the power plant to recover waste heat. The operation is located in a hangar, where sunlight filters through a white roof covering. The operation includes 24 tanks filled with sea water for the Pacific white shrimp, a popular species choice for shrimp farming that has had success elsewhere, notably Ecuador.

The sea water, warmed by a waste heat from the energy plant, is kept at 29 ^{o}C, the ideal temperature for this species of shrimp.

- **ADM Hydroponics and Aquaculture - Decateur, Illinois (US)**

The following section on greenhouse opportunities describe an integrated operation in Illinois, involving the use of waste heat for both greenhouse and aquaculture operations.

- **Other Examples**

Worldwide, there are numerous aquaculture operations producing a wide range of aquaculture products using the steady waste heat from electrical power generation. Often these are warm water species being produced in cold climates. Tilapia is a common aquaculture species requiring warm water. Seabait Ltd, in England, is using waste heat to grow worms that are used for many things beyond fish bait. A salmon aquaculture operation used waste heat from the Lingan thermal electric generation

facility in Cape Breton. A land based aquaculture based aquaculture and greenhouse operation was established in Minto, NB to use waste heat from a thermo electric generation facility.[16]

4.5.4 *Northern Pulp Waste Heat Aquaculture Opportunities*

The Northern Pulp waste heat would be potentially very attractive to the aquaculture industry, if it could be demonstrated that it would substantially reduce the heating costs compared to other heating options such as oil, natural gas or biomass. There appears to be available land adjacent to the Northern Pulp operations as well as access to both freshwater and sea water.

Among the potential aquacultural operations would be hatchery operations to supply salmon and other finfish operations. Numerous attempts have been made to establish land-based finfish production operations for salmon, halibut and other species. There have been a number of successes in Nova Scotia and elsewhere, including operations that tap into industrial waste heat and geothermal resources.

Tropical species such as tilapia would also be potential applications. There are numerous land-based tilapia aquaculture operations both in warm locations such as Asia and in colder regions in North America. Tilapia is a relatively easy species to raise, has an established market in North America, and requires significant energy input to maintain warm water conditions.

As mentioned previously, there are numerous factors beyond access to low cost heating source which will determine the economic feasibility of an aquaculture operation. In addition, aquaculture has proven to be a very challenging industry in Canada and elsewhere. The initial excitement of the early years has disappeared. Numerous aquaculture companies have been created and disappeared due to a long list of challenges (changing markets, production issues, emergence of new competitors, management). However, there are also numerous successes, demonstrating the potential for new operations and new species. While preliminary discussions have been held with aquaculture officials and industry experts, the next step should be to approach the Provincial government and existing aquaculture companies with a package of information on the availability of the waste heat, land, and water resources to determine the level of interest and development requirements.

4.6 Greenhouse and Other Agriculture Applications

Greenhouses are used for the production of various plants, flowers, seedlings and other agriculture products. Greenhouses allow production to take place year-round in locations such as Nova Scotia. Flowers, seedlings and bedding plants are likely the most common products produced by greenhouses in Canada; however, vegetables such as tomatoes and lettuce are becoming more common in Canada. Greenhouse operations in climates such as Nova Scotia's require significant heating to achieve adequate plant/crop growth. Heating cost are one of the most significant costs of production and is a major focus

[16] It should be noted that both the Lingan and Minto aquaculture operations are now closed due to production and financial reasons.

in terms of minimizing energy requirements and developing the most efficient heat sources. There are numerous examples of greenhouse operations (in other parts of Canada and elsewhere) taking advantage of heat sources such as waste heat from industrial and electrical power generation facilities. Whole greenhouse industries have grown up around industrial and geothermal heat sources.

The Northern Pulp waste heat represents a potential opportunity for existing and new greenhouse operations to reduce their very significant energy costs.

4.6.1 *The NS Greenhouse Industry*

The NS greenhouse industry consists of approximately 130 growers who together have in excess of 3 million ft^3 of production space under glass or plastic. The industry generates approximately $36 million in annual sales. The sector employs over 1250 people, contributing in excess of $9 million to the economy through annual payroll. [17]

Greenhouse operations are spread throughout Nova Scotia producing a variety of plant materials and food items. The list includes:

- Annuals and Perennials for gardens and landscaping
- Cut Flowers and potted plants
- Herbs and Vegetables - tomatoes, cucumbers, peppers etc.
- Trees - Christmas tree seedlings, fruit, ornamental

The Pictou-area greenhouse operations include Sunrise Gardens located just outside Pictou as well as Duykers Greenhouses in Antigonish.

4.6.2 *Greenhouse Operations Feasibility Considerations*

Any potential aquaculture operation looking at using the waste heat available from Northern Pulp will need to examine a number of key considerations.

- **Waste Heat Availability and Cost**

Potential users of the waste heat will need to know the quantity, quality, availability and cost of the waste heat. On the plus side, 16,000 m^3 of 40^o to 50^o C water would clearly meet the heating requirements of several major greenhouse operations. Any potential user of the waste heat will need to know the availability, reliability and cost of the waste heat. A greenhouse operation would also require some form of backup heating system to protect their valuable products. This would be an additional cost.

Depending on the product and market focus of the greenhouse operation, the heat requirements could be considerably different. As discussed elsewhere, most greenhouse operations in Nova Scotia are

[17] Source Greenhouse Nova Scotia www.greenhousenovascotia.com

seasonal operations, requiring heat during the late winter and spring period. These types of operations would not be as suitable as an operation that had a more consistent heat requirement throughout the year, or at least throughout the heating season (fall, winter, spring).

- **Water Supply**

Greenhouses require a reliable water supply. However the requirements would not be as large or as critical as the aquaculture industry. With the significant freshwater availability in the area, water supply is not anticipated to be a concern for greenhouse operations.

- **Land**

Greenhouse operations require significant space for the greenhouses, supporting operations and potentially for retail operations. In the case of the Northern Pulp waste heat operation, the greenhouses would need to be located adjacent to the mill to take advantage of the low cost waste heat. The available land and transportation access in the vicinity of the mill will need to be examined to determine its suitability.

- **Financing, Marketing, Human Resources Etc.**

Like any business operations, the execution of a sound business plan will be critical. Ignoring one factor, such as human resource requirements, can lead to serious problems and business failure.

4.6.3 Waste heat Use by Greenhouse Operations

There are numerous examples around the world of greenhouse operations using waste heat from industrial and electric power generation operations. Following are examples of a number of successful applications.

- **Greenhouse Operation Thermal Electric Facility Waste Heat (Italy)**

ENEL (the National Board of Electricity, in Italy) established a program to research the use of thermoelectric power plant cooling waters for aquaculture and agriculture. As a part of this program, in South Italy, some technological (greenhouse heating through buried pipes and water-to-air heat exchangers) and agronomical aspects (growing of different ornamental pot plants) related to the use of low enthalpy waters (20^{o} to 26^{o}C), were developed.

- **Burlington, Vermont Food Works Agricultural Eco-Park (US)**

The Agricultural Eco-Park in Burlington's Intervale project is using waste heat from a local wood-fired power plant to fuel a series of year-round greenhouses where byproducts from local food manufacturers and farms are converted to fish, shrimp, mushrooms, salad greens, and composts.

- **Quebec Agrothermal Projects (Canada)**

There has been considerable research and development work in Quebec related to the use of waste heat for greenhouses and aquaculture. There is a major proposal for a 10 hectare greenhouse operation to grow tomatoes, peppers, lettuce and other vegetables. This proposed project would be in Salaberry de Valleyfield. The original feasibility study was completed in 2004. While the study was quite positive, the Community has not been able to proceed to implementation. Other waste heat proposals have been developed for Saguenay Lac St-Jean, and Témiscamingue.

- **New Richmond Waste Heat Tomato Greenhouse Operation (Gaspe, Canada)**

A more modest waste heat/greenhouse project was developed in New Richmond (Gaspe Region). This 12,000 m^2 greenhouse produces tomatoes and other products for the local, Quebec and other Eastern Canada markets. The greenhouse was originally heated by waste heat from a Smurfit Stone Paper Mill. The Paper Mill has since closed and the heat is now provided by a biomass heating facility. The available waste heat was an impetus to develop the greenhouse. A solid business strategy and plan has allowed the greenhouse to remain in business despite the loss of the waste heat supply.

- **ADM Hydroponics and Aquaculture Decateur, Illinois (US)**

ADM is a large multinational agribusiness company headquartered in the US. It has a major production facility in Illinois, including a number of hydroponic greenhouse operations. It is using waste heat from one part of its operation to heat the hydroponic nutrient as well as the greenhouses. Waste heat is also used for an adjacent aquaculture operation that produces tilapia. Byproducts from processing operations also provide nutrients for the fish.

4.6.4 Northern Pulp Waste Heat Agriculture Opportunities

The application of waste heat to greenhouse operations is well established in many jurisdictions. The potential of a large volume of low grade waste heat from the Northern Pulp operation would be extremely attractive to a new greenhouse operation, provided the other critical business requirements can be met. Other requirements would include land, water, markets, labour, financing and operational/management expertise.

While heating costs are a very significant cost factor for greenhouses in Nova Scotia, there are many other factors that will determine if an operation would take advantage of the Northern Pulp waste heat. First on the list will be the actual cost of the waste heat in relation to existing heat sources such as oil or biomass.

Many greenhouses operate seasonally, in that their major markets are to serve the local and regional gardening and landscaping markets. These seasonal greenhouses start up operations in the late winter to be able to meet the spring and summer market requirements. This reduces the annual heat requirements. A greenhouse operation based on the use of Northern Pulp waste heat would likely need to be a year round operation to justify the investment in a waste heat recovery system.

Canada is seeing an expansion of year-round greenhouse operations producing vegetables for the local markets. The New Richmond operation is a good example. There are also other examples in Atlantic Canada. These types of operations would benefit more from the available waste heat.

Nova Scotia has a relatively modest greenhouse industry with not a lot of new operations occurring each year. The modest growth combined with the cost for an existing operation to relocate to the Northern Pulp site would mean there would likely be very few businesses that would seriously consider this opportunity.

On the plus side, there would be support from all levels of government to investigate and potentially implement such an operation. For example the Nova Scotia Government has funding programs for agriculture energy conservation and renewable technologies. These programs are available for the identification, assessment and implementation of energy conservation and renewable technologies. Furthermore, the Nova Scotia Department of Agriculture has an Energy Specialist to advise on the options and programs (Julie Bailey (902) 896-4473). The federal government has similar programs that generally mesh with the Provincial programs.

The next steps should be to enter into discussions with agriculture officials and the greenhouse industry to review the waste heat opportunities and receive feedback on how best to take advantage of this potential energy resource.

4.7 Summary of Waste Heat Utilization Options

The review of options for use of the available waste heat has identified a number of options that warrant further research and analysis. The nearly 16,000 m^3/d of 43^{o}C wastewater represents a very significant energy source that could potentially be used by both Northern Pulp and other new operations. All of the opportunities have focussed on the non-contact use of the effluent; the use of the treated effluent in a direct-contact manner is deemed not feasible. In most cases, the quality of the water is not of a major concern; the water should be “clean” enough to be utilized in a heat exchanger with minimal fouling.

The opportunities examined included :

- District heating;
- Lumber drying;
- Power generation;
- Aquaculture; and,
- Agriculture.

As well, the mill could investigate the feasibility of reclaiming the heat to pre-heat the raw water for the appropriate processes requiring “hot” water. Regardless of the end use, the wastewater treatment

process would benefit if the heat was removed prior to the wastewater being introduced into the secondary treatment system.

The district heating option, in and of itself at the high level of review conducted for this report, would not be considered feasible since the existing building density/building types in the vicinity of the mill are not conducive to that type of an operation. However, the concept of marketing the available waste heat as a regional asset to businesses and other forms of development could be considered.

Using the waste heat for lumber drying, only, particularly with the current state of the lumber industry, may be a difficult opportunity to promote.

Aquaculture and agriculture (greenhouse operations) are two examples of the types of industries that should be part of any attempt to develop markets for the waste heat. Lower cost heat sources are always of interest to these industries, particularly in a colder climate like Nova Scotia. The key to pursuing these opportunities will be to determine the delivered cost of the heat to these potential operations, along with the other required basic business inputs (land, water, transportation, markets etc.)

Electric Power Generation – There is limited demonstrated success of generating electricity from low grade heat sources such as is available. However, there is enough promising new developments to continue to investigate the potential. There is a well established and stable market for the electricity which will be key for any potential user of the waste heat. Locating a power generation system at the mill would provide access to their grid infrastructure. The generation of “green” power also conforms to the Nova Scotia provincial government’s policy to increase the percentage of power being generated from renewable resources.

5.0 Opinion of Probable Costs

5.1 Tertiary Effluent Treatment

The capital costs for the various process options of tertiary treatment have been calculated based on a variety of resources. All probable costs are preliminary and originate from vendors budgetary quotes, published R&D papers and ADI in-house experience. The capital costs, as well as operating costs, have all been calculated based on large equipment prices and considering industry standard construction rates. The installation of specialized equipment is anticipated to be challenging so it is included as a cost that is equal to that of the equipment costs. Any sludge handling equipment is not included in the probable costs as the secondary treatment will be required to do this operation and it is anticipated that it would be sized to accommodate the sludge handling requirements of the tertiary treatment system. It should be noted that this may impact the sizing of the secondary treatment sludge handling equipment and configuration. Additionally, all probable costs include a contingency for the purpose of covering currently unknown costs that will be realized when the piloting stage and detail design is undertaken.

The operational costs have been calculated based on estimated power costs, chemical consumption estimates and cross referenced to other installations. Not included is any additional labour costs as it is assumed that minimal operation time will be required and will be done by existing WWTP personnel.

The following tables provide the breakdown of the costs for the three tertiary treatment systems that are deemed the most appropriate for this project.

Table 5-1 Engineered Wetlands

ITEM NO	Definition	Units	Quantity	Unit Price	Total
1	Clearing & Grubbing	ha	6.1	$ 20,000	$ 122,000
2	Berms	m	1750	$ 200	$ 350,000
3	Excavation	m^3	75000	$ 15	$ 1,125,000
4	Liner	m^2	61000	$ 10	$ 610,000
5	Distribution Header	m	550	$ 500	$ 275,000
6	Collection System	m	500	$ 500	$ 250,000
7	Wetland Media	m^3	91500	$ 25	$ 2,287,500
8	Wetland Vegetation	m^2	61000	$ 5	$ 305,000
	Other				
9	Indirect Costs @ 15%				$ 780,375
10	Engineering @ 15%				$ 780,375
11	Contingency @ 20%				$ 1,040,500
	Total Opinion of Probable Cost				**$ 7,804,000**

Table 5-2 Chemical Precipitation/Clarifier

ITEM NO	Definition	Units	Quantity	Unit Price	Total
1	Capital Equipment				
	Clarifier	ls	1	$ 1,500,000	$ 1,500,000
	Floculator	ea	3	$ 100,000	$ 300,000
	Chemical Addtion	ea	3	$ 40,000	$ 120,000
	Process Piping	ls	3	$ 150,000	$ 450,000
2	Equipment Installation, % of Equip.	%	100%		$ 2,370,000
3	Building	m^2	500	$ 3,000	$ 1,500,000
	Other				
4	Indirect Costs @ 15%				$ 936,000
5	Engineering @ 17%				$ 1,060,800
6	Contingency @ 20%				$ 1,647,360
	Total Opinion of Probable Cost				**$ 8,236,800**

Table 5-3 Ozonation

ITEM NO	Definition	Units	Quantity	Unit Price	Total
1	Capital Equipment				
	Ozone Generator	ea	3	$ 1,660,000	$ 4,980,000
	Oxygen Skid	ea	1	$ 300,000	$ 300,000
	Contact Chamber	ea	3	$ 100,000	$ 300,000
	Biofilter	ea	3	$ 250,000	$ 750,000
2	Equipment Installation, % of Equipment	%	50%		$ 3,165,000
3	Building	m^2	500	$ 3,000	$ 1,500,000
	Other				
4	Indirect Costs @ 15%				$ 1,649,250
5	Engineering @ 17%				$ 1,869,150
6	Contingency @ 20%				$ 2,902,680
	Total Opinion of Probable Cost				**$ 17,416,080**

Annual operating costs for the various tertiary treatment options are presented in Table 5-4.

Table 5-4 Annual Probable Operations and Maintenance Costs

Tertiary Treatment Process	Estimated Annual Operating Cost **
Ozonation	$ 2,363,000
Clarification	$ 2,063,000
Engineered Wetland	$ 500,000

**based on 350 days/year, $0.1 per kWh electricity

5.2 Outfall Extension to Northumberland Strait or Pictou Harbour

Probable costs have been developed for the two outfall options: to the inner harbour of Pictou Harbour and to the MacKenzie Head area in the Northumberland Strait. These costs provide order-of-magnitude values which should be refined once a decision has been made to proceed with the project, an environmental assessment has been completed and preliminary design work has been done.

Some assumptions which were made during the formation of this opinion of probable cost are as follows:

1. Locations where gravel roads currently exist, it was assumed that the pipe can be installed within the road itself, without causing traffic disruptions;
2. Pipe being installed within wooded areas, a swath width of 15m was deemed sufficient and that this area will serve as the permanent access road once work has been completed. As such, it was assumed that the permanent access road will be completed with access points (manholes for inspection, vacuum and air relief, etc.);
3. The underwater routes were assumed to be buried in armour rock. The volume of rock could vary depending on amount of protection required;
4. Additional costs would include survey, contractor's overhead and profit, mobilization and demobilization;
5. The engineering costs would include design and field services; and,
6. There has been no accounting for the possible costs of land acquisition or easements.

The following tables provide the breakdown of the costs for the two discharge location options. In the event that the discharge point has to be moved further out into the harbour or ocean from the point(s) shown in Figure 2-7, the additional underwater piping cost will be in the order of $300,000/100m.

Table 5-5 Outfall into Pictou Harbour

ITEM NO	Definition	Units	Quantity	Unit Price	Total
	Pipe Work				
1	Clearing & Grubbing	ha	0.23	$ 20,000	$ 5,000
2	900 mm HDPE DR 17	kg	248754	$ 2.45	$ 610,000
3	Pipe Delivery	ea	28	$ 4,000	$ 112,000
4	Pipe Fusion	m	1700	$ 15.5	$ 27,000
5	Land Installation	m	600	$ 750	$ 450,000
6	Marine Installation	m	1100	$ 2,250	$ 2,475,000
7	Diffuser	ls	1	$ 500,000	$ 500,000
8	Armour Rock	m^3	1100	$ 250	$ 275,000
9	Rock to be Excavated	m^3	2550	$ 80	$ 204,000
10	Manhole (Inspection, Vacuum, Air Relief)	ea	1	$ 5,000	$ 5,000
	Road Work				
11	Access Road	m^3	563	$ 35	$ 20,000
	Restoration				
12	Topsoil and Hydroseed	m^2	1150	$ 6	$ 7,000
	Other				
13	Indirect Costs @ 15%				$ 703,500
14	Engineering @ 17%				$ 797,300
15	Contingency @ 20%				$ 938,000
	Total Opinion of Probable Cost				**$ 7,128,800**

Table 5-6 Outfall into Northumberland Strait (MacKenzie Head)

ITEM NO	Definition	Units	Quantity	Unit Price	Total
	Pipe Work				
1	Clearing & Grubbing	ha	8.36	$ 20,000	$ 168,000
2	900 mm HDPE DR 17	kg	1331566	$ 2.45	$ 3,263,000
3	Pipe Delivery (truckload, 4 pipe/truck)	ea	150	$ 4,000	$ 600,000
4	Pipe Fusion	m	9100	$ 16	$ 142,000
5	Land Installation	m	8200	$ 750	$ 6,150,000
6	Marine Installation	m	900	$ 2,250	$ 2,025,000
7	Diffuser	ea	1	$ 500,000	$ 500,000
8	Armour Rock	m^3	900	$ 250	$ 225,000
9	Rock to be Excavated	m^3	13650	$ 80	$ 1,092,000
10	Manhole (Inspection, Vacuum, Air Relief)	ea	5	$ 5,000	$ 25,000
	Road Work				
11	Access Road	m^3	23415	$ 35	$ 820,000
12	Asphalt (x0.13)	tonne	72	$ 110	$ 8,000
13	150 mm Granular Base	m^3	1969	$ 35	$ 69,000
14	450 mm Granular Sub-base	m^3	5906	$ 35	$ 207,000
	Restoration				
15	Topsoil and Hydroseed	m^2	55750	$ 6	$ 335,000
	Other				
16	Indirect Costs @ 15%				$ 2,344,350
17	Engineering @ 17%				$ 2,656,930
18	Contingency @ 20%				$ 3,125,800
	Total Opinion of Probable Cost				**$ 23,756,080**

6.0 Conclusions/Recommendations

6.1 Conclusions

The current use of Boat Harbour as a component of the wastewater treatment system for the Northern Pulp mill at Ambercrombie is being re-evaluated with a commitment being made by the Provincial Government to return Boat Harbour to its natural state. Previous studies have examined the changes required to the wastewater treatment system to remove the existing system form Boat Harbour as well as options for alternative outfall locations. This study further examined the additional treatment required to improve upon the quality of the final effluent to allow discharging into Pictou Harbour. This study also examined an alternative outfall location if tertiary treatment is not implemented.

From a regulatory perspective, there are no regulations preventing the effluent from being discharged into Pictou Harbour. In its current state, it is anticipated that the poor aesthetic quality could lead to a degradation of the visual quality of the Harbour and would require an improvement of the effluent qualities to have the discharge to the Harbour be acceptable from a public perspective. It is believed that, from a technical perspective, the addition of a tertiary treatment process would improve the effluent quality sufficiently to allow the effluent to be discharged into the Harbour.

Several tertiary treatment system options have been presented that could improve upon the secondary treatment (the option if tertiary treatment is not applied is to relocate the outfall to the Northumberland Strait a sufficient distance from Pictou Harbour such that tidal action does not pull the effluent into the Harbour on an incoming tide). The three tertiary treatment options that show promise are:

1. Engineered wetlands;
2. Chemical precipitation followed by clarification; and,
3. Ozonation.

Costs for the tertiary treatment ranged from $ 7.8M to $ 17.4M. Costs for the two outfall options (Pictou Harbour and Northumberland Strait (MacKenzie Head area)) range from $ 7.13M to $ 23.76M. However, it must be noted that the Pictou Harbour outfall cost ($ 7.13M) must be combined with a tertiary treatment cost (minimum of $ 7.8M) to realize the full cost of the discharge option to Pictou Harbour. Where there is no need for tertiary treatment to extend the outfall to the Northumberland Strait, this option will, in all likelihood, have the lowest operational and maintenance cost.

There are market opportunities that could benefit from the availability of heat that could be recovered from the wastewater effluent. The opportunities exist within the mill (pre-heat the incoming fresh water), in the aquacultural and agricultural industries, as well as potential “green” power generation. As well, it may be possible to combine opportunities (e.g., power generation plus raw water pre-heating for the mill).

6.2 Recommendations

The Northern Pulp mill has plans to implement in-mill process changes this year (2011) (using funding obtained from the federal Green Transformation Program) that may impact mill effluent quality. This impact is expected to be in both quantity (less wastewater produced) and quality (a reduction in the organic and solids loading requiring wastewater treatment as well as a possible colour reduction). It is, therefore, recommended that any decisions on effluent treatment options be delayed until after these changes are implemented. Further, it is recommended that at least three (3) months of effluent monitoring data be collected after the changes are implemented with this data being used in conjunction with the tertiary treatment option review.

If the decision is made to proceed with tertiary treatment to allow the outfall to be potentially relocated to Pictou Harbour, it will be necessary to pilot test the technologies so to gather additional data for design and costing purposes. Through the pilot-testing process, additional information will be collected regarding the improvement on the effluent quality as well as operational requirements. Pilot testing for the precipitation/clarification option would take six to eight weeks; the ozonation option may require four to six moths (due to the biological nature of the filter for the follow-up BOD removal); and the wetlands option should be pilot tested a minimum of one (1) year due to the biological nature of the process.

Additional preliminary design work will be required to determine the appropriate site for the new outfall. The best approach may be to continue to investigate both sites so that better pricing can be established. As well, the other factors that will determine the final location (social, political, regulatory, etc.) can be examined.

While several potential market opportunities for using the waste heat have identified, additional studies will be required to determine their feasibility. One promising opportunity is power generation; however, the quantity of heat available may change with the completion of the current modifications within the mill. While further preliminary studies can be undertaken to provide additional details, it is recommended that the results of the in-mill changes be reviewed so to provide better definition of the available waste heat. This study also only focussed on a portion of the effluent as a source of the heat available for such a project. In fact, the whole wastewater stream can be utilized for this type of non-contact application.

Identify an appropriate organization (e.g. Pictou Regional Development Agency) that would take the lead in identifying potential businesses that would locate in the proposed business/industrial park and take advantage of the available waste heat. Initial focus should include the aquaculture, agriculture and power generation sectors. However, there are many other businesses and institutions that would be attracted by access to a lower cost energy source. Then, develop a conceptual plan and preliminary cost estimate to develop serviced business/industrial lots in the park adjacent to Northern Pulp. These lots would include municipal services including access to the available waste heat from Northern Pulp.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 10:49:42 AM

Project: replacement_effluent_treatment_facility_project Comments: In my opinion, if a company doesnt provide an environmentally friendly output they shouldnt be operating. I know this is a big industry and by closing the mill it will hurt many NScotians in the industry. What about building another industry that doesnt cause deforestation, polluting of water ways and hurt our environment. Hemp anyone??

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 10:52:48 AM

Project: replacement_effluent_treatment_facility_project Comments: Any plan that pipes effluence directly into the Strait is a no go. Period. End of story. If they want an extension, it should be to build a closed loop system. They had years to prepare this, to work with the government, the industry and the community to get this right and they were silent for the first 3 years and then came out saying No pipe, no mill. Finally something we can all agree on No pipe, no mill! Good riddance! :

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 10:54:24 AM

Project: replacement_effluent_treatment_facility_project Comments: This project is very important for the longevity of the Forest Industry in Pictou Co.and for the economy of Nova Scotia. I feel NP has done their homework for this project and have presented the best replacement solution for Boat Harbour. Effluent has been pouring into the Northumberland Strait for 50 years with no harmful effects on the environment or the fishing industry. Now in 2019, NP will be using the best technology available for bleach kraft pulp mills in the world which will meet or excede provincial and federal guidelines for the environment.They have done 28 studies for the Government with consultation from the Environment,Transport Canada,Fisheries and Oceans and many other departments. They crossed all the Is and Ts necessary to be awarded an Environmental permit to procede with the construction and completion of the project to replace Boat Harbour. When completed there be safe guards in place to protect the environment and to continue to let the forest industry and fishery industry co-exist like they have in the past. I hope you will grant this permit to build this treatment plant as 12,000 jobs associated with the Mill are at risk as well as the economies of Pictou, Colchester, Cumberland Counties and the economy of our Province. The science is there to back this Mega project. Hopefully, calm and cool heads will look at this project which has turned into such a contentious issue when there is no need for it. I have no doubt in my mind when your Department looks at all the scientific data and studies by NP it will be a no brainer to approve the permit. Respectfully yours

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:09:47 AM

Project: replacement_effluent_treatment_facility_project Comments: I absolutely object to this companys plans to put effluent anywhere...whether in Boat Harbour or the Northumberland Strait. This type of environmental racism has to stop, and it has to stop now.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:28:09 AM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotians need NP to continue to operate providing jobs and money to our economy. We all need health care and paved roads. Theyâ?Tre only asking for 1 more year. NP wants to clean up Boat Harbour and we should give them that time. The whole province should want that.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:31:03 AM

Project: replacement_effluent_treatment_facility_project Comments: Shut down this mill!! Government and business colluding against the better welfare, health and future of the people of N.S. the raping of our forests should have stopped years ago. I live in the forest and the ancestors must be ready to rise up after the insult to the land this company and the government have subjected it to. I see the damage. I see the loss of animal and bird life. I hear the bald-faced lies that the company supported by the government espouse. You cant hide anymore. Climate change is real!! stop polluting and raping the forest and the seas!

From: [redacted]
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:31:59 AM

Project: replacement_effluent_treatment_facility_project Comments: We need nothernpulp to continue, thereâ?Ts to many jobs and people depending on this please consider and help everyone come to an agreement.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:51:56 AM

Project: replacement_effluent_treatment_facility_project Comments: Go for it

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 11:52:01 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe its a good plan with the best technology. I believe it will be okay for the approval.

From:
To: Environment Assessment Web Account
Subject: No pipe in Northumberland Strait . Mill highly polluting too long. We want clean air, water and soil.
Date: Thursday, February 07, 2019 12:01:56 PM

Sent from Samsung tablet

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:02:32 PM

Project: replacement_effluent_treatment_facility_project Comments: This treatment facility is vital to the forest industry. I fully support this state of the art facility and the cleanup of boat harbour. Though a short extension on boat harbour may be needed to do this right

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:09:17 PM

Project: replacement_effluent_treatment_facility_project Comments: As a Pictou County Resident, a provincial tax payer, and most importantly, a father of three , I find it appalling that we are even contemplating allowing this Industry to dump toxic effluent into the Northumberland Strait in the hopes that dilution is a viable a solution. Northern Pulp continuously says the effluent is already going into the Strait, but fail to mention that that only happens after sitting for a month or more in a 300 acre tidal estuary which acts as a natural filter. The proof of Boat Harbours filtering ability lie in the sheer effort it will take to clean that environmental disaster up, and even after all that effort and money, it will never be the same. There seems to be a lot of focus on the people that will be forced to move away for work, however there also should be a focus on the young families who will choose to move away, or never relocate here in the first place should this proposal be allowed to go through. There are many of us that are not interested in being poisoned for the sake of Asia Pulp and Papers profit. Its time to think about the future, and dumping at minimum, 50-60 million liters per day of pulp waste into the Northumberland Strait, jeopardizing a more profitable fishing industry as well as severely limiting tourism and growth in the surrounding areas, is doing the exact opposite of that. As we move into the future there will be an even greater focus on environmental sustainability. Nova Scotia should be looking to invest in being a leader in that area, not taking significant steps backward in time.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:12:02 PM

Project: replacement_effluent_treatment_facility_project Comments: I have concerns regarding the proposed pipeline and project and the transparency of what the discharged effluent is comprised of. I would hope that this could be used as an opportunity to review the rules and regulations that Northern Pulp operate under. I hope that there is continued environmental monitoring put in place for the upgrade,cleanup, and continued operation of the the pipeline.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:18:15 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp is attempting to correct a long standing environmental problem. This is important to both citizens and employees of the forestry industry. This ownership should be given the opportunity to do so.

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	Thursday, February 07, 2019 12:18:57 PM

Project: replacement_effluent_treatment_facility_project Comments: There is not enough information given to the general public or the fisherman to so hastily approve this project. More science should be done to better ensure the least amount of impact on the fishery and environment. Recommend federal environmental assessment

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:21:10 PM

Project: replacement_effluent_treatment_facility_project Comments: As a long time visitor to the area over many years I have seen the enviromental damage that the Mill has done to business and health in the area, in my opinion you should be paying the local population for the mess you have caused and attempting to remedy the situation. Dumping more rubbish in Northumberland Strait is not the answer.

Stourbridge West Midlands England.

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:21:27 PM

Project: replacement_effluent_treatment_facility_project Comments: Full support for this project

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:36:38 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp/Paper Excellence is making all efforts to make this work for everyone. The loss of Northern Pulp in Atlantic Canada will be devastating. I believe in the company and believe the MacNeil government will do the right thing and allow Northern Pulp the time to get the project in place in the time frame needed to get it done right. Thank you.

From: _____@gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:45:00 PM

Project: replacement_effluent_treatment_facility_project Comments: Not enough is known about the proposed effluent discharge. It is unknown how the effluent will effect a marine environment, especially an environment of tremendous cultural and vocational value . The federal standards now in place are outdated , 65,000cubic meters a day of heated effluent can only have a detrimental and unbalancing effect on a delicate and understudied environment. Northern pulp has proven to be a bad environmental actor and cannot be trusted to temper its corporate greed In the interest of a clean environment

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:48:59 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe Name:

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:51:14 PM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia can not loose the the forestry industry our economy would collapse.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 12:55:38 PM

Project: replacement_effluent_treatment_facility_project Comments: We need to maintain our workforce in Nova Scotia. If an extension is necessary to complete project, DO IT. Give them the TIME.....

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:00:24 PM

Project: replacement_effluent_treatment_facility_project Comments: We need you Northern Pulp , yes pipe for Pictou County ðY' ðY' ðY' ðY'

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:08:39 PM

Project: replacement_effluent_treatment_facility_project Comments: #yespipe I support Nothern Pulp!! This pipeline has to go in.

From: @gmsil.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:10:56 PM

Project: replacement_effluent_treatment_facility_project Comments: I think they need to try this pipe. #yespipe

From: ∂gamil.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:24:20 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe ever you had 5 years to do this now looking for one more year extension ? PLFN will not agree the act his past

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:24:29 PM

Project: replacement_effluent_treatment_facility_project Comments: In that it meets environmental guidelines it is necessary to keep a critical part of our struggling rural economies.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:26:26 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe!!!!!!!

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s planned Pipeline
Date: Thursday, February 07, 2019 1:27:18 PM

My answer is just no. Are you willing to risk the #1 economic engine (fisheries) in our province?

No pipe in our Strait.

Pictou

Sent from my Samsung device over Bell's LTE network.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:28:38 PM

Project: replacement_effluent_treatment_facility_project Comments: This pipe into the water must be stopped forever. This is an ecological disaster in the making. Please stop this now

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	Thursday, February 07, 2019 1:33:23 PM

Project: replacement_effluent_treatment_facility_project Comments: Effulent treated or otherwise must not be allowed to enter the Northumberland Strait!

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:43:34 PM

Project: replacement_effluent_treatment_facility_project Comments: Agree with the proposal !

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 1:47:08 PM

Project: replacement_effluent_treatment_facility_project Comments: Good morning The government of Nova Scotia need to rely on the experts and engineers to base their decision on in this project. Let the science decide not peer pressure from the public on either side of the argument. There is a lot at stake here and I fear the decision will be based on whatever will gain the most votes. If the science displays the mill will produce an effluent that is better than it currently is and it will meet all the current regulations and the new regulations coming down soon it should be allowed to run. If the effluent is going to be worse than the current system then thatâ?Ts a different story. A lot of locals are uneducated and very determined to stop this project due to lack of knowledge and poor communication at all levels. We need a government that will take an unbiased stance on this and think of the whole province. The government must do the right thing and protect the environment and the economy.rely on the experts, do the right thing. Keep this province working. Currently all political parties have been playing politics on this matter and not taking a side. A lot of forestry families need a government that will be straight up and honest. Families are leaving this province and many are making plans to leave. This is no time for games. If the science works approve the project and let these families know they have a future here in Nova Scotia. Thanks

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	Thursday, February 07, 2019 2:00:17 PM

Project: replacement_effluent_treatment_facility_project Comments: This is a very well put together document that Im sure answers a large majority of the questions from those who truly want to learn. If we simply remove our emotional biases and allow science to dictate our thoughts and decisions on large scale engineering projects such as this one, it is obvious to see that both the Forestry and Fishing industries of Pictou County can continue to coexist, as they have for the past fifty-two years.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 2:08:26 PM

Project: replacement_effluent_treatment_facility_project Comments: Looks like a good upgrade from the current system. With the new equipment I canâ?Tt see how it could have any more of a footprint than the current process being used. If anything it should be less. Lots of effort put in on Northern Pulps part to cover all necessary aspects of the build.

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 2:15:11 PM

Project: replacement_effluent_treatment_facility_project Comments: It looks like a thorough plan which meets all regulations.

From:
To: Environment Assessment Web Account
Subject: Feedback opposing the Northern Pulp Waste Proposal
Date: Thursday, February 07, 2019 2:18:23 PM
Attachments: ambient air study.pdf

NS Department of Environment and Premier McNeil,

I believe that the proposed effluent project SHOULD NOT be approved for the following reasons :

1. **The proposed waste process is not better than the current waste process**

Some say, "the effluent has been going out into the Strait for years anyway. " This is only partially true. A study conducted in 2005 showed that healthy mussels deployed into the Pictou Harbour and exposed to mill effluent and untreated municipal sewage for 6 months had developed leukemia. Another study showed that the effluent had never been flushing properly with a large amount settling back into Pictou Harbour. Because the old system was never flushing properly, most of the effluent has been confined to the local shoreline and has been flowing back into Pictou Harbour, rather than into the Strait. This was a good thing for the Strait, but not for area residents, especially Pictou Landing First Nation. In Northern Pulp's proposed new system, waste water would go straight out from the new Abercrombie Point treatment facility into "deeper waters. "This could result in the pollutants affecting a far wider area because of "improved flushing."

Old Waste Process

Northern Pulp's proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with micro-organisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as "polishing" or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulp's figures, during the time in Boat Harbour Basin, total suspended solids (TSS) and biochemical oxygen demand (BOD) decrease up to 30%, before the effluent flows out at the shore edge of the Strait at Point D.

NOTE : Northern Pulp's effluent meets the regulations at Point C in the above process. Point C is also now a DEAD ZONE.

Northern Pulp's own reports say that they release over 1000 kg (one metric ton) of suspended solids in their waste water each day. Test results have revealed the presence of dioxins, furans, chlorinated compounds, halogenated organic compounds and traces of heavy metals. These substances are known to have negative impacts to aquatic life. The study prepared for Northern Pulp by engineering consultants KSH Solutions Inc. clearly shows that there will be very little change in

wastewater quality with the new AST facility

The Proposed Waste Proposal

In the proposed new Activated Sludge Treatment (AST) system on the mill site, effluent will move through a primary clarifier to an aeration basin using micro-organisms to break down pollutants, and then to a secondary clarifier. The process will take less than 24 hours.

Therefore it will not have the 300 acre lagoon to provide further aeration, settling, cooling, volatilization and breakdown of materials that takes place during that time. This is referred to as "polishing" or tertiary treatment. That is one of the main reasons why the proposed system is not better since it doesn't have the time like the old process to settle, cool down, become further diluted etc.

Northern Pulp states that effluent from the new system, including an added oxygen delignification system (confirmed from mill execs that it will not be ready for the proposed launch of the new effluent system and does not have a timeline), will be similar to treated effluent leaving the present system at point C, with some (unspecified) reduction in biochemical oxygen demand (BOD.)

2. <u>Additional Air Quality Issues</u>

The new proposal also shows a plan to burn contaminated sludge in power boiler which raises new threats to air quality. The waste sludge contains toxins which would be released through the stacks of the mill's power boiler. The proposal is to "dewater the sludge prior to mixing it with bark and other woodwaste for combustion in the mill's power boiler." This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NP's air emission

Recently a group of scientists decided to measure the levels of VOCs (volatile organic compounds) in Pictou County with an ambient air monitor. They chose Granton as the location and they found that when the mill blew toward the monitoring station that the cancer risk thresholds for VOC levels were exceeded. They also studied the seasonal wind directions and determined that the mill mostly blew in other directions where no monitoring stations were ever located to measure VOC levels. The study concludes by recommending that monitoring stations should be installed in higher populated areas such as the town of Pictou where exposure is greater. But instead of installing more monitoring stations to measure VOC levels the Provincial Government removed the monitoring station in Granton. The VOC monitoring station in Granton was decommissioned - An email response from NSE (Nova Scotia Environment) states "Environment Canada decided to decommission the Granton VOC monitor in 2015 after they analyzed the 10 years of data and determined there were no pollutants of concern in the area" - Yet this attached study is contradictory to the findings of this ambient air study.

According to the NPRI data on Environment Canada's website the VOC levels were not reduced since the installation of the new precipitator at Northern Pulp. The precipitator is designed to filter out visible particulate but does not lower the VOC levels. So Northern Pulp is still currently releasing cancer causing levels of VOCs and we can only assume this would become much worse once they would begin to burn their dried up waste sludge in their already failing power boiler.

The study shows that VOC levels (volatile organic compounds) in the air around Pictou County "exceeded their respective cancer risk thresholds and are of primary health concern in terms of population risk. Results highlight associations with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to location of the pulp mill"

But most importantly the study revealed that there are no monitoring stations located in many of the populated areas that are susceptible to the pollution coming from the mill - "Findings suggest that Granton's NAPS site is not positioned to accurately represent ambient levels of toxidity in PC." And the study concludes that NSE should install the proper monitoring stations such as in Pictou where there is "higher residential exposure". This should also include places like New Glasgow, Trenton, Pictou Landing, Westville, Stellarton and other areas around the County where the population is being exposed.

Northern Pulp also doesn't have "Continual Emissions Monitoring" CEM on all of their stacks like other mills in Canada are required to do with live streaming to a website for everyone to see exactly what chemical compounds are being released and whether or not they are surpassing the risk thresholds.

Since this study was done (and since the new precipitator was installed), the NPRI data on the Environment Canada's website shows very little change in the amounts of VOCs being emitted to the present day. AND for some reason the Granton VOC air monitoring station was decommissioned approximately three years ago.

From NPRI data - Northern Pulp's Self Reported VOC Levels from 2010-2016:

2010 – 118

2011 – 108

2012 – 143

2013 – 144

2014 – 140

2015 – 132

2016 - 136

See Volatile organic compounds http://ec.gc.ca/inrp-npri/donnees-data/index.cfm…

In light of this new information about high cancer causing VOC levels coming from the mill, several monitoring stations would be required because readings from any one monitoring station will only detect pollutants from the mill if the wind happens to be blowing that way - the mill is the point source. An even better solution would be the mill having continuous air monitoring (CEM) on each of the three main stacks with set limits monitored by a third party and real time data made available to the public.

Another study in 2008 shows Pictou County had the highest rates of cancer in Nova Scotia with stillbirths and infant deaths amongst the highest in the province.

3. Bleach Chlorine Mills and the Impacts on Marine Life

The molecular chlorine or chlorine-containing compounds currently used as bleaching agents by the pulp and paper sector react with materials released from wood during the pulping process, resulting in the formation of chlorinated organic compounds which are in part discharged into the aquatic environment via effluents. Canadian mills are estimated to use over 610 000 tonnes of chlorine annually to produce over 10 million tonnes of bleached pulp and to release over a million tonnes of

chlorinated organic compounds to the aquatic environment.

- The dioxins and furans are part of the bleaching process and are considered “toxic" under Sections 11(a) and 11(c) of the Canadian Environmental Protection Act and I believe the Federal Government has more expertise and resources to asses this compared to the province.
- TSS and BOD are regulated under Sections 34 and 36 of the Fisheries Act which is a Federal act thus requiring Federal involvement.
- The chemical composition of bleached pulp mill effluents is variable and not well characterized. Approximately 250 compounds have been identified in bleachery effluents but many more remain unidentified. Thus, substantial quantities of chlorinated organic compounds, both of known and of unknown composition, enter the Canadian aquatic environment from bleached pulp mill discharges.
- Many of these chlorinated organic compounds are persistent and have been detected in water, sediments and biota up to 1400 km from bleached pulp mills outfalls. Compounds with low chlorine substitution degrade within hours to days, whereas highly chlorinated organic compounds may persist from days to weeks or longer. Persistence may be longer in winter, especially under ice. Some chlorinated organic compounds can be biologically degraded or transformed and transformation may lead to more persistent and bioaccumulative compounds.
- Chloroveratroles, for example, transformation products of chloroguaiacols which are unique to bleached pulp mill effluents, are capable of accumulating in fish up to 25 000 times the concentration in water.
- Some other chlorinated organic compounds detected in biological tissues downstream of bleached pulp mills reflect repeated or long-term exposure rather than high bioaccumulative potentials.
- Seventy-five percent of Canadian bleached pulp mills discharge effluents that are acutely lethal to fish, sometimes at concentrations as low as 3.2% effluent. A few individual chlorinated organic compounds in these effluents approach or surpass concentrations that cause mortalities in aquatic organisms ranging from algae to fish.
- Seventy percent of Canadian freshwater bleached pulp mills discharge whole effluent that, even upon dilution by the receiving waters, are at levels which cause chronic effects. Chronic effects, such as reproductive anomalies, biochemical changes, and behavioural alterations in aquatic organisms, have been observed in Canadian field studies at 0.5 to 5 % whole effluent.
- Laboratory studies using individual chlorinated organic compounds that are commonly discharged from bleached pulp mills have demonstrated such chronic effects as deformities, and embryo and larval mortalities in fish. These chronic effects include significant irreversible factors which jeopardize the continuance of the species and the integrity of the ecosystem. Thus, the levels of whole effluents discharged from Canadian bleached pulp mills to the aquatic environment and the resulting acute and chronic effects observed both in the field and in the laboratory combine to represent a

significant risk to the aquatic ecosystem.

Supporters of piping the effluent into the Strait say waste water will be diluted in the larger body of water, so the effluent will not cause harm to the fisheries or the larger environment. But that's not accurate. Even diluted, the toxins can have serious effects on aquatic life and the overall environment. Levels may be low at any one moment, but cumulative impacts over the longer term would have negative effects on aquatic life and the aquatic environment. In the case of NP's effluent, the volume of contaminants contained in the waste effluent is significant. Studies show that exposure even to low concentrations of heavy metals and other chemicals over time can disrupt reproduction, weight gain, and food sources of aquatic life. Also, bioaccumulation of toxins including heavy metals in aquatic species is of great concern.

Northern Pulp's proposal boasts about using an Activated Sludge Treatment (AST) effluent treatment system similar to the system used at Port Hawkesbury Paper for their treatment facility but it ignores the differences between the mills. Both mills produce pulp, but PHP is a thermomechanical pulp (TMP) mill, while NP is a chemical bleached kraft mill.

Port Hawkesbury Paper uses peroxide bleach and thermo-mechanical refining (no chemicals) to break down the lignin in wood fiber to produce pulp. Northern Pulp uses chemicals to produce pulp, plus additional chemicals to bleach the pulp. Northern Pulp bleaches with chlorine dioxide (ECF), and while, switching to ECF was an improvement from an older method used pre-1997, it does not eliminate the presence of dioxins, furans or other toxins in the effluent.

NOTE: Environment Canada has "Effluents From Pulp Mills Using Bleaching" listed as a toxic substance. This includes any mills still utilizing a chlorine or chlorine dioxide process. NP does not have an oxygen delignification system as most other modern pulp mills do. Oxygen delignification aids in reducing chemical usage and environmental impact. In addition, many mills recycle water, while NP does not.

A chemical-bleached kraft mill like Northern Pulp produces approximately 4 times more wastewater than Port Hawkesbury Paper. NP's waste water contains toxins that are not found in PHP's waste water, or in the waste water of most mills using AST systems that employ the use of oxygen delignification and recycle water. The new system proposed by Northern Pulp for treating effluent would use a multi-stage process to separate liquids and solids and then aerate. The wastewater would still contain toxic chemicals and traces of heavy metals which would accumulate at the 'point source' outflow location in the Strait.

4. <u>The Northumberland Strait – Depth and Ice Scouring</u>

The Strait is shallow and ice scouring occurs in the Winter. This presents a huge risk for the effluent pipe to get damaged. The Stantec Receiving Water Report calls this out - The general information provided below was obtained from the Canadian Coast Guard on Ice Climatology and Environmental Conditions (CCG, 2012). Generally, or normally, the first ice formation in the Gulf of St. Lawrence occurs in the St. Lawrence River in early to mid-December and progressively moves to Saguenay River and then forms along the coast of New Brunswick and progressively moves eastward. In January, the ice concentrations have reached very closepack range in the Northumberland Strait. By the end of February, thin first-year ice may be found in the Northumberland Strait. It is emphasized, however, that ice conditions in the Northumberland Strait are highly variable and the ice cover varies considerably from year-toyear.

There have been years when the entire Strait is frozen and totally ice-covered, while other years the Strait is relatively ice-free. It is quite possible for drift ice to be blown into the shore with winds out of the north. There is also the possibility of some ice-rafting along Nova Scotia's Northumberland shore where ice sheets over-ride each other and stack-up along the shore. Fast ice (ice which forms and remains fast along the coast) for most coastal regions in the Gulf has limited extents as it forms

in smaller bays and inlets which might be more typical and expected in Pictou Harbour (ENSR 1999).

The 1999 ENSR report included a review of available ice data for the Pictou area including consultation with researchers and review of published literature. It was determined that quantitative data in Pictou Road and Pictou Harbour was unavailable, while ice in the Northumberland Strait has been measured and studied extensively. Of particular interest were the events of ice scouring as it is well known that pipelines, outfalls, diffusers, and submarine cables are at risk during ice scour events.

It was reported (in ENSR, 1999) that Maritime Telephone and Telegraph (MT&T) performed an ice evaluation in support of an optical communication cable deployment across the Northumberland Strait. Based on MT&T's review, the estimated potential for damage to the cable from ice scour extended to water depths of 12 to 14 m. In 1991 their cable was trenched and buried to a selected depth (depth is unknown) and left on the surface of the sea bottom at greater depths. Unfortunately, the winter of 1991/1992 was severe and the cable was severed by ice keels at a water depth greater than 18 m towards the Woods Island, PEI side of the Northumberland Strait.

Based on the above, substantial ice pile-up should be expected near shore of the Northumberland Strait and ice scour is possible and should be anticipated anywhere in Pictou Road and the Northumberland Strait area. Available information suggests that there is a potential for damage to the pipe, outfall, and diffusers in the areas of Pictou Road out into the Northumberland Strait, based on ENSR (1999)

5. <u>The Northumberland Strait Cannot withstand Additional Pressures</u>

The Northumberland Strait Ecosystem Overview Report, prepared for DFO in 2007, documents increasing stresses on the Strait. "Increased nutrient loading from land-based activities was identified as the most important MEQ [Marine Environment Quality] issue in the near shore areas such as the estuaries, harbours, and bays. The principal sources of nutrients to the coastal areas of the Northumberland Strait are sewage, agricultural runoff, fish plant effluents, and pulp mill effluent." The Ecosystem Overview Report also states, "In addition to individual impacts of the various elements identified as having an impact on the environment in the Northumberland Strait, there can be cumulative impacts that exceed the individual effects." Ocean stresses are increasing generally. Anoxic areas, where there is insufficient oxygen for marine life, are growing, and are expected to continue to do so due to global warming and other factors. The discharge of pulp effluent, with significant amounts of total suspended solids, biochemical oxygen demand, chemical oxygen demand and contaminants including heavy metals and AOX, has to be evaluated in the context of cumulative impacts on an increasingly stressed ecosystem. The consequences will be greater now and in coming decades than they would have been 50 or 25 years ago in healthier oceans.

6. <u>Weak Regulations</u>

Pulp and Paper Effluent Regulations (PPER) in Canada cover two matters; total suspended solids (TSS) and biochemical oxygen demand (BOD.) Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90% and 97% respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment. Information gathered through environmental effects monitoring (EEM) at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70% are having harmful effects on aquatic life and habitat, and 55% are having harmful effects on the larger environment.

This information led the federal department of Environment and Climate Change to undertake a

modernization review of pulp and paper effluent regulations in 2017. “Results from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,” the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100% concentration kills more than 50% of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes.

Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations (PPER), which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act.

70% of pulp & paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations . Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand (COD).

For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does.

7. Effluent Make up Unknown

Hot water is a hazard to marine environment. NP presently releases 80 to 90 million litres of wastewater per day. This waste currently enters Boat Harbour at a temperature of approximately 40 degrees . A cooling tower as proposed by NP for its new treatment facility should lower waste effluent temperature to 32-36 degrees C. This would represent a 20 to 28-degree C water shock to marine life, if this water entered a marine habitat. This thermal shock would kill any marine life within meters of the discharge point. This thermal loading should be contrary to the Fisheries Act. Yet this issue is not addressed in KSH’s design proposal for a new facility. There is no plan to bring wastewater to within 1 to 5 degrees of the natural habitat. Further to this, Northern Pulp has been unable to release the exact composition of this proposed effluent.

8. Economics

The Nova Scotia Economy exports $1.5 Billion dollars worth of Shellfish per year. Shellfish that are caught in the Strait are sold under the “Atlantic Canadian” brand. Contamination of even a few shellfish would destroy the excellent reputation Atlantic Canada has in regards to this resource. The

results for Atlantic Canada would be catastrophic. Examples of similar situations would be:

1. In 2003, one case of mad cow disease was discovered in Alberta. The result, it collapsed the Canadian Beef market.
2. In 2018, a trace of GMO Wheat that came from Canada was discovered in Asia. The result, Asia declared they no longer would buy wheat from Canada until the issue was addressed.

Besides the $2 Billion dollar Commercial Fishery in NS, The Northumberland Strait also employs a lot of people in Tourism. There are 3200 jobs in this industry along the Strait that generates $200 Million in revenue and brings in about $24 Million in Tax Revenue.

In addition to those two industries, The NS Sportfishing industry is growing and more emphasis is being placed on attracting Fishers from outside our Province. This industry is currently worth $65 Million dollars to the economy, with the Strait bringing in a big piece of that. The Strait has 15 + rivers that come in off of the Strait that all have world class Atlantic Salmon, Brook Trout and Brown Trout. These species are considered in the top 5 in the world for Sport Fish.

9. Pictou Town Water Supply

Although very little info has been released by Northern Pulp on this, the latest proposed route show the effluent pipe going through the Pictou Town water supply. Should this pipe be compromised like it has multiple times with the current waste prices, the Pictou Town water supply would become contaminated.

10. Marine Protected Area

The receiving water area is part of a Marine Protected Area and a scallop buffer zone.

11. Trust/History

Northern Pulp has had over a dozen infractions since 2014 and 2 very large effluent spills that they did not report in a timely manner nor in an accurate manner per the Federal judge presiding over one of these spills

12. Federal Fishing Zone

The receiving water area is part of a Federal fishing zone and shared by 3 Provinces.

13. Pictou Landing First Nations

The Aboriginal rights of PLFN need to be considered. The new discharge location still has a direct affect on them and their livelihood, as it pertains to fishing.

14. Species at Risk and Species of Concern

There are 'Species at Risk' that potentially will be negatively affected via this effluent pipe during construction as well as at the outflow. They are listed on the DFO and NS websites.

15. Wild life Sanctuary

The proposed discharge location is directly adjacent to Caribou-Munroe's Island Park; a bird and wildlife sanctuary.

Thank you for this opportunity to provide my feedback. I look forward to the results of a thorough

review.

Sincerely,

Environ Sci Pollut Res (2017) 24:20685–20698
DOI 10.1007/s11356-017-9719-5

RESEARCH ARTICLE

Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia

Emma Hoffman[1] · Judith R. Guernsey[2] · Tony R. Walker[1] · Jong Sung Kim[2] · Kate Sherren[1] · Pantelis Andreou[2]

Received: 15 December 2016 / Accepted: 21 June 2017 / Published online: 15 July 2017
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Abstract Air toxics are airborne pollutants known or suspected to cause cancer or other serious health effects, including certain volatile organic compounds (VOCs), prioritized by the US Environmental Protection Agency (EPA). While several EPA-designated air toxics are monitored at a subset of Canadian National Air Pollution Surveillance (NAPS) sites, Canada has no specific "air toxics" control priorities. Although pulp and paper (P&P) mills are major industrial emitters of air pollutants, few studies quantified the spectrum of air quality exposures. Moreover, most NAPS monitoring sites are in urban centers; in contrast, rural NAPS sites are sparse with few exposure risk records. The objective of this pilot study was to investigate prioritized air toxic ambient VOC concentrations using NAPS hourly emissions data from a rural Pictou, Nova Scotia Kraft P&P town to document concentration levels, and to determine whether these concentrations correlated with wind direction at the NAPS site (located southwest of the mill). Publicly accessible Environment and Climate Change Canada data (VOC concentrations [Granton NAPS ID: 31201] and local meteorological conditions [Caribou Point]) were examined using temporal (2006–2013) and spatial analytic methods. Results revealed several VOCs (1,3-butadiene, benzene, and carbon tetrachloride) routinely exceeded EPA air toxics-associated cancer risk thresholds. 1,3-Butadiene and tetrachloroethylene were significantly higher ($p < 0.05$) when prevailing wind direction blew from the northeast and the mill towards the NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. Despite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with P&P emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in P&P towns and contribute to poor health in nearby communities.

Keywords Air toxics · Air quality · Volatile organic compounds (VOCs) · Community health · Pulp and paper · Cancer risk

Responsible editor: Constantini Samara

Electronic supplementary material The online version of this article (doi:10.1007/s11356-017-9719-5) contains supplementary material, which is available to authorized users.

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Introduction

Poor ambient air quality is an increasing global concern with recent revelations that 92% of the world's population is exposed to air pollution levels above the World Health Organization (WHO) air quality guidelines (WHO 2006, 2016; Kelly and Fussell 2015). Ambient air pollution is widely recognized and increasingly associated with a wide range of acute and chronic adverse health effects, including cancer, cardiovascular, respiratory, and mortality outcomes (IOM 2011; Villeneuve et al. 2013; ECCC 2015a). The pathological mechanisms by which these toxic exposures exert their effects are not well understood. WHO highlights the need for research in order to better inform exposure-response relationships (WHO 2016).

Most air pollution surveillance activities are limited to measurement of respirable fine particulate matter ≤2.5 μm ($PM_{2.5}$), without regard to their specific chemical composition and criterion air contaminant (CAC) gases (i.e., nitrogen oxides [NO_x] and ground-level ozone [O_3]). There is growing concern about the toxicity of volatile organic compounds (VOCs) (Cicolella 2008) and the consequences of long-term, low-dose exposure to these agents. VOCs are varied and widespread air pollutants (e.g., hydrocarbons, aromatics, and some chlorinated compounds) that are increasingly recognized as important precursors to $PM_{2.5}$ and ground-level O_3 formation through photochemical reactions (Ryerson et al. 2001). Atmospheric deposition of VOCs may contaminate other environmental media (e.g., soils, sediments, and biota) (ATSDR 2014a; MacAskill et al. 2016). Many VOCs are included in the US Environmental Protection Agency (EPA) "air toxics" list. "Air toxics" are defined as "those pollutants that cause or may cause cancer or other serious health effects […] or adverse environmental and ecological effects" (EPA 2015a).

According to the Canadian Environmental Protection Act 1999 (CEPA), VOC releases are acknowledged as a health concern, but, due to their highly volatile properties, are challenging to monitor and manage (CCME 2011). Although no specific Canadian legislative or regulatory tools address ambient VOC levels, emissions are indirectly controlled through regulatory mitigation of $PM_{2.5}$ and ground-level O_3 under the Canadian Ambient Air Quality Standards (CAAQS). Under CEPA, it is mandatory for owners or facility operators, who meet reporting requirements, to self-report pollutant releases to air, water, and land to Environment and Climate Change Canada (ECCC)'s National Pollutant Release Inventory (NPRI) (ECCC 2014). While this provides a disincentive to those industries releasing these agents, there is less regulatory control or routine monitoring of these agents in Canada which, in turn, limits scientific understanding of sources, exposures, and the effectiveness of current control measures across the country.

Ambient air monitoring in the US is conducted in accordance with the *Clean Air Act* (CAA) (Clean Air Act 1970). CAA amendments identify 187 air toxics, which form the basis for EPA's approach to regulating emissions (EPA 2015a). Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas (EPA 2015b). Although many CEPA-toxic or equivalent agents are monitored by the National Air Pollution Surveillance (NAPS) network, it includes a selection (not all) of EPA's list of prioritized air toxics, and the main criteria for air toxics monitoring in Canada has been their potential contribution to ambient PM and ground-level O_3 (Galarneau et al. 2016). Consequently, there are gaps in understanding of air toxics concentrations across the NAPS network. Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment (NATA), a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics (EPA 2015c). Such a rigorous initiative has yet to be implemented in Canada, where no federal guidelines exist for ambient air toxics.

Despite economic benefits of the P&P industry, it generates large quantities of atmospheric and effluent emissions, resulting in environmental degradation (Hewitt et al. 2006; Hoffman et al. 2015; Hoffman et al. 2017). P&P mill emissions vary depending on the pulping method, wood species, and by the age and technology used (Soskolne and Sieswerda 2010). P&P mills are industrial emitters of air toxics, although few investigations (e.g., the Nez Perce National Air Toxics Program, funded by EPA [STI 2009]) have characterized ambient concentrations in nearby communities.

Potential adverse health effects associated with exposure to air pollutants in the vicinity and downwind from P&P facilities include respiratory disease, neurophysical symptoms, and higher risks of contracting lung cancer (Soto et al. 1991; Toren et al. 1996; Mirabelli and Wing 2006). Yet, few investigations reported adverse health effects from chronic community-level ambient exposures to P&P mills emissions in Canada (Mirabelli and Wing 2006; Soskolne and Sieswerda 2010). While there have been a number of occupational epidemiological studies of P&P workers, these investigations have not been extended to examine community exposures, due to research design challenges including ecological fallacy (i.e., inferences made about individuals deduced from the population) in community studies (Soskolne and Sieswerda 2010). Additionally, most of these studies focused on respiratory disease outcomes; there is a dearth of epidemiological studies of cardiovascular effects or cancer effects in these communities.

Decades-long concerns for perceived higher incidence and mortality rates for all-cause cancer, cardiovascular disease, chronic respiratory disease, and diabetes (Reid 1989; PCHA 2008; Statistics Canada 2013) in PC, Nova Scotia, have generated considerable community antipathy among residents towards a local P&P mill (Hoffman et al. 2015). This bleached kraft P&P mill ("the mill") is located approximately 3 km south of the town of Pictou (population 3500) and produces approximately 280,000 t of bleached kraft pulp annually from softwood and hardwood chips (NP 2016b) (Fig. 1) and has been in production since 1967 (Ogden 1972). Public backlash gained momentum during 2014 due to the failure of the recovery boiler electrostatic precipitator (i.e., particulate filtration device).

Environmental reporting by the mill, when compared against provincial and federal regulatory compliance standards, contrasted to local perceptions of impacts. Most environmental monitoring reports indicated some

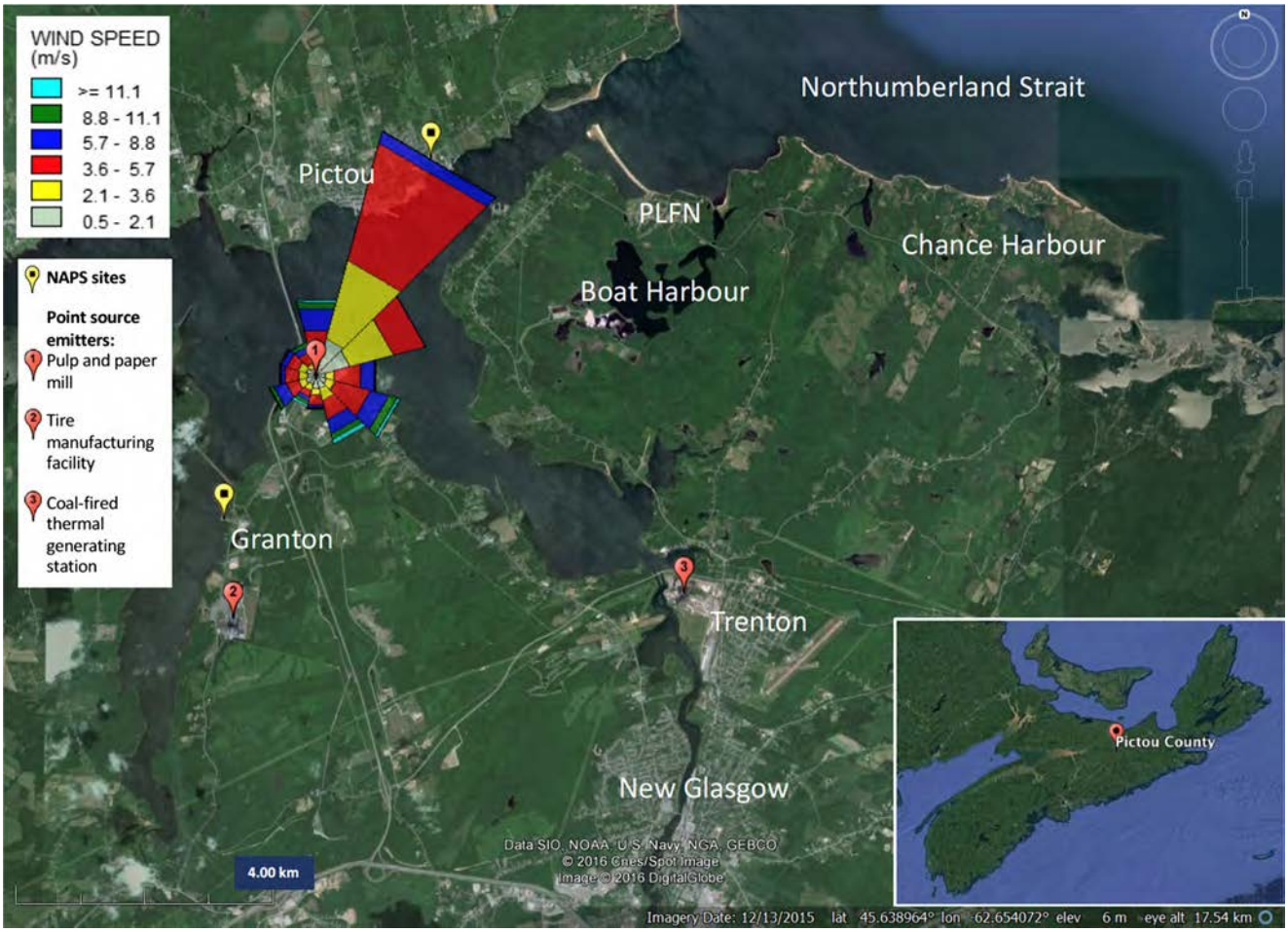

Fig. 1 Summer (2006–2013) wind rose simulation using WRPlot View™ (blowing to direction) with the mill as the focal point (*1*), relative to communities (e.g., Pictou and Pictou Landing First Nation [PLFN]), NAPS discrete receptor sites, and other local point source emitters (e.g., tire manufacturing facility (*2*), coal-fired thermal electrical generating station (*3*)). The length of each radial spoke represents the relative frequency of wind direction (©Google Earth)

level of compliance in atmospheric emissions, but when compliance targets were exceeded, there were inconsistent regulatory enforcement (Hoffman et al. 2015). The mill is required to report emissions to NPRI: conduct third-party stack testing, continuous emission monitoring of total reduced sulfur (TRS), and ambient air monitoring for pollutants found in the Nova Scotia Air Quality Regulations pursuant to the *Environment Act* (NSE 2015). The mill's air emission monitoring data are reviewed by provincial and federal regulators to ensure compliance with applicable environmental permits and air quality objectives (ECCC 2014). Hoffman et al. (2015) provided detailed information on new and existing environmental policies that impose pollution abatement in the P&P industry in Canada, particularly the PC mill (e.g., 2015 Industrial Approval).

These are critical research gaps both in relation to community exposures to VOCs in P&P communities and in regard to adverse health effects resulting from chronic exposure to P&P emissions which are a concern given the potential adverse health outcomes that VOCs and other P&P air emissions pose. This further justifies the need for more research to characterize air quality in this particular subset of industrial communities, which have often been neglected because of their remote locations.

An intensive study of specific ambient air toxic emissions in PC has not been undertaken. The aim of this pilot study was to assess levels of PC community exposures to VOC air toxics emissions from 2006 to 2013, and to evaluate these data in relation to potential risks suggested by EPA air toxic guidelines. The main objective of this study was to determine whether wind direction correlated with prioritized air toxic ambient VOC concentrations at a nearby NAPS site (Granton). As the Granton NAPS site is positioned southwest of the mill, it was hypothesized that prevailing winds (PW) from northerly and northeasterly directions would

positively correlate with an increase in ambient VOC concentrations, as capturing potential VOCs from the mill's plume would be optimized (Fig. 1).

Materials and methods

Spatial and temporal sampling

Historical meteorological and NAPS data from the Granton NAPS site discrete receptor (ID: 31201) were collected from publically assessable ECCC databases (http://climate.weather.gc.ca/climateData/; http://maps-cartes.ec.gc.ca/rnspa-naps/). Hourly surface wind observations (i.e., speed and direction to the nearest 10°) were obtained from the closest EC meteorological station, Caribou Point (45.767° N; 62.683° W), located ~10 km north of the mill (45.652° N; 62.718° W). Temporal data for ambient VOCs monitored at the Granton NAPS station were limited to 2006 to 2013.

Nova Scotia Environment (NSE) operates both NAPS monitoring stations in PC: (i) downtown Pictou (ID: 30901) located 3.5 km northeast of the mill and (ii) Granton (ID: 31201) located 2.5 km southwest of the mill (Fig. 1). The Pictou NAPS site routinely monitors NO, NO_2, NO_x, O_3, $PM_{2.5}$, TRS (not VOCs), and wind characteristics, whereas the Granton site monitors 36 VOC species. Multi-component VOC monitoring at NAPS sites are conducted using canister sampling and gas chromatography/mass spectrometry (GC/MS) (CCME 2011). Sampling of 24 h (midnight to midnight) cumulative ambient air samples ($\mu g/m^3$) are taken on a 1-in-6-day schedule by pumping ambient air into pressurized stainless steel SUMMA® canisters and analyzed by an EC accredited Laboratory (CCME 2011; Galarneau et al. 2016).

Statistical analyses

Variation of meteorological conditions and VOC concentrations were assessed by conducting a spatiotemporal analysis to characterize ambient air toxics emissions in PC from 2006 to 2013. Various analytical methods can be applied to concentration data to estimate source apportionments of air pollutants to provide additional insights into the source/receptor relationships to guide development of more effective air quality management strategies (Hopke 2016). However, given the limitations of having complete VOC data from only one NAPS monitoring station in the region, a full chemical mass balance analysis to identify and apportion sources of atmospheric contaminants were not conducted in this study.

Wind rose plots were generated with WRPlot View™ (©Lakes Environmental Software) to simulate seasonal and spatial variation of wind direction (°) frequency and wind speed (m/s) with the mill as the focal point. Although simplified, wind rose models have proven utility for estimating spatial gradients for fate and transport of pollutants from emission sources (Gibson et al. 2013). Summer, when local people spend more time outdoors (and more vulnerable to outdoor pollution exposure), was a focus of this study (Figs. 1 and 2).

This pilot study was conducted to determine whether ambient concentrations of VOCs exceeded their EPA-associated cancer and/or noncancer risk thresholds, to help identify potential human health concerns in PC. VOCs selected for analysis were based on EPA's list of 30 urban air toxics (EPA 2015b) and *National Air Toxics Trends Station Work Plan Template* (EPA 2015d). Health Canada and the province of Nova Scotia currently do not have specific guidelines for air toxics exposures. Therefore, EPA thresholds were considered a more acceptable standard for carcinogenic exposures in this study. Cancer risk threshold refers to the probability of contracting cancer if exposed to a substance every day over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity. Noncancer risk threshold is associated with effects other than cancer, based on reference concentrations via the "hazard quotient" ratio (HQ; exposure divided by appropriate chronic or acute value) (EPA 2015c). The HQ should not be interpreted as a probability of adverse effects. Noncancer risk thresholds are typically higher compared to cancer risk thresholds, as lower concentrations can elicit a carcinogenic response, whereas other diseases are not triggered until higher exposure thresholds are reached. US and Canadian method detection limits (MDL) are provided (Health Canada 2010; EPA 2015d) (Table 1).

The mill is located approximately 40° northeast of the Granton NAPS site. The selected PW range expected to result in increased VOC concentrations at the NAPS site (±40° either side of the mill [80° total]). A narrower range may be more accurate; however, due to the sample size of VOC samples, the selected range captured more data. All other wind directions (AOWD) represent ranges outside PW (i.e., >80°, <360°). AOWD represent sampling days when no time PW blew from the selected range (i.e., 0 h). VOC concentrations for AOWD were compared to when PW were present for at least 1 h.

Hourly meteorological data were compiled to correspond with ambient VOC sampling. Hourly wind direction within defined PW range (i.e., 360°–80°) was assigned a value of 1; AOWD were assigned a value of 0. Daily totals represented the proportion of time with PW (i.e., 1–24 h) compared to AOWD. Daily

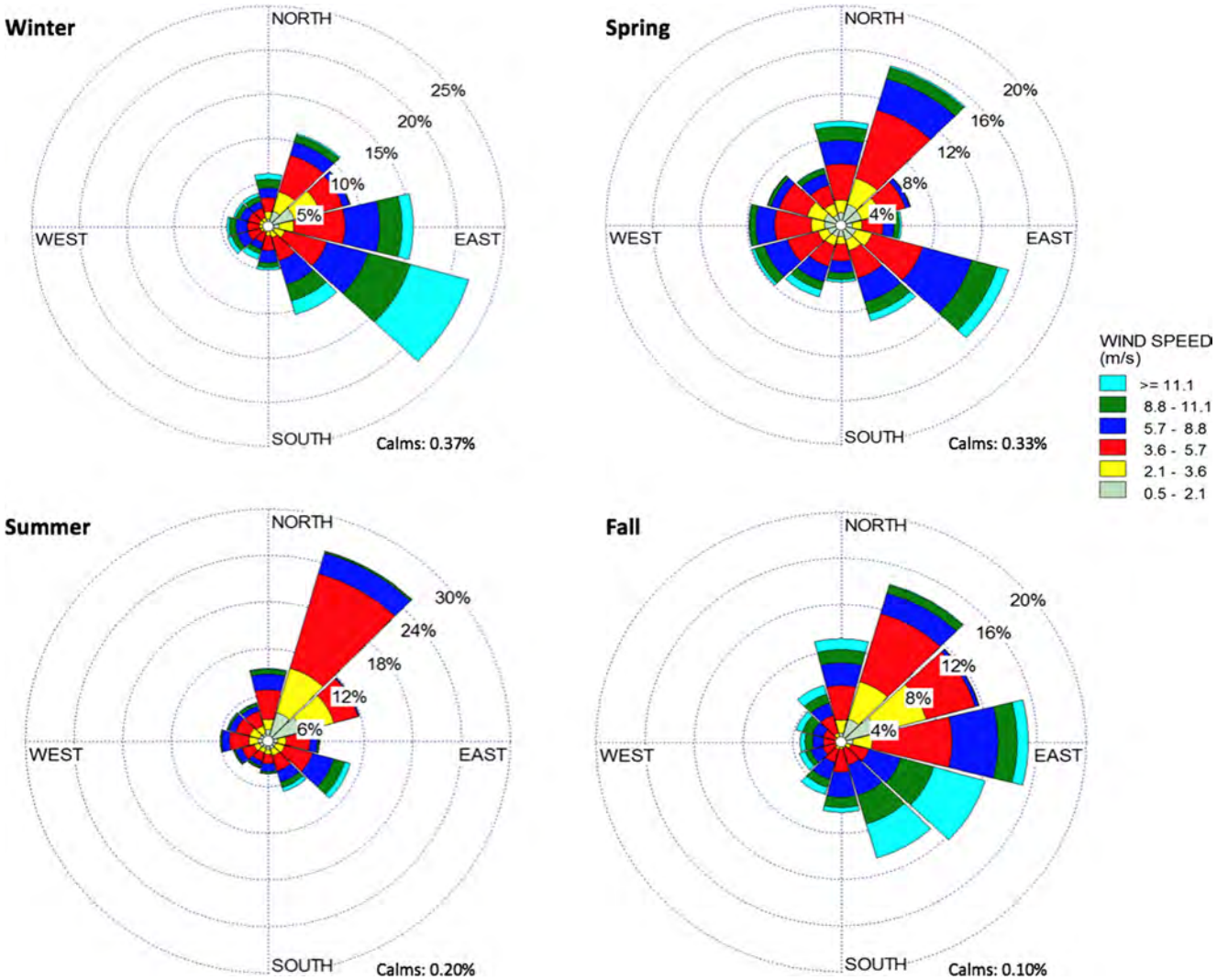

Fig. 2 Seasonal (2006–2013) wind rose simulations using WRPlot View™ (blowing to direction). Percentages represent frequency of wind direction

totals corresponding to VOC sampling were paired. Increasing proportions of PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) categorized VOC concentrations, which were predicted to correlate with higher VOC concentrations. To test the effect of wind direction and season on ambient VOC concentrations, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) were applied in ©R. Due to right-skewed distributions for all VOCs, except for carbon tetrachloride, statistical procedures were performed on both raw and log-transformation of VOC concentrations (Supplementary material Table S1).

Box plots and histograms were used to compare VOC concentrations with PW ≥ 1 h to AOWD on an annual and seasonal basis in relation to their respective cancer and noncancer risk thresholds. See Supplementary material for histograms, and additional box-and-whisker plots illustrating VOC concentrations with increasing time categories with PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) (Figs. S2 and S4). Box plots display the distribution of data based on a five-number summary: minimum, first quartile, median, third quartile, and maximum. The central rectangle ("box") spans the first to the third quartile (i.e., interquartile range [IQR]). The horizontal line segment within the box represents the median, and "whiskers" above and below the box represent the minimum and maximum. Radar plots consist of a sequence of angular spokes, whose length extending from the center along a separate axis is proportional to the magnitude of the variable relative to the magnitude of the variable across all data points. Lines connect the data values for each spoke. Radar plots were used to display seasonal variation of median VOC concentrations for PW ≥ 1 h and AOWD. One-tailed *t* tests, assuming unequal variance, were performed to determine whether seasonal variation associated with increasing proportions of time

Table 1 List of priority air toxics (i.e., VOCs), associated cancer/noncancer risk thresholds (μg/m^3), and method detection limits (MDL) (μg/m^3) (Health Canada 2010; EPA 2015d)

VOC	Cancer risk[a] (μg/m^3)	Noncancer risk at HQ = 0.1[b] (μg/m^3)	MDL[c] (NATS) (μg/m^3)	MDL (Health Canada) (μg/m^3)
Chloroform	–	9.8	0.50	0.089
1,3-Butadiene	0.0300	0.2	0.10	0.055
Vinyl chloride	0.1100	10.0	0.11	0.046
Benzene	0.1300	3.0	0.13	0.038
Carbon tetrachloride	0.1700	19.0	0.17	0.123
Trichloroethylene	0.2083	0.2	0.20	0.190
Tetrachloroethylene	3.8462	4.0	0.17	0.120

[a] Cancer risk threshold: the probability of contracting cancer over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity (EPA 2015c)

[b] Noncancer risk threshold: the risk associated with effects other than cancer, based on the reference concentration via a ratio known as the "hazard quotient" (HQ; the exposure divided by the appropriate chronic or acute value)

[c] MDL: the lowest concentration that can be detected with confidence. NATA and Health Canada's MDLs are listed for comparison (Health Canada 2010; EPA 2015d)

with PW (i.e., ≥1 h, ≥4 h, ≥8 h, ≥12 h) resulted in a significant increase ($p < 0.05$) in VOC concentrations compared to AOWD (see Supplementary material, Table S3).

Quality control

Standard procedures of the Meteorological Service of Canada have been developed in accordance with internationally recommended procedures established by the World Meteorological Organization (ECCC 2013a). As part of the quality assurance and quality control (QA/QC) program, observational meteorological data are subjected to a computer analysis or review to reveal possible errors. EC and the operating agency are jointly responsible for the NAPS network QA/QC program. Elements of the program include site selection, sampling system requirements, instrument calibration and reference standard requirements, and inter-laboratory testing and performance audits. With few exceptions, analyzers are accorded with EPA designation as either a reference or equivalent method for ambient air monitoring (ECCC 2004). ECCC's air quality laboratories use International Organization for Standardization requirements (i.e., ISO 9001:2008 or ISO/IEC 17025:2005) (ECCC 2013b).

Results and discussion

Meteorological observations

Wind rose simulations illustrate seasonal variability with respect to wind direction, with the mill as the focal point (Fig. 2). During summer, wind blew NNE (25.47%) and ENE (11.80%) directions (aggregate range 15°–75°) towards Pictou and Pictou Landing First Nation (PLFN) (Figs. 1 and 2). Wind blew less frequently towards S-NNW (aggregate range 165°–345°) towards the Graton NAPS site. During winter, wind typically prevailed from the north; the highest frequency (21.99%) blowing ESE, followed by E (15.37%) directions (aggregate range 75°–135°) (Fig. 1). Spring and fall have meteorological characteristics that are similar to summer and winter and were considered transitional periods. Pictou, PLFN, Chance Harbour, Trenton and New Glasgow are communities close to the mill that are downwind of annual PW (range 15°–165°). The Granton NAPS site correlates poorly with seasonal or annual wind directions (Fig. 2).

VOC concentrations

Carbon tetrachloride had the highest median concentration (0.5452 μg/m^3) and vinyl chloride had the lowest (0.0014 μg/m^3) (Fig. 3). Carbon tetrachloride concentrations exceeded its EPA cancer risk threshold (0.1700 μg/m^3) for all samples, with maximum and minimum concentrations of 0.7047 and 0.2892 μg/m^3, respectively. Benzene concentrations exceeded its cancer risk threshold (0.1300 μg/m^3) for most samples, with maximum and minimum concentrations of 1.889 and 0.0266 μg/m^3, respectively. Concentrations of 1,3-butadiene concentrations occasionally exceeded its cancer risk threshold (0.0300 μg/m^3), with maximum and minimum concentrations of 0.1062 and 0 μg/m^3, respectively (Fig. 3). Consequently, 1,3-butadiene, benzene, and carbon tetrachloride were air toxics of primary concern in terms of local

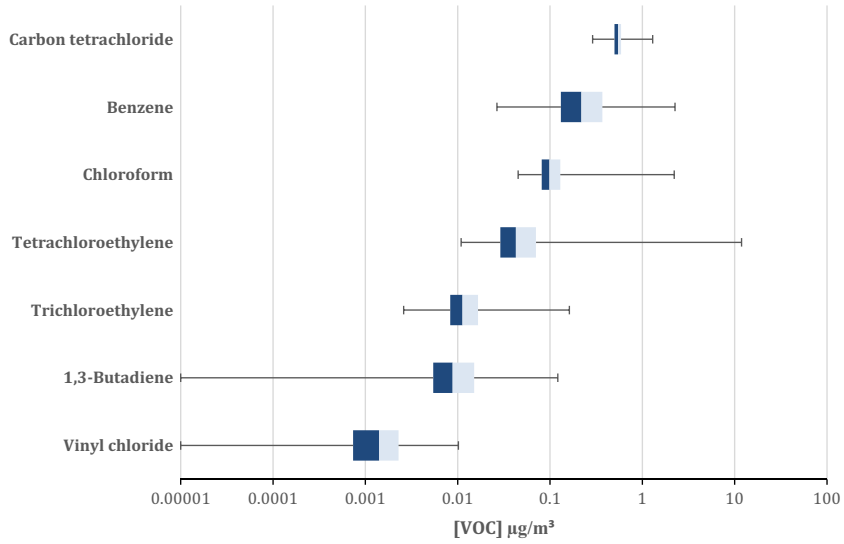

Fig. 3 Relative VOC concentrations (µg/m^3) (2006–2013). Should not be interpreted as orders of magnitude of toxicity. Minimum concentration for 1,3-butadiene and vinyl chloride is 0 µg/m^3 or undetectable

population risk. Other VOCs are presented in Supplementary material (Fig. S5).

ANOVA and MANOVA results revealed that 1,3-butadiene was significantly higher with the presence of PW ≥ 1 h (p = 0.001and p = 0.01 for raw and log-transformed data, respectively). Tetrachloroethylene was also statistically higher with the presence of PW ≥ 1 h (p < 0.01) for log-transformed data. Benzene approached significance with the presence of PW ≥ 1 h (p = 0.07) for log-transformed data. Although not statistically significant, median concentrations of other VOCs, except carbon tetrachloride, were equal or marginally higher with presence of PW ≥ 1 h compared to AOWD. Season had a consistent significant effect on VOC concentrations, except chloroform and tetrachloroethylene (Supplementary material Fig. S2 and Table S1).

Box plots combined with radar graphs illustrate seasonal variation of VOC concentrations of primary concern (i.e., 1,3-butadiene, benzene, carbon tetrachloride) under PW ≥ 1 h and AOWD conditions (Figs. 4, 5, and 6). Median VOC concentrations associated with PW ≥ 1 h and AOWD display parallel

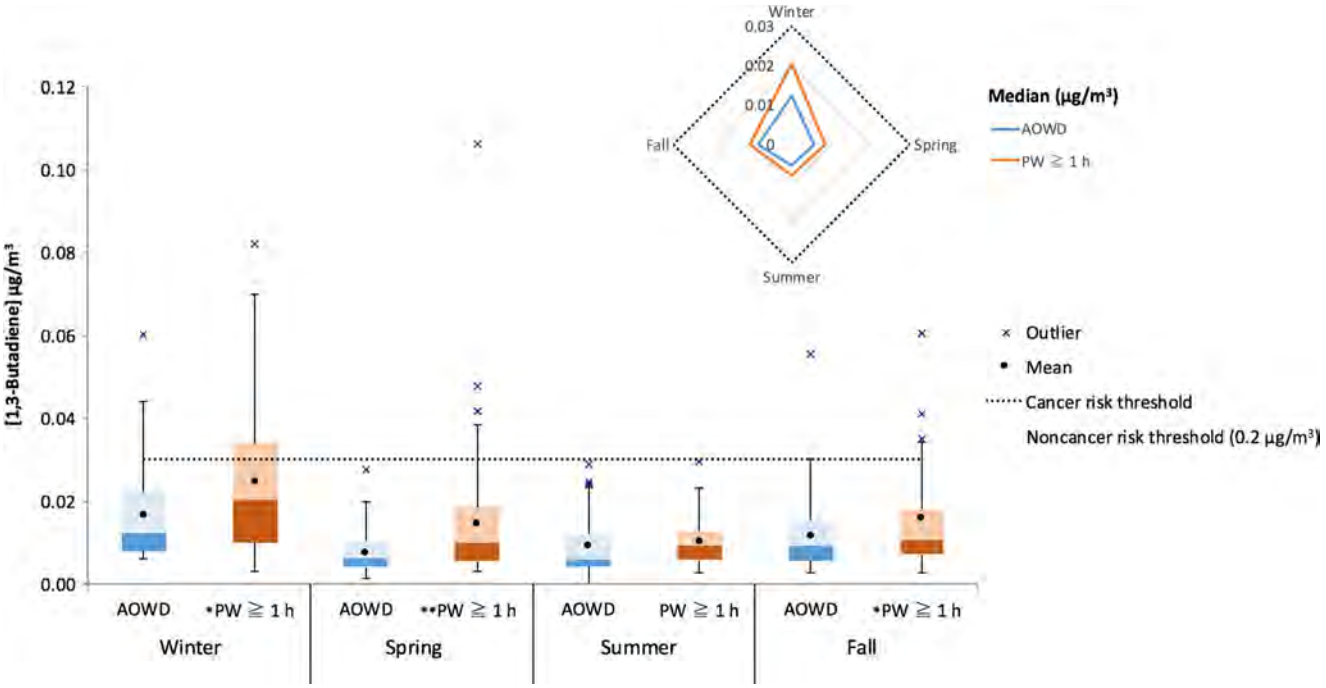

Fig. 4 Seasonal variation (2006–2013) of [1,3-butadiene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds. Minimum concentration is 0 µg/m^3 or undetectable. Significant differences indicated as *<0.05; **<0.01

seasonal trends. Concentrations of 1,3-butadiene (Fig. 4) and benzene (Fig. 5) exhibit seasonal variation. Both have evidently higher concentrations during winter, with summer having overall lowest concentrations. In addition to exceeding cancer risk thresholds, *t* test results revealed that 1,3-butadiene and benzene concentrations were significantly higher with the presence of PW ≥ 1 h compared to AOWD during at least two seasons, including spring and fall. Conversely, median carbon tetrachloride concentrations showed little variation (Fig. 6). Regardless of season or wind direction, all carbon tetrachloride samples exceeded its associated cancer risk.

This pilot study presents findings of a secondary analysis of 8 years of air toxic VOC exposure data associated with ambient air quality in a Canadian P&P town. Concentrations of three ambient outdoor air toxics routinely exceeded EPA air toxics-associated cancer risk thresholds and are consequently of primary health concern in relation to population health risk in PC: 1,3-butadiene, benzene, and carbon tetrachloride. Exceedance in cancer risk thresholds for these air toxics is consistent in the literature (e.g., Morello-Frosch et al. 2000). The extent to which threshold exceedances of 1,3-butadiene adversely affect human health is poorly understood, with little toxicity information available to compare with cancer risk estimates (Morello-Frosch et al. 2000). With respect to benzene exposure, most monitoring data are associated with occupational studies (ATSDR 2007a), where long-term exposure can cause leukemia (ATSDR 2007b). High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage (ATSDR 2005). Combinations of air toxics may have additive or synergistic adverse health effects (Morello-Frosch et al. 2000). Therefore, exposure to mixed VOCs might pose health risks to facility employees and neighboring residents (An et al. 2014; He et al. 2015).

Emission sources within the defined PW range, N to ENE of the Granton NAPS site, may be a causal factor for the increase in VOC concentrations, except carbon tetrachloride. The largest point source emitter within this range is likely the mill; however, the origin(s) of VOCs are inconclusive. According to the mill's most recent substance report submitted to NPRI in 2012, 143.18 t of VOCs were atmospherically emitted on-site (ECCC 2012). An estimated 3.195 t of benzene were released to the air from a stack higher than 50 m and 0.022 t were released within 50 m of the ground. Additionally, benzo(a)anthracene and of benzo(a)phenanthrene were emitted to the air (9.7 and 6.7 kg, respectively) and deposited on-site (0.753 and 0.142 kg, respectively) (ECCC 2012). Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not reported to have been released, they may become airborne through evaporation from P&P wastewater (Soskolne and Sieswerda 2010). Boat Harbour (the mill's effluent treatment facility) may therefore contribute to ambient concentrations of VOCs. Collectively, these emissions may have contributed to the ambient atmospheric levels of VOCs measured at the Granton NAPS site. While

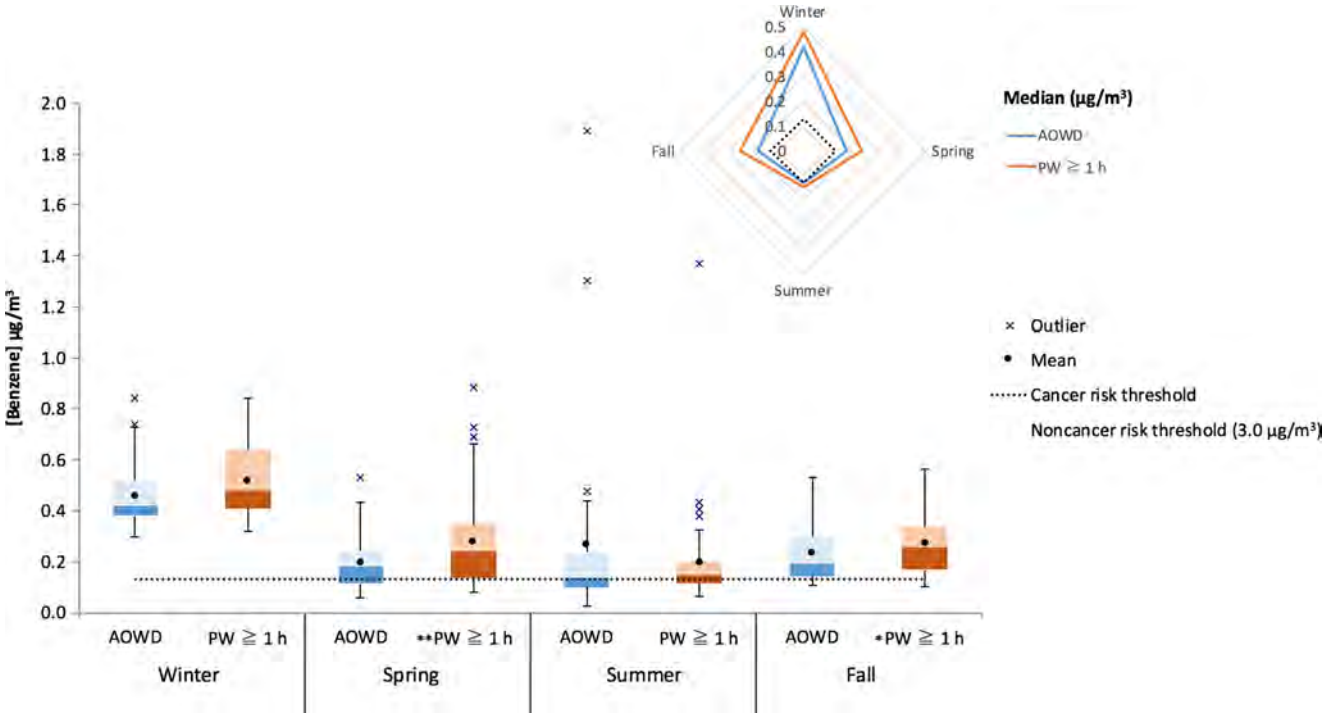

Fig. 5 Seasonal variation (2006–2013) of [benzene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds. Significant differences indicated as *<0.05; **<0.01

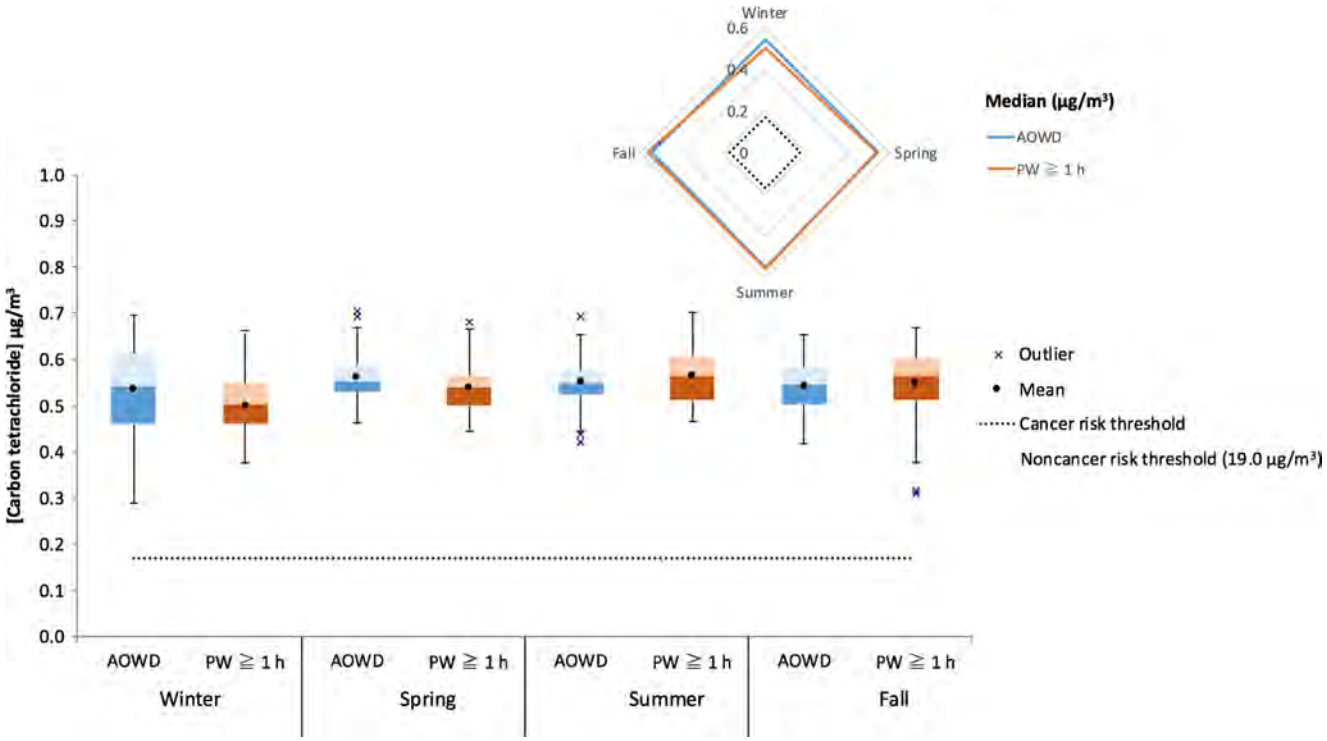

Fig. 6 Seasonal variation (2006–2013) of [carbon tetrachloride] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds

NPRI provides detailed information on pollutant releases, data are self-reported by facilities, with no audits to ensure accuracy. Consequently, data quality may be compromised.

The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane (EPA 1985). Although chloroform is a recognized by-product of the chlorination process in the P&P industry, it has been suggested that up to 90% of total emission sources may be natural in origin and is widely dispersed in marine environments (McCulloch 2003). As PC is located along the coast of the Northumberland Strait, marine environments may have contributed to the observed ambient chloroform concentrations (see Supplementary material).

Results implicate the mill as a source of air toxics (particularly 1,3-butatdiene and tetrachloroethylene); however, other local sources likely contribute to air toxics emissions. Area and mobile sources have been reported to largely contribute to concentrations of 1,3-butadiene (ATSDR 2014b) and benzene (ATSDR 2007a). Because the Granton NAPS site is located near a highway and access roads, vehicle emissions may have contributed to the observed concentrations of these compounds. A coal-fired thermal generating station and a tire manufacturing facility (located 7 km E and 1.5 km S from the Granton NAPS site, respectively) may be other local point source emitters of VOCs (e.g., 1,3-butadiene is used to make synthetic rubber [ATSDR 2014b]) (Fig. 1). According to the latest NPRI substance reports: the tire manufacturing facility released 220 t of atmospheric VOCs, whereas no VOC releases were reported by the thermal generating station (ECCC 2015b), despite that coal combustion is a significant contributor (Chagger et al. 1999). Direct links between 1,3-butdiene and vinyl chloride with P&P industries were not found in the literature.

Major monitored pollutants at the mill include NO_x, sulfur dioxide (SO_2), and total PM ([TPM] upper size limit of 100 µm diameter) (NP 2016a). A 2013 study concluded that $PM_{2.5}$ concentrations were highest (0.88 µg/m^3) downwind from the mill from using an AERMOD atmospheric dispersion model (Gibson et al. 2013), though this investigation used Halifax wind speed and direction meteorological data (130 km to the south). Hoffman et al. (2015) reported an analysis of 2013 data showing that when Pictou is downwind of the mill, average 1 h ambient $PM_{2.5}$ concentrations result in a twofold increase (12.96 µg/m^3), compared to all other wind directions (5.73 µg/m^3), suggesting the mill is likely the primary contributor of ambient $PM_{2.5}$ in the community. Additionally, TRS, TPM, $PM_{2.5}$, and coarse particulate matter ≤10 µm (PM_{10}) emission exceedances at the mill during 2012 were two to three

orders of magnitude higher than five similar Canadian kraft P&P mills; however, VOC emissions were comparable (Hoffman et al. 2015).

A comparable ambient air toxics monitoring study of a P&P community was conducted in the metropolitan Lewiston, Idaho area and the Nez Perce Reservation (STI 2009). Findings revealed that concentrations of formaldehyde and acetaldehyde were much higher than expected relative to Lewiston's size. Chloroform, tetrachloroethylene, and trichloroethylene were highest at monitoring sites nearest the mill, which presumably contributed at least 50% to pollutant concentrations (STI 2009). However, due to insufficient information on local concentrations of anthropogenic and biogenic VOCs, it was inconclusive whether the mill was a causal factor.

Recent (2009–2013) measurements of ambient CEPA-toxic or equivalent agents monitored at NAPS sites revealed that 11 air toxics, including benzene, chloroform, trichloroethylene, and tetrachloroethylene exceeded ambient air quality guidelines set by respective Canadian jurisdictions (Galarneau et al. 2016). An additional 16 air toxics approached guidelines. Although these guidelines are not necessarily enforceable, CEPA outlines provisions for toxic compounds and are thus subject to risk management actions. Air toxics' contribution to poor health on a regional and national scale has not been thoroughly investigated; therefore, calls into question the effectiveness of current toxic substance management in Canada.

Nova Scotia is known as the "tail pipe of North America," due to being within the trajectory of long-range transport of emissions from transboundary sources along the Eastern Seaboard, plus central and eastern Canada (NSE 2014). Background levels of air pollution that originate from resuspension and natural sources has been found to be major contributors to concentrations of carbon tetrachloride and benzene (Morello-Frosch et al. 2000). Background levels, in combination to carbon tetrachloride's capacity to persist in the atmosphere for a least a year, may explain why observed concentrations are consistently above its associated cancer risk threshold at the Granton NAPS site, regardless of wind direction.

Atmosphere circulation plays a complex role in dispersion, transformation, and removal of pollutants. The dispersion of pollutants from source emitters (e.g., smokestacks) is affected by crosswind mixing in both horizontal and vertical directions. Meteorological variables, including wind speed, wind direction, temperature, humidity, precipitation (process of removal), and atmospheric pressure are the main drivers of variation in pollutant concentrations and dispersion (Bates and Caton 2002). Furthermore, gravitational settling is important for pollutants with larger molecular weights (Oliver 2008); heavier particles settle or deposit closer to emission sources (Walker et al. 2003a, 2003b). Gravitational settling may also explain the high concentrations of carbon tetrachloride.

Topography and coastal conditions can affect wind characteristics (e.g., direction, speed) and the behavior of pollutant transport. A sea breeze that is trapped under descending warmer air from land can exaggerate conditions at coastal zones, a phenomenon known as coastal inversion (Bates and Caton 2002). In addition, turbulent winds along the coast may influence wind characteristics at the Caribou Point meteorological station, and the fate and transport of pollutants. Such coastal conditions, in combination with transboundary air pollution, may be occurrences that coastal areas experience in Nova Scotia, including PC.

Seasonal variability

Seasonal variability exists for both meteorological conditions and VOC concentrations. Variations in meteorological conditions, the nature and intensity of emissions from nearby sources, and photochemical activity are factors that could have led to the observed seasonal variability of outdoor VOC levels (Al-Khulaifi et al. 2014). Of the three VOCs considered particular concern in this study, 1,3-butdaiene and benzene exhibited the highest concentrations during winter. Photochemical reactions involved with ground-level O_3 formation are catalyzed by ultraviolet radiation and temperature. Therefore, peak ground-level O_3 levels typically occur during warm days with sufficient sunlight exposure; thus, people are more vulnerable to exposure during summer. The opposite is true during winter, when available light is diminished, and temperatures are colder (ATSDR 2014b).

Demographic behavior and technological improvements that aim to mitigate emissions (e.g., smokestack precipitator installation in 2015) also need to be considered when evaluating pollutant concentrations. For instance, households in the Atlantic provinces are heated primarily with oil, electricity, and wood or wood pellets (Statistics Canada 2011); therefore, as residential heating increases during winter, biogenic VOCs (e.g., benzene [ATSDR 2007a], 1,3-butadiene [ATSDR 2014b]) from wood burning may have contributed to higher concentrations of these compounds observed in this study. As the mill operates on a 24/7 schedule (ECCC 2012), atmospheric VOC emissions were assumed consistent throughout the year.

Implications

Location of ambient air quality monitoring stations has a direct impact on the observed concentrations of pollutants

(Craig et al. 2008). Based on the time series and spatial analyses, wind direction appears to play a key role in the Granton NAPS site's ability to monitor ambient VOCs from the mill. PW ≥ 1 h from the selected range (360°–80°) typically resulted in equal or higher VOC concentrations for all compounds, except carbon tetrachloride, compared to AOWD (Figs. 4, 5, and 6; Supplementary material), suggesting that the mill is likely a causal factor. Furthermore, as there is a higher frequency of northerly winds blowing towards the south during winter (Fig. 2), the Granton NAPS site is more likely to capture ambient pollutants from the mill's atmospheric emissions. Southwest PW blowing towards Pictou dominate during the summer months when people are more vulnerable to ambient air pollution exposure. Due to Pictou's geography, air toxics from the Eastern Seaboard in combination with local emission sources, including the mill, converge there; hence, higher concentrations of VOCs are expected in Pictou during summer. Subsequently, southwest PW are expected to result in lower VOC concentrations at the Granton NAPS site, as capturing the mill's atmospheric emissions would not be optimized. Therefore, VOC concentrations at the Granton NAPS site during winter would likely be representative of ambient VOC concentrations in Pictou during summer. Moreover, Pictou's considerably larger population base compared to the rural area of Granton further confirms that the NAPS site is not strategically positioned to accurately represent ambient levels of air toxics where there is higher residential exposure.

Study limitations

This study only evaluated exposure to ambient VOC air pollutants. Human exposure to air pollution is a combination of both outdoor and indoor environments and varies according to daily activity patterns and the conditions of specific settings. Secondary data analysis was used in this study; therefore, the ecological nature of these findings limit the explicit attribution of ambient air toxic exposures to the risk potential for cancer for community residents. Personal exposure monitoring, more detailed spatial analysis of ambient conditions, and source apportionment studies would be required to establish more explicitly the health risk associated with these exposures. The analysis was limited by the inability to examine the interaction of local meteorological conditions. Meteorological data were retrieved from Caribou Point, located approximately 10 km from the mill; consequently, coastal conditions may cause differences in meteorological measurements between sites.

Future research and monitoring

A *field component* consisting of real-time measurements of ambient air toxics would improve the rigor and validly of the present study. Although labor intensive, air toxics samples can be analyzed with a high degree of accuracy (Craig et al. 2008). Because monitoring stations are typically fixed, government-approved *atmospheric dispersion modeling* that considers landscape dynamics and seasonal meteorological variability (e.g., ©CALPUFF, ©AERMOD) would more accurately estimate spatial patterns of air toxics dispersion, and human exposure at the population or individual level (EPA 2013). This would require numerous stations within the community so would likely only be feasible for a specific research investigation. Further, installation of a new precipitator in 2015 has likely changed in ambient conditions. A follow-up assessment would provide a comparison to these findings to determine if VOC levels have improved. Additional research includes applying a *Conditional Probability Function* to calculate the probability that an air pollution source is located within a particular wind direction sector to help determine direction of a source from a NAPS discrete receptor site, and conducting an analysis of the effect of mixing height on measured VOC concentrations to further investigate seasonal patterns.

Investigation of health outcomes might involve longitudinal epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate consideration for latency of health outcomes, while controlling for indoor and occupational sources and other contextual factors. Several recent Canadian nationwide cohort studies that may provide a foundation for such investigations have been described (e.g., Crouse et al. 2012).

A *comprehensive risk assessment* investigates uncertainties that have implications for risk estimates in the present study, including those surrounding toxicity information (Morello-Frosch et al. 2000). More research is required to determine what cancer and noncancer risks are from ambient air toxics exposure. Further, it is important to consider synergistic effects of a full suite of ambient pollutants, and physical and chemical processes involved in fate and transport of these compounds. Comprehensive emission inventories are necessary to thoroughly address (i.e., characterize, model, and manage) air quality issues (CEC 2009). Collectively, these research efforts aim to better inform air quality management, composed of federal (e.g., ECCC, Health Canada) and provincial (e.g., NSE, Nova Scotia Department of Health and Wellness) government and public health agencies, how best to proceed to ensure the health of residents in industrial communities is prioritized. Implications of the current findings warrant further investigation.

Given the contribution emissions from local sources have to regional, national, and global airsheds, local mitigation initiatives should be an integral part of air quality strategies. There is no common approach to assess health effects of a mixture of pollutants, as they tend to be site specific; hence, an assortment of effective measures may be required. Case studies that provide evidence of effective of air quality

management interventions and guidance documents for risk managers may help inform air quality management for stakeholders (Craig et al. 2008).

To address potential adverse health effects associated with degraded air quality, Health Canada, the Public Health Agency of Canada (PHAC) and provincial partners might work collaboratively with local stakeholders to mitigate health risks and improve efficient industrial technology, while balancing economic, political, and social factors in development and implementation of air quality management. Mitigating industrial emissions has beneficial outcomes for wellbeing (Clougherty 2010); environmental stewardship and governance fosters a more proactive and cleaner environment, while building trusting relationships between industrial stakeholders (Pascal et al. 2013). "A comprehensive enforcement program with mandatory reporting of emissions, […] and meaningful penalties for noncompliance ensures that emission standards are being met" (Craig et al. 2008), and facility operators are held accountable. Data collected internally by the mill is not readily available. To improve transparency, siting rationale for air quality monitoring stations and accompanying data should be provided as part of a commitment to corporate responsibility of the mill (Hoffman et al. 2015).

To improve air quality conditions, stakeholders could increase the capacity for surveillance, assessment, and response to air quality. Furthermore, evaluation of a wide-suite of air toxics, including NATA compounds not measured by the NAPS network (particularly prioritized air toxics) would contribute to ensuring that air quality in Canada is adequately studied. Therefore, ECCC and NSE should consider implementation of a long-term monitoring program for priority air toxics that is comparable to the NATA network monitored by EPA to characterize air toxics exposure on local, regional, and national scales. Data will be useful to help mitigate emissions and achieve acceptable air quality standards that do not exceed cancer or noncancer risk thresholds.

ECCC should also consider the feasibility of installing and maintaining additional strategically placed NAPS sites to improve air pollution evaluation in both rural and urban areas, as well as in microenvironments (e.g., near point source emitters, high-traffic areas) (Craig et al. 2008). More effective communication of the results is required to increase transparency among stakeholders, including the public (Hoffman et al. 2015). Based on the population's risk of exposure, it is strongly recommended that ambient air toxics monitoring to be incorporated at the established NAPS station in Pictou to optimize capturing of said air toxics, and to best correlate pertinent results. Additionally, atmospheric dispersion modeling should use local meteorological data; therefore, meteorological data should also be collected concurrently at NAPS sites to help identify source emitters.

Measurement of individual VOC compounds is necessary to provide insight into their contribution to $PM_{2.5}$ and ground-level O_3 formation. Data would be useful to help target large source emitters and aid regulatory enforcement. Establishment of stringent and/or adapted air quality standards that encompass more air toxics (e.g., VOCs) fosters strong public support and political engagement to address air quality issues. Moreover, health impacts associated with background air pollution should be estimated. Air quality management programs are human resource intensive; therefore, they must have clear and feasible short- and long-term objectives. These initiatives gain predictive insights on atmospheric chemistry, and engage and support relevant sectors in the development and implementation of policies to reduce health risks associated with air pollution exposure (Craig et al. 2008).

Conclusions

Findings reveal that 1,3-butadiene, benzene, and carbon tetrachloride exceeded their respective cancer risk thresholds and are of primary health concern in terms of population risk. Results highlight associations with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to location of the pulp mill. Compared to AOWD, PW from the selected range (360°–80°) typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations. In addition, there are clear seasonal variations of meteorological conditions and VOC concentrations. Southwest PW blowing towards Pictou dominate during summer months, when people spend more time outdoors, and consequently are exposed to higher concentrations. Due to Pictou's geography, air toxics from transboundary and local sources may converge in summer, resulting in higher VOC concentrations. Findings suggest the Granton NAPS site is not positioned to accurately represent ambient levels of toxicity in PC. Therefore, ECCC and NSE should consider incorporating ambient air toxics (e.g., VOCs) monitoring at the established Pictou NAPS site where there is higher residential exposure.

Future research will provide air quality management with a comprehensive characterization of air toxics to support informed public health decisions. Moreover, this pilot study may serve as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of citizens is safeguarded and prioritized.

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From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 2:24:59 PM

Project: replacement_effluent_treatment_facility_project Comments: the pipeline is an impossibility,,,im the local diver,,i know,,,,,the ice will rip it out in the first winter.....did you also know there is a fish plant in the area that depends on clean salt water to process.....there is also no wat the town of pictou will allow this through their watershed Name: Email: @yahoo.ca Address: Municipality: : ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 53 y: 19

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 3:01:30 PM

Project: replacement_effluent_treatment_facility_project Comments: I am strongly opposed to any plan that allows the dumping of any industrial, commercial, or civic sludge/effluent into any body of water. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 67 y: 25

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: Thursday, February 07, 2019 3:03:30 PM

Project: replacement_effluent_treatment_facility_project Comments: This company has made a genuine effort to fix things .they are a major emoter and player in the forest industry of Nova Scotia .They should be Lliwed to complete their project .

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 3:47:14 PM

Project: replacement_effluent_treatment_facility_project Comments: Improvement to the status quo seems like progress! We need those valuable jobs and continued market for the forestry sector Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 86 y: 32

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 3:47:17 PM

Project: replacement_effluent_treatment_facility_project Comments: I object to this facility going ahead. The environmental impact on our fisheries and the potential for future effluent spills as has happened in the past is incongruous with the safety of the local population. Furthermore, Northern Pulp refuses to accept that a closed pipe system would be practical citing that the effluent would be too harmful to their machinery. This is not true, but it does mean that they would have to change the nature of their end product. Even so the new end product would still be marketable in an open market. The issue is that the company doesnâ?Tt engage fully in an open market and is possibly participating in Base Erosion Profit Shifting Transfer Pricing. If so, you will be aware yhat this is an international crime within the signatories of the OECD countries. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 75 y: 13

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 3:51:56 PM

Project: replacement_effluent_treatment_facility_project Comments: I do NOT give any support to this project. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 27 y: 33

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 3:56:32 PM

Project: replacement_effluent_treatment_facility_project Comments: Yes keep jobs and put new treatment plant in Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 69 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 4:01:26 PM

Project: replacement_effluent_treatment_facility_project Comments: This is completely criminally insane! Pumping poison into our oceans is a crime. NS government and Northern Pulp should be arrested and jailed for even suggesting such a thing. Name:
Email: @gmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 50 y: 21

From:	@hotmail.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 4:14:43 PM

Project: replacement_effluent_treatment_facility_project Comments: I fully support this project. It will be an improvement to existing facilities and assist to reduce the environmental impact of Northern Pulp. I support an extention to the use of Boat Harbour until project completion to allow adequate time to have a new ast ayatem up and running. Allowing a mill closure would have lasting negative effects on a pillar industry in Nova Scotia especially Pictou County. I feel the regulations will be met and exceeded surrounding effluent discharge as it has been since 1967. Name: Email: @hotmail.ca Address:

Privacy-Statement: agree x: 37 y: 22

From:	@hotmail.con
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 4:20:08 PM

Project: replacement_effluent_treatment_facility_project Comments: Absolutely no pipe. It cannot and will no cross over the Pictou watershed land. This is not going to happen and will not get the approval needed to go ahead. There should never be an extension granted to the Boat Harbour ACT.Keep the chip plant open,go buy the Sheet Harbour chip plant, get the dock with it and ship the raw chips by ship to the motherland. The company will get the fibre they want, and we as taxpayers already know we will have to pay for list revenue. The sawmills will still have a market for their chips, the truckers will still truck, the woods guys will still cut. There will probably be 100 or so go to early retirement and pension bridging, about 60 red seal tradesmen that can work anywhere they want. Might be 100 jobs lost of unskilled labour that will need to find a new job. There will be some spin off work lost, but there will be no more effluent to worry about or where to put it. NO PIPE Name:
Email: @hotmail.con Address:

Privacy-Statement: agree x: 43 y: 12

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 4:57:03 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel that allowing northern pulp to go ahead with the replacement of the effluent treatment facility is the right decision as the closure of said facility would relate in the closure of my families second generation forestry company employing 10 people directly. Name: Email: @gmail.com Address:

Privacy-Statement: agree

x: 50 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:00:33 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern pulp is doing the best they can to clean up Envionment I see it as a benefit to having the new waste water treatment facility in place and should be granted a one year extension on boat harbour this will greatly clean up the environment from whatâ?Ts being done now we need the forestry industry for the whole province not just Picou County Name: Email: @hotmail.com Address:

Privacy-Statement: agree

x: 44 y: 35

From:
To: Environment Assessment Web Account
Subject: Nothern Pulp Effluent Proposal
Date: February 7, 2019 5:06:12 PM

Dear sirs,
Although the fate of the Northern Pulp Effluent Proposal will be decided by the Government of Nova Scotia, residents of New Brunswick will be impacted by the decision since our province also borders the Northumberland Strait. Although provincial governments have a legitimate interest in creating and keeping jobs for the residents of their province, it is counter productive to spend government funds to support industries that damage the health of the local environment, population and other local industry. Environmental regulations should be designed to protect us from industrial pollution, not make it more profitable for companies to carry out their operations and companies should have to spend their own money to meet those regulations. If they can't meet them and still make a profit, then their business plan is flawed and they should shut down. Governments are always talking about the impact of deficit spending on our children and future generations but the impact of the environmental deficit, destroying and polluting the environment faster than it can rehabilitate itself, will be far more burdensome - no air fit to breath, water fit to drink or land fit to produce food fit to eat.

Bloomfield, Carleton County, New Brunswick

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:09:15 PM

Project: replacement_effluent_treatment_facility_project Comments: This county needs to show patience. It needs to recognize the importance of Northern Pulp to our province. We have to think of the thousands of lives that would be turned upside down by the loss of direct and related industry jobs should the plant close. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 83 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:09:58 PM

Project: replacement_effluent_treatment_facility_project Comments: keep pictou county working Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 37 y: 15

From:
To: Environment Assessment Web Account
Subject: NoPipe - No!
Date: February 7, 2019 5:19:18 PM

There isn't much I can say that you don't already know/have heard and seem intent on ignoring anyway.

My reasons to stop what is being proposed:
1. NO
2. NO
3. NO
4. NO
5. NO

If those supporting this destruction of the environment (yes, destruction) are so keen to allow it - then let them have the effluent disposed of by filling up the basements of their own homes or their wells or the homes and wells of their family and friends. Do Not Dump into into the home of life that lives in the ocean and waterways and into the backyards of people who did not create this ecological mess!!

The company that created the mess gets to clean it up - in a ethical and environmentally sound way! Costs too much? Too bad - it's the 'cost of doing business'. Destruction of the environment isn't a method they get to employ to 'clean up their mess'.

Despicable that yellow-bellied people are even Considering such an act!! You have to wonder about their 'payoff'...

In case you need a reminder - NO! Pipe!

Sent from my iPhone

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:27:44 PM

Project: replacement_effluent_treatment_facility_project Comments: Extend the deadline and give them a chance. We canâ?Tt afford to loose anymore jobs in Pictou County. Name: Email: @bellaliant.net Address:

Privacy-Statement: agree x: 79 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:27:53 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe all you wanted to do his dump there soure pipe in the strait enough his enough no more of this look at boat harbor the mess Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 34 y: 23

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:32:48 PM

Project: replacement_effluent_treatment_facility_project Comments: Please do not approve this project.It will ruin fishing,both commercial and sport.This is 2019, our environment must be of utmost importance!Northern Pulp has had 5 yrs. to address their problem at Boat Harbor.They have not and only threaten closure.Call their bluff!! Name: Email: @hotmail.com Address:

Privacy-Statement:

agree x: 50 y: 20

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:38:07 PM

Project: - Choose - Comments: northern pulp putting a discharge pipe into the Northumberland strait doesnt sound like a good choice for the environment. cant northern pulp recycle the effluent? Name: Email: @yahoo.com Address:

Privacy-Statement: agree

x: 52 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:40:39 PM

Project: replacement_effluent_treatment_facility_project Comments: effluent treatment facility project looks like they have met all studies and will meet or exceed their required regulations the project should be a go. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 75 y: 26

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:41:24 PM

Project: replacement_effluent_treatment_facility_project Comments: Build this. It works all across Canada, no reason we cannot have it in Nova Scotia. Name: Email: @gmail.com Address:

Privacy-Statement: agree

x: 69 y: 26

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 5:50:21 PM

Project: replacement_effluent_treatment_facility_project Comments: This is not a safe alternate to Boat Harbour. This proposal will lead to an even larger environmental disaster then the one occurring presently in Boat Harbour. This will destroy our beautiful East Coast waters as well as mammal and marine life. In addition to damaging our environment, it will also kill both the fishery and the tourist trade further destroying small towns and lives. there is also a serious and likely risk of this pollution poisoning the ground water and food supplies as well as the health of local people. Do not let this happen! Name:
Email: @hotmail.com Address:

Privacy-

Statement: agree x: 91 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:04:06 PM

Project: replacement_effluent_treatment_facility_project Comments: #yespipe Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 26 y: 22

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:04:41 PM

Project: replacement_effluent_treatment_facility_project Comments: I am not in support of building an effluent pipe into the Northumberland Strait or any other body of water. Name: Email: @yahoo.com Address:

Privacy-Statement: agree x: 66 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:07:01 PM

Project: replacement_effluent_treatment_facility_project Comments: This is what you call a no brainer minister of environment , sit down for 5 minutes and just think about this proposal , itâ?Ts an environmental disaster. A billion dollar fishery will e destroyed over some tree huggers ? They want to put the pipe through out Pictou eater table and into the caribou harbour where thousands of kbs of lobsters are floating in holding tanks during May and June not mentioning beaches , northumberland ferries Ltd which thousands of tourist cross every summer and fall , this is an absolute joke , no pipe all the way Name: Email: @gmail.com Address:

Privacy-

Statement: agree x: 70 y: 34

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 6:12:00 PM

Project: replacement_effluent_treatment_facility_project Comments: We need this mill to continue operations. Nova Scotia will be in a bad situation without this mill. Yes pipe. Thanks Name: Email: Address

Privacy-

Statement: agree x: 77 y: 22

From:	@yahoo.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 6:12:50 PM

Project: replacement_effluent_treatment_facility_project Comments: I oppose the planned idea of dumping the effluent into the Northumberland Strait. I believe this will harm our environment to a very high degree. Please stop this from happening. Name:
Email: @yahoo.ca Address:

Privacy-

Statement: agree x: 59 y: 29

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:19:30 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel the replacement is needed / as long as it is using the best technology available. We need to keep industry going and create jobs I feel the replacement is helping the environment and protecting jobs Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 69 y: 30

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:21:39 PM

Project: replacement_effluent_treatment_facility_project Comments: this is fantastic news Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 69 y: 33

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:27:00 PM

Project: replacement_effluent_treatment_facility_project Comments: That mill is an eyesore, it stinks, polluted and is owned by a multinational corporation while they get rich. If you repurposed the employees into a tear down/clean up and concentrated on clean energy as a replacement maybe our children would have a chance. Name: Email: Address: Municipality: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 69 y: 35

From:
To: Environment Assessment Web Account
Subject: Northern pulp pipe
Date: February 7, 2019 6:40:39 PM

Hi, I grew up in Pictou County,moved away and moved back home in 2014.The changes that the mill has wrought upon the area is astounding. Walk along the jitney trail,read the yellow signs about everything being poisoned and don't eat the shellfish.The beautiful West River ,polluted beyond belief.Boat Harbour completely destroyed.
We have a cottage on the Northumberland Strait and ours waters are beautifully clear and gorgeous .PLEASE PLEASE don't allow them to dump their poison in our strait . They don't care,they don't live here.
Get Outlook for Android

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:54:20 PM

Project: replacement_effluent_treatment_facility_project Comments: Stop hurting our ecosystems and environment to continue with the pipe is silly. Please thibk of your children or young relatives. Name: Email: @gmail.com Address: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 76 y: 35

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:55:39 PM

Project: replacement_effluent_treatment_facility_project Comments: I see this project as an oppurtunity for the provincal government to ensure a prosperous future for pictou county. A project of this magnitude will allow continued operation of the pulp mill for years to come while ending a legacy of boat harbour. Since the lease was terminated early i feel it reasonable to allow an extention to guarantee continued operation until completion. Since PLFN have already received settlement it seems unusal to allow them to dictate the usage of Boat harbour. In any event i feel a year extention is small request. This mill owner is committed to investing in this operation and i feel a number of improvements will follow after completion of their ast system. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 82 y: 23

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 6:57:56 PM

Project: replacement_effluent_treatment_facility_project Comments: In 2019 we cannot allow corporations to pollute our environment and risk the health of our families and natural environment. The mill in Pictou County has had a terrible track record of polluting, and the government of Nova Scotia has not managed the situation properly from the very beginning. It is now time to get this right and protect our land and waterways. No Pipe is safe, and no extension of boat Harbour is acceptable. Name: Email: @ns.sympatico.ca Address: : Privacy-Statement: agree

x: 60 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:15:51 PM

Project: replacement_effluent_treatment_facility_project Comments: This eft should be allowed to go through the environment assessment. It should not be held up for any reason. If the assessment comes back no then the mill should be granted an extension to the boat harbour site Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 56 y: 30

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 7:25:30 PM

Project: replacement_effluent_treatment_facility_project Comments: What to fucks wrong with society, to even consider this in the Northumberland Strait,the sea is the most aboused resource we have , the thousands of minute life fotrms that co-exists in salt water are part of the extroardinary food chain that today is Name: Email: Address: Municipality: Postal-Code: Phone:
Privacy-Statement: agree x: 50 y: 19

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:35:46 PM

Project: replacement_effluent_treatment_facility_project Comments: The Northumberland Straight and Cape Breton Shore of the Gulf of St. Lawrence provide stable income to many thousands of people through fishing and tourism. There has been an intentional lack of information to people outside of the Pictou region. I have tried several times to get information from my MLA PC Allan MacMaster and have been met with hostile comments and personal attacks. If there is nothing to be worried about our politicians should have no problem giving us straight answers. Name:

Privacy-Statement: agree x: 38 y: 23

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:37:35 PM

Project: replacement_effluent_treatment_facility_project Comments: Please let the science and Dept of Enviroment without political influence pro or con come up with the best solution based on science for this Mill to operate or close ,ever remembering that the Enviromental Laws are in place in Canada so that all companies ,industries are held to the same standards. If the Environmental Laws require change than that should be a decisions for another day. Name: Email: @hotmail.ca Address:

Privacy-Statement: agree x: 66 y: 19

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:39:54 PM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia cant afford to have this mill shutdown, it will be devastating to the community and the province. There will be too many jobs lost both directly and indirectly. Name: Email:

: Privacy-Statement:

agree x: 63 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:43:28 PM

Project: replacement_effluent_treatment_facility_project Comments: Do not approve this the seas are already dying. The government needs to force the paper mill clean-up by the deadline Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 59 y: 19

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:43:31 PM

Project: replacement_effluent_treatment_facility_project Comments: I live in Pictou County at present and pumping any kind of effluent from this new treatment facility into the fishing grounds and tourist areas is violating federal fishery laws and should not me allowed no matter what the mill says about the quality of said effluent...There are no studies done about the long term affects of this affluent on our fish species or shellfish species that are a mainstay to our local fishery. The mill should keep all this affluent in house on site or close down the mill.... Also in no way should the Boat Harbour Facility closure date be extended pass Jan 2020.... Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 51 y: 18

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:53:49 PM

Project: replacement_effluent_treatment_facility_project Comments: I am greatly concerned about the impact Northern Pulp is having. When will profit be less important than the environment?! When everything is dead? Shut the mill down until this facility is created! The government should subsidize the labourers at the plant while shutdown is taking place. This implementation will protect our fisheries and avoid risking the everlasting effects of water pollution. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 75 y: 22

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:57:01 PM

Project: replacement_effluent_treatment_facility_project Comments: I have major concerns involving this proposed treatment plant. I think a more through review is required and that this system will harm the Northumberland Strait. I am against this proposed project and its potential impacts on wildlife and lavre and oyster absorption of the chemical being discharged. Name: Email: @hotmail.ca Address:

Privacy-Statement: agree x: 38 y: 19

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:58:38 PM

Project: replacement_effluent_treatment_facility_project Comments: These treatment facilities are used all around the world! I believe Michelin uses the same system! The deadline was unfair given to the fact that NP was already trying to work something out with govt that would have shut it down, so working on the boat harbour situation was a mout point until itâ?Ts IA was approved! Give them an extension!! Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 81 y: 20

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 7:59:33 PM

Project: replacement_effluent_treatment_facility_project Comments: Please approve this project. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 88 y: 18

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 8:03:29 PM

Project: replacement_effluent_treatment_facility_project Comments: Hello my name is and I am from Maine. I travel 12 hours to Nova Scotia to fish for Atlantic Salmon every year. I would like to state that the Northern Pulp plan to dump affluent into the Northumberland straight is recklace and poor stewardship of the natural resources of Nova Scotia and Atlantic Canada. I would like to stress that if international buyers of Northumberland straight seafood and shellfish hear that Pulp mill affluent is being pumped into the waters these fish come from that they will most likely refuse and boycott future purchases from these waters. I am also extremely concerned about the trout and salmon that would be exposed to these contaminants! I am extremely concerned that one of the last places in North America to fish for Atlantic Salmon would be put on Jepardy by allowing this plan to go through!! I want to state that each year fishermen from the U.S. and Europe flock to Nova Scotia to fish for Atlantic Salmon, Trout and other spe cies along the Northumberland straight. We are depending on the wisdom of leadership in Nova Scotia to do the right thing and protect the Northumberland Straight This means we are depending on leadership to REJECT the plans of Northern Pulp to dump affluent into the Northumberland Straight. Thank you Name: Email: @yahoo.com Address: : Privacy-Statement: agree x: 64 y: 23

From: @sdmm.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 8:11:56 PM

Project: replacement_effluent_treatment_facility_project Comments: I support the modernization of Northern Pulpâ?Ts effluent treatment and an extension of the timeline required to make that happen. The Mill is too important to the Provincial economy to force it to shut down in the meantime and possibly not re-open. Name:

Privacy-Statement:

agree x: 78 y: 27

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 7, 2019 8:19:02 PM

Project: replacement_effluent_treatment_facility_project Comments: This needs to be a federal assessment. No questions. The blatant conflict of our provincial government is on the verge of being taken to court. Pictou Landing First Nations will not stand for anything else but the closure of Boat Harbour. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 46 y: 13

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 8:50:58 PM

Project: replacement_effluent_treatment_facility_project Comments: 11,600 jobs at stake. An economic landslide we canâ?Tt recover from. Build the treatment facility! Surely the government will accept the science and the numbers Name: Email: @outlook.com Address:

Privacy-Statement: agree

x: 47 y: 31

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 8:54:39 PM

Project: replacement_effluent_treatment_facility_project Comments: This mill has polluted our waters, air and stripped our lands of trees and replaced with softwood for over 50 years and not too mention the millions of tax payers money that has been used and continue to be used . Now they want to continue to put water fields in danger along with putting an ecosystem in danger not only with effluent but with millions of liters of warm fresh water pumping into it. The people of Nova Scotia are taking a stand and saying NO Pipe into our strait. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 68 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:03:15 PM

Project: replacement_effluent_treatment_facility_project Comments: I am adamantly opposed to this project. This 60 year old mill is grossly outdated, has never met even the lax standards of the past and the owners, Asia Pulp, have the worst environmental record in the world. There is no chance this is going to change. Allowing them to pour their pollution directly onto one of Nova Scotias richest shellfishing areas would be pure insanity. Even the suggestion that this might be done would be enough to kill our overseas markets. Can you imagine what the EU would do with lobster shipped to Europe from a province with so little environmental awareness? Our competitors in the US would have a field day with this. Name:
Email: @gmail.com Address:
: Privacy-
Statement: agree x: 48 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:06:10 PM

Project: replacement_effluent_treatment_facility_project Comments: Hey no pipe there itâ?Ts done right class 1 itâ?Ts should be federal accesment because there a lot ice out there and wind . Also all they care itâ?Ts about them self northern pulp send them back to Asia. Stop dumping your shit in ocean itâ?Ts not subtic tank you look at boat harbor so margarite Miller say no Approve election his coming Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 25 y: 35

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:07:52 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe the effluent treatment facility will be a much needed upgrade to the way the wast is handled now. And it

Privacy-Statement: agree x: 71 y: 19

From:
To: Environment Assessment Web Account
Subject: Northern pulp
Date: February 7, 2019 9:15:05 PM

I work as a fisherman. I live in pictou n.s. no way should environment nova Scotia alou this pipe to pollute were I work play and live .enough is enough please stop this maddness before it gets any crazier.
Get Outlook for Android

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:23:20 PM

Project: replacement_effluent_treatment_facility_project Comments: This project cannot go forward. Our air quality, our health, our fishery, enjoyment of our beaches, devaluing of coastal properties, promises to our indigenous peoples who have endured this terrible situation for over 50 years, our tourism, etc. Please stop the insanity. Time for an outdated mill to go. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 58 y: 37

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:39:44 PM

Project: replacement_effluent_treatment_facility_project Comments: We need this mill for our economy, the spinoffs from this plant is astronomical. I believe northern pulp will come up with a solution to both take care of the environment and continue to provide many jobs for the province. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 44 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:41:24 PM

Project: replacement_effluent_treatment_facility_project Comments: The mill has had more time than needed to improve and has not done so. They have had leaks and have poisoned our county long enough. No pipe !!! Ever !! Our fisheries and tourism are more important to our economy and do not kill us with pollution and stink ! Name: Email: @gmail.com Address:

Privacy-Statement:

agree x: 58 y: 17

From: @seasidehighspeed.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 9:50:35 PM

Project: replacement_effluent_treatment_facility_project Comments: It seems as though this project should meet or exceed all environmental requirements. The effluent has been running into the strait untreated for 50 years without contaminating any seafood. Now with modern, world class technology, the effluent will be treated before leaving the site and will meet all environmental standards. There are many other much more troubling environmental factors affecting the Northumberland Strait, such as untreated sewage, farm runoff from PEI, and many others. This company has been given an unfair timeline and has been the subject of political grandstanding. The company has put a large investment into improving the environmental impacts of this mill. Rural Nova Scotia needs this mill for its economic viability. Name: Email: @seasidehighspeed.com Address:

Privacy-Statement: agree x: 61 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 10:22:05 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern pulp is taking responsibility by correcting the current issue and upgrading their facility. Public should invest the time to actually hear them out and realize this will have 0 impact on the environment and have major impact not just the 11,500 jobs, it is the 50,000 plus family members that depend on that job. The government has the power to extend, let NP roll out their plan. Name: Email: @gmail.com Address:

Privacy-

Statement: agree x: 33 y: 10

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 10:33:13 PM

Project: replacement_effluent_treatment_facility_project Comments: Born and raised in Pictou I have 3 main concerns : 1 No where in this EA does it state Northern Pulp,s proposed pipe will run directly through the Town of Pictous watershed. Where are the facts of what happens if there was a leak in this area ? The Town of Pictou was NOT consulted on this information. 2 The effluent will be discharged directly into prime fishing grounds. This will greatly effect the marine life. Just the difference in the water temperature, not to mention the amount of chemicals, discharging from the pipe,destroying the eco system of several species of fish, birds etc.The time line of the release of the effluent into the lagoons of the heavily polluted Boat Harbour, gave it extra time to cool the water and settle some of the heavy toxins. This will no longer be the case as it will be piped within an 8-9 hour period directly into the Northumberland Stright, removing the 30 day period it had to cool and settle. It will destroy the Northumberland Stright as we know it. 3 Continuing to use Boat Harbour extension requested by Northern Pulp People have lived with the posion in this area long enough. Boat Harbour needs to be closed on the date legislated for it to close. It should have been closed and clean up started years ago. Name: Email: @hotmail.com Address:

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 10:44:08 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel it is imparitive that this new treatment system be installed and that the mill be given extra time to complete this project. The mills effluent has been flowing into Pictou Harbour for the past 50 years and the fishing industry has flurished. With the new system the effluent will be much better quality and if a break was to occur it has already been treated before it ever leaves the mill site ! We need both fishing and forestry to survive in Nova Scotia,so lets all work together to make this happen! Name: Email: @live.ca Address:

Privacy-Statement: agree x: 59 y: 29

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 10:47:47 PM

Project: replacement_effluent_treatment_facility_project Comments: We must preserve the Northumberland Strait Eco-system and the traditional way of life for those who rely on the Strait to provide for their families through fishing. We must protect the thousands of migratory sea birds, paleagic fish and sea mammals who move through this area and need it kept pristine in order to survive. The planet is warming, we have huge pollution problems, we all must make significant changes to the way we live in order to slow down these changes. Not to do so is to undermine the life support systems of the Earth. Hard decisions need to be made for the future. I compell the minister to not allow any effluent what so ever to be piped into the Strait, treated or not. No Pipe. However, it is incredibly important to me that if the mill were to close that we approach the mill/forestry workers and their families with the same compassion we must show the planet and provide them fully with monetary compensation and support. I feel for everyone involved in this, but it does not make any sense to allow effluent to be discharged into a body of water that defines this part of Nova Scotia. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x:

44 y: 27

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 10:51:00 PM

Project: replacement_effluent_treatment_facility_project Comments: ********* Environmental Assessment Feedback Needed ********* The time is now for you to provide feedback on the Northern Pulp Effluent Proposal. You can do so here: https://novascotia.ca/nse/ea/comments.asp See below for a few concerns around this waste proposal. THE TOP 5 REASONS TO SUPPORT #NOPIPE 1. For your HEALTH The composition of the toxic effluent will contain dioxins, furans, metals, 1000KG of solids and other contaminates at 90,000,000 Litres PER DAY. Dioxins and Furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mills power boiler. This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. http://ec.gc.ca/inrp-npri/donnees-data/index.cfmâ?¦ https://www.nrcm.org/projects/waters/cleaning-up-the-androscoggin-river/maines-dioxin-problem/?fbclid=IwAR3gT3KRRmPu8j22heOksunum4i6VAp0cD-tb6hqJTVOTTyrGeRh7YAtZc8 https://docs.wixstatic.com/ugd/b61814_40a0f43682ee45d99af01fb432d910fd.pdf?fbclid=IwAR3a7QpiR253DqowGxu5DQK13vDIcJru0rFyGl1cYCrO4GsFjHKMp6aghz4 2. For the overall ECONOMY The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 Billion dollars to the Nova Scotia economy. The tourism industry is worth $2.7 Billion and prides itself on warm, clean water and world class sandy beaches. The Commercial Fishing Industry is worth over $1 Billion and prides itself on sustainable wild shellfish that is shipped all across the world. The Sport Fishing industry is worth $56 Million and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks in the province. All of this is at risk due to 32,000,000,000 Liters of waste water PER YEAR that will be 37 Celsius that will contain deleterious substances harmful to Fish species and humans. https://docs.wixstatic.com/ugd/b61814_246fdf7e04a64e239be0fbf7dc64f976.pdf?fbclid=IwAR3JjsPZQ-_npJ0a5-B4Xv4-nJeqnSfkZk9an--3s0W92fB5oZrbUWFLTnU https://novascotia.ca/news/release/?id=20180222001 https://docs.wixstatic.com/ugd/b61814_f856b6a7c7b34ffb9eba165dc3ed894b.pdf?fbclid=IwAR3es-LiMLiVx1Lc-eJZI1TLQkqYBXBRw0OBS3upgGj9ibusKsO1wl_Uqfc 3. For the ENVIRONMENT â?" Meeting Regulations DOES NOT Prevent Harm Nova Scotia and the Northumberland Strait has many great resources. However, they are at risk with the proposed Effluent treatment process. As it stands right now, there are no CCME guidelines established for Marine Environments for some of the different chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on

fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having harmful effects on the larger environment. This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations . Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does.
https://drive.google.com/file/d/1H1HltUnh9Oem_KpPHwxmye7z5mfJP5_W/view?fbclid=IwAR1WyzupTqjLC9u8tjxWpq94e5anlEQDs_-JTH0z8vPWAoaKkyIoGBuumdM 4. New treatment Facility is NOT BETTER Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with micro-organisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. POINT C is also a DEAD ZONE!! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days.

Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â?opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the proposed water quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns!! https://thetyee.ca/Analysis/2019/02/07/Pollution-Nova-Scotia-Pulp-Mill-Sink-Trudeau/?
fbclid=IwAR2_XplvKgfjWHCh2fTuzimxmeMsnWVTVVhE6agYFPiXSwR3VvkEXHB4GEA
https://docs.wixstatic.com/ugd/b61814_ab61cca668f1432f890d2d0a7715a554.pdf?
fbclid=IwAR27oqDYJfCCBWdlMyNExvUrYZ_rBS86Gw77cT35IlLtVdyzh05AYwwcB1c 5. Better return for your TAX DOLLARS Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 Million dollars and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 Million dollars. Further to that $127 Million dollars of NS Tax payers dollars have been given to the mill in the last several years. Meanwhile we have doctors over worked and leaving our province. We have ER closures and very long wait times for treatment and care. Our Education system is also at its max with constant cuts. Funding for Seniors and Veterans as well as many more public programs and services would benefit from the large sums of NS tax dollars instead of it going towards Northern Pulp.
https://www.halifaxexaminer.ca/featured/northern-pulp-scotsburn-lumber-and-u-s-tariffs/#News https://www.halifaxexaminer.ca/province-house/health-care-crisis-check-leadership-to-solve-it-another-question/?fbclid=IwAR1oPeQe3iFB-Oe0llwCNT9uax2Gos8ZQNhV3YYvTOO67j5aRX8p310_tQ8 #NOPIPE
https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/ Name:
Email: @bellaliant.net Address:

rivacy-Statement: agree x: 83 y: 28

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 11:00:39 PM

Project: replacement_effluent_treatment_facility_project Comments: our families depend on the forestry industry to survive and has for many years and if you close this place down there will be a lot of people and families out of work and a lot of people and industries rely on the paper products from this mill to just manage in daily activities Name: Email: @hotmail.com Address:

Privacy-Statement:

agree x: 45 y: 17

From:
To: Environment Assessment Web Account
Subject: No pipe, no extension
Date: February 7, 2019 11:15:25 PM

Add my name to those opposed.

From: @shaw.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 11:32:19 PM

Project: replacement_effluent_treatment_facility_project Comments: I totally disagree with this. A federal assessment needs to be carried out. The proposed pipe goes through the watershed of the town of Pictou. Consequently any spill will destroy the towns drinking water. Effluent into the northumberland strait will destroy the fisheries and tourism. NO pipe. Name:
Email: @shaw.ca Address:

Privacy-Statement: agree x: 61 y: 35

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 7, 2019 11:38:30 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe the project should go ahead the pulp mill is a very valuable industry in Pictou County and for Nova Scotia. Northern Pulp has been trying to do the right thing with the new effulent system. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 50 y: 16

From:
To: Environment Assessment Web Account
Subject: pollution
Date: February 7, 2019 7:25:53 PM

I will not consider your area as a place to LIVE

From: Watcher
To: Environment Assessment Web Account
Subject: I Guess YOU Care NOT FOR YOUR CHILDREN
Date: February 7, 2019 1:16:52 PM

Live Life with Your Heart
Care, Kindness, Understanding

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 12:11:18 AM

Project: replacement_effluent_treatment_facility_project Comments: Please do not let this mill ruin our favourite beaches and fishing grounds. Who is going to want to fish and swim in a plume of effluent? Not me or anyone else. The fact this mill is turning up to 90 million litres of fresh water per day into waste is a tragedy in itself. Not to mention destroying our forests.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 1:31:02 AM

Project: replacement_effluent_treatment_facility_project Comments: I am very concerned that our province is in a bad position to perform this assessment.the indemnity clause makes an argument of bias favouring the mill.Not to mention that if you follow Nortern Pulps public Relations efforts,you are living in fear of the financial ruin of the forestry industry.i donâ?Tt feel one area should be singled out to suffer for Northern Pulp to control pulse of the industry

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 3:18:51 AM

Project: replacement_effluent_treatment_facility_project Comments: This should not even be a consideration for the government. Shame on you!! The damage that will be done to the oceanâ?Ts ecology would be devastating.

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 6:30:49 AM

Project: replacement_effluent_treatment_facility_project Comments: If ever there is a crime against humanity, this project must not see the light of day ,WTF is wrong with these people , where has respect gone? It will destroy the marine ecosystem for the lower Northumberland Strait.Asia is gonna fuck this country ,give it ten /twenty years

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 6:43:18 AM

Project: replacement_effluent_treatment_facility_project Comments: I cannot believe that in this day and age you would even consider going ahead with a project of this scale. I am a local boater who has seen first hand the crap that comes out of the boat harbour facility and would not in any way want to pollute any more than has already been done. Toxic waste, heaven forbid your oil barrel leaks it originally came from the earth.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 7:35:23 AM

Project: replacement_effluent_treatment_facility_project Comments: Please no pipe people are done with this out dated mill and we want our clean air and water back. The only people who support the mill are the people with invested interstates in it. Pc has spoken and the mill is out of luck

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 7:35:51 AM

Project: replacement_effluent_treatment_facility_project Comments: This is not a project that fits into 2019 and the direction all of us need to go to ensure a healthy environment and to fight climate change. Nova Scotians and the Pictou Landing First Nation have supported this mill long enough. The economic benefits for some people is not more important than the harm this mill has done over 52 years of resistance. Pumping hot effluent deep into the Northumberland Strait is going to create another Boat Harbour situation, and we all know it. This pipe is a horrible idea, as it was when proposed a couple times in the past. The proposed effluent treatment facility is not going to make the effluent any less toxic. The taxpayers of NS are still on the hook to assess, build and run this project. There is a huge conflict of interest here. Sane minds need to prevail.in this process and see it for what it is: a multinational corporation that wants its maximum profit and the least expense to it, with no consideration of the damage it does, a nd not responsible for its environmental liabilities. This proposal must be rejected.

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 7:46:07 AM

Project: replacement_effluent_treatment_facility_project Comments: This looks like a very well researched, thorough plan, approve it without delay, and extend their deadlines as the scope of this work was impossible in the existing timeframe. If this is the standard required for a project approval then expect no new industry ever in Nova Scotia and no improvements either.

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 7:46:39 AM

Project: replacement_effluent_treatment_facility_project Comments: I fail to understand why Northern Pulp isnt building an artificial wetland to further clean and naturally release their effluent rather than a pipeline to dump it. That is a 1960s strategy we do not want in our province. The creation of artificial wetland to treat this type of problem is the global standard. They need to get with the environmental times.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 8:00:49 AM

Project: replacement_effluent_treatment_facility_project Comments: i think boat harbour be cleaned up.and closed.next year.and i think it shouldnt be approve i live in across .they have that mill.pumping there poison.and its really bad at night time.and the other you could not see pictou caseway. it was really.bad.and the smell is ungody.and i donnt think there should not be no pipe .going into out pretty strait where we fish at it will kill everything out there.. i love my nova scotia lobsters/the best in nova scotia.and i VOTE NO.NO PIPE .norther pulp just want to destroy our land and our waters.we not to going let them do it no more.enought is enought.we are takeing a stand.we our takeing back what is ours.canadas ocean playground .

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 8:25:57 AM

Project: replacement_effluent_treatment_facility_project Comments: The regulations governing the safety of releasing effluent into the Strait are exceptionally weak and misleading to the public. The government should protect the health of our waters, lands and people. Do not poison the Northumberland Strait. No pipe.

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 8:27:21 AM

Project: replacement_effluent_treatment_facility_project Comments: Looks like another major improvement to the environmental footprint of northern pulp

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 8:36:17 AM

Project: replacement_effluent_treatment_facility_project Comments: Please please do not allow thid project. Do you want to be responsible for destroying our fisheries? How can this mske any sense in the 22st Century to DUMP anything into our water?

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 8:47:52 AM

Project: replacement_effluent_treatment_facility_project Comments: I support Northern Pulp and the tremendous work they have done and continue to do to reduce the environmental footprint they inherited. They have taken the high road through all this anti-mill publicity. The work they are doing shows they are deserving of an extension to get this amazing project completed for the betterment of all concerned .

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:07:37 AM

Project: replacement_effluent_treatment_facility_project Comments: Please I am begging you not to allow this pipeline to go through. The Pulp Mill has caused so much damage to our province we cannot allow it to continue. Seriously, what are we thinking??

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:23:23 AM

Project: replacement_effluent_treatment_facility_project Comments: As an employee of a local sawmill, , I fully support the plans for the new effluent system.

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:31:25 AM

Project: replacement_effluent_treatment_facility_project Comments: My husband works at a sawmill and his job will be put in jeopardy.

From:	@ns.sympatico.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 9:35:35 AM

Project: replacement_effluent_treatment_facility_project Comments: In a recent scientific publication Pulp Mill Wastewater: Characteristics and Treatment By MarÃa Noel Cabrera Submitted: April 1st 2016Reviewed: January 19th 2017 Published: March 29th 2017 the author writes The concept of a closed loop mill aims to eliminate discharges to the aquatic environment.... and ...not much information on its effluents is available.... The mill is going to pump toxic waste directly into an aquatic environment. These waters are an important resource not only for Nova Scotia but also for Prince Edward Island and New Brunswick. It beggars belief that the pumping of effluent nearby to water sources on land and into the ocean is even being considered. If you allow this to happen you are not only going to harm fishing industries and ocean life you are threatening the health of Nova Scotians who live and work in the area. The mill have been given huge sums of money in the past and have had 5 years to fix the problem presumably relying on government to bail them out. Amongst many otherd, the family own Sinar Mas, Asia Pulp and Paper, P aper Excellnce and Northern Pulp. They are one of the richest families in the world. It is their waste and they need to deal with it, without threatening our pristine environment. Are you aware that Northumberland Strait water has been used as an indicator of quality for oyster cultivation within the European Union? If you allow this to happen you will be making a lot of people very unhappy. Dangerously and politically unhappy.

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:53:39 AM

Project: replacement_effluent_treatment_facility_project Comments: My understanding is that even the current effluent is mainly organic. Why this is not good for sea life puzzles me. Isnt this food? Improving this seems like it would be worse to sea life than better. And how exactly is this worse than allowing raw sewage from thousands of homes to enter the Strait?

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:05:41 AM

Project: replacement_effluent_treatment_facility_project Comments: The opposition to this seems to be based on a perception that Northern Pulp has historically been a poor corporate citizen. We have to look forward and ask ourselves what it will take to change that. One thing I do know is that the answer is not shutting down the plant, throwing all of those people out of work and creating chaos in the NS Pulp industry. Those who would do that should be asked what they will do to support those unemployed workers and their families. All I see from opponents to this project is their limits on what is permissible. What is their alternative to shutting down the plant, destroying jobs and disrupting a fundamental NS Industry? The pipeline into the strait will not measurably add to the Straits problems. Build it and solve the Boat Harbour problem.

From: @xplornet.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:19:45 AM

Project: replacement_effluent_treatment_facility_project Comments: This is a very bad idea, still pipe out to the Strait when the fishing industry has warned you what it will do. Pipe through water shed????? One leak and the water is contaminated. Are they going to pay for a new water shed area, are they going to pay for the clean up or are we the taxpayers going to pay. Why would you risk the loss of your fishing industry when it is by far bigger than this industry. Closed loop system , air protection system. You are not even using common sense here, common sense has to come into play sometime.

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:20:46 AM

Project: replacement_effluent_treatment_facility_project Comments: ********* Environmental Assessment Feedback Needed ********* The time is now for you to provide feedback on the Northern Pulp Effluent Proposal. You can do so here: https://novascotia.ca/nse/ea/comments.asp See below for a few concerns around this waste proposal. THE TOP 5 REASONS TO SUPPORT #NOPIPE 1. For your HEALTH The composition of the toxic effluent will contain dioxins, furans, metals, 1000KG of solids and other contaminates at 90,000,000 Litres PER DAY. Dioxins and Furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mills power boiler. This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. http://ec.gc.ca/inrp-npri/donnees-data/index.cfmâ?¦ https://www.nrcm.org/projects/waters/cleaning-up-the-androscoggin-river/maines-dioxin-problem/?fbclid=IwAR3gT3KRRmPu8j22heOksunum4i6VAp0cD-tb6hqJTVOTTyrGeRh7YAtZc8 https://docs.wixstatic.com/ugd/b61814_40a0f43682ee45d99af01fb432d910fd.pdf?fbclid=IwAR3a7QpiR253DqowGxu5DQK13vDIcJru0rFyGl1cYCrO4GsFjHKMp6aghz4 2. For the overall ECONOMY The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 Billion dollars to the Nova Scotia economy. The tourism industry is worth $2.7 Billion and prides itself on warm, clean water and world class sandy beaches. The Commercial Fishing Industry is worth over $1 Billion and prides itself on sustainable wild shellfish that is shipped all across the world. The Sport Fishing industry is worth $56 Million and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks in the province. All of this is at risk due to 32,000,000,000 Liters of waste water PER YEAR that will be 37 Celsius that will contain deleterious substances harmful to Fish species and humans. https://docs.wixstatic.com/ugd/b61814_246fdf7e04a64e239be0fbf7dc64f976.pdf?fbclid=IwAR3JjsPZQ-_npJ0a5-B4Xv4-nJeqnSfkZk9an--3s0W92fB5oZrbUWFLTnU https://novascotia.ca/news/release/?id=20180222001 https://docs.wixstatic.com/ugd/b61814_f856b6a7c7b34ffb9eba165dc3ed894b.pdf?fbclid=IwAR3es-LiMLiVx1Lc-eJZI1TLQkqYBXBRw0OBS3upgGj9ibusKsO1wl_Uqfc 3. For the ENVIRONMENT â?" Meeting Regulations DOES NOT Prevent Harm Nova Scotia and the Northumberland Strait has many great resources. However, they are at risk with the proposed Effluent treatment process. As it stands right now, there are no CCME guidelines established for Marine Environments for some of the different chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on

fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having harmful effects on the larger environment. This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations . Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does.
https://drive.google.com/file/d/1H1HltUnh9Oem_KpPHwxmye7z5mfJP5_W/view?fbclid=IwAR1WyzupTqjLC9u8tjxWpq94e5anlEQDs_-JTH0z8vPWAoaKkyIoGBuumdM 4. New treatment Facility is NOT BETTER Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with micro-organisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. POINT C is also a DEAD ZONE!! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days.

Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â?opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the proposed water quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns!! https://thetyee.ca/Analysis/2019/02/07/Pollution-Nova-Scotia-Pulp-Mill-Sink-Trudeau/?fbclid=IwAR2_XplvKgfjWHCh2fTuzimxmeMsnWVTVVhE6agYFPiXSwR3VvkEXHB4GEA https://docs.wixstatic.com/ugd/b61814_ab61cca668f1432f890d2d0a7715a554.pdf?fbclid=IwAR27oqDYJfCCBWdlMyNExvUrYZ_rBS86Gw77cT35IlLtVdyzh05AYwwcB1c 5. Better return for your TAX DOLLARS Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 Million dollars and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 Million dollars. Further to that $127 Million dollars of NS Tax payers dollars have been given to the mill in the last several years. Meanwhile we have doctors over worked and leaving our province. We have ER closures and very long wait times for treatment and care. Our Education system is also at its max with constant cuts. Funding for Seniors and Veterans as well as many more public programs and services would benefit from the large sums of NS tax dollars instead of it going towards Northern Pulp. https://www.halifaxexaminer.ca/featured/northern-pulp-scotsburn-lumber-and-u-s-tariffs/#News https://www.halifaxexaminer.ca/province-house/health-care-crisis-check-leadership-to-solve-it-another-question/?fbclid=IwAR1oPeQe3iFB-Oe0llwCNT9uax2Gos8ZQNhV3YYvTOO67j5aRX8p310_tQ8 #NOPIPE https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:35:11 AM

Project: replacement_effluent_treatment_facility_project Comments: Since our government broke the lease to Boat Harbour , we should give Northern Pulp the required time it needs to complete their new system . Also I believe the new treatment system should be built and the pipe should go to Boat Harbour , that would help prevent all the uproar in a small part of the province . Give the mill the time they need !

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:40:32 AM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia can not afford to have the mill closed down. It effects too many lives. I am a fourth generation family member of forestry practices in NS. My father employed many people in the forestry industry from trucking, working in the woods, running skidders and processors, building roads, Silverculture work etc. He has worked with Northern Pulp What does my future look like if this mill is forced to close?

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:52:39 AM

Project: replacement_effluent_treatment_facility_project Comments: I do not support this for the following reasons: Environmental- Effluent is a toxic substance. I welcome any politician to drink some. The natives lost their land and fish were killed off. We have seen this in new Brunswick, marmachi and Irving recently. It is not worth the risk. Economic- our province was so desperate to pay the costs of cleanup. It is not worth it and now municipalities have rights with the most recent SCC decision, we are wasting money because of bad negotiations. Although the idea of diluting the substance into a straight appears nice. It fails to recognize the downstream effects fishing industry, tourism in shediac, seafood of the native people. Climate change- this plant produces ghgs and toxic pollution. The people of pictou are not healthy. We understand sea level rise is coming which will bring coastal erosion. This mill would be affected because most of it is 5 meters above sea level and the whole area is a flood plane. Tax revenue- this is a private company. They will file for bankruptcy protection and creditors will steal the workers pensions. In addition decrease tax revenue. Ecology- we have clear cut a huge chunk of nova Scotia, this mill encourages such actions which is degrading our natural wealth. It is harming species at risk which is illegal. Those trees took thousands of years to grow and they are not receiving a true value. Once our natural wealth is gone, we have nothing. Economy continued- closing that mill will open a free market where small businesses can mill their own wood again. It is more sustainable that way. International commitments- this does not mix with the paris agreement or the IPCC. We need to restore our forests not degrade them. Innovation and future- I would support destroying the mill and building another one in another location, but only for hemp based products. There is a business case for help plastics. If the tax payer is on the line, we should be forward thinking. Interprovincial relations- both nb and pei have expressed dissatisfaction towards these plans. Respect that we share close proximity to other jurisdictions. Public outcry- lots of protests have taken place and more to follow. This degrades confidence on democracy. That is all I can think of right now!

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:05:01 AM

Project: replacement_effluent_treatment_facility_project Comments: I am not a scientist but I can only assume this to be an upgrade over the existing waste water treatment plant. It is extremely important to me and my employees/contractors that Northern Pulp be able to continue operations uninterrupted. It should have minimal impact on lobster and other fish. Furthermore I am a salmon fisherman that fishes the rivers of the Northumberland Strait. I cannot see how this would impact salmon as salmon are known to migrate in the top 4-5 meters of the ocean. The benefit to our economy far outweighs the environment footprint . I support the proposed effluent pipe 100.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:07:56 AM

Project: replacement_effluent_treatment_facility_project Comments: No

From: @sobeys.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:11:45 AM

Project: replacement_effluent_treatment_facility_project Comments: No

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:13:23 AM

Project: replacement_effluent_treatment_facility_project Comments: No Pipe Respect Northumberland Strait life

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:15:20 AM

Project: replacement_effluent_treatment_facility_project Comments: This project cannot go forward with effluent being piped out into the Northumberland Strait. What part of any of this makes sense? What happens 30 years from now?

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 11:21:41 AM

Project: replacement_effluent_treatment_facility_project Comments: On behalf of our marine environment, our fishing industry, and our northern Nova Scotia ocean playground, I wish to go on record as strongly stating absolutely â?oNOâ? to the proposed plan to discharge treated effluent into the beautiful waters of the Northumberland Strait, as it is totally unacceptable and morally wrong. No pulp waste in the Srait! I am hopeful and trusting that our government will put our environment, our well being and our health first!

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:49:00 AM

Project: replacement_effluent_treatment_facility_project Comments: Nothing has changed. This wasnt allowed in 1994 and it shouldnt be today. How can NSE give NP permission to run an effluent pipe throught a community watershed and into the ocean. Its 2019, we need to be better. End the suffering for the people in Pictou County and beyond with air and water pollution. Do the right thing for the people and environment and deny NPs EA application. Attachment The Chronicle Herald Published: 3/26/1994 Day: Saturday Headlines: TOBIN VOWS TO PROTECT FISH HABITAT FROM EFFLUENT Reporter: BY BRIAN UNDERHILL OTTAWA BUREAU AND THE CANADIAN PRESS Ottawa â?" The Nova Scotia government wont be allowed to pipe Boat Harbour effluent into the Northumberland Strait if it poses a threat to fish habitat, federal Fisheries Minister Brian Tobin said Friday. And the minister said a decision on the controversial proposal wont be made until theres a full environmental assessment and fishermen are consulted. British Columbia Reform MP John Cummins raised the issue during the daily question period, saying groups in the area are justifiably apprehensive over proposals for a new facility to treat effluent from the Scott Maritime Ltd. pulp mill in Abercrombie Point. Plans are under way for a $17â?"million upgrade of the provincially operated Boat Harbour system, which treats about 87 million litres of waste from the nearby mill daily. The province wants to pipe effluent about two kilometres into the Northumberland Strait. The province hopes to award construction contracts by July and complete construction by September 1995. The issue has generated heated debate in Pictou County. Fishermen fear the proposal could damage spawning grounds and fish stocks, and theyve threatened to blockade the project. Mr. Cummins sought assurances the Liberals will not allow damage to the fish habitat. He said shellfish harvests in some areas off the West Coast had been curtailed because of poisoning from pulp mill effluents. Tobin said he had an obligation under the Fisheries Act to protect fish habitat. The easy decisions like not allowing pollutants that would be contrary to the Fisheries Act into critical spawning areas would be easy for us to take. This government will not compromise conservation habitat for any reason. Mr. Tobin said a full assessment of the proposal has not been completed and no decision will be made until that process is wrapped up.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:54:56 AM

Project: replacement_effluent_treatment_facility_project Comments: Its got to be for the good of the mill.

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 12:12:39 PM

Project: replacement_effluent_treatment_facility_project Comments: Diluting salt water with millions of litres of fresh water in a sensitive fishing area is very concerning. Do not extend the time to fix this problem, that would be rewarding the company for poor planning. The tourism benefits of not extending the deadline and cleaning up the environment would be substantial.

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: February 8, 2019 12:16:41 PM

Good Day Minister,

After all the mixed hype and media attention this past year, I have to say that I was truly very impressed reading up on Northern Pulps Replacement Effluent Treatment Facility Project for the environmental assessment, in accordance with Part IV of the Environment Act., submitted on February 7, 2019.

I personally feel that you should permit an extension to Northern Pulp in order that they will be able to complete this amazing project.

Thanking you,

<mailto: @hrsb.ca>

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 12:27:09 PM

Project: - Choose - Comments: I think this is a great plan . Itâ?Ts exactly what this province needs . #yespipe

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 12:51:57 PM

Project: replacement_effluent_treatment_facility_project Comments: I support the environmentally responsible decision to replace the existing effluent treatment facility with a new one to treat the waste water.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 1:13:19 PM

Project: replacement_effluent_treatment_facility_project Comments: A few reasons for a Federal Environmental Assessment, based on the negative impact the proposed discharge location and associated effluent will have on the Northumberland Strait: 1. The obvious conflict of interest of having the Province as both the supplier of the new treatment facility and regulator of the same. 2. Northern Pulpâ?Ts receiving water study is based on dated modeling of the Northumberland Strait. This modeling, to have any chance at accuracy, needs to be made current. 3. The receiving water area is part of a Marine Protected Area a scallop buffer zone. 4. This is within a Federal fishing zone. 5. The Aboriginal rights of Pictou Landing First Nations need to be considered. The new discharge location still has a direct affect on them and their livelihood, as it pertains to fishing. 6. The Northumberland Strait borders on Prince Edward Island, New Brunswick and Nova Scotia. There are fishers from all three provinces, including First Nations, that this proposed effluent, will impact. 7. There are â?~Species at Riskâ?T that potentially will be negatively affected. 8. The proposed discharge location is directly adjacent to Caribou-Munroeâ?Ts Island Park a bird and wildlife sanctuary. 9. Northern Pulp is undoubtedly going to take the Province of Nova Scotia to court, when Boat Harbour closes as per the â?~Boat Harbour Actâ?T. Consequently, there is pressure on the Province to expedite the environmental process, due to the Indemnity Agreement and lease arrangements between our Provincial government and Northern Pulp. 10. The proposed path of the pipe in Caribou Harbour will destroy fish habitat, eelgrass beds, etc. Northern Pulps EA suggests to avoid ice damage to the effluent pipe, a trench 9 meters wide by 3 meters deep for 4.1 kilometers in length to the discharge point would be installed. This construction would directly breach section 35.1 of the Federal Fisheries Act as it will kill fish and destroy fish habitat. 11. The 62 to 90 million liters of hot, according to Northern Pulp, summer temperature of effluent at the discharge point will be 38 degrees Celcius, treated effluent daily, containing approximately 1000 kg of solids which technically are toxic waste, will negatively impact and kill lobster and herring larvae directly breaching section 36 of the Federal Fisheries Act. Please ensure a Federal Environmental Assessment is applied, to adequately address these concerns.

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 1:14:29 PM

Project: replacement_effluent_treatment_facility_project Comments: This is a good project that will have a very positive impact on Nova Scotias economy by preserving existing jobs and injecting millions of dollars in the local economy during construction. It will have no significant impact on the environment. We need to get this done and we need to amend the Boat Harbour Act to allow sufficient time for the project to be completed without forcing a temporary closure of the Northern Pulp mill.

From: @xplornet.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 1:27:21 PM

Project: replacement_effluent_treatment_facility_project Comments: Thousands of people, consisting of fishers, fish buyers,deckhands, boat builders, restaurant owners, tourism operators --- living along the south shore --- are watching this unfold and have expressed grave concerns on social media about the negative impacts and reputation the pipe will have on the ENTIRE lobster/fishing industry and fish related exports. Think about it for a moment...you are living in Paris, France ----- London, England ----- Hong Kong ----- New York City ----- and you sit down at a high-end restaurant - Fresh Nova Scotia Lobster catches your eye...caught off the shores of Nova Scotia! You order, your mouth starts watering...and then - the person across the table from you leans in and says, Did you read that article? Those lobsters from Nova Scotia are caught where a pulp and paper company dumps their toxic effluent from their processing plant. Yes. Apparently the Nova Scotia Environment approved an effluent pipe that contains dioxins, furans, and metals from a company called Northern Pulp. All this goes into the ocean just off their coast. I wouldnt eat a lobster from there...it could be contaminated. All it takes is ONE NEWS ARTICLE - ONE POST and this damning information will be sent around the world that will CONTAMINATE the lobster fishing industry here in Nova Scotia...the #1 export. No pipe. No more cancer causing particulate. No extension. We want clean water - clean air - clean soil - and a cleaned up government system. We want ecological forestry and species at risk protect. We want jobs that are created from restoring the environment - not destroying it. We want a government with integrity.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 2:45:22 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp has no interest in our ecosystems. They have had several opportunities to change the way the waste is processed. It is terrible they have already being poisoning the environment for so many years already. Now, because they did nothing in the time given - 5 years - they will not be able to meet the Jan 31, 2020 deadline. That was their choice. No extension should be allowed as they have proven they dont intend to comply. Now they are also telling the public about the job losses this will cause. They havent been concerned about those jobs while wasting time doing nothing to prepare. If people are out of work, it is on them, not the province. Not only have they condoned clear cutting which affects our wildlife, now they want to destroy our marine life the fishing industry. Please, I am asking for NO PIPE.

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 3:06:38 PM

Project: replacement_effluent_treatment_facility_project Comments: will contain dioxins, furans, metals, solids and other contaminates at a rate of 90,000,000 Litres per day. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to â?odewater the sludge prior to mixing it with bark and other wood waste for combustion in the millâ?Ts power boiler.â? This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 3:11:08 PM

Project: replacement_effluent_treatment_facility_project Comments: There should be absolutely no pipe delivering treated effluent into any waterway. 50 years of toxic waste in our environment already.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 3:48:21 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel the indemnity clause the province has with Northern pulp makes it impossible for the province to do environmental assessment! Conflict of interest. We are talking about pollution into the Ocean, at 70,000,000 litres/day! Why is this considered at all, in this day and age?

From:
To: Environment Assessment Web Account
Subject: Northern pulp
Date: February 8, 2019 4:06:14 PM

The composition of the toxic effluent will contain dioxins, furans, metals, solids and other contaminates at a rate of 90,000,000 Litres *per day*. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water.

The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the mill's power boiler. The proposal is to "dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mill's power boiler."

This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NP's air emissions.

Sent from my iPhone

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 4:34:31 PM

Project: replacement_effluent_treatment_facility_project Comments: I am happy to see the new treatment facility to replace Boat Harbour is an updated modern system designed to treat the waste from Northern Pulp. Nova Scotia s economy depends on these companies for employment and stability in our province.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 5:22:08 PM

Project: replacement_effluent_treatment_facility_project Comments: I support Northern Pulp in building a new effluent treatment facility. I also support Northern Pulp being granted an extension of using Boat Harbour to treat their effluent until their new facility is operational.

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 8, 2019 5:42:15 PM

Project: replacement_effluent_treatment_facility_project Comments: We want federal involvement!!!! The province of NS ignores the precautionary principle at all costs, proving they are incompetent or complicit, but they do not have jurisdiction in the Northumberland Strait to do so. 2.4 Precaution in science-based decision making The Federal Government has developed a document entitled A Framework for the Application of Precaution in Science-based Decision Making about Risk [Privy Council Office PCO, 2003]. This paper addresses the application of precaution in its various forms - precaution, the Precautionary Principle or the precautionary approach - all of which have three basic components: the need for a decision a risk of serious or irreversible harm and a lack of full scientific certainty. As stated in the document, the application of precaution primarily affects the development of options and the decision phases within science-based risk management, is clearly linked to scientific analysis, and cannot be applied without an appropriate assessment of scientific factors and consequent risks. A key role of developing ecological and human health risk assessments is to provide the necessary evaluation of science and potential risks to support the use of precaution in the ultimate decision making process, at which point factors such as social and ethical values and political and economic considerations will also be taken into account. The precautionary principle is entrenched in CEPA 1999. In the preamble, CEPA 1999 recognizes that the Government of Canada is committed to implementing the precautionary principle. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In addition, section 76.1 of CEPA 1999 specifically directs the Ministers to apply a weight-of-evidence approach and the precautionary principle when conducting and interpreting the results of assessments of existing substances. As described in greater detail in PCO 2003, the general principles outlining the distinguishing features of precautionary decision making are that: The application of precaution is a legitimate and distinctive decision-making approach, notably within risk management. It is legitimate that decisions be guided by societys chosen level of protection against risk. In risk management, sound scientific information and its evaluation must be the basis for the decision to apply precaution and the measure selected in applying precaution the scientific information base and responsibility for producing it may shift as knowledge evolves. Mechanisms should exist for re-evaluating the basis for decision and for providing a transparent process for further consideration, recognizing that in some cases re-evaluation may not be practical or productive. A high degree of transparency, clear accountability and meaningful public involvement are appropriate.

From: @ .ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 6:13:50 PM

Project: replacement_effluent_treatment_facility_project Comments: This environmental assessment is to examine the efficacy of a proposed effluent treatment and evacuation system proposed by Northern Pulp. A clear deadline for the use of Boat Harbour as a depuration site by Northern Pulp was legislated and a commitment has been made to the community of Pictou Landing First Nation that Boat Harbour will stop being used as a depuration site in January 2020. Five years have gone by since the deadline was established. Northern Pulp says that the only alternative to Boat Harbour is a straight pipe into the Northumberland Strait. They have had to change the proposed site for the pipe at least once and have not been able to complete the marine surveys needed to evaluate the newly proposed site. This proposed site for the pipe is near a prime area for the lobster fishery. The waters in the Strait reach Prince Edward Island and New Brunswick. The premiers of these provinces are opposed to this pipe being installed without a full fed eral environmental assessment. The design of the effluent treatment system and the pipe to the Northumberland Strait has been subsidized by provincial funding. I believe that it is a conflict of interest for the province of Nova Scotia to carry out an environmental assessment of a project that it has subsidized. A recent change in federal regulations concerning effluents from pulp mills has raised the bar for treatment plants. The new standards are considerably more rigorous than those enacted into law in 1992. Will the proposed effluent treatment and evacuation system meet those standards? Will the provincial environmental assessment take the new federal standards into account? Or will a â?owork-aroundâ? solution promising upgrades to meet the more recent standards be allowed? Northern Pulpâ?Ts willingness to endanger the waters crucial for the lobster fishery of three provinces by releasing an effluent of unproven quality is frightening. We are told that the best science is being used, but do these â?obest practicesâ? apply to a tidal salt marsh that serves as a nursery for juvenile lobster? Scientists from government and university laboratories have voiced their concerns about this treatment system. A massive public relations campaign by Northern Pulp and the industrial forestry industry is trying to mobilize public opinion to accept an extension of their use of Boat Harbour. The long-standing environmental racism embodied by the poisoning of Boat Harbour cannot be continued. Given the strong conflict of interest the province of Nova Scotia has in this matter, given Nova Scotiaâ?Ts heavy financial involvement in the mill and its subsidizing of the plans for the effluent treatment system, given that the fishery in three provinces could be affected by the release of effluent into the Northumberland Strait, given that the evaluation of the proposed release site is incomplete, I strongly believe 1 that this project should be returned to Northern Pulp so that the crucial aspects concerning the proposed release site be validated by marine surveys, and 2 that the proposed effluent treatment system undergo a federal environmental impact assessment and be evaluated relative to the most recent federal standards.

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 6:14:46 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe that Northern Pulp should be allowed to continue with the new effluent plant. Its a win ,win for everyone involved. It will be better for the environment and save many well needed jobs.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 7:05:53 PM

Project: replacement_effluent_treatment_facility_project Comments: Absolutely NO PIPE in the Northumberland Strait. This mill and its operators have no respect for the environment and the people who live in northern NS and PEI. Countless articles to prove they are not environmental stewards. At the very least, this project demands federal assessment at the highest levels due to the potential risk of creating yet another environmental disaster like the one they created in Boat Harbor. There is NO science that you can find to support that there will be no harm done to fish, shellfish and all the other living organisms that live in the Strait. Technology is out there to keep all their pollution in house. They have no business running a pipe into the Northumberland Strait or any other body of water.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 7:54:19 PM

Project: replacement_effluent_treatment_facility_project Comments: For the sake of a few jobs, Northern Pulp has been allowed to operate in an incomprehensibly irresponsible manner. The ecological damage to Boat Harbour is unfixable. A few jobs does not justify the complete devastation of 350 acres of First Nations Territory. I stand with Pictou Landing First Nation. I demand that an extension not be given to Northern Pulp. And I demand that Northern Pulp not be allowed to put an effluent pipe into the Northumberland Strait that would have them continue to operate in an environmentally catastrophic manner. It is on Northern Pulp to figure out how to do what they do without causing the kind of damage to our land and water that they have been allowed to get away with for decades. If they cant, they must go. If it not perfectly clear, I am against a replacement effluent treatment facility project that would put any amount of effluent into the Northumberland Strait. I am categorically opposed to any additional timeline extension beyond the January 31, 2019 deadline.

From: @GMAIL.COM
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:31:14 PM

Project: replacement_effluent_treatment_facility_project Comments: There are more environmentally sound ways of dealing with the pulp mill effluent than the proposed project. Too much at stake here. I visit Nova Scotia for its Atlantic Salmon fishing. I hope to continue to do so for years to come, provided there will be fish available to catch...

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 9:50:43 PM

Project: replacement_effluent_treatment_facility_project Comments: Please donâ?Tt mar the pristine waters of Caribou Island. We fish there and our children swim in those waters. It is such a beautiful habitat that is precious to me and my family.

From: @sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:12:37 PM

Project: replacement_effluent_treatment_facility_project Comments: Do not allow effluent to flow into the Northumberland strait. Our tourism and water environment mean to much to the people of NS, PEI and NB.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:18:03 PM

Project: replacement_effluent_treatment_facility_project Comments: I am fully in support of the Replacement Effluent Treatment Facility project for Northern pulp

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 10:48:40 PM

Project: replacement_effluent_treatment_facility_project Comments: I totally support this project. Pictou County and Nova Scotia need these jobs

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 8, 2019 11:37:04 PM

Project: replacement_effluent_treatment_facility_project Comments: Itâ?Ts time to close the mill and move on

From:
To: Environment Assessment Web Account
Subject: Unreal
Date: February 8, 2019 8:40:28 AM

Can’t believe even having this conversation.Close the poison hole.
Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: Pollution
Date: February 8, 2019 5:06:57 AM

This is TORALKY unacceptable. No amount of profit justifies this treatment of the worlds waterways.

And it’s an outrage that you and previous managers have allowed this to continue for so long!!

I’m disgusted with companies and people like you.

.

--

Email:
Phone:

From: @tncweb.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 9, 2019 8:48:05 AM

Project: replacement_effluent_treatment_facility_project Comments: As the Nova Scotia government is directly invested in Northern Pulp being responsible for all environmental damages, having paid for the plan for this new treatment project, having invested hundreds of millions in the mill over the years, etc., it cant be also the regulator of that mill. The conflict of interest is obvious and contradicts the very core of an unbiased assessment. The minister should refer this file to the federal minister to ensure an independent environmental assessment.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 9, 2019 10:44:42 AM

Project: replacement_effluent_treatment_facility_project Comments: I really hope the mill getâ?Ts the extension required to get this treatment plant done. My job as an outside contractor needâ?Ts this as well as alot of other Nova Scotian companies!

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 9, 2019 11:31:01 AM

Project: replacement_effluent_treatment_facility_project Comments: the new system will need a very rigorous and state of the art monitoring system to ensure that the leaks are dealt with immediately. Given that most leaks in the past took time to detect, my concern is that the leaks from the new pipe will allow 50 million litres or more of waste into the straight. This happening only once could decimate the fisheries industry. What is being done to ensure that leaks are detected and dealt with immediately? Also how will you mitigate temperature differences between the effluent and the surrounding temperature of the water in the strait?

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 9, 2019 11:51:40 AM

Project: replacement_effluent_treatment_facility_project Comments: If the EA is not approved for Northern Pulp it will cause devastation to Pictou County. Northern Pulp is trying to do the right thing now and need this granted.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 9, 2019 2:07:37 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel that northern pulp and paper excellents should be granted an extension to build and construct their proposed new treatment facility. Paper excellents has and continues to invest and update the mill and its practices and should not be held accountable for the previous mishaps and issues caused by previous owners. They are making the steps in the right direction for the environment and the industry.

From:
To: Environment Assessment Web Account
Subject: Making sens
Date: February 9, 2019 2:58:53 PM

As a human, i look for MY well being
As a parent, i look for MY kids' (grand kids') future
As a lobsterman (owner), i look for MY future in many years of fishing (the best « job » in the world)
As a biologist, i llook for MY planet
As a resident of a fishing community, i look for MY Community

So if the government asks us to not flush our boat toilet close to shore, to bring our garbage to shore,
to take care of the environment…
and if they ask our Community to be careful with garbage, sewage, rain water, road salt, road snow…
and if they ask our fish plants to restraint the quantity of blood water …

plus the fsihing industry is ask to keep the highest quality of product for the custumers around the world

then just one little so called mistake from a mill like that could result in a BIG part of our canadian Economy to be lost for a LONG time.

We are triing to protect the wright whales, so how is it OK to dump waste from a mill in the our community.

For your info, i live on an island up north New Brunswick, i know how fragile any ecosystem is, our planet included. The old saying : « Out of sight-Out of mind », just does not work any more, because we know about tidal mouvements, how the waters in the gulf of St-Laurence flow, so anything that is drop in Nova Scotia WILL end up around my place.

So every person living in the big community of the atlantic provinces should be consulted.

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 9, 2019 7:20:48 PM

Project: replacement_effluent_treatment_facility_project Comments: NO! NO! NO! I have never known a Pictou without the Mill. That is a lot of years. My father says before the mill there were home grown saw mills. I want it that way again. Restore our original environment. I dont want boat harbor the way it is. It isnt fair to ANYONE. It all needs cleaned up and pack your bags and move on! The smoke is so green I cant see down the street. I cant breathe. I am on a puffer. Some people are on 4 puffers. People are dying of cancer. My dog and two cats died of cancer. NO MORE!!!!

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Proposal
Date: February 9, 2019 7:32:51 PM

I am 100% opposed to the proposal by Northern Pulp to discharge its waste directly into the Northumberland Strait. There is no way this volume of warm, fresh, toxin filled water into a water body like the strait will not effect the delicate ecosystem. This massive volume of waste water will not just disappear when pumped into the strait, this is not the open ocean but a narrow strip of water with complex tides and incomplete flushing between two provinces who rely heavily on the fisheries industry. Northern Pulp should have to prove that this plan will not harm the marine environment, it is hard to take their word for it when common sense and science suggest that even minor changes in temperature and salinity will have a major impact on delicate lobster larvae. The proposal to dig up that much of the bottom to bury the pipe will have the potential to destroy many fishing lands with the sediment alone. There is no way the toxins and solid waste won't build up on the ocean floor and destroy the fisheries and buildup on our beaches and destroy tourism and the health of many families along these cottage lined shores. Please, put the environment first and stop this insanity! There is already a higher rate of cancer in Pictou County, I can only assume this will be worse when we are all swimming in these toxins without the settling time and filtering that boat harbour currently provides. At a minimum please let an unbiased federal assessment happen since this provincial government has a conflict of interest being on the hook financially. Current environmental standards and minimum requirements are outdated and being reviewed federally and I would hate to see our government push ahead with this ludicrous proposal before there is time for new standards to be implemented which surely would not allow this level of pollution to happen.
Sincerely,
Concerned mother, and citizen of County,

Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: Environmental Assessment must not be passed.
Date: February 9, 2019 9:45:39 PM

TO WHOM IT MAY CONCERN

I agree with all the reasons has carefully researched and written so I'm not going to reinvent the wheel. I present his five reasons not to allow this industry to put a pipe into the Northumberland Strait below.

I will say that the owner of this company (which is also responsible for clearcutting and using whole trees for an industry, biomass, that was brought in on the basis that only scrap wood would be used) is responsible for clearcutting the Borneo Rainforest--earth's lungs. This company must be regulated or, better still, removed from this province. Let the (wood) chips fall where they may regarding lost jobs, we need clean sustainable industry that doesn't contribute to destroying our precious resources in the Northumberland Strait and in the Acadian Forests, not to mention the carbon-sequestering capacity that is being removed by clearcutting and the deterioration of our air and waters.

wrote recently five reasons not to pass the Provincial EA that would allow this effluent to be piped into the Northumberland Strait:

"1. For your health
The composition of the toxic effluent will contain dioxins, furans, metals, solids and other contaminants at a rate of 90,000,000 Litres *per day*. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water.

Dioxins and Furans - Canada.ca

Health Canada

2001 article (updated 2005) from Health Canada and the Public Health Agency of Canada. Dioxins and furans are co...

The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the mill's power boiler. The proposal is to "dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mill's power boiler."

This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NP's air emissions.

It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and the surrounding area.

See also: Maine's dioxin problem; What you should know about Northern Pulp's proposed new treatment facility

2. For the economy

The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 billion to the Nova Scotia economy. The tourism industry is worth $2.7 billion and prides itself on warm, clean water and world-class sandy beaches. The commercial fisheries are worth over $1 billion and relies on sustainable wild shellfish that is shipped all across the world. The sport fishing industry is worth $56 million, and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks on mainland Nova Scotia.

See also: Nova Scotia exports top 10; Nova Scotia celebrates seafood export success at fisheries conference

Nova Scotia Celebrates Seafood Export Success at Fisheries Conference

News releases from the Government of Nova Scotia

3. For the environment – Meeting regulations does not prevent harm

Nova Scotia and the Northumberland Strait are put at risk by the proposed effluent treatment process. As it stands right now, there are no CCME guidelines established for marine environments in terms of some of the chemicals and compounds that make up the pulp mill effluent.

CCME

Pulp and Paper Effluent Regulations (PPER) in Canada cover two matters; total suspended solids (TSS) and biochemical oxygen demand (BOD.) Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90% and 97% respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment.

Information gathered through environmental effects monitoring (EEM) at all Canadian mills

points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70% are having harmful effects on aquatic life and habitat, and 55% are having harmful effects on the larger environment.

This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. “Results from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,” the department states.

If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100% concentration kills more than 50% of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes.

Only two mills in Canada test for and report the impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations (PPER), which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act.

70% of pulp & paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations. Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand (COD).

For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does.

See also: Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement, Pictou Harbour, Nova Scotia

Stantec_Receiving Water Study_Effluent Treatment Plant Replacement.pdf

4. The new treatment facility is not better than the current one

Northern Pulp's proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with microorganisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished.

At point C, samples are taken for testing to determine whether the treated effluent meets regulations. *Point C is also a dead zone!*

After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days.

Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as "polishing" or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulp's figures, during the time in Boat Harbour Basin, total suspended solids (TSS) and biochemical oxygen below the proposed water quality standard of 1%."

The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000 kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour.

Further to this, the same proposal was rejected in 1994 for the same concerns!

See also: How pollution from a Nova Scotia pulp mill could sink Trudeau on both coasts; Fifty years of pulp effluent

How Pollution from a Nova Scotia Pulp Mill Could Sink Trudeau on Both Co...

Michael Harris

PM's hands-off stance on threat to fisheries betrays environmentalist posture.

5. Better return for your tax dollars

Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 million and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 million. Further to that $127 million of Nova Scotia taxpayers money have been given to the mill in the last several years.

Meanwhile, we have overworked doctors leaving our province. We have ER closures and very long wait times for treatment and care. Our education system is also at its max with constant cuts. Funding for seniors and veterans as well as many other public programs and services would benefit from these large sums of tax dollars."

From:
To: Environment Assessment Web Account
Subject: FW: Effluent pipe to Caribou Harbour
Date: February 12, 2019 9:22:29 AM

From: @gmail.com>
Date: February 9, 2019 at 10:39:37 AM AST
To: <min@dfo-mpo.gc.ca>, <Minister.Environment@novascotia.ca>, <Helen.MacPhail@novascotia.ca>, <Sean.Fraser@parl.gc.ca>, Premier <PREMIER@novascotia.ca>, <ec.ministre-minister.ec@canada.ca>, "Maclean, Lachlan (CEAA/ACEE)" <lachlan.maclean@canada.ca>
Cc: @gmail.com>, dng-news <news@ngnews.ca>, <editor@pictouadvocate.com>, Chronicle Herald Letters <letters@herald.ca>, <pictouwestmla@bellaliant.com>
Subject: Effluent pipe to Caribou Harbour

Honorable Ministers,

I have a hard time understanding how there is any confusion regarding how an effluent pipe, with a volume of this magnitude, directly to the Northumberland Strait, won't cause any negative effects to the marine environment and the existing fishery. Basically, Northern Pulp wants to redirect the majority of the flow from the Middle River – between 62 and 90 million liters per day, heat it up to 37 degrees Celsius, add 1 ton of what is technically toxic waste solids, then direct that to the mouth of Caribou Harbour. This effluent will kill lobster larvae; it's inevitable and would directly breach section 36 of the Federal Fisheries Act. The mill then states, 'it's unlikely there will be any harm to lobster', in their environmental assessment. It is virtually impossible that there will not be adverse effects from this dramatic redirection of the Middle River, to the mouth of Caribou Harbour. For our Provincial government to have not immediately sent this to the Federal government for environmental assessment is outrageous. To suggest, 'this is not a new facility, just replacement of an existing one', as the reason for a provincial assessment, is not reasonable or realistic. To completely redirect the flow of a major river to the mouth of Caribou Harbour, miles from where it's been flowing, into the very heart of the most lucrative lobster and herring grounds in the Northumberland Strait, a provincially shared Federal Fishing zone, this goes beyond responsible, honest government, with regards to the environmental assessment applied. Our government is in an obvious conflict of interest. The Supreme Court of Canada agrees, according to the ruling of Justice Timothy Gabriel last fall, with regards to Pictou Landing First Nations and the Provincial Government

with respect to the government funding of a replacement facility and the relationship with Northern Pulp. Justice Gabriel stated, "... it would essentially boil down to the Crown (wearing one hat) being called upon to determine whether a project which the Crown (wearing another hat) has funded passes muster. This will do nothing to assuage whatever cynicism has been engendered in the past."
I believe the working group of fishermen's organizations, together with Pictou Landing First Nations, should be taking the Province and Northern Pulp to Supreme Court on this basis; in the event the Federal Government does not step in and take control of this environmental assessment. I believe we, as Fishermen and First Nations, have a legal right to protect our industry – and Justice Gabriel has set the precedent.

We undoubtedly will lose our Marine Stewardship Certification, (a major marketing tool), for both our herring and lobster fisheries as a result of this new effluent pipeline, as part of the criteria is the species are harvested from a healthy environment, in a sustainable fashion. It's already affecting the existing fishery and not just here, in P.E.I as well. Fishermen are anticipating the value of their enterprises to be less than half what there are now, as soon as there is real indication of construction of this effluent pipe; and some have literally already sold out on this realistic assumption.

In Northern Pulps submitted environmental assessment, the pipe would be required to be set at a depth below the seabed of 3 meters due to potential from ice damage. To accomplish this, they submit the trench would have to be 9 meters across, for the entire length of 4.1 kilometers from where it enters the harbour adjacent to the ferry dock, to the mouth of the harbour, the proposed discharge location. The sediment alone from this construction would destroy the local fishery and directly breaches section 35 of the Federal Fisheries Act as it will destroy marine habitat, eelgrass beds, etc., killing juvenile fish, lobster and crab. The sediment dispersed will cause havoc with the marine environment for miles and for how long, is anyone's guess.

There came a point, when the environment outweighs the economy, it's past. In this day and age, to even consider directing this massive flow of 'treated', poisonous effluent directly to the Northumberland Strait, is not reasonable or remotely with noble conscience from Northern Pulp. There is an alternative, yet the mill will not consider it, as it would mean less profits – converting the mill to a mechanical process that separates the pulp, no effluent discharge required and less air emissions – this actual possibility could be discussed at length. The mill simply will not consider it, as it is less profitable and there would be 'downtime' at their expense while converting.

Our government is closing Boat Harbour in January 2020, ten years premature of the lease agreement, but actually 25 years late, from what was originally promised to Pictou Landing First Nations. To continue using Boat Harbour, is to continue with the current environmental racism that PLFN have been enduring for 52 years and are currently, on a daily basis, contending with. To ask for an extension, is simply ignorant. Because the closure of Boat Harbour is premature of this lease agreement that the Province agreed to without PLFN consent, Premier McNeil has been quoted saying that the monies our government will be giving Northern Pulp are not to directly pay for the estimated 130 million dollar 15.5 km pipe and new treatment facility, but in lieu of the lease agreements early closure….
Obviously, this 130 million could be better spent on converting the mill to a mechanical, closed loop system. The mill has no interest and has continually stated, no pipe = no mill. If all you are thinking about is profits, you can't blame them. This company, Asia Pulp and Paper, subsidiary, Paper Excellence, buys up moth balled pulp mills for peanuts in comparison to todays cost, (that would be upwards of 2 billion dollars), spends next to nothing on upgrades, rakes in government subsidies and hand-outs… and in the case of our mill, is not responsible for any environmental damage. What a deal! The mill with the worst environmental record in the Country, has no environmental consequence – a coincidence? Think about that, why would you improve your discharges, (air and water), if there are no consequences?
No you can't blame them for not wanting to convert the mill. There would be downtime and they couldn't sue our government for it – and they will be suing for any 'downtime' when Boat Harbour closes, you can count on that. They have a sweetest of deals right now and the fishing and forestry industries are both paying for it! The thing is, our government, (the people), have allowed this to happen. The question is, will we continue to?
This mill is not worried about our marine environment and really, other than from a profits perspective, they are not worried about the longevity of our forest industry either.
I don't suspect anyone in the forest industry would want any harm to the fishing industry and I know the reverse is the same; we in the fishing industry want the forest industry to thrive, but simply not at our expense.
There is a solution and the extension of Boat Harbour is not the solution. The solution is to covert the mill; this is what the Forest industry should be promoting to Northern Pulp.

Thanks,

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 6:54:01 AM

Project: replacement_effluent_treatment_facility_project Comments: While all of the documentation provided about the proposed pipeline seems to go into great detail it seems to me that there is very little information that the general public would understand. It would take a chemist or scientist to understand the facts and figures in this document. I think something written that the average person would understand would be very helpful. My first instinct is that this pipeline is a very bad idea because the document as presented doesnt really tell me anything. I think after all of the years of seeing what has happened at Boat Harbour, the potential of disaster with the pipeline is very real. I certainly wouldnt like to see the pulp mill closed with great job loss but environmental protection must be first and foremost. Another thing that comes to mind is tourism with the pipeline right next to the P.E.I. ferry route. There is far to much at stake here for a quick decision and I think a lot of questions still to be answered. Thank Yo u, Name: Email: @gmail.com Address:

Privacy-Statement:

agree x: 57 y: 18

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 7:07:00 AM

Project: replacement_effluent_treatment_facility_project Comments: I definitely support the proposal put forward by Northern Pulp.Every mill,no matter what type they are,needs a place to dispose of their waste water.I did not agree with dumping untreated waste,but technology has changed and we can safely treat waste water before it gets to the ocean.Our fishermen cry about pollution,but have they ever sold a contiamented lobster.Instead of everyone fighting among each other,it is time to start working together and install a proper treatment plant so this mill can coexist and be a welcomed member of our community and also supply very badly

: Privacy-Statement: agree x: 61 y: 15

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 10, 2019 7:16:58 AM

Project: replacement_effluent_treatment_facility_project Comments: I took several hydrography courses at NSCC Centre of Geographic Sciences in Lawrencetown NS. I learned that when a steady stream of water enters the ocean at a different temperature, salinity, composition etc. It does not simply mix and dilute, this steady stream will create its own current and travel great distances before it dilutes. In this case with the effluent pipe, in my educated opinion, this waste product could remain concentrated for an extended period after it enters the strait and could be damaging to ocean life the comes in contact. This is a very high risk and irresponsible plan put forth by Northern Pulp. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 64 y: 14

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 9:05:34 AM

Project: replacement_effluent_treatment_facility_project Comments: This project is a must for our province and forest industry . There is no need to have to choose an industry fishing or forestrywhen we can have both. Come on people...Dont drive another company out of Nova Scotia. Name: Email: @outlook.com Address:

Privacy-Statement: agree x: 55 y: 18

From: @gmial.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 9:25:16 AM

Project: replacement_effluent_treatment_facility_project Comments: I agree with everything Matt Dort said in a recent article in the Nova Scotia Advocate: https://nsadvocate.org/2019/02/08/matt-dort-five-reasons-to-support-nopipe/ The composition of the toxic effluent will contain dioxins, furans, metals, solids and other contaminates at a rate of 90,000,000 Litres per day. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to â?odewater the sludge prior to mixing it with bark and other wood waste for combustion in the millâ?Ts power boiler.â? This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 billion to the Nova Scotia economy. The tourism industry is worth $2.7 billion and prides itself on warm, clean water and world class sandy beaches. The commercial fisheries is worth over $1 billion and relies on sustainable wild shellfish that is shipped all across the world. The sport fishing industry is worth $56 million, and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks on mainland Nova Scotia. Nova Scotia and the Northumberland Strait are put at risk by the proposed effluent treatment process. As it stands right now, there are no CCME guidelines established for marine environments in terms of some of the chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having harmful effects on the larger environment. This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on

the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations. Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does. The new treatment facility is not better than the current one. Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with microorganisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. Point C is also a dead zone! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â? opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the proposed water quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000 kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns! Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 million and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 million. Further to that $127 million of Nova Scotia tax payers money have been given to the mill in the last several years. Meanwhile we have overworked doctors

leaving our province. We have ER closures and very long wait times for treatment and care. Our education system is also at its max with constant cuts. Funding for seniors and veterans as well as many other public programs and services would benefit from these large sums of tax dollars. It is time to close this mill and transition to more sustainable, environmentally-friendly forestry practices in our province. Name: Email: @gmial.com

Privacy-Statement: agree x: 42 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 11:14:21 AM

Project: replacement_effluent_treatment_facility_project Comments: This is Ruining many of the fish populations in the Nothumberland Strait. I dont understand how anyone can think this is ok. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 74 y: 37

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 11:48:42 AM

Project: replacement_effluent_treatment_facility_project Comments: Hello, I am super concerned about the pipe and this whole situation. It worries me that so many more people are concerned about the economical impact than the environment when in fact this will indeed affect our forest industry as well. Is Northern Pulps needs more important than the well being of our Straight? More important than our fishing industry? I am so worried about the dire environmental impacts this pipe could have. Norther Pulp should not get an extension for a this project. Name: Email: @outlook.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 59 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 12:11:10 PM

Project: replacement_effluent_treatment_facility_project Comments: There can be NO PIPE into the Northumberland STRAIT. We have all the science we need at Boat Harbour. Health and environment are far more important than any amount of money for a foreign investor is worth. If they were truly concerned for the area they would spend the money to do a closed loop system. We cannot be stupid enough to make the same mistake all over again. We would be a global laughing stock in a terrible mess. Stand up for the citizens of the Maritime provinces Ã nd stop this now. Name: Email: @gmail.com

Privacy-Statement: agree x: 60 y: 27

From: @sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 12:29:30 PM

Project: - Choose - Comments: THE TOP 5 REASONS TO SUPPORT #NOPIPE 1. For your HEALTH The composition of the toxic effluent will contain dioxins, furans, metals, 1000KG of solids and other contaminates at 90,000,000 Litres PER DAY. Dioxins and Furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mills power boiler. This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. Name: Email: @sympatico.ca

: Privacy-Statement: agree x: 76 y: 19

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 10, 2019 1:42:23 PM

Project: replacement_effluent_treatment_facility_project Comments: Only would this happen in a communist ,capitalist country like Russia or China , wake up you dictatorship, this pipe will not enter the Northumberland Strait ! Modernize this mill or shut it down.#nopipe #noextension Name: Email: Address:

Privacy-Statement: agree x: 55 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 4:15:37 PM

Project: replacement_effluent_treatment_facility_project Comments: THE TOP 5 REASONS TO SUPPORT #NOPIPE 1. For your HEALTH The composition of the toxic effluent will contain dioxins, furans, metals, 1000KG of solids and other contaminates at 90,000,000 Litres PER DAY. Dioxins and Furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mills power boiler. This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. http://ec.gc.ca/inrp-npri/donnees-data/index.cfmâ?¦ https://www.nrcm.org/projects/waters/cleaning-up-the-androscoggin-river/maines-dioxin-problem/?fbclid=IwAR3gT3KRRmPu8j22heOksunum4i6VAp0cD-tb6hqJTVOTTyrGeRh7YAtZc8 https://docs.wixstatic.com/ugd/b61814_40a0f43682ee45d99af01fb432d910fd.pdf?fbclid=IwAR3a7QpiR253DqowGxu5DQK13vDIcJru0rFyGl1cYCrO4GsFjHKMp6aghz4 2. For the overall ECONOMY The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 Billion dollars to the Nova Scotia economy. The tourism industry is worth $2.7 Billion and prides itself on warm, clean water and world class sandy beaches. The Commercial Fishing Industry is worth over $1 Billion and prides itself on sustainable wild shellfish that is shipped all across the world. The Sport Fishing industry is worth $56 Million and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks on mainland NS. All of this is at risk due to 32,000,000,000 Liters of waste water PER YEAR that will be 37 Celsius that will contain deleterious substances harmful to Fish species and humans.
https://docs.wixstatic.com/ugd/b61814_246fdf7e04a64e239be0fbf7dc64f976.pdf?fbclid=IwAR3JjsPZQ-_npJ0a5-B4Xv4-nJeqnSfkZk9an--3s0W92fB5oZrbUWFLTnU
https://novascotia.ca/news/release/?id=20180222001
https://docs.wixstatic.com/ugd/b61814_f856b6a7c7b34ffb9eba165dc3ed894b.pdf?fbclid=IwAR3es-LiMLiVx1Lc-eJZI1TLQkqYBXBRw0OBS3upgGj9ibusKsO1wl_Uqfc 3. For the ENVIRONMENT â?" Meeting Regulations DOES NOT Prevent Harm Nova Scotia and the Northumberland Strait has many great resources. However, they are at risk with the proposed Effluent treatment process. As it stands right now, there are no CCME guidelines established for Marine Environments for some of the different chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having harmful effects on the larger environment. This

information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations . Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does.
https://drive.google.com/file/d/1H1HltUnh9Oem_KpPHwxmye7z5mfJP5_W/view?fbclid=IwAR1WyzupTqjLC9u8tjxWpq94e5anlEQDs_-JTH0z8vPWAoaKkyIoGBuumdM 4. New treatment Facility is NOT BETTER Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with micro-organisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. POINT C is also a DEAD ZONE!! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â?opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the

proposed water quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns!! https://thetyee.ca/Analysis/2019/02/07/Pollution-Nova-Scotia-Pulp-Mill-Sink-Trudeau/?fbclid=IwAR2_XplvKgfjWHCh2fTuzimxmeMsnWVTVVhE6agYFPiXSwR3VvkEXHB4GEA https://docs.wixstatic.com/ugd/b61814_ab61cca668f1432f890d2d0a7715a554.pdf?fbclid=IwAR27oqDYJfCCBWdlMyNExvUrYZ_rBS86Gw77cT35IlLtVdyzh05AYwwcB1c 5. Better return for your TAX DOLLARS Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 Million dollars and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 Million dollars. Further to that $127 Million dollars of NS Tax payers dollars have been given to the mill in the last several years. Meanwhile we have doctors over worked and leaving our province. We have ER closures and very long wait times for treatment and care. Our Education system is also at its max with constant cuts. Funding for Seniors and Veterans as well as many more public programs and services would benefit from the large sums of NS tax dollars instead of it going towards Northern Pulp. https://www.halifaxexaminer.ca/featured/northern-pulp-scotsburn-lumber-and-u-s-tariffs/#News https://www.halifaxexaminer.ca/province-house/health-care-crisis-check-leadership-to-solve-it-another-question/?fbclid=IwAR1oPeQe3iFB-Oe0llwCNT9uax2Gos8ZQNhV3YYvTOO67j5aRX8p310_tQ8 #NOPIPE https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/ Name: Email: @gmail.com Address: : Privacy-Statement: agree x: 70 y: 24

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 10, 2019 7:31:47 PM

Project: replacement_effluent_treatment_facility_project Comments: I fully support the proposed effluent treatment facility project at Northern Pulp Nova Scotia. The level of investment that the company has spent on this project to date is significant and there is no doubt in my mind that the company has full intentions on building the best possible solution that is economically feasible. There has been a significant negative social impact to our region as a result of those who choose to refuse to trust in our forestry industry. Technology investments of the past 50 years make it possible to protect our environment and encourage industrial development, unlike the Boat Harbour facility as it currently sits. The findings of the provincial assessment should directly assess and evaluate the impacts to the local fisheries and waterways as this is undoubtedly at the forefront of the minds of many particularly those that are opposed to this facility. Name: Email:

: Privacy-

Statement: agree x: 41 y: 28

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 7:49:13 AM

Project: replacement_effluent_treatment_facility_project Comments: Our waters and environment matter for today and the future. Name: Email: @eastlink.ca Address: Municipality: Postal-Code: : Privacy-Statement: agree x: 35 y: 34

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 7:49:58 AM

Project: replacement_effluent_treatment_facility_project Comments: Stupidest plan ever, poison the streight. And poison the air. Health or profit. Who lives or who dies. Not a hard decision. Its 2019. Time to force closed loop or shut her down Name: Email: @gmail.com Address:

: Privacy-Statement: agree

x: 57 y: 17

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 8:46:39 AM

Project: replacement_effluent_treatment_facility_project Comments: I say NO to any extension of time to clean up! Northern Pulp has had ample time - which they agreed to. We want no effluent pipe, and grant no extra time to clean up. Northern Pulp should be facing crippling fines if they dont return the area to pristine condition by the date agreed upon. The NS government has dragged its feet, looked the other way, and dangled jobs in front of the local population. How about providing well-paid jobs that the clean up will create? Keeping jobs for Nova Scotians is not the problem, distorted profits for foreign companies is. We judge by results, not by promises and fantasy claims. The poisoning of our water, destruction of our rich fishing areas and their communities, and the battle-field scarring where our forests used to stand are the results that generations of Nova Scotians will live with. There is nothing that could be worth this rapid, wholesale destruction. No extension, and no effluent pipe! Hire real scientists to work out something that will in fact be good for the environment and people of Nova Scotia, now and down the generations. Name: Email: @gmail.com Address: Municipality: Clementsport Postal-Code: Privacy-Statement: agree x: 52 y: 26

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 9:01:29 AM

Project: replacement_effluent_treatment_facility_project Comments: It is completely irresponsible in this day and age to further consider allowing pollution to continue from this facility. The new plan is slightly better than the current condition but still allowing pollution to be introduced in to a natural habitat at an alarming rate. A slightly lesser evil is still an evil. And this new evil is being moved to a location that is potentially allowing the bad decision to reach further into the eco system and not only affect the environment and people of this province but neighboring ones. It is ridiculous that the tax payers of NS are on the hook for clean up of this companies negligent actions up until now due to the indemnity clause that should have never been approved, why on earth should we consider actions that will only increase this bill into the future. while I am admittedly not completely informed about how much government money in the way of tax cuts or grants go to this antiquated mill, I am sure they are getting some financial backing from the NS tax payers. Perhaps this should stop and the money be allocated to funding more environmentally sound companies to offset jobs that may be lost if the company were to pull up and leave because it didnt get its way and be allowed to continue to work towards destroying our environment. Why do we let foreign companies get rich at expense of our health and out land. I dont always agree with the view points of our indigenous peoples but in matters like this they do prove to be better stewards of the natural resources than the rest of us more often than not. In closing I think the only way northern pulp should continue is in an updated facility that does not in any way further our march into the climate crisis sitting before us and the measures that are required come out of their pockets not ours. If they decide they cannot part with the money required to be a responsible corporate citizen then I am sure the savings to our taxpayers can go to help find business partners who can. No extensions, no more corporate welfare, no more compromise on my daughters future. Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: :
Privacy-Statement: agree x: 55 y: 32

From:	@eastlink.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 11, 2019 9:21:40 AM

Project: replacement_effluent_treatment_facility_project Comments: There is no way that this ancient mill and old technology will treat this poison. I know for a fact that this mill is crumbling internally and it needs way more updates than a treatment facility. I will not support this and shame on you if you do and shame on me for voting for you Name:
Email: @eastlink.ca Address:

Privacy-Statement: agree x: 38 y: 30

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 11, 2019 10:53:44 AM

Project: replacement_effluent_treatment_facility_project Comments: To Ms. Miller Dept. of Environment NS, My wife and I have a cottage on Caribou Island. The island is beautiful. We swim there, dig quahogs and enjoy watching the ferry pass by every summer. We are literally a good golf ball drive from where Northern Pulp wants to have the outflow of its pipe. I see firsthand every winter the huge amount of sea ice that comes into the strait and Caribou Harbour. The harbour and strait are very shallow in places. Just this fall we had a huge storm that moved the entire beach and armour rocks. With rising oceans being the new normal, the extremes are only going to get worse and this pipe will not survive. What is in the pipe is also a problem. They say it is treated effluent but there will be solids and other leftover particles from what I have read. Even if the effluent was completely clean it is not a clever idea to release such a huge volume of fresh water into a salt water environment especially with temperatures between 24 and 34 degrees Celsius. We spend most of the su mmer at the cottage and get to see firsthand where the lobster traps are set. Many are set exactly where NP wants their pipe to go. We also see in September hundreds of herring boats that drop anchor in the evenings who fish just to the left of where the pipe is going to go. I have a daughter and I do not want her to have to witness what the people of Pictou Landing have had to do deal with and live with for the last 50 years. It is 2019, we know better now! We have not been able to trust this company. They have had 5 years to come up with a better plan and have let the citizens of NS and their own employees down by not doing so. They think they can continue to bully us and our governments into accepting their substandard operating methods. If they were serious about continuing to do business here they would have invested in a bleach closed loop system. They have been a bad neighbour and the smell every 2nd day is a continuous reminder of them and their arr ogance. I like anyone else hate to see jobs go but they are not worth the risk of wrecking the entire Northumberland Strait and its eco system. Please do the right thing and reject this and be on the right side of history. Sincerely,

Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 61 y: 19

From: upei.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 11:20:23 AM

Project: replacement_effluent_treatment_facility_project Comments: An environmental impact assessment needs to be done of the effluent treatment ponds that are directly adjacent to First Nations land. The health impacts of their exposure to these wastes should be performed - census of cancer, asthma and autoimmune disorders. The people who have been impacted by effluent from the Northern Pulp Mill should be compensated financially by the mill. The mill has negatively impacted the tourism industry in the Pictou area due to the foul odours emitted into the air. Another once prosperous industry - local fin fish and lobster fisheries - may also being impacted by treated effluent but this has not been investigated by the DFO although there is significant anecdotal evidence that this is the case. This mill has received large government handouts to remain in business as it contributed so much to the local economy even though this is a foreign owned company which employs merely hundreds of locals. The detrimental impact of the Northern Pul p Mill on the local fishery and tourism industries certainly outweighs the mere hundreds of jobs provided by this company. Name:
Email: @upei.ca Address:

Privacy-Statement: agree x: 65 y: 21

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 1:45:27 PM

Project: replacement_effluent_treatment_facility_project Comments: We are a family of six who rely on the Mill and its projects to sustain our life here in Pictou County. The job loss that could be felt in our community if this project is not given the proper time to unfold will be catastrophe. My husband and I are already seeking employment and property in Prince George and Kamloops, British Columbia. If we can not maintain our life here due to loss of our primary source of income- our source to provide post second education for our four children to be a contributing member of our community to be able to be a consumer that allows our fellow community members to maintain their businesses than there is really no point in staying. Without Northern Pulp remaining open and continuing we will just be another statistic of young families leaving Nova Scotia to find a sustainable living. There is, in my mind, no need for the hype that the treatment facility will cause adverse affects to the surrounding waters and natures. There is no amoun t of tourism and other employment opportunities that can adequately provide for the economy of rural Nova Scotia than the NP mill and its 11000 spin off jobs.There is no way a government can sit by and allow this to happen in good conscious. The time for being environmentally friendly is upon us but we must not forgo the people who provide for the opportunity to create the change. This projects future is mandatory for Nova Scotia and my family personally. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 59 y: 14

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 1:48:45 PM

Project: replacement_effluent_treatment_facility_project Comments: It is disgraceful to think that any government who says that they are for the environment and wants the people to pay for reducing the effects of pollution that cause global warming would think this is ok. Toxic effluent being pumped into the ocean, really! This will kill ocean life that is integral in producing oxygen and using carbon dioxide thus reducing the carbon in our atmosphere. Not only will it impact the algae and other sea plants that use carbon dioxide but it will poison fish and ruin the habitat where many species such as striped bass that were at risk in this area and have just now made a comeback but everything that feeds and spawns in this part of the ocean. Seams like the Liberal Party, provincial and federal talk the talk but dont walk the walk. Allowing spraying of toxic chemicals in forest to kill hardwoods off. Sprays that have been proven to be carcinogenic . Clear cutting of our forests, etc. The list of environmental issues that this governme nt endorses is disgusting. Never will I vote Liberal again. Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 62 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 3:06:06 PM

Project: replacement_effluent_treatment_facility_project Comments: This tremendous project should be approved without delay. Northern Pulp NP is replacing the old Boat Harbour facility it inherited with a modern, state-of-the-art system like those in the very best kraft pulp mills worldwide. There are no significant residual environmental effects on the 17 valued environmental components identified. Even under worst case conditions water quality will reach ambient conditions within 2m of the diffuser colour will return to baseline within 5m of the diffuser and temperature will be within 0.1C of background within 100M. Congratulations to the NP team for this comprehensive plan. It cannot be approved, built and commissioned soon enough. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 41 y: 32

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 3:26:20 PM

Project: replacement_effluent_treatment_facility_project Comments: This mill is not worried about our marine environment Northumberland Strait Sportfishing Association Canada Feb 11, 2019 â?" I have a hard time understanding how there is any confusion regarding how an effluent pipe, with a volume of this magnitude, directly to the Northumberland Strait, wonâ?Tt cause any negative effects to the marine environment and the existing fishery. Basically, Northern Pulp wants to redirect the majority of the flow from the Middle River â?" between 62 and 90 million liters per day, heat it up to 37 degrees Celsius, add one ton of what is technically toxic waste solids, then direct that to the mouth of Caribou Harbour. This effluent will kill lobster larvae itâ?Ts inevitable and would directly breach section 36 of the Federal Fisheries Act. The mill then states, â?~itâ?Ts unlikely there will be any harm to lobster,â?T in their environmental assessment. It is virtually impossible that there will not be adverse effects from this dramatic redirection of the Middle River, to the mouth of Caribou Harbour. For our Provincial government to have not immediately sent this to the Federal government for environmental assessment is outrageous. To suggest, â?~this is not a new facility, just replacement of an existing oneâ?T, as the reason for a provincial assessment, is not reasonable or realistic. To completely redirect the flow of a major river to the mouth of Caribou Harbour, miles from where itâ?Ts been flowing, into the very heart of the most lucrative lobster and herring grounds in the Northumberland Strait, a provincially shared Federal Fishing zone, this goes beyond responsible, honest government, with regards to the environmental assessment applied. Our government is in an obvious conflict of interest. The Supreme Court of Canada agrees, according to the ruling of Justice Timothy Gabriel last fall, with regards to Pictou Landing First Nations and the Provincial Government with respect to the government funding of a replacement facility and the relationship with Northern Pulp. Justice Gabriel stated, â?oâ?¦ it would essentially boil down to the Crown wearing one hat being called upon to determine whether a project which the Crown wearing another hat has funded passes muster. This will do nothing to assuage whatever cynicism has been engendered in the past.â? I believe the working group of fishermenâ?Ts organizations, together with Pictou Landing First Nations, should be taking the Province and Northern Pulp to Supreme Court on this basis in the event the Federal Government does not step in and take control of this environmental assessment. I believe we, as fishermen and First Nations, have a legal right to protect our industry â?" and Justice Gabriel has set the precedent. We undoubtedly will lose our Marine Stewardship Certification, a major marketing tool, for both our herring and lobster fisheries as a result of this new effluent pipeline, as part of the criteria is the species are harvested from a healthy environment, in a sustainable fashion. Itâ?Ts already affecting the existing fishery and not just here, in P.E.I as well. Fishermen are anticipating the value of their enterprises to be less than half what there are now, as soon as there is real indication of construction of this effluent pipe and some have literally already sold out on this realistic assumption. In Northern Pulps submitted proposal, the pipe is required to be set at a depth below the seabed of three meters due to potential from ice damage. To accomplish this, they submit the trench would have to be 9 meters across, for the entire length of 4.1 kilometers from where it enters the harbour adjacent to the ferry dock, to the mouth of the harbour, the proposed discharge location. The sediment alone from this construction would destroy the local fishery and directly breaches section 35 of the Federal Fisheries Act as it will destroy marine habitat, eelgrass beds, etc., killing juvenile fish, lobster and crab. The sediment dispersed will cause havoc with the marine environment for miles and for how long, is anyoneâ?Ts guess. There came a point in

time when the environment outweighed the economy, it has passed. In this day and age, to even consider directing this massive flow of â?~treatedâ?T, poisonous effluent directly to the Northumberland Strait, is not reasonable. There is an alternative, yet the mill will not consider it, as it would mean less profits â?" converting the mill to a mechanical process that separates the pulp, no effluent discharge required and less air emissions â?" this actual possibility could be discussed at length. The mill simply will not consider it, as it is less profitable and there would be â?~downtimeâ?T at their expense while converting. Our government is closing Boat Harbour in January 2020, ten years premature of the lease agreement, but actually 25 years late, from what was originally promised to Pictou Landing First Nations PLFN. To continue using Boat Harbour, is to continue with the current environmental racism that PLFN have been enduring for 52 years and are currently, on a daily basis, contending with. To ask for an extension, is simply ignorant. Because the closure of Boat Harbour is premature of this lease agreement that the Province agreed to without PLFN consent, Premier McNeil has been quoted saying that the monies our government will be giving Northern Pulp are not to directly pay for the estimated $130 million 15.5 km pipe and new treatment facility, but in lieu of the lease agreements early closureâ?¦. Obviously, this $130 million could be better spent on converting the mill to a mechanical, closed loop system. The mill has no interest and has continually stated, no pipe = no mill. If all you are thinking about is profits, you canâ?Tt blame them. This company, Asia Pulp and Paper, subsidiary, Paper Excellence, buys up mothballed pulp mills for peanuts in comparison to todayâ?Ts cost, that would be upwards of 2 billion dollars, spends next to nothing on upgrades, rakes in government subsidies and hand-outsâ?¦ and in the case of our mill, is not responsible for any environmental damage. What a deal! The mill with one of the worst environmental records in the country, suffers no consequences for environmental damage â?" a coincidence? Think about that, why would you improve your discharges, air and water, if there are no consequences? No, you canâ?Tt blame them for not wanting to convert the mill. There would be downtime and they couldnâ?Tt sue our government for it â?" and they will be suing for any â?~downtimeâ?T when Boat Harbour closes, you can count on that. They have a sweetest of deals right now and the fishing and forestry industries are both paying for it! The thing is, our government, the people, have allowed this to happen. The question is, will we continue to? This mill is not worried about our marine environment and really, other than from a profits perspective, they are not worried about the longevity of our forest industry either. I donâ?Tt suspect anyone in the forest industry would want any harm to the fishing industry and I know the reverse is the same we in the fishing industry want the forest industry to thrive, but simply not at our expense. There is a solution and the extension of Boat Harbour is not the solution. The solution is to convert the mill this is what the forest industry should be promoting to Northern Pulp. Name:

Email: @hotmail.com Address:

: Privacy-

Statement: agree x: 87 y: 33

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 3:42:47 PM

Project: replacement_effluent_treatment_facility_project Comments: Effluent has been flowing into the Northumberland Strait for 50 years with little-known impact on fish habitat. With the new system, the effluent entering the strait will be improved. Please remove emotion from your decision-making process and make your decision based upon the scientific merits of the proposal. Name: : @gmail.com Address:

Privacy-Statement: agree x: 41 y: 32

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 4:09:06 PM

Project: replacement_effluent_treatment_facility_project Comments: I am in favor of the Government of Nova Scotia granting NPNS permission to construct and operate their proposed new ETF. Please also grant the Company the needed time extension of a year or more, to enable the Boat Harbor facility to operate until the new ETF is commissioned. It is impossible to emphasize too strongly how important the continued operation of the NPNS mill is to the economy of Nova Scotia. NPNS is the largest export shipper from the Port of Halifax and the dollar value of their shipments is one third of Nova Scotias total. Thank you very much for your consideration. Name: Email: @ns.sympatico.ca Address

: Privacy-Statement: agree x: 60 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 5:28:34 PM

Project: replacement_effluent_treatment_facility_project Comments: Listen to the fishermen. Listen to the natives who were lied to and crapped on for 50 years. The town of Pictou should be a tourist draw. every business in that town is affected by the stink of this thing. Reading The Mill by Joan Baxter - one story in it comes to mind. A teacher having to not let her students outside for recess because their school was literally in a cloud of pollution. This mill has to go. Let this thing die. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 62 y: 25

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 6:07:03 PM

Project: replacement_effluent_treatment_facility_project Comments: Dear Government of Nova Scotia, I am asking the Government of Nova Scotia to ENFORCE THE ENVIRONMENTAL LAW in Pictou County: Shut down Northern Pulp until they comply 100: PROTECT THE PEOPLE! We have environmental issues in Pictou County. Northern Pulp Operations threaten our environment. Our air and water are unsafe. The ocean is an important resource in Pictou County. Northern Pulp wants to dump liquid pollution into our ocean. Northern Pulp has a track record indicating it cannot be trusted with environmental concerns. Northern Pulp still pollutes our air after being told to fix its emissions. I do not trust Northern Pulp with our ocean/fisheries. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 67 y: 27

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 11, 2019 6:45:17 PM

Project: replacement_effluent_treatment_facility_project Comments: I have reviewed the document and feel that this will be an environmental improvement over the existing facility. I understand that the impact on the Northumberlamd Strait will be less than the current effluent being discharged into the Strait where it has been going for the past 50 years. I also understand that this new type of treatment plant is used all over the world with minimal impact to the receiving waters. It also seems that Paper Excellence wants to invest in NP so the mill can continue to run . I reviewed the table and am encouraged that the consultants have rated the environmental effects as Not Significant. I also understand that there will be a comprehensive monitoring program. I find all these facts to be encouraging. Name: Email: hotmail.com Address:

: Privacy-Statement:

agree x: 68 y: 15

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 7:42:33 PM

Project: replacement_effluent_treatment_facility_project Comments: Just as it is not acceptable to dump raw sewage into rivers and lakes where it will eventually e consumed by humans, it is not acceptable for corporations to dump effluent into waters where it will eventually be consumed by creatures which will eventually be consumed by humans. This especially true where a closed loop alternative exists. Name: Email: @gmail.com Address:

rivacy-Statement: agree x: 65 y: 25

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 11, 2019 8:30:39 PM

Project: replacement_effluent_treatment_facility_project Comments: There are so many reasons the people of this province and beyond will NOT accept anything less than a federal assessment. This plan was declined twice already in the past by federal level so Im unsure how this is acceptable in 2019. It should also be noted this plan makes NO mention to ice scours that would damage the pipe at the caribou location. The people have continually stated we will not accept a pipe. We know this would destroy our waters. The Supreme court has already ruled any future construction must be worked on with Pictou Landing first Nations. We the people are standing FIRM with this group. We believe many land demonstrations would occur and escalating incidents would happen. We do NOT WISH THIS. As a long time resident of Pictou County, I am ashamed at the true blatant corruption that has taken place since 1967 regarding this mill. It is far too old to continue. CLOSED LOOP should be be the target. Our many reasons can be found here as well, why we a re demanding a federal assessment. For your health: The composition of the toxic effluent will contain dioxins, furans, metals, solids and other contaminates at a rate of 90,000,000 Litres per day. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to â? odewater the sludge prior to mixing it with bark and other wood waste for combustion in the millâ?Ts power boiler.â? This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. See also: Maineâ?Ts dioxin problem What you should know about Northern Pulpâ?Ts proposed new treatment facility 2. For the economy The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 billion to the Nova Scotia economy. The tourism industry is worth $2.7 billion and prides itself on warm, clean water and world class sandy beaches. The commercial fisheries is worth over $1 billion and relies on sustainable wild shellfish that is shipped all across the world. The sport fishing industry is worth $56 million, and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks on mainland Nova Scotia. See also: Nova Scotia exports top 10 Nova Scotia celebrates seafood export success at fisheries conference 3. For the environment â?" Meeting regulations does not prevent harm Nova Scotia and the Northumberland Strait are put at risk by the proposed effluent treatment process. As it stands right now, there are no CCME guidelines established for marine environments in terms of some of the chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having

harmful effects on the larger environment. This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations. Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does. See also: Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement, Pictou Harbour, Nova Scotia 4. The new treatment facility is not better than the current one Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with microorganisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. Point C is also a dead zone! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â?opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the proposed water

quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000 kg of solids will have the same impact as the effluent which presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns! See also: How pollution from a Nova Scotia pulp mill could sink Trudeau on both coasts Fifty years of pulp effluent 5. Better return for your tax dollars Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 million and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 million. Further to that $127 million of Nova Scotia tax payers money have been given to the mill in the last several years. Meanwhile we have overworked doctors leaving our province. We have ER closures and very long wait times for treatment and care. Our education system is also at its max with constant cuts. Funding for seniors and veterans as well as many other public programs and services would benefit from these large sums of tax dollars. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 37 y: 32

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 8:54:03 PM

Project: replacement_effluent_treatment_facility_project Comments: I am gravely concerned about untreated effluent going into our oceans. This water sustains life on our planet and the effluent must be treated. The lobster and fishing industries are vital to our livelihood here in Nova Scotia. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 57 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 11, 2019 11:24:02 PM

Project: replacement_effluent_treatment_facility_project Comments: It has been polluting our air and water long enough.If it cannot clean up its pollution ,it should be closed.Nova Scotians will adjust. The pulp mill in Liverpool closed and new businesses have started.We should not be paying for the clean-up costs, they need to be passed on to the polluter. No profits should accrue to the shareholders until this pollution cost is factored in as a cost of production. Besides, I doubt very much that stumpage fees to Nova Scotians come anywhere close to the pollution cost.The old joke where I grew up was in winter if you smelled sulfurdioxide in Truro some 50 miles away, we were in for a nasty eastern wind and snowstorm. Name:
Email: @hotmail.com Address:
: Privacy-
Statement: agree x: 51 y: 28

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 12:01:00 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe we need to give Northern pulp the time to make things right .We need all the jobs that go with the forest industry and Northern Pulp.We all win when new technology is used reducing polution .and this is the best technology known at this time. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree

x: 53 y: 31

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 6:04:44 AM

Project: replacement_effluent_treatment_facility_project Comments: If the effluent treatment facility can meet all standards and regulations set forth why is being denied even an option? The fishing industry and pulp industry have co existed for 51 years now. The science shows that it will work and science is what I believe. Build it and show us what this new system can do!! Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 46 y: 28

From: @gmail.com
To: nt Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 7:04:54 AM

Project: replacement_effluent_treatment_facility_project Comments: I strongly support an extension for the replacement of Northern Pulpâ?Ts effluent treatment facility. Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 84 y: 18

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 9:12:08 AM

Project: replacement_effluent_treatment_facility_project Comments: If anyone wants to know the potential impacts on Marine species in the Northumberland Strait, look no further than NPs 1700 page Environmental Assessment. We the people will NOT accept anything less than a federal assessment. We will stand strong and firm with Pictou Landing first nations. The plan to mitigate the risk is weak at best and meets regulations. Meeting regulations is not good enough when the Strait is at its max threshold for pressures. SEE BELOW FOR INFO DIRECTLY FROM THEIR PROPOSAL Impact Evaluation/Effects Assessment The potential environmental effects of the project and project activities on marine fish and fish habitat are assessed in the following section. Potential Effects Marine fish could be affected by activities and components of the project during the construction phase and operation and maintenance phase. If unmitigated, these changes have the potential to change marine fish populations and fish habitat e.g., adult fish, juveniles, eggs and larvae, invertebrates and marine plants through direct mortality or indirectly through alteration or destruction of habitat. The environmental assessment of marine fish is focused on changes in marine fish populations. For the purposes of this assessment, a change in marine fish populations includes any physical injury or mortality on fish attributable to the project, and any destruction or alteration of habitat from disturbance of the marine environment. Construction Phase During construction, marine fish may experience direct mortality or functional impairment resulting in eventual mortality. The placement of in-water infrastructure would have a direct effect on sessile or slow-moving demersal fish and invertebrates as they would be unlikely to avoid construction activities within the marine PFA and could experience mortality as a result of smothering or crushing. The construction of marine-based infrastructure may affect marine fish populations through a change in available substrate and size distribution, a change in water and sediment quality, or changes to the acoustic qualities of the marine environment. The process of installing marine pipelines has a direct effect on the benthic environment. In-water activities during the construction phase may also result in a change in sediment quality. The disturbance of marine sediments may temporarily increase the concentration of TSS in the water column. Suspended solids can reduce feeding and growth rates and can alter migration of salmon in nearshore habitats Robinson and Cuthbert 1996. Reduced feeding rates, avoidance behaviour and suffocation due to effects on gill function have been observed in herring from suspended sediments Robinson and Cuthbert 1996. There may also be indirect effects on fish through alterations within localized food web structures. The severity of the effect of suspended sediments increases as a function of sediment concentration and duration of exposure Newcombe and Jensen 1996. During the construction phase, vessel noise will be concentrated within the LAA and the majority of anthropogenic sound in the marine environment generated during construction will originate through trenching, pipe laying, and backfilling. There is also the potential for underwater sound if blasting is used during the construction phase. Some marine fish species may be affected when exposed to high intensity sounds Popper 2003. The sound emitted to the marine environment during the construction phase could therefore temporarily reduce the quality of fish habitat in the marine PFA. Operation and Maintenance Phase Potential effects on marine fish and fish habitat during pipeline operation include the discharge of treated effluent from the ETF. These potential effects could result from: an increase in temperature, nutrients nitrogen and phosphorus, or TSS a change in colour, chemical and biochemical oxygen demand, dissolved oxygen DO, or pH or a reduction in salinity from the discharge of treated freshwater effluent into the Northumberland Strait.

Lobster harvesters in the Pictou region have expressed concern about the potential effects of the discharge of treated effluent on lobsters, particularly in the larval stage. Potential effects to fish during the construction phase may also be applicable during the operation and maintenance phase if project maintenance activities require the presence and operation of project vessels or equipment, and in-water activities that include seabed disturbance e.g., for pipeline retrieval #NOPIPE #NOEXTENSION Name: Email: Address: Municipality:
Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 49 y: 12

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:07:58 AM

Project: replacement_effluent_treatment_facility_project Comments: I do not support the proposed effluent waste proposal. Northern Pulp have listed some of the potential impacts on Marine species in the Northumberland Strait in their submission. The plan to mitigate the risk is weak at best and meets regulations. Meeting regulations is not good enough when the Strait is at its max threshold for pressures. This area is a major ecomonmic driver for the province of NS as well as PEI and NB. Further to that, this area has over 50 species of vegetation, wildlife and marine life that are listed as SAR, SOCC, Threatened and Endangered within the ETF footprint. SEE BELOW FOR INFO DIRECTLY FROM THEIR PROPOSAL Impact Evaluation/Effects Assessment The potential environmental effects of the project and project activities on marine fish and fish habitat are assessed in the following section. Potential Effects Marine fish could be affected by activities and components of the project during the construction phase and operation and maintenance phase. If unmitigated, these changes have the potential to change marine fish populations and fish habitat e.g., adult fish, juveniles, eggs and larvae, invertebrates and marine plants through direct mortality or indirectly through alteration or destruction of habitat. The environmental assessment of marine fish is focused on changes in marine fish populations. For the purposes of this assessment, a change in marine fish populations includes any physical injury or mortality on fish attributable to the project, and any destruction or alteration of habitat from disturbance of the marine environment. Construction Phase During construction, marine fish may experience direct mortality or functional impairment resulting in eventual mortality. The placement of in-water infrastructure would have a direct effect on sessile or slow-moving demersal fish and invertebrates as they would be unlikely to avoid construction activities within the marine PFA and could experience mortality as a result of smothering or crushing. The construction of marine-based infrastructure may affect marine fish populations through a change in available substrate and size distribution, a change in water and sediment quality, or changes to the acoustic qualities of the marine environment. The process of installing marine pipelines has a direct effect on the benthic environment. In-water activities during the construction phase may also result in a change in sediment quality. The disturbance of marine sediments may temporarily increase the concentration of TSS in the water column. Suspended solids can reduce feeding and growth rates and can alter migration of salmon in nearshore habitats Robinson and Cuthbert 1996. Reduced feeding rates, avoidance behaviour and suffocation due to effects on gill function have been observed in herring from suspended sediments Robinson and Cuthbert 1996. There may also be indirect effects on fish through alterations within localized food web structures. The severity of the effect of suspended sediments increases as a function of sediment concentration and duration of exposure Newcombe and Jensen 1996. During the construction phase, vessel noise will be concentrated within the LAA and the majority of anthropogenic sound in the marine environment generated during construction will originate through trenching, pipe laying, and backfilling. There is also the potential for underwater sound if blasting is used during the construction phase. Some marine fish species may be affected when exposed to high intensity sounds Popper 2003. The sound emitted to the marine environment during the construction phase could therefore temporarily reduce the quality of fish habitat in the marine PFA. Operation and Maintenance Phase Potential effects on marine fish and fish habitat during pipeline operation include the discharge of treated effluent from the ETF. These potential effects could result from: an increase in temperature, nutrients nitrogen and phosphorus, or TSS a change in colour, chemical and biochemical oxygen demand, dissolved

oxygen DO, or pH or a reduction in salinity from the discharge of treated freshwater effluent into the Northumberland Strait. Lobster harvesters in the Pictou region have expressed concern about the potential effects of the discharge of treated effluent on lobsters, particularly in the larval stage. Potential effects to fish during the construction phase may also be applicable during the operation and maintenance phase if project maintenance activities require the presence and operation of project vessels or equipment, and in-water activities that include seabed disturbance e.g., for pipeline retrieval Name: Email: @outlook.com Address: : Privacy-Statement: agree x: 61 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:09:28 AM

Project: replacement_effluent_treatment_facility_project Comments: The fact that we are even discussing the possibility of harming the lucrative fishing industry is bizarre.I live in Pictou County. I want the Federal government to do a proper review. The Nova Scotian government is unable due to its close affiliation with Northern Pulp. For goodness sakes, John Hamm, our former premier, sits on the board of Northern Pulp and made the unfair deal that the province is currently bound by. The province is unable to assess the environmental damage- itâ?Ts too involved. We need a Federal assessment. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 77 y: 30

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:27:14 AM

Project: replacement_effluent_treatment_facility_project Comments: hello, myself my wife family and friends are against the pipe installation and would like to see a federal review. our sensitive ecosystem, tourism industry and local health will hurt greatly if care and caution are not taken. no extension and no installation . our forestry industry will still thrive practices are and need to be reviewed please take the publics opinion into full consideration. no pipe and no extension enough is enough thank-you Name: Email: @gmail.com Address:

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:40:41 AM

Project: replacement_effluent_treatment_facility_project Comments: Please dont ruin our beaches and fishery with this Pipe. No one wants this in their back yard no matter how great you say the Effluent Treatment is. I dont believe a word spend the money on a closed loop system or go polute somewhere else where Mens hands are easily greased.These beaches is where I spent my life they are a perfect place to take your family no matter your income.No PIPE! Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 52 y: 31

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:45:19 AM

Project: replacement_effluent_treatment_facility_project Comments: My primary concerns with this project are the lack of time an accountability associated with a Level one provincial assessment. Since the province is assessor, regulator and financier of this project then no open, clear and thorough assessment can be done in one month. The ministry needs to go s to go hands off and allow for a federal assessment, as per petition 1750 that is before parliament currently. Name: Email: @yahoo.com Address:

Privacy-Statement: agree x: 27 y: 26

From:	@ns.sympatico.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 11:46:55 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe the extension to the boat harbor treatment facility MUST be extended so Northern Pulp can complete whatever is necessary to forge forward. It amazes me that the premier is taking such a hard stand on this matter which will reduce the provincial taxes paid by all those that will loose their jobs if the mill closes, whereas he is so willing to spend multi millions of taxpayer dollars on the Yarmouth ferry. How political is that! Pictou county is hard hit employment wise as it is. Closing the mill would have a dire affect on our economy. No matter what scientists say about the negligent affect the new system would have on the Northumberland Strait, the fishermans association would not believe it anyway.THE PLANT MUST STAY OPEN FOR THE GREATER BENEFIT OF ALL NORTHERN NOVA SCOTIA! Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 55 y: 23

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 11:47:13 AM

Project: replacement_effluent_treatment_facility_project Comments: N.S.Govt, you dont give a GOD dam about the Northumberland Strait , First Nation or Fisherman .Pictou is a shithole as far as your concerned , or MacNeil would have showed his face . You push this pipe dream on us , youll create HATE within this province and others .Spend our money , change the process within the MILL , limit the water use . Get your ship in order, were trying to sustain generations, killing our waters , dead wrong !!! Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 60 y: 45

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 11:57:56 AM

Project: - Choose - Comments: As a fisherman in the northumberland Strait I am very concerned with a pipe in the strait our association has financed a hatchery for lobsters to get them past there most vulnerable people stage which has helped get our fishery to record landings. As a fisherman seance 1981 I have seen a lot of changes in the way we treat the environment. When I first started the garage went over the side of boat now everything comes ashore sorted and put in the popper garbage or recycling container witch Wes as a harbour authority pays for Oil use to go over board now we have a tank to put it in and have it cleaned out properly payed for the harbour authority. Was this all a wast of our time and money we all take care not to have oil or other contaminants in our bilge that would be pumped out into the environment. Yet the pulp mill is proposing to dump there wast into the environment and see no problem with that. In there assessment app The waters of the northumbland Stright are getting warmer all ready whitch is a threat to the fish living there. Yet the mill thinks it is all right to dump hot water there witch will heat it at a faster rate. The proposed pipe will empty on the edge of one of last large herring spanning grounds in the Stright. Right on the lobster grounds There is a lot of talk about jobs in the forest what about jobs in the fishery if the mill closes there will still be forestry jobs if this wast kills the northumbland Stright there will be no fishing jobs left. Please donâ?Tt Pass this assessment Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 61 y: 27

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 12:39:59 PM

Project: replacement_effluent_treatment_facility_project Comments: Although people are saying â?othey had wnough timeâ? I think people need to realize that NP had to do research for the best option of wonâ?Tt hurt thief system, or the natural habitat. I mean the town of pictou is putting their effluent into the water, so them saying that they care about the environment and NP is being bad for putting stuff in the water is so hypocritical. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 37 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 1:02:19 PM

Project: replacement_effluent_treatment_facility_project Comments: You have to be an idiot to not realize this has harmful effects on the environment and peopleâ?Ts health. The environment and peopleâ?Ts health are more important than jobs. Do the right thing and donâ?Tt side with greed. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 71 y: 20

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 2:02:15 PM

Project: replacement_effluent_treatment_facility_project Comments: The mill needs to close. PERIOD. Theyâ?Tve had more than enough time to come up with a solution to the effluent treatment issue and they havenâ?Tt. Itâ?Ts time they were held accountable after years of â?ofree passesâ? . Theyâ?Tve been given TOO MUCH leeway in the past and it has done nothing but cause more harm and delay what shouldâ?Tve happened years ago-the closure of the mill. Iâ?Tm a 21 year old native of Pictou County and Iâ?Tm ashamed to tell people thatâ?Ts where Iâ?Tm from because they all associate it with the pulp mill and how disgusting it is. As a child I was scared to swim and fish in the waters because of the pollution. I used drive by the mill and smell that sulphuric smell and plug my nose , and walk out of my high school under a sheet of pollution trying not to breathe while I ran to the bus. Now, as a university student, my professors use the Pictou mill as an example of environmental destruction, negative industrial power and mistreatment of loc al Aboriginal Communities. Itâ?Ts embarrassing. I understand the concern surrounding jobs loss and economic dependence...but at what cost are we willing to keep that mill open for a tiny percentage of the population of the county? What about the jobs of the lobster fishers from Nova Scotia and PEI? The people and businesses who could have MASSIVE potential in tourism if the mill wasnâ?Tt there? Real estate companies who might have an explosion of business on water front prosperities? The long term environmental impact to ecosystems and animals? The overall health and well-being of indigenous population and general CITIZENS of the county? The cancer, asthma and COPD rates in the county are no coincidence. I understand job loss is a scary thing but Michelin just opened new positions, as did the marijuana plant in Stellarton-the people that are currently employed at the mill WILL find jobs and the county will soon have new economic opportinities. Maybe even more if the mill closes. Itâ?Ts time that we stop putting the needs of the few above the needs of the many. This is a prime example of how industries manipulate, exploit and overpower small economically dependent communities and it needs to stop. It should stop with us. I am the next generation that will be living in that county, working there, investing there, raising a family there. Pictou County is MY HOME and companies like northern pulp have no place in it. However, as long as that mill is open, I will be packing my bags and I wonâ?Tt be going back until itâ?Ts closed. The generations to come are depending on us to make the right decision here, so letâ?Ts follow through and make them proud. Please donâ?Tt let them down. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 46 y: 38

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 2:14:11 PM

Project: replacement_effluent_treatment_facility_project Comments: As a visitor to NS and committed to protection of the environment, i trust the environmental assessment will make clear whats needed to protect fish,, fishermen, water from dangerous toxins. the planet is not ours to kill. No Pipe. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 61 y: 14

From:
To: Environment Assessment Web Account
Cc: James Gunvaldsen Klaassen; Sarah McDonald
Subject: Comment in Writing re: Replacement Effluent Treatment Facility Project
Date: February 12, 2019 1:21:25 PM

Good afternoon,

Please see the attached link enclosing comments in regard to the Replacement Effluent Treatment Facility Project proposed by Northern Pulp Nova Scotia Corporation.

https://ln.sync.com/dl/bc47c0da0/2tw6jfaf-gun5ieas-v2annjfa-dd3kb2ku

Please confirm that this link has been accepted by the Environmental Assessment Branch at your earliest convenience. If there should be a technical difficulty, we shall arrange for alternate submission today.

Best regards,

Legal Administrative Assistant/Office Administrator | Ecojustice
520-1801 Hollis Street, Halifax, NS B3J 3N4
T: 902-417-1700 | 1-800-926-7744
F: 902-417-1701

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February 12, 2019

Environmental Assessment Branch
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8
EA@novascotia.ca

The Honourable Margaret Miller
Minister of Environment
Nova Scotia Environment
1894 Barrington St, Suite 1800
PO Box 442
Halifax, NS B3J 2P8
minister.environment@novascotia.ca

Sent Via Electronic Mail

Dear Minister Miller:

Re: Reasonable apprehension of bias with respect to the environmental assessment of Northern Pulp's proposed effluent treatment facility

We write to you on behalf of our client, Friends of the Northumberland Strait ("**FONS**"). As per FONS' letter to you dated September 27, 2018, FONS is of the view that you, in your position as Minister of Environment, have a significant and direct financial interest in ensuring that the environmental assessment ("**EA**") for Northern Pulp's proposed effluent treatment facility ("**ETF**") is concluded as quickly as possible. In addition, your government has ongoing contractual relationships with Northern Pulp that could be interpreted as requiring you to favour Northern Pulp when deciding whether to approve the EA.

Given your position as a Cabinet minister committed to acting in the interest of your government,[1] these factors give rise to a reasonable apprehension of bias with respect to your role in the EA process. As a result, the current EA process, and any decision you make pursuant to s 34 of the *Environment Act*, are void.

On this basis, FONS respectfully requests that you recuse yourself from the EA and delegate your authority to an independent and unbiased body. FONS specifically requests delegation to the Canadian Environmental Assessment Agency ("**CEAA**"), as this body is familiar with the file and the public has already expressed extensive and unprecedented support for a federal-level assessment.

[1] See *Canadian Union of Public Employees v Ontario (Minister of Labour),* [2003] 1 SCR 539 at paras 114-116 [Appendix A, Tab 1].

A. Background

(1) The current EA

Northern Pulp currently uses Boat Harbour as its effluent treatment facility, and has done so since the 1960s. However, in 2015 concern about the impacts of the Boat Harbour facility on Pictou Landing First Nation led the Provincial legislature to pass the *Boat Harbour Act* ("***BHA***"). Section 3 of the *BHA* requires Northern Pulp to close the Boat Harbour facility on or before January 31, 2020.[2]

If the Mill is to continue operating past the closure date, Northern Pulp must have a replacement ETF up and running by that deadline. Unfortunately, Northern Pulp has already publically acknowledged that it will miss the closure date.[3] This raises the question of how long the Mill must remain idle after the closure date before it can begin operating its new ETF.

The Province has decided to apply a Class 1 environmental assessment to Northern Pulp's proposed ETF. This means that your task is to review the information provided by Northern Pulp and to make a determination pursuant to section 34(1) of the *Environment Act,* SNS 1994-95, c 1. Section 34(1) authorizes you to approve or reject the ETF, or to lengthen the EA process by requesting additional information, ordering a focus report or an environmental-assessment report, or referring the project to alternate dispute resolution.

Importantly, any decision that would have the effect of lengthening the EA process could potentially result in further delays in construction and could ultimately add months or even years to the Mill's closure time.

(2) Reasonable apprehension of bias: the legal framework

The widely accepted and unchallenged test for reasonable apprehension of bias originates with the Supreme Court of Canada's decision in *Committee for Justice and Liberty*.[4] That test, which has been adopted by the Nova Scotia Court of Appeal,[5] is as follows: what would an informed person, viewing the matter realistically and practically, conclude? Would he or she think that it is more likely than not that the decision-maker, whether consciously or unconsciously, would not decide fairly?

A finding of reasonable apprehension of bias is highly fact-specific and must be established via cogent evidence.[6] However, as a general principle the case law has established that a decision-maker's pecuniary interest in the outcome of a proceeding, however large or small that interest

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[2] *Boat Harbour Act,* SNS 2015, c 4, s 3 [*BHA*].
[3] Paul Withers, "Premier unmoved by Northern Pulp's ask for more time to close waste water facility," 31 January 2019, CBC News [Appendix B, Tab 1]; Michael MacDonald, "N.S. mill's future at risk without extension, Northern Pulp warns," 1 February 2019, CTV News Atlantic [Appendix B, Tab 1].
[4] *Committee for Justice and Liberty v Canada (National Energy Board),* [1978] 1 SCR 369 at 386 [Appendix A, Tab 2].
[5] *Nova Scotia (Attorney General) v MacLean,* 2017 NSCA 24 at paras 40-41 [*MacLean*] [Appendix A, Tab 3].
[6] *Ibid,* at para 39.

may be, is grounds for automatic disqualification. This principle was affirmed by the Supreme Court in its 2003 decision in *Wewaykum Indian Band.*[7]

Where a reasonable apprehension of bias exists in a proceeding, it cannot be cured by a subsequent decision. The Supreme Court has been clear that "[t]he damage created by apprehension of bias cannot be remedied. The hearing, and any subsequent order resulting from it, is void."[8]

As will be illustrated in the following sections, because of your position as a Minister and member of Cabinet, both your government's pecuniary interest in the outcome of the EA and your government's contractual relationships with Northern Pulp give rise to a reasonable apprehension of bias in the context of the ongoing EA. As a result, your participation voids the current EA process and any decisions or orders flowing from it, and you are disqualified from participation in any future EA of Northern Pulp's proposed ETF.

(3) Reasonable apprehension of bias & the public interest

The rule against bias is essential to maintaining public confidence in the administration of justice. This fundamental principle of procedural fairness is all the more important when the decision-maker is tasked with making a decision in the public interest.[9]

You are unquestionably required to have regard for the public interest when making a decision under section 34(1) of the *Environment Act*. The *Act*'s purpose provisions illustrate its clear focus on the public interest, enumerating goals such as the following:

(a) maintaining environmental protection as essential to the integrity of ecosystems, human health and the socio-economic well-being of society;[10]
(b) maintaining the principles of sustainable development, including the principle of shared responsibility of all Nova Scotians to sustain the environment and the economy, both locally and globally, through individual and government actions;[11] and
(c) providing access to information and facilitating effective public participation in the formulation of decisions affecting the environment […].[12]

The requirement to have regard for the public interest when making your decision is further emphasized by the *Environmental Assessment Regulations*, NS Reg 26/95 ("***EA Regs***"). Section 12 of the *EA Regs* lists the factors that you must consider when formulating your decision. These include the following:

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[7] *Wewaykum Indian Band v Canada,* 2003 SCC 45 at paras 69-70 [*Wewaykum*] [Appendix A, Tab 4].
[8] *Newfoundland Telephone Co v Newfoundland,* [1992] 1 SCR 623 at 645 [*Newfoundland Telephone*] [Appendix A, Tab 5].
[9] *Committee for Justice and Liberty, supra* note 4 at 391 [Appendix A, Tab 2].
[10] *Environment Act,* SNS 1994-95, c 1, s 2(a).
[11] *Ibid,* s 2(b)(iv).
[12] *Ibid,* s 2(h).

(a) concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking;[13]
(b) steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people;[14] and
(c) potential and known adverse effects or environmental effects of the proposed undertaking […].[15]

As a result, the rule against bias must be observed to the highest possible standard in these circumstances.

(4) The current public controversy

As you are certainly aware, there has been significant public controversy over Northern Pulp's proposed ETF. As a result, our clients anticipate that the EA process, and your initial decision under section 34(1), will be heavily scrutinized. An appearance of bias in this context could result in a widespread loss of public confidence in the administration of justice in the Province.

The public controversy over the proposed ETF has been documented in numerous news stories over the past year. A sample of this extensive media coverage is attached to this submission at **Appendix B, Tab 2**.

The importance of maintaining an unbiased appearance throughout the EA process is all the more important in light of this historic public controversy.

B. The Minister of Environment has a significant and direct financial interest in the outcome of the EA

Your financial interest in the outcome of the current environmental assessment can be divided into two categories:

1. The Province's direct financial investment in the design and development of the new ETF; and
2. Significant unpaid loans from the Province to Northern Pulp.

These two categories will be examined in turn.

(1) The Province has invested directly in the proposed ETF

As documented in the Province's Public Accounts for the fiscal year ended March 31, 2018, Northern Pulp received a $6 million contribution from the Department of Transportation and Infrastructure Renewal ("**TIR**").[16] When media contacted TIR about this payment, the Department revealed that it was a "contribution towards detailed design and engineering studies

[13] *Environmental Assessment Regulations,* NS Reg 26/95, s 12(c) [*EA Regs*].
[14] *Ibid,* s 12(d).
[15] *Ibid,* s 12(e).
[16] Nova Scotia, *Public Accounts: Volume 3 – Supplement to the Public Accounts for the fiscal year ended March 31, 2018* (Halifax, NS: Communications Nova Scotia, 2018) at p 330 [Appendix B, Tab 3].

for a potential replacement effluent treatment facility."[17] In addition, TIR noted that it had contributed $144,980.00 towards design and engineering studies in 2016-2017, for a grand total of $6.146 million for the fiscal years 2016-2017 and 2017-2018.[18]

The results of various requests for information under the provincial *Freedom of Information and Protection of Privacy Act* ("***FOIPOP Act***") reveal that negotiations between Northern Pulp and TIR over funding for the design and construction of the new ETF continued throughout 2018.[19] This is further confirmed by both the Province and Northern Pulp. For example, in Justice Gabriel's decision in *Pictou Landing First Nation v Nova Scotia (Aboriginal Affairs),* he cited a brief from the Province disclosing that "[the Province] is also engaged in confidential discussions directly with Northern Pulp regarding potential crown funding that may be provided to support construction of the new ETF […]."[20]

In addition, Terri Fraser, the Mill's Technical Manager, submitted an affidavit in the context of Northern Pulp's application for an injunction against a number of fishermen. In that affidavit, she acknowledged the execution of a 2016 agreement between the Province and Northern Pulp to share the cost of "preliminary engineering studies for a replacement ETF,"[21] and a 2017 funding agreement between the same parties to "allow detailed engineering work to be done, the environmental studies to continue, and allow major equipment to be purchased."[22] Ms. Fraser also stated that the Province and Northern Pulp began negotiating "[…] how the cost of the new ETF should be shared […]" in September 2017, and that "[t]hose discussions continue today."[23]

Although the Province has not yet revealed the outcome of these funding negotiations, the final cost of the new ETF is estimated to be $130 million.[24] If your decision on the EA were to delay this project further, or even to reject the proposal, the Province could risk losing any anticipated return on its investment. Furthermore, any decision requiring redesign of the ETF, or any measures required to ensure environmental compliance (such as adding tertiary treatment or making changes to enable the mill to utilize a closed-loop effluent treatment system) could result in further significant monetary contributions from the Province. These are, and will be seen as, powerful incentives to approve the current design with no significant changes.

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[17] Tim Bousquet, "Northern Pulp, Scotsburn Lumber, and U.S. tariffs," 8 January 2019, Halifax Examiner [Appendix B, Tab 4].
[18] *Ibid.*
[19] Email from Marla J. MacInnis to Gary S. Porter, 22 August 2018 [Appendix B, Tab 5]; Memorandum from Honourable Lloyd Hines, Minister, Transportation and Infrastructure Renewal to the Executive Council, 15 May 2018 [Appendix B, Tab 5].
[20] *Pictou Landing First Nation v Nova Scotia (Aboriginal Affairs),* 2018 NSSC 306 at para 7 [Appendix B, Tab 6].
[21] Affidavit of Terri Fraser, Sworn 30 November 2018, para 17 [Appendix B, Tab 7].
[22] *Ibid,* para 26.
[23] *Ibid,* para 22.
[24] Chris Muise, "Northern Pulp Seeks Extension," 6 February 2019, The Advocate [Appendix B, Tab 8]; Keith Doucette, "Northern Pulp mill formally registers controversial effluent treatment project," 7 February 2019, Globalnews.ca [Appendix B, Tab 8].

(2) The Province has provided significant loans to Northern Pulp, many of which remain outstanding

In 2017, the Department of Business disclosed that between 2009 and 2017 it had loaned Northern Pulp and its affiliates a total of $110.8 million (plus an additional $900,000 in "incentives").[25] $3.6 million was repaid in August 2016, leaving the remaining $107.2 m lion outstanding.[26]

Although the details of these loans have not been disclosed, it is clear that the Province has provided very substantial financing for the Mill over the past decade. Logic dictates that a lengthy or even permanent closure of the Mill resulting from the EA process could jeopardize the Province's chances of recouping these investments.

These financial connections between the Province and Northern Pulp create a significant and direct pecuniary interest on your part in the outcome of the EA process. It is clear that the Province is at risk of suffering a significant financial blow if the Mill is forced to close, even temporarily, as of January 31, 2020 – and that financial blow may worsen the longer the Mill is required to stay idle. As a member of Cabinet, you have a collective responsibility with your colleagues to pursue positive financial outcomes for your government, or at the very least to avoid devastating financial losses.[27] Although Northern Pulp has now acknowledged that it will miss the closure deadline, the decisions relating to the process and outcome of the EA will be a contributing factor in determining the length of the Mill's closure. In other words, your decision on the EA could result directly in a significant increase in the Province's financial liability.

These circumstances create an obvious bias toward approving the project as quickly as possible.

C. Extensive contractual relationships between the Province and Northern Pulp prevent the Minister from making impartial regulatory decisions impacting Northern Pulp's operations

On December 1, 1995, the Province entered into a Memorandum of Understanding ("**MOU**")[28] with Scott Maritimes Limited, a prior owner and operator of the Mill. The MOU is extensive, but for our purposes the two relevant clauses are as follows:

> 4.01(d) Nova Scotia agrees to undertake a clean-up program with respect to the [Boat Harbour] Facility prior to the commencement of the Lease with Scott […] If a

[25] Department of Business, "FOIPOP 2017-03648-BUS – Loans to Northern Pulp and Affiliates," June 2017 [Appendix B, Tab 9]; Bousquet, "Northern Pulp, Scotsburn Lumber, and U.S. tariffs," *supra* note 17 [Appendix B, Tab 4].

[26] Although we do not have updated information on outstanding loans, with the exception of the $3.6 million repaid in August 2016 all of the repayable loans disclosed by the Department of Business in 2017 were listed as having terms ending in 2023 or later.

[27] See *Canadian Union of Public Employees, supra* note 1 at paras 114-116 [Appendix A, Tab 1].

[28] Memorandum of Understanding between Her Majesty the Queen in Right of Nova Scotia and Scott Maritimes Limited, 1 December 1995 [Appendix B, Tab 10].

> pipeline and diffuser is required by any level of government during the term of the Lease it shall be installed at the sole expense of Nova Scotia.
>
> […]
>
> 4.01(l) Nova Scotia agrees to use its best efforts to assist Scott obtain [sic] all necessary permits, consents and approvals to permit the construction and operation of a replacement effluent treatment facility to replace the [Boat Harbour] Facility at the expiration of the term of the Lease.

The MOU, including the two provisions cited above, continues to operate as between the Province and Northern Pulp. On May 12, 2008, the Province signed an "Acknowledgement Agreement"[29] with Northern Pulp that states, in part, as follows:

> [T]he Province acknowledges, agrees and confirms that […] the Memorandum of Understanding between the Province and Scott dated December 1, 1995 and the Indemnity Agreement between the Province and Scott dated December 31, 1995 shall continue to apply with respect to the ongoing operation of the Effluent Treatment system, Purchaser's [sic] use of the Lands […] and Purchaser's use of Boat Harbour […].

The obligations imposed by these two provisions appear to be completely at odds with your obligation to conduct an independent, neutral and unbiased EA. In fact, these provisions suggest that a decision to reject the proposed ETF, or to lengthen the EA process by requesting further information, could result in contractual liability for the Province.

Northern Pulp is also party to a number of other long-standing agreements with the Province. These agreements include the Indemnity Agreement[30] referenced above, a Lease[31] and a License Agreement[32] both dated December 31, 1995, and a 2002 Lease Extension Agreement.[33] These agreements impose various obligations on the Province in relation to Northern Pulp's proposed ETF.

In fact, Northern Pulp has stated publicly that its various contracts with the Province should be determinative of the results of administrative approval processes. As per its 2015 appeal of the Industrial Approval issued by the Province, "[g]overnment cannot arbitrarily revoke Northern Pulp's contractual rights under the Agreements with the Province by way of an administrative

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[29] Acknowledgement Agreement from Her Majesty the Queen in Right of the Province of Nova Scotia to Northern Pulp NS LP, its affiliates and Northern Pulp Nova Scotia Corporation, 12 May 2008 [Appendix B, Tab 11].
[30] Indemnity Agreement between Her Majesty the Queen in Right of the Province of Nova Scotia and Scott Maritimes Limited, 31 December 1995 [Appendix B, Tab 12].
[31] Lease between Her Majesty the Queen in Right of the Province of Nova Scotia and Scott Maritimes Limited, 31 December 1995 [Appendix B, Tab 13].
[32] License Agreement between Her Majesty the Queen in Right of the Province of Nova Scotia and Scott Maritimes Limited, 31 December 1995 [Appendix B, Tab 14].
[33] Lease Extension Agreement between Her Majesty the Queen in Right of the Province of Nova Scotia and Kimberly-Clark Inc, 22 October 2002 [Appendix B, Tab 15].

approval process."[34] In response to this appeal, Randy Delorey, then Minister of the Environment, revoked a number of the conditions originally included in the 2015 Industrial Approval, and agreed to re-examine others[35] – suggesting that the Province is concerned about the potential contractual liability resulting from its efforts to effectively regulate Northern Pulp's operations.

Northern Pulp also refers explicitly to the Province's potential contractual liability in its Registration Document for the current EA. At section 1.0, it states as follows:

> At the date of Registration, the Province of Nova Scotia has made contributions to the cost planning and design of the project. The contributions may be off set against any future award Northern Pulp may be granted for damages against the Province in any respect due to early termination of the present [Boat Harbour Effluent Treatment Facility] lease.[36]

This statement speaks for itself, but Northern Pulp apparently contemplates a claim for damages for "early termination" of the Boat Harbour lease (which currently extends until 2030). Once again, it stands to reason that such a damages claim, and the Province's alleged liability, for early termination of the Boat Harbour lease will increase the longer the Mill stays idle.

Your position as a member of Cabinet creates a direct interest in upholding the Province's contractual obligations and/or minimizing the liability associated with any unavoidable contractual disputes and litigation. As a result, these extensive contractual relationships between the Province and Northern Pulp gives rise to a reasonable apprehension of bias in the context of the ongoing EA.

D. The Minister must recuse herself from the EA and delegate her authority to an independent and unbiased body

As a consequence of this apprehension of bias, the current EA process is void.[37] In addition, in your capacity as Minister of Environment you are disqualified from presiding over and making decisions under section 34 of the *Environment Act* in relation to the current EA. You are likewise disqualified from making decisions in relation to any future EA of Northern Pulp's proposed ETF.[38]

Accordingly, FONS respectfully requests that you recuse yourself from the EA and delegate your authority under section 34(1) of the *Environment Act* to an independent and unbiased body.

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[34] Letter from Ms. Terri Fraser, Technical Manager Northern Pulp Nova Scotia Corporation, to the Honourable Randy Delorey, Minister of Environment, 9 April 2015 [Appendix B, Tab 16].
[35] Letter from the Honourable Randy Delorey, Minister of Environment, to Ms. Terri Fraser, Technical Manager Northern Pulp Nova Scotia Corporation, 9 July 2015 [Appendix B, Tab 17].
[36] Northern Pulp Nova Scotia Corporation, *Environmental Assessment Registration Document: Replacement Effluent Treatment Facility,* 31 January 2019 at p 1.
[37] *Newfoundland Telephone, supra* note 8 at 645 [Appendix A, Tab 5].
[38] *Wewaykum, supra* note 7 at paras 69-73 [Appendix A, Tab 4].

FONS specifically asks that you delegate the EA to the Canadian Environmental Assessment Agency. This delegation is authorized by section 17 of the *Environment Act.*

We look forward to hearing from you on this important matter.

Sincerely,

Barrister & Solicitor

Barrister & Solicitor

Enclosures
Appendix A – Case Law, Tabs 1-5
Appendix B – Evidence, Tabs 1-17

ecojustice

APPENDIX A

Canadian Union of Public Employees (C.U.P.E.) v. Ontario (Minister of Labour), [2003] 1 S.C.R. 539

Supreme Court Reports

Supreme Court of Canada

Present: McLachlin C.J. and Gonthier, Iacobucci, Major, Bastarache, Binnie, Arbour, LeBel and Deschamps JJ.

Heard: October 8, 2002;

Judgment: May 16, 2003.

File No.: 28396.

[2003] 1 S.C.R. 539 | *[2003] 1 R.C.S. 539* | *[2003] S.C.J. No. 28* | *[2003] A.C.S. no 28* | *2003 SCC 29*

Minister of Labour for Ontario, appellant; v. Canadian Union of Public Employees and Service Employees International Union, respondents, and Canadian Bar Association and National Academy of Arbitrators (Canadian Region), interveners.

(209 paras.)

Case Summary

Appeal From:

ON APPEAL FROM THE COURT OF APPEAL FOR ONTARIO

Catchwords:

Labour relations — Hospital labour disputes — Appointment of board of arbitration — Legislation requiring disputes over collective agreements in hospitals and nursing homes to be resolved by compulsory arbitration — Minister of Labour appointing retired judges to chair arbitration boards — Whether Minister required to select arbitrators qualified by expertise and acceptance in labour relations community — Whether retired judges, as a class, biased against labour — Hospital Labour Disputes Arbitration Act, R.S.O. 1990, c. H.14, s. 6(5).

Catchwords:

Administrative law — Judicial review — Appointment of board of arbitration — Legislation requiring disputes over collective agreements in hospitals and nursing homes to be resolved by compulsory arbitration — Minister of Labour appointing retired judges to chair arbitration boards — Whether appointment process for selecting chairs of arbitration boards violates natural justice or infringes institutional independence [page540] and impartiality of arbitration boards — Whether appointment process breached legitimate expectations of unions — Whether appointments caused reasonable apprehension of bias — Whether Minister disqualified or required to delegate task of making appointments because of interest in arbitrations — Whether Minister's appointments patently unreasonable — Hospital Labour Disputes Arbitration Act, R.S.O. 1990, c. H.14, s. 6(5).

Summary:

Since 1965, Ontario's hospitals, nursing homes and their employees have been required to resolve disputes over

collective agreements by compulsory arbitration under the *Hospital Labour Disputes Arbitration Act* ("*HLDAA*"). If the parties cannot agree on a mutually acceptable arbitrator, a panel of three members is struck, two designated by the parties and the third chosen by the two designates or, if they fail to agree, appointed by the Minister of Labour. Amendments to the *Labour Relations Act* in 1979 facilitated the formation and use of a list of arbitrators with expertise acceptable to both management and the unions. A similar register of arbitrators was dropped from the *HLDAA* in 1980 but a normal practice was for senior officials of the Ministry of Labour, under delegated authority, to identify appropriate arbitrators. Following the 1995 provincial election, a reorganization of public sector institutions, including schools and hospitals, led to Bill 136. The Bill contained the proposed *Public Sector Dispute Resolution Act, 1997* which included a Dispute Resolution Commission. Organized labour opposed many aspects of the Bill, including the proposed commission. When the Minister announced a return to the sector-based system of appointing arbitrators, the unions believed the selection of *HLDAA* chairpersons would thereafter be limited to mutually agreed candidates.

In early 1998, the Minister appointed four retired judges to chair several arbitration boards. They were not appointed by mutual agreement nor were they on the "agreed" list compiled under s. 49(10) of the *Labour Relations Act, 1995*. The unions were not consulted. The President of the Ontario Federation of Labour complained to the Minister that the understanding about a return to the *status quo* had been breached without consultation. The unions objected that retired judges lack expertise, [page541] experience, tenure and independence from government. They also complained the Minister had breached procedural fairness by not delegating the task of making appointments to senior officials. The four judges initially appointed declined to act but other retired judges accepted the appointments. The unions sought declarations that the Minister's actions denied natural justice and lacked institutional independence and impartiality. The Divisional Court dismissed the application for judicial review. The Court of Appeal allowed the unions' appeal, concluding that the Minister had created a reasonable apprehension of bias and interfered with the independence and impartiality of the arbitrators, as well as defeating the legitimate expectation of the unions contrary to the requirements of natural justice. The Minister was ordered not to make any further appointments "unless such appointments are made from the long-standing and established roster of experienced labour relations arbitrators" compiled under s. 49(10) of the *Labour Relations Act, 1995*.

Held (McLachlin C.J. and Major and Bastarache JJ. dissenting): The appeal should be dismissed for reasons that differ somewhat from those of the Court of Appeal. The Minister is required, in the exercise of his power of appointment under s. 6(5) of the *HLDAA*, to be satisfied that prospective chairpersons are not only independent and impartial but possess appropriate labour relations expertise and are recognized in the labour relations community as generally acceptable to both management and labour.

Per Gonthier, Iacobucci, Binnie, Arbour, LeBel and Deschamps JJ.: The Minister, as a matter of law, was required to exercise his power of appointment in a manner consistent with the purpose and objects of the statute that conferred the power. A fundamental purpose and object of the *HLDAA* was to provide an adequate substitute for strikes and lock-outs. To achieve the statutory purpose, as the Minister himself wrote on February 2, 1998, "the parties must perceive the system as neutral and credible". This view was fully supported by the *HLDAA*'s legislative history.

The Minister was not required to proceed with the selection of chairpersons by way of "mutual agreement" or from the s. 49(10) roster. Nor were retired judges as a "class" reasonably seen as biased against labour. Nevertheless, the Minister was required by the *HLDAA*, properly interpreted, to select arbitrators from candidates [page542] who were qualified not only by their impartiality, but by their expertise and general acceptance in the labour relations community.

Section 6(5) of the *HLDAA* contemplates the appointment of "a person who is, in the opinion of the Minister, qualified to act". The Minister's discretion is constrained by the scheme and object of the Act as a whole, which is to create a "neutral and credible" substitute for the right to strike and lock-out. Labour arbitration has traditionally rested on a consensual basis, with the arbitrator chosen by the parties or being acceptable to both parties. Although the s. 6(5) power is expressed in broad terms, the Minister is nevertheless required, in the exercise of that power, to have regard to relevant labour relations expertise, independence, impartiality and general acceptability within the labour relations community. These criteria are neither vague nor uncertain. The livelihood of a significant group of professional labour arbitrators depends on their recognized ability to fulfill them. The

result is a perfectly manageable framework within which the legislature intended to give the Minister broad but not unlimited scope within which to make appointments in furtherance of the *HLDAA*'s object and purposes. The Minister, under the *HLDAA*, is not given a broad policy function. His narrow role is simply to substitute for the parties in naming a third arbitrator in case of their disagreement and, given the context, background and purpose of the Act, his rejection of labour relations expertise and general acceptability as relevant factors was patently unreasonable.

Although, as a member of Cabinet, the Minister was committed to public sector rationalization and had a perceived interest in the appointment process and the outcome of the arbitrations, the legislature specifically conferred the power of appointment on the Minister and, absent a constitutional challenge, clear and unequivocal statutory language conferring that authority prevailed over the common law rule against bias. The Minister's power to delegate the appointment process under s. 9.2(1) of the *HLDAA* was permissive only and to take away his authority to make his own choice would amount to a judicial amendment of the legislation.

The Minister satisfied any duty to consult with the unions about the change in the appointments process. [page543] There were extensive meetings during which the Minister signalled that the process was subject to reform and that retired judges were potential candidates for appointments. The unions made clear their opposition. Section 6(5) of the *HLDAA* did not impose on the Minister a procedural requirement to consult with the parties to each arbitration nor does the evidence establish a firm practice of appointing from a list or by mutual agreement. A general, ambiguous promise to continue an existing system subject to reform does not suffice under the doctrine of legitimate expectation to bind the Minister's exercise of his or her discretion.

The Court of Appeal had concluded that the Minister's approach tainted both the independence and impartiality of the *HLDAA* arbitration boards to which the retired judges had been appointed. This conclusion was not justified. The *HLDAA* commands the use of *ad hoc* arbitration boards. Such boards are not characterized by financial security or security of tenure beyond the life of the arbitration itself. The independence of arbitrators is guaranteed by training, experience and mutual acceptability. Since s. 6(5) requires the appointment of individuals qualified by training, experience and mutual acceptability, the proper exercise of the appointment power would lead to a tribunal which would satisfy reasonable concerns about institutional independence.

Impartiality raises different considerations. The Court of Appeal did not suggest that the retired judges were in fact biased or partial but concluded that they might reasonably be seen to be "inimical to the interests of labour, at least in the eyes of the appellants". The test, however, is not directed to the subjective perspective of one of the parties but to the reasonable, detached and informed observer. Retired judges as a class have no greater interest than other citizens in the outcome of the arbitrations and there are no substantial grounds to think they would do the bidding of the Minister or favour employers so as to improve the prospect of future appointments. A fully informed, reasonable person would not stigmatize retired judges, as a class, with an anti-labour bias. Allegations of individual bias must be dealt with on a case-by-case basis.

[page544]

The appropriate standard of review is patent unreasonableness. The pragmatic and functional approach applies to the judicial review of the exercise of a ministerial discretion and factors such as the existence of a privative clause, the Minister's expertise in labour relations, the nature of the question before the Minister and the wording of s. 6(5) all call for considerable deference. A patently unreasonable appointment is one whose defect is immediate, obvious and so flawed in terms of implementing the legislative intent that no amount of curial deference can justify letting it stand.

The appointments were not patently unreasonable simply because the Minister did not restrict himself to the s. 49(10) list of arbitrators. Some arbitrators on the list were unacceptable to the unions and some acceptable arbitrators were not on the list, confirming the reasonableness of the Minister's view that candidates could qualify without being on the list. However, in assessing whether the appointments were patently unreasonable, the courts are entitled to have regard to the importance of the factors the Minister altogether excluded from his consideration. In this case, the Minister expressly excluded relevant factors that went to the heart of the legislative scheme. The matters before the boards required the familiarity and expertise of a labour arbitrator. Expertise and neutrality foster general acceptability. Appointment of an inexpert and inexperienced chairperson who is not seen as generally acceptable in the labour relations community is a defect in approach that is both

immediate and obvious. Having regard to the legislative intent manifested in the *HLDAA*, the Minister's approach to the s. 6(5) appointments was patently unreasonable. The qualifications of specific appointees will have to be assessed on a case-by-case basis if challenged.

The appeal is thus dismissed on the limited ground that appointments that excluded from consideration labour relations expertise and general acceptability in the labour relations community were patently unreasonable.

Per McLachlin C.J. and Major and Bastarache JJ. (dissenting): The appropriate standard of review for the exercise of the Minister's appointment power under s. 6(5) of the *HLDAA* is patent unreasonableness. The pragmatic and functional approach focusses on the particular provision being invoked. The Minister exercised power under [page545] a single statute, his enabling legislation, and, absent a constitutional challenge, the patent unreasonableness standard need not make room for a review of statutory interpretation of enabling legislation on a correctness basis. There is no basis for dividing the Minister's decision into component questions subject to different standards of review, nor should the Minister's power be viewed as due less deference because it is circumscribed by legislation. Not every administrative action involves a distinct and identifiable exercise of statutory interpretation. Where, as here, the factors indicate that the question raised by the provision is one intended by the legislators to be left to the exclusive decision of the administrative decision maker, it simply is not one for the courts to make. The presence of a privative clause is compelling evidence that deference is due. The Minister knows more about labour relations than the courts and will be taken to have expertise. Deference is owed to expert decision makers designated by the legislature. The fact-based nature of the question before the Minister also points to deference and empowering the Minister, rather than an apolitical actor, suggests a legislative intent of political accountability.

The Minister did not make appointments that were patently unreasonable. A contextual approach to statutory interpretation of the enabling legislation is necessary for determining the criteria relevant to exercise of the discretion. In some cases, the criteria are spelled out in the legislation, regulations or guidelines or found in the specific purposes of the relevant Act. In others, the relevant factors may be unwritten and derived from the purpose and context of the statute. In this case, there are no relevant regulations, guidelines, or other instruments, and the statute does not say much. The Act stipulates that appointees must be qualified in the opinion of the Minister, expressly contemplating the importance of the Minister's opinion. Labour relations expertise, independence and impartiality, reflected in broad acceptability, are not necessarily dominant or obvious factors and should not be imposed as specific restrictions on the Minister's discretion. The Minister developed an opinion and determined that judging experience was a relevant qualification. The Act called for the Minister to reach his own opinion, not to consider a specific determining factor. Given how much work it takes to identify labour relations experience and broad acceptability as factors and to imply them into s. 6(5), weighing them less heavily than another unwritten qualification, namely judicial experience, does not vitiate the appointments as patently [page546] unreasonable. It takes significant searching or testing to find the alleged defect or even the factors said to constrain the Minister. It is therefore difficult to characterize the appointments as immediately or obviously defective, not in accordance with reason, clearly irrational, or so flawed that no amount of curial deference could justify letting them stand based on a failure to consider these factors. Recognition of the seriousness of quashing a decision as patently unreasonable is crucial to maintaining the discipline of judicial restraint and deference, and our intervention is not warranted in these circumstances.

Concerns about institutional independence and institutional impartiality do not render the Minister's appointments patently unreasonable. The Act requires that the tribunals be *ad hoc* and retired judges as a class cannot reasonably be seen as so partial that appointing them took the Minister outside the bounds of his statutory discretion. The possibility of a successful challenge to a particular board is not foreclosed but the constraints on the Minister's discretion do not permit a general inquiry into the independence and impartiality of the boards on the basis of the appointment process in the absence of a direct challenge to the boards actually appointed.

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By Binnie J.

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By Bastarache J. (dissenting)

Pushpanathan v. Canada (Minister of Citizenship and Immigration), *[1998] 1 S.C.R. 982*; Canadian Broadcasting Corp. v. Canada (Labour Relations Board), *[1995] 1 S.C.R. 157*; Padfield v. Minister of Agriculture, Fisheries and Food, [1968] A.C. 997; Roncarelli v. Duplessis, *[1959] S.C.R. 121*; Toronto Catholic District School Board v. Ontario English Catholic Teachers' Assn. (Toronto Elementary Unit) *(2001), 55 O.R. (3d) 737*, leave to appeal refused, [2002] 2 S.C.R. ix; Domtar Inc. v. Quebec (Commission d'appel en matière de lésions professionnelles), *[1993] 2 S.C.R. 756*; National Corn Growers Assn. v. Canada (Import Tribunal), *[1990] 2 S.C.R. 1324*; Canadian Union of Public Employees, Local 963 v. New Brunswick Liquor Corp., *[1979] 2 S.C.R. 227*; Pasiechnyk v. Saskatchewan (Workers' Compensation Board), *[1997] 2 S.C.R. 890*; Canada (Director of Investigation and Research) v. Southam Inc., *[1997] 1 S.C.R. 748*; Ivanhoe inc. v. UFCW, Local 500, [2001] 2 S.C.R. 566, *2001 SCC 47*; Ajax (Town) v. CAW, Local 222, *[2000] 1 S.C.R. 538*, *2000 SCC 23*; Suresh v. Canada (Minister of Citizenship and Immigration), *[2002] 1 S.C.R. 3*, *2002 SCC 1*; Mount Sinai Hospital Center v. Quebec (Minister of Health and Social Services), *[2001] 2 S.C.R. 281*, *2001 SCC 41*; Pezim v. British Columbia (Superintendent of Brokers), *[1994] 2 S.C.R. 557*; Bell Canada v. Canada (Canadian Radio-Television and Telecommunications Commission), *[1989] 1 S.C.R. 1722*;

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History and Disposition:

APPEAL from a judgment of the Ontario Court of Appeal *(2000), 51 O.R. (3d) 417*, *194 D.L.R. (4th) 265*, *138 O.A.C. 256*, *26 Admin. L.R. (3d) 55*, *5 C.C.E.L. (3d) 8*, *[2000] O.J. No. 4361* (QL), allowing an appeal from a judgment of the Divisional Court *(1999), 117 O.A.C. 340*, *[1999] O.J. No. 358* [page550] (QL). Appeal dismissed, McLachlin C.J. and Major and Bastarache JJ. dissenting.

Counsel

Leslie McIntosh, for the appellant.

Howard Goldblatt, Steven Barrett and Vanessa Payne, for the respondents.

J. Gregory Richards, Jeff G. Cowan and Susan Philpott, for the intervener the Canadian Bar Association.

Michel G. Picher and Barbara A. McIsaac, Q.C., for the intervener the National Academy of Arbitrators (Canadian Region).

The reasons of McLachlin C.J. and Major and Bastarche JJ. were delivered by

BASTARACHE J. (dissenting)

1 I adopt Binnie J.'s recital of the facts and judicial history. In my view, however, the Minister of Labour ("Minister") did not make appointments that were patently unreasonable. In reaching that decision, I would adopt a somewhat different approach to that of Binnie J. with regard to judicial review for abuse of discretion. I also object to Binnie J.'s conclusion that the impartiality and independence of boards can be challenged on the sole basis of the appointment process without any direct attack on a board actually constituted.

2 With regard to judicial review for abuse of discretion, as I shall explain, the balance of factors in this case

labour relations community as widely acceptable to both unions and management by reason of his or her independence, neutrality and proven expertise.

112 I do not consider these criteria to be vague or uncertain. The practice of labour relations in this country has developed into a highly sophisticated business. The livelihood of a significant group of professional labour arbitrators depends on their recognized ability to fulfill these criteria. Some of them not only enjoy national reputations for their skills in resolving industrial conflicts but are retired judges. From the Minister's perspective, there exists not only a large pool of recognized candidates, but the *HLDAA* allows generous latitude to his selection (i.e., a candidate "who is, in the opinion of the Minister, qualified"). The result is a perfectly manageable framework within which the legislature intended to give the Minister broad but not unlimited scope within which to make appointments in furtherance of the *HLDAA*'s object and purposes.

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(2) Procedural Fairness

113 Under this heading, I group the challenges to the Minister's impartiality, the allegation that he violated procedural fairness by allegedly changing the "system" of appointments without prior consultation, and his alleged violation of the doctrine of legitimate expectation.

(a) *Was the Minister Impartial in the Exercise of the Power of Appointment?*

114 The unions say the Minister could not, as a member of a cost-cutting government, make the appointments impartially. He was therefore disqualified and ought to have delegated the appointments to senior officials.

115 The Minister says that he is not responsible for health costs or hospital administration. He is, however, a member of Cabinet and committed to government policy which, in 1997, included public sector "rationalization" and pay restraint. He was elected on a platform called "the Common Sense Revolution" and people would reasonably think he was committed to carrying it out.

116 The Ontario Court of Appeal concluded that the Minister had a "significant and direct interest" in the outcome of the arbitral awards (para. 21). As Austin J.A. pointed out, "[a]pproximately 75 per cent to 80 per cent of hospital budgets relate to labour costs and the government's primary method for controlling expenditures is wage control. Although nursing homes have sources of income that are not available to hospitals, they too are substantially dependent upon the government for funding" (para. 21). The Minister's response is that here, unlike in cases such as *MacBain v. Lederman*, [1985] 1 F.C. 856 (C.A.), at pp. 869-71 and 884, neither he nor his government was a party to hospital sector arbitral proceedings. In the *MacBain* case, the Canadian Human Rights Commission appointed the members of the *ad hoc* tribunal to adjudicate the very dispute between the Commission and the person complained about. The Minister argues that his interest in hospital finance [page598] is not "directly at stake" (*Canadian Pacific Ltd. v. Matsqui Indian Band*, [1995] 1 S.C.R. 3, at para. 100) and "too attenuated and remote to give rise to a reasonable apprehension of bias" (*Pearlman v. Manitoba Law Society Judicial Committee*, [1991] 2 S.C.R. 869, at p. 891). The local hospital boards could absorb higher unit labour costs by reducing services, thus keeping public funding requirements more or less constant. This approach, I think, is unrealistic. It underestimates the Minister's collective responsibility with his colleagues at a time of pitched confrontation with the unions over reductions in public sector staffing and financing. At the very least, there was an appearance that he had a significant interest in outcomes as well as process.

117 The legal answer to this branch of the unions' argument, however, is that the legislature specifically conferred the power of appointment on the Minister. Absent a constitutional challenge, a statutory regime expressed in clear and unequivocal language on this specific point prevails over common law principles of natural justice, as recently affirmed by this Court in *Ocean Port Hotel, supra*. In that case, the members of the provincial liquor licensing appeal board, who were empowered to impose penalties on liquor licences for non-compliance with the Act, were

Committee for Justice and Liberty v. Canada (National Energy Board), [1978] 1 S.C.R. 369

Supreme Court Reports

Supreme Court of Canada

Present: Laskin C.J. and Martland, Judson, Ritchie, Spence, Pigeon, Dickson and de Grandpré JJ.

1976: March 8, 9 and 10 / 1976: March 11.

[1978] 1 S.C.R. 369 | *[1978] 1 R.C.S. 369*

IN THE MATTER OF the National Energy Board Act; AND IN THE MATTER OF an application by Canadian Arctic Gas Pipeline Limited for a certificate of public convenience and necessity for the construction and operation of a natural gas pipeline, under File No. 1555-C46-1; AND IN THE MATTER OF applications by Foothills Pipe Lines Ltd., Westcoast Transmission Company Limited and The Alberta Gas Trunk Line (Canada) Limited for certificates of public convenience and necessity for the construction and operation of certain natural gas pipelines, under File Nos. 1555-F2-3, 1555-W5-49 and 1555-A34-1; AND IN THE MATTER OF an application by Alberta Natural Gas Company Ltd. for a certificate of public convenience and necessity for the construction and operation of certain extensions to its natural gas pipeline, under File No. 1555-A2-10; AND IN THE MATTER OF a submission by The Alberta Gas Trunk Line Company Limited, under File No. 1555-AS-2; AND IN THE MATTER OF an application by the National Energy Board pursuant to section 28(4) of the Federal Court Act. The Committee for Justice and Liberty, The Consumers' Association of Canada, Canadian Arctic Resources Committee, Appellants; and The National Energy Board, Canadian Arctic Gas Pipeline Limited and The Attorney General of Canada et al., Respondents.

ON APPEAL FROM THE FEDERAL COURT OF APPEAL

Case Summary

Administrative law — Judicial review — Boards and tribunals — Natural justice — Bias or apprehended bias — Application for certificate of public necessity — National Energy Board Act, R.S.C. 1970. c. N-6, s. 44

The issue in this appeal arose in connection with the organization of hearings by the National Energy Board to consider competing applications for a Mackenzie Valley pipeline, i.e. applications for a certificate of public convenience and necessity under s. 44 of the National Energy Board Act, R.S.C. 1970, c. N-6. The Board assigned Mr. Crowe, Chairman of the Board, and two other of its members to be the panel to hear the applications. The appellants were recognised by the Board as "interested persons" under s. 45 of the Act. The appellants objected to the participation of Mr. Crowe as a member of the panel because of reasonable apprehension or reasonable likelihood of bias: Mr. Crowe became Chairman and Chief Executive Officer of the National Energy Board on October, 15, 1973. Immediately prior to that date he was president of the Canada Development Corporation, having assumed the position late in 1971 after first having been a provisional director following the enactment of the Canada Development Corporation Act, 1971 (Can.), c. 49. The objects of that Corporation included assisting in business and economic development and investing in shared securities, ventures, enterprises and property to that end. As Corporation president and as its representative Mr. Crowe was associated with the Gas Arctic-Northwest Project Study Group which considered the physical and economic feasibility of a northern natural gas pipeline to bring natural gas to southern markets. The Agreement setting up the Study Group brought together two groups of companies which merged their efforts and pursuant to the agreement set up two companies of which Canadian Arctic Gas Pipeline Limited was one. Mr. Crowe was an active participant in the Study Group as a member of the Management Committee and a member and subsequently vice-chairman of its Finance, tax and accounting committee and during his period of membership

of the Management Committee he participated in the seven meetings held during that time, and joined in a unanimous decision of the Committee on June 27, 1973, respecting the ownership and routing of a Mackenzie Valley pipeline. The Canada Development Corporation remained a full participant in the Study Group until long after the applications were made for certificates of public convenience and necessity and until after the hearings had commenced, in effect to the time of the reference of the question of reasonable apprehension of bias in Mr. Crowe to the Federal Court of Appeal. Further, during the period of Mr. Crowe's association with the Study Group as the representative of the Canada Development Corporation the latter contributed $1,200,000 to the Study Group as its share of expenses. The National Energy Board referred to the Federal Court of Appeal the following question, "Would the Board err in rejecting the objection and in holding that Mr. Crowe was not disqualified from being a member of the panel on grounds of reasonable apprehension or reasonable likelihood of bias?" pursuant to the Federal Court Act, 1970-71-72 (Can.), c. 1, s. 28(4). That Court answered in the negative.

Held (Martland, Judson and de Grandpré JJ. dissenting: The appeal should be allowed.

Per Laskin C.J. and Ritchie, Spence, Pigeon and Dickson JJ.: In dealing with applications under s. 44 of the National Energy Board Act, the function of the pro Board is quasi-judicial, or, at least, is a function which the Board must discharge in accordance with the rules of natural justice: and if not necessarily the full range of such rules as would apply to a Court (though the Board is a court of record under s. 10 of the Act) certainly to a degree that would reflect integrity of its proceedings and impartiality in the conduct of those proceedings. A reasonable apprehension of bias arises where there exists a reasonable probability that the judge might not act in an entirely impartial manner. The issue in this situation was not one of actual bias. Thus the facts that Mr. Crowe had nothing to gain or lose either through his participation in the Study Group or in making decisions as chairman of the National Energy Board and that his participation in the Study Group was in a representative capacity became irrelevant. The participation of Mr. Crowe in the discussions and decisions leading to the application by Canadian Arctic Gas Pipeline Limited for a certificate did however give rise to a reasonable apprehension, which reasonably well-informed persons could properly have, of a biased appraisal and judgment of the issues to be determined. The test of probability or reasoned suspicion of bias, unintended though the bias may be, is grounded in the concern that there be no lack of public confidence in the impartiality of adjudicative agencies, and emphasis is added to this concern in this case by the fact that the Board is to have regard for the public interest.

Per Martland, Judson and de Grandpré JJ. dissenting: The proper test to be applied was correctly expressed by the Court of Appeal. The apprehension of bias must be a reasonable one, held by reasonable and right minded persons, applying themselves to the question and obtaining thereon the required information, the test of "what would an informed person, viewing the matter realistically and practically--conclude?" There is no real difference between the expression found in the decided cases "reasonable apprehension of bias", "reasonable suspicion of bias" or "real likelihood of bias" but the grounds for the apprehension must be substantial. The question of bias in a member of a court of justice cannot be examined in the same light as that in a member of an administrative tribunal entrusted with an administrative discretion. While the basic principle that natural justice must be rendered is the same its application must take into account the special circumstances of the tribunal. By its nature the National Energy Board must be staffed with persons of experience and expertise. The considerations which underlie its operations are policy oriented. The basic principle in matters of bias must be applied in the light of the circumstances of the case a bar. The Board is not a court nor is it a quasi-judicial body. In hearing the objection of interested parties and in performing its statutory function the Board has the duty to establish a balance between the administration of policies which they are duty bound to apply and the protection of the various interests spelled out in s. 44 of the Act. In reaching its decision the Board draws upon its experience, upon that of its own experts and upon that of all agencies of the Government of Canada. The Board is not and cannot be limited to deciding the matter on the sole basis of the representations made before it. In the circumstances of the case the Court of Appeal rightly concluded that no reasonable apprehension of bias by reasonable, right minded and informed persons exists.

Cases Cited

[Ghirardosi v. Minister of Highways for British Columbia, *[1966] S.C.R. 367*; Blanchette v. C.I.S. Ltd., *[1973] S.C.R. 833*; Szilard v. Szasz, [1955] S.C.R. referred to].

APPEAL from a judgment of the Federal Court of Appeal [*[1976] 2 F.C. 20*] which answered in the negative a question referred to it by the National Energy Board. Appeal allowed, Martland, Judson, and de Grandpré JJ. dissenting.

LASKIN C.J.:— On March 11, 1976, this Court gave judgment in an appeal from a decision of the Federal Court of Appeal which answered in the negative a question referred to it by the National Energy Board pursuant to s. 28(4) of the Federal Court Act, 1970-71-72 (Can.), c. 1. The question so referred was as follows:

Would the Board err in rejecting the objections and in holding that Mr. [Marshall] Crowe was not disqualified from being a member of the panel on grounds of reasonable apprehension or reasonable likelihood of bias?

This Court allowed the appeal, set aside the decision of the Federal Court of Appeal and declared that the question should be answered in the affirmative. It stated in its formal judgment on March 11, 1976 that reasons of the majority and dissenting judges would be delivered later. The reasons of the majority now follow.

The issue referred to the Federal Court of Appeal and which came by leave to this Court arose in connection with the organization of hearings by the National Energy Board to consider competing applications for a Mackenzie Valley pipeline, that is, applications for a certificate of public convenience and necessity under s. 44 of the National Energy Board Act, R.S.C. 1970, c. N-6. One of the applications, filed on March 21, 1974 by Canadian Arctic Gas Pipeline Limited was in respect of a proposed natural gas pipeline and associated works to move natural gas in an area of the Northwest Territories (the Mackenzie River Delta and Beaufort Basin) to markets in southern Canada and also to move natural gas in Alaska markets in other states of the United States. This application was supplemented by other material filed on January 23, 1975, on March 10, 1975 and on May 8, 1975. The competing application, filed in March, 1975 by Foothills Pipe Lines Ltd., was for a natural gas pipeline to move natural gas only from the area in the Northwest Territories, mentioned above, to southern Canada markets and not from Alaska as well.

On April 17, 1975, the National Energy Board assigned Mr. Crowe, Chairman of the Board and two other members (of the eight members in all who then constituted the Board) to be the panel with Mr. Crowe presiding, to hear the applications, beginning on October 27, 1975. Under s. 45 of its governing statute the Board was empowered to give standing at its s. 44 hearings to "interested persons", and it was then obliged to hear the objections to the granting of a certificate of public convenience and necessity. The three appellants in this case, The Committee for Justice and Liberty Foundation, The Consumers' Association of Canada and the Canadian Arctic Resources Committee were recognized by the Board as "interested persons" as were other organizations and individuals. In all, some 88 parties were represented at the commencement of the hearings, and of these 80 indicated that they had no objection to Mr. Crowe continuing as a member and presiding over the hearings. One of the non-objectors was Canadian Arctic Gas Pipeline Limited, one of the applicants for a certificate. It was its counsel who raised on July 9, 1975 the question of reasonable apprehension of bias on Mr. Crowe's part in favour of the client by reason of Mr. Crowe's association with a Study Group out of whose deliberations and decisions the applicant was born.

When the hearings opened on October 27, 1975 as scheduled, Mr. Crowe read a statement detailing his involvement with the Study Group. Objections were then invited. In the result, the question mentioned at the beginning of the reasons was referred to the Federal Court of Appeal on October 29, 1975. I turn now to deal with the facts upon which the issue of reasonable apprehension of bias is raised.

Mr. Marshall Crowe became Chairman of the National Energy Board and its Chief Executive Officer on October 15,

hearings.

What must be kept in mind here is that we are concerned with a s. 44 application in respect of which, in my opinion, the Board's function is quasi-judicial or, at least, is a function which it must discharge in accordance with rules of natural justice, not necessarily the full range of such rules that would apply to a Court (although I note that the Board is a court of record under s. 10 of its Act) but certainly to a degree that would reflect integrity of its proceedings and impartiality in the conduct of those proceedings. This is not, however, a prescription that would govern an inquiry under ss. 14(2) and 22.

I am of the opinion that the only issue here is whether the principle of reasonable apprehension or reasonable likelihood of bias applies to the Board in respect of hearings under s. 44. If it does apply--and this was accepted by all the respondents--then, on the facts herein, I can see no answer to the position of the appellants.

Before setting out the basis of this conclusion I wish to reiterate what was said in the Federal Court of Appeal and freely conceded by the appellants, namely, that no question of personal or financial or proprietary interest, such as to give rise to an allegation of actual bias, is raised against Mr. Crowe. The Federal Court of Appeal founded its conclusion against disqualification on the following statement of principle:

It is true that all of the circumstances of the case, including the decisions in which Mr. Crowe participated as a member of the study group, might give rise in a very sensitive or scrupulous conscience to the suspicion that he might be unconsciously biased, and therefore should not serve. But that is not, we think, the test to apply in this case. It is, rather, what would an informed person, viewing the matter realistically and practically--and having thought the matter through-- conclude. Would he think that it is more likely than not that Mr. Crowe, whether consciously or unconsciously, would not decide fairly.

This was followed by an encompassing factual conclusion which was as follows:

On the totality of the facts, which have been described only in skeletal form, we are all of the opinion that they should not cause reasonable and right minded persons to have a reasonable apprehension of bias on the part of Mr. Crowe, either on the question of whether present or future public convenience and necessity require a pipe-line or the question of which, if any, of the several applicants should be granted a certificate.

The Federal Court of Appeal supported this factual conclusion by emphasizing that Mr. Crowe participated in the Study Group as merely a representative, that he had nothing to gain or lose by his participation or by any decision he might reach in the course of his duties as chairman of the National Energy Board in connection with the applications that were before it. I do not think that Mr. Crowe's representative capacity is a material consideration on the issue in question here, any more than representative capacity would be a material consideration if the president or chairman of one of the other participants in the Study Group had been appointed chairman of the National Energy Board and had then proceeded to sit on an application which he had a hand in fashioning, albeit he was divorced from the Study Group at the time the application was filed. Mr. Crowe was not a mere cipher, carrying messages from the board of directors of the Canada Development Corporation and having no initiative or flexibility in the manner and degree of his participation in the work of the Study Group. Nowhere in the Study Group Agreement nor in the minutes of proceedings of the Management Committee is there any indication that the representatives came to the meetings with fixed instructions from which they could not depart without a reference back. The nature of the exercise carried on under the Study Group Agreement required the representatives to apply their own judgment and their own talents to the joint project, with of course concern for the interests of the companies that they represented and subject, of course, to such directions as the companies might give. Since the representatives were all high officials of the companies, they had latitude in their participation that would not have been open to a junior employee.

Nor do I think that anything turns in this case on the fact that Mr. Crowe (according to the Federal Court of Appeal) had nothing to gain or lose either through his participation in the Study Group or in making decisions as chairman of the National Energy Board. The Federal Court of Appeal appears here to have moved over into the area of actual bias and that is not an issue.

The additional factor which underlay the Federal Court of Appeal's factual conclusion is, in its own words, as

NOVA SCOTIA COURT OF APPEAL

Citation: *Nova Scotia (Attorney General) v. MacLean*, 2017 NSCA 24

Date: 20170317
Docket: CA 454541
Registry: Halifax

2017 NSCA 24 (CanLII)

Between:

The Attorney General of Nova Scotia
representing Her Majesty the Queen in Right
of the Province of Nova Scotia (including the Minister
of Community Services and the Minister of Health and Wellness)

Appellant

v.

Beth MacLean, Olga Cain on behalf of Sheila
Livingstone, Susan Lattie on behalf of Joseph
Delaney, Disability Rights Coalition,
J. Walter Thompson, Q.C., in his capacity as
Nova Scotia Human Rights Board of Inquiry
Chair, and The Nova Scotia Human Rights Commission

Respondents

Judge:	The Honourable Mr. Justice Jamie W.S. Saunders
Appeal Heard:	November 28, 2017, in Halifax, Nova Scotia
Subject:	**Human Rights Act, R.S.N.S. 1989, c.214. Board of Inquiry. Reasonable Apprehension of Bias. Standard of Review. Prematurity. Legal Principles to be Applied Whenever Considering a Complaint of Apparent, or Actual, Bias. Costs.**
Summary:	During the course of a Board of Inquiry established to consider a complaint under the *Human Rights Act*, R.S.N.S. 1989, c. 214, it came to light that 15 years earlier the Board

Chair had written two letters concerning matters said to be similar to the issues raised in the complaint. The Attorney General of Nova Scotia moved to have the Chair recuse himself on the basis that the impugned correspondence raised a reasonable apprehension of bias.
After a hearing, the Chair ruled that the letters he had written did not give rise to a reasonable apprehension of bias, and he dismissed the motion.
The Attorney General appealed that ruling to this Court, asking that we allow the appeal and order the Chair to recuse himself from any further consideration of the complaint.

Held: Appeal dismissed. This human rights complaint actually consists of four separate complaints alleging discrimination by the Province against the complainants because of the "combined effect" of their mental disabilities and their reliance upon social assistance. They say they have been forced to live in institutions with large groups of people and been denied the opportunity to integrate and participate in supportive, community-based housing. They allege that this "prolonged detention" has caused lasting harm to their mental and physical health and socialization skills, preventing them from realizing their full potential as contributing members of society. They say that by not providing them with their preferred choice of housing in locations of their choosing, the Province has violated their rights under the *Act*. They claim entitlement to the kinds of help and professional supports available to others, in order to live in the community.
The appellant was right to bring a motion to challenge the Board's jurisdiction on the basis that a reasonable apprehension of bias existed. On this record, raising the issue was certainly justified and a thorough review of the allegation was warranted.
The Commission argued that this Court ought to decline to consider the issue, on the grounds that it is premature, and that the Board ought to be able to complete its inquiry, following which – should it be necessary – an allegation that a reasonable apprehension of bias exists, could be included as a ground of appeal, were an appeal commenced. Ordinarily, this Court is reluctant to entertain appeals from interim or interlocutory rulings in the course of a proceeding, except

2017 NSCA 24 (CanLII)

where a departure from that norm would be appropriate. This is such a case. It would be a colossal waste of time to refuse to deal with the allegation of apparent bias now, thus permitting the Board to complete its hearings and deliberations; yet at the end of all of that risking the possibility that if the Board's decision were appealed, a ground of appeal months (or years) later would likely raise the very same allegation.

After considering the record and counsels' able submissions, the appeal is dismissed. The Attorney General has failed to displace the presumption of impartiality by offering cogent evidence that would establish a reasonable apprehension of bias in this case. The Chair's earlier writings do not demonstrate that his duty to remain impartial has been compromised. Rather, the record confirms that the Chair remains open to deciding the issues impartially and upon the evidence that will be adduced at the hearing, not on any pre-determined views favoring one side or the other.

2017 NSCA 24 (CanLII)

This information sheet does not form part of the court's judgment. Quotes must be from the judgment, not this cover sheet. The full court judgment consists of 31 pages.

NOVA SCOTIA COURT OF APPEAL

Citation: *Nova Scotia (Attorney General) v. MacLean*, 2017 NSCA 24

Date: 20170317
Docket: CA 454541
Registry: Halifax

Between:

The Attorney General of Nova Scotia
representing Her Majesty the Queen in Right
of the Province of Nova Scotia (including the Minister
of Community Services and the Minister of Health and Wellness)

Appellant

v.

Beth MacLean, Olga Cain on behalf of Sheila Livingstone, Susan Lattie on behalf of Joseph Delaney, Disability Rights Coalition, J. Walter Thompson, Q.C., in his capacity as Nova Scotia Human Rights Board of Inquiry Chair, and The Nova Scotia Human Rights Commission

Respondents

2017 NSCA 24 (CanLII)

Judges:	Bryson, Saunders and Bourgeois, JJ.A.
Appeal Heard:	November 28, 2016, in Halifax, Nova Scotia
Held:	Appeal dismissed per reasons for judgment of Saunders, J.A.; Bryson and Bourgeois, JJ.A. concurring.
Counsel:	Dorianne Mullin, for the appellant Vincent Calderhead and Charlene Moore, for the respondents, Beth MacLean, Olga Cain and Susan Lattie Dianne Pothier, Claire McNeil and Donna Franey, for the respondent, Disability Rights Coalition Jason T. Cooke and Jennifer Keliher, for the respondent, Nova Scotia Human Rights Commission

[39] First, as a matter of law, there is a strong presumption of judicial impartiality, which is not easily displaced. Second, there is a heavy burden of proof upon the person making the allegation to present cogent evidence establishing "serious grounds" sufficient to justify a finding that the decision-maker should be disqualified on account of bias. Third, whether a reasonable apprehension of bias exists is "highly fact-specific". Such an inquiry is one where the context, and the particular circumstances, are of supreme importance. The allegation can only be addressed carefully in light of the entire context. There are no shortcuts. See *Wewaykum Indian Band v. Canada*, 2003 SCC 45.

2017 NSCA 24 (CanLII)

[40] The "test" regarding what constitutes a reasonable apprehension of bias appears in the oft-quoted dissenting judgment of de Grandpré, J. in *Committee for Justice and Liberty v. National Energy Board*, [1978] 1 S.C.R. 369 at ¶40:

> …the apprehension of bias must be a reasonable one, held by reasonable and right minded persons, applying themselves to the question and obtaining thereon the required information, that test is "what would an informed person, viewing the matter realistically and practically— …conclude? Would he think that it is more likely than not that Mr. Crowe, whether consciously or unconsciously, would not decide fairly.

[41] In relation to what constitutes the "reasonable person", the qualifications are not limited to just being "reasonable". The law requires a fully *informed* "reasonable person". That is:

> …a person who approaches the question of whether there exists a reasonable apprehension of bias with a complex and contextualized understanding of the issues in the case. The reasonable person understands the impossibility of judicial neutrality, but demands judicial impartiality.

[*R. v. S.(R.D.)(R.D.S.)*, [1997] 3 S.C.R. 484]

[42] In that case, the Supreme Court of Canada explained in detail the requirement for neutrality in decision-making, and how the duty to be impartial did not oblige judges to have no sympathies or opinions at all, but rather to ensure that they were receptive to other points of view. In his reasons, Justice Cory (joined by Justice Iacobucci, said at ¶119:

> 119 The requirement for neutrality does not require judges to discount the very life experiences that may so well qualify them to preside over disputes. It has been observed that the duty to be impartial

Roy Anthony Roberts, C. Aubrey Roberts and John Henderson, suing on their own behalf and on behalf of all other members of the Wewaykum Indian Band (also known as the Campbell River Indian Band) *Appellants*

v.

Her Majesty The Queen *Respondent*

and

Ralph Dick, Daniel Billy, Elmer Dick, Stephen Assu and James D. Wilson, suing on their own behalf and on behalf of all other members of the Wewaikai Indian Band (also known as the Cape Mudge Indian Band) *Respondents/Appellants*

and between

Ralph Dick, Daniel Billy, Elmer Dick, Stephen Assu, Godfrey Price, Allen Chickite and Lloyd Chickite, suing on their own behalf and on behalf of all other members of the Wewaikai Indian Band (also known as the Cape Mudge Indian Band) *Appellants*

v.

Her Majesty The Queen *Respondent*

and

Attorney General of Ontario, Attorney General of British Columbia, Gitanmaax Indian Band, Kispiox Indian Band and Glen Vowell Indian Band *Interveners*

INDEXED AS: WEWAYKUM INDIAN BAND *v.* CANADA

Roy Anthony Roberts, C. Aubrey Roberts et John Henderson, poursuivant en leur nom et au nom de tous les autres membres de la Bande indienne Wewaykum (également connue sous le nom de Bande indienne de Campbell River) *Appelants*

c.

Sa Majesté la Reine *Intimée*

et

Ralph Dick, Daniel Billy, Elmer Dick, Stephen Assu et James D. Wilson, poursuivant en leur nom et au nom de tous les autres membres de la Bande indienne Wewaikai (également connue sous le nom de Bande indienne de Cape Mudge) *Intimés/Appelants*

et entre

Ralph Dick, Daniel Billy, Elmer Dick, Stephen Assu, Godfrey Price, Allen Chickite et Lloyd Chickite, poursuivant en leur nom et au nom de tous les autres membres de la Bande indienne Wewaikai (également connue sous le nom de Bande indienne de Cape Mudge) *Appelants*

c.

Sa Majesté la Reine *Intimée*

et

Procureur général de l'Ontario, procureur général de la Colombie-Britannique, Bande indienne Gitanmaax, Bande indienne Kispiox et Bande indienne de Glen Vowell *Intervenants*

RÉPERTORIÉ : BANDE INDIENNE WEWAYKUM *c.* CANADA

Neutral citation: 2003 SCC 45.

File No.: 27641.

2003: June 23; 2003: September 26.

Present: McLachlin C.J. and Gonthier, Iacobucci, Major, Bastarache, Arbour, LeBel and Deschamps JJ.

MOTION FOR DIRECTIONS

MOTIONS TO VACATE A JUDGMENT

Courts — Judges — Impartiality — Reasonable apprehension of bias — Supreme Court judgment dismissing Indian bands' appeals — Indian bands presenting motions to set aside judgment alleging reasonable apprehension of bias arising from involvement of judge in bands' claims while serving as federal Associate Deputy Minister of Justice over 15 years prior to hearing of appeals — Whether judgment tainted by reasonable apprehension of bias — Whether judgment should be set aside.

In 1985 and 1989 respectively, the Campbell River Band and the Cape Mudge Band instituted legal proceedings against each other and the Crown, each band claiming exclusive entitlement to two reserves on Vancouver Island. In 1995, the Federal Court, Trial Division dismissed the actions and the Federal Court of Appeal upheld the decision. In December 2002, in reasons written by Binnie J. and concurred in unanimously, this Court dismissed the bands' appeals. In February 2003, the Campbell River Band made an access to information request to the federal Department of Justice seeking copies of all records to, from or which make reference to Mr. Binnie concerning the bands' claims against the Crown Mr. Binnie, when he was Associate Deputy Minister of Justice in 1982-1986, had been responsible for all litigation, except tax matters and cases in Quebec, involving the Government of Canada and had supervisory authority over thousands of cases. The Department of Justice found a number of internal memoranda which indicate that, in late 1985 and early 1986, Mr. Binnie had received some information concerning the Campbell River Band's claim and that he had attended a meeting where the claim was discussed. The Crown filed a motion in this Court seeking directions as to any steps to be taken. Binnie J. recused himself from any further proceedings in this matter and filed a statement setting out that he had no recollection of personal involvement in the case. The bands sought an order setting aside this Court's judgment. Both bands agree that actual bias is not at issue and accept Binnie J.'s statement that he had no

Référence neutre : 2003 CSC 45.

Nº du greffe : 27641.

2003 : 23 juin; 2003 : 26 septembre.

Présents : La juge en chef McLachlin et les juges Gonthier, Iacobucci, Major, Bastarache, Arbour, LeBel et Deschamps.

REQUÊTE SOLLICITANT DES DIRECTIVES

REQUÊTES EN ANNULATION DE JUGEMENT

Tribunaux — Juges — Impartialité — Crainte raisonnable de partialité — Pourvois de bandes indiennes rejetés par la Cour suprême — Présentation par les bandes indiennes de requêtes en annulation du jugement fondée sur la crainte raisonnable de partialité qui découlerait du rôle joué par un juge dans les demandes des bandes en tant que sous-ministre adjoint de la Justice plus de 15 ans avant l'audition des appels — Le jugement est-il entaché d'une crainte raisonnable de partialité? — Y a-t-il lieu d'annuler le jugement?

En 1985 et 1989 respectivement, la bande de Campbell River et la bande de Cape Mudge ont intenté une action en justice, chacune poursuivant l'autre ainsi que la Couronne et revendiquant le droit exclusif à deux réserves situées dans l'île de Vancouver. En 1995, la section de première instance de la Cour fédérale a rejeté les actions et la Cour d'appel fédérale a confirmé cette décision. En décembre 2002, notre Cour a rejeté les pourvois des bandes dans des motifs exposés par le juge Binnie, auxquels ont souscrit tous les autres juges de la Cour. En février 2003, la bande de Campbell River a présenté au ministère de la Justice une demande d'accès à l'information dans laquelle elle sollicitait des copies de tous les documents qui soit avaient été expédiées à M. Binnie, soit émanaient de ce dernier ou encore faisaient mention de lui et qui se rapportaient aux demandes présentées contre le gouvernement fédéral par les bandes. Lorsqu'il a occupé le poste de sous-ministre adjoint de la Justice, de 1982 à 1986, M. Binnie était responsable de tous les litiges auxquels était partie le gouvernement fédéral, sauf les affaires fiscales et celles se déroulant au Québec, et il supervisait des milliers de dossiers. Le ministère de la Justice a trouvé un certain nombre de notes de service internes qui indiquent que, à la fin de 1985 et au début de 1986, M. Binnie a reçu certains renseignements concernant la demande de la bande de Campbell River et a assisté à une réunion au cours de laquelle cette demande a été discutée. La Couronne a présenté à notre Cour une requête sollicitant des directives quant aux mesures qui pourraient devoir être prises. Le juge Binnie s'est

recollection of personal involvement in the case. However, they allege that Binnie J.'s involvement as federal Associate Deputy Minister of Justice in the early stages of the Campbell River Band's claim in 1985 and 1986 gives rise to a reasonable apprehension of bias.

Held: The motion for directions and the motions to vacate a judgment should be dismissed. In the circumstances of this case, no reasonable apprehension of bias is established and hence Binnie J. was not disqualified from hearing the appeals or participating in the judgment.

Public confidence in our legal system is rooted in the fundamental belief that those who adjudicate in law must always do so without bias or prejudice and must be perceived to do so. A judge's impartiality is presumed and a party arguing for disqualification must establish that the circumstances justify a finding that the judge must be disqualified. The criterion of disqualification is the reasonable apprehension of bias. The question is what would an informed, reasonable and right-minded person, viewing the matter realistically and practically, and having thought the matter through, conclude. Would he think that it is more likely than not that the judge, whether consciously or unconsciously, would not decide fairly?

It is necessary to clarify the relationship of this objective standard to two other factors: the subjective consideration of actual bias and the notion of automatic disqualification. Most arguments for disqualification are not based on actual bias. When parties say that there was no actual bias on the part of a judge, it can mean one of three things: (1) that reasonable apprehension is a surrogate for actual bias; (2) that unconscious bias can exist even where the judge acted in good faith; and (3) that looking for real bias is simply not the relevant inquiry since justice should not only be done but must be seen to be done. This third justification for the objective standard of reasonable apprehension of bias envisions the possibility that a judge may be totally impartial in circumstances which nevertheless create a reasonable apprehension of bias, requiring his disqualification. The idea that "justice must be seen to be done" cannot be severed from the

récusé à l'égard de toutes procédures ultérieures dans cette affaire et il a déposé une déclaration précisant qu'il n'avait aucun souvenir d'avoir participé personnellement à ce dossier. Les bandes ont demandé une ordonnance portant annulation du jugement de notre Cour. Les deux bandes reconnaissent qu'il ne s'agit pas d'une affaire de partialité réelle et elles acceptent la déclaration du juge Binnie selon laquelle il n'avait aucun souvenir d'avoir participé personnellement à cette affaire. Cependant, elles font valoir que le rôle joué par le juge Binnie en tant que sous-ministre adjoint de la Justice aux premiers stades de la demande de la bande de Campbell River en 1985 et 1986 fait naître une crainte raisonnable de partialité.

Arrêt : La requête sollicitant des directives et les requêtes en annulation de jugement sont rejetées. À la lumière des circonstances de l'espèce, aucune crainte raisonnable de partialité n'a été établie et le juge Binnie n'était pas inhabile à connaître des présents pourvois et à participer au jugement.

La confiance du public dans notre système juridique prend sa source dans la conviction fondamentale selon laquelle ceux qui rendent jugement doivent non seulement toujours le faire sans partialité ni préjugé, mais doivent également être perçus comme agissant ainsi. L'impartialité du juge doit être présumée et c'est à la partie qui plaide l'inhabilité qu'incombe le fardeau d'établir que les circonstances permettent de conclure que le juge doit être récusé. Le critère de récusation est la crainte raisonnable de partialité. Il consiste à se demander à quelle conclusion arriverait une personne bien renseignée qui étudierait la question en profondeur, de façon réaliste et pratique. Croirait-elle que, selon toute vraisemblance, le juge, consciemment ou non, ne rendra pas une décision juste?

Il est nécessaire de clarifier le rapport entre cette norme objective et deux autres facteurs : le facteur subjectif de la partialité réelle et la notion d'inhabilité automatique. Dans la plupart des cas où l'inhabilité du décideur est invoquée, la partie qui la soulève n'invoque pas la partialité réelle. Lorsque des parties affirment qu'il y avait absence de partialité réelle de la part du juge, cela peut signifier l'une des trois choses suivantes : (1) que la crainte raisonnable de partialité est un critère de remplacement de la partialité réelle; (2) qu'il peut y avoir partialité inconsciente, même lorsque le juge a agi de bonne foi; (3) que la présence ou l'absence de partialité réelle n'est tout simplement pas la bonne question à se poser, puisque justice doit non seulement être rendue mais elle doit également paraître être rendue. Cette troisième justification de la norme objective de la crainte raisonnable de partialité admet la possibilité qu'un juge puisse être totalement

standard of reasonable apprehension of bias. The relevant inquiry is not whether there was in fact either conscious or unconscious bias on the part of the judge, but whether a reasonable person properly informed would apprehend that there was. With respect to the notion of automatic disqualification, recent English case law suggests that automatic disqualification is justified in cases where a judge has an interest in the outcome of a proceeding. This case law is not helpful here because automatic disqualification does not extend to judges somehow involved in the litigation or linked to counsel at an earlier stage. In Canada, proof of actual bias or a reasonable apprehension of bias is required. In any event, on the facts of this case, there is no suggestion that Binnie J. had any financial interest in the appeals, or had such an interest in the subject matter of the case that he was effectively in the position of a party to the cause.

In this case, disqualification can only be based on a reasonable apprehension of bias. In light of the strong presumption of judicial impartiality, the standard refers to an apprehension based on serious grounds. Each case must be examined contextually and the inquiry is fact-specific. Where, as here, the issue of bias arises after judgment has been rendered, it is not helpful to determine whether the judge would have recused himself had the matter come to light earlier. Although the standard remains the same, an abundance of caution guides many, if not most judges, at this early stage, and judges often recuse themselves where it is not legally necessary. Lastly, this Court's dictum that judges should not preside over a case in which they played a part at any stage is but an illustration of the general principle. It does not suggest that any degree of earlier participation in a case is cause for automatic disqualification, but rather suggests that a reasonable and right-minded person would likely view unfavourably the fact that the judge acted as counsel in a case over which he is presiding, and could take this fact as the foundation of a reasonable apprehension of bias.

Here, neither Binnie J.'s past status as Associate Deputy Minister nor his long-standing interest in matters involving First Nations is by itself sufficient to justify his disqualification. The source of concern for the bands is

impartial dans des circonstances faisant néanmoins naître une crainte raisonnable de partialité requérant qu'il soit déclaré inhabile. L'idée selon laquelle « justice doit paraître être rendue » ne peut être dissociée de la norme de la crainte raisonnable de partialité. La question pertinente n'est pas de savoir si, dans les faits, le juge a fait preuve de partialité consciente ou inconsciente, mais si une personne raisonnable et bien renseignée craindrait qu'il y ait eu partialité. Relativement à la notion d'inhabilité automatique, certains arrêts britanniques récents suggèrent que l'application de cette notion est justifiée lorsque le juge a un intérêt dans l'issue de l'instance. Cette jurisprudence n'est pas utile en l'espèce, parce que la règle de l'inhabilité automatique ne s'applique pas dans les cas où le décideur a, d'une certaine façon, participé au litige ou été en contact avec les avocats aux premiers stades de l'affaire. Au Canada, il faut prouver l'existence de partialité réelle ou d'une crainte raisonnable de partialité. Quoi qu'il en soit, au vu des faits de l'espèce, rien n'indique que le juge Binnie avait quelque intérêt pécuniaire dans les pourvois ou qu'il manifestait pour l'objet de l'affaire un intérêt tel qu'il se trouvait effectivement dans la position d'une partie à la cause.

Dans la présente affaire, l'inhabilité ne peut être invoquée que sur le fondement de la crainte raisonnable de partialité. Vu la forte présomption d'impartialité dont jouissent les tribunaux, la norme exige une crainte de partialité fondée sur des motifs sérieux. Chaque affaire doit être examinée au regard du contexte et des faits qui lui sont propres. Lorsque, comme en l'espèce, la question de l'inhabilité se soulève après le prononcé du jugement et non au début de l'instance, il n'est pas utile de se demander si le juge se serait récusé si la situation avait été connue plus tôt. Quoique la norme reste la même, bon nombre de juges, sinon la plupart d'entre eux, font montre d'une prudence extrême tôt dans l'instance, et il arrive souvent qu'ils se récusent alors qu'ils ne seraient pas légalement tenus de le faire. Enfin, la remarque incidente de notre Cour selon laquelle les juges ne doivent pas siéger dans une cause à laquelle ils ont participé à quelque stade de l'affaire n'est qu'une illustration du principe général. Elle ne dit pas que toute participation dans le passé à une affaire est automatiquement cause d'inhabilité, mais elle indique plutôt qu'une personne sensée et raisonnable verrait vraisemblablement d'un mauvais oeil le fait que le juge a agi comme avocat dans une affaire dont il est saisi, et que cette personne pourrait considérer que ce fait naître une crainte raisonnable de partialité.

En l'espèce, ni le fait que le juge Binnie ait dans le passé occupé la charge de sous-ministre adjoint ni son intérêt de longue date pour les questions concernant les Premières nations ne justifient en soi de conclure

Binnie J.'s involvement in this case in the mid-1980s. The documentary record, however, does not support a reasonable apprehension of bias. Binnie J.'s involvement in the dispute was confined to a limited supervisory and administrative role. While his link to this litigation exceeded *pro forma* management of the files, he was never counsel of record and played no active role after the claim was filed, nor did he plan litigation strategy. Any views attributed to Binnie J. earlier on were offered in the context of wider implications of the negotiation process, and not in the context of litigation. Furthermore, in his capacity of Associate Deputy Minister, he was responsible for thousands of files at the relevant time and the matter on which he was involved in this file was not unique to this case but was an issue of general application to existing reserves in British Columbia. More importantly, Binnie J.'s supervisory role dates back over 15 years. This lengthy period is significant in relation to Binnie J.'s statement that he had no recollection of his involvement because it is a factor that a reasonable person would properly consider, and it makes bias or its apprehension improbable. Nor would a reasonable person, viewing the matter realistically, conclude that Binnie J.'s ability to remain impartial was unconsciously affected by a limited administrative and supervisory role dating back over 15 years.

Even if the involvement of a single judge had given rise to a reasonable apprehension of bias in this case, no reasonable person informed of the decision-making process of this Court and viewing it realistically could conclude that the eight other judges who heard the appeals were biased or tainted.

Cases Cited

Applied: *Committee for Justice and Liberty v. National Energy Board*, [1978] 1 S.C.R. 369; **distinguished:** *R. v. Bow Street Metropolitan Stipendiary Magistrate, Ex parte Pinochet Ugarte (No. 2)*, [1999] 2 W.L.R. 272; **referred to:** *Guerin v. The Queen*, [1984] 2 S.C.R. 335; *Valente v. The Queen*, [1985] 2 S.C.R. 673; *Locabail (U.K.) Ltd. v. Bayfield Properties Ltd.*, [2000] Q.B. 451; *R. v. Bertram*, [1989] O.J. No. 2123 (QL); *R. v. S. (R.D.)*, [1997] 3 S.C.R. 484; *Newfoundland Telephone Co. v. Newfoundland (Board of Commissioners of Public Utilities)*, [1992] 1 S.C.R. 623; *R. v. Gough*, [1993] A.C. 646; *The Queen v. Barnsley Licensing Justices*, [1960] 2 Q.B. 167; *The King v. Sussex Justices, Ex parte*

à son inhabilité. La préoccupation des bandes est la participation du juge Binnie à la présente affaire au milieu des années 1980. La preuve documentaire n'étaye toutefois pas l'existence d'une crainte raisonnable de partialité. Le juge Binnie n'a joué dans le différend en cause qu'un rôle de supervision et d'administration limité. Bien que le lien entre le juge Binnie et le présent litige ait dépassé la gestion *pro forma* des dossiers, ce dernier n'a jamais été l'avocat inscrit au dossier et il n'a pas joué de rôle actif dans le différend après le dépôt de l'action ni planifié la stratégie d'instance. Les opinions attribuées au juge Binnie ont été formulées dans le contexte des répercussions plus larges du processus de négociation plutôt que dans le contexte du litige. De plus, en sa qualité de sous-ministre adjoint, il était responsable de milliers de dossiers à l'époque pertinente et la question sur laquelle il s'est penché dans la présente affaire ne touchait pas exclusivement celle-ci mais concernait en général les réserves existantes en Colombie-Britannique. Fait plus important encore, le rôle limité de supervision qu'a joué le juge Binnie remonte à plus de 15 ans. Ce très long délai est important en ce qui concerne la déclaration du juge Binnie selon laquelle il n'avait aucun souvenir de sa participation à cette affaire, parce qu'il s'agit d'un facteur dont la personne raisonnable tiendrait à juste titre compte et qui rend improbable l'existence de partialité ou de crainte de partialité. Considérant la question de façon réaliste, cette personne ne conclurait pas non plus que le rôle limité d'administration et de supervision qu'a joué le juge Binnie dans ce dossier, il y a de cela plus de 15 ans, a inconsciemment influencé sa capacité de demeurer impartial.

Même si le rôle joué par un seul juge avait fait naître une crainte raisonnable de partialité en l'espèce, aucune personne raisonnable connaissant le processus décisionnel de notre Cour et le considérant de façon réaliste ne saurait conclure que les huit autres juges étaient partiaux ou ont été influencés.

Jurisprudence

Arrêt appliqué : *Committee for Justice and Liberty c. Office national de l'énergie*, [1978] 1 R.C.S. 369; **distinction d'avec l'arrêt :** *R. c. Bow Street Metropolitan Stipendiary Magistrate, Ex parte Pinochet Ugarte (No. 2)*, [1999] 2 W.L.R. 272; **arrêts mentionnés :** *Guerin c. La Reine*, [1984] 2 R.C.S. 335; *Valente c. La Reine*, [1985] 2 R.C.S. 673; *Locabail (U.K.) Ltd. c. Bayfield Properties Ltd.*, [2000] Q.B. 451; *R. c. Bertram*, [1989] O.J. No. 2123 (QL); *R. c. S. (R.D.)*, [1997] 3 R.C.S. 484; *Newfoundland Telephone Co. c. Terre-Neuve (Board of Commissioners of Public Utilities)*, [1992] 1 R.C.S. 623; *R. c. Gough*, [1993] A.C. 646; *The Queen c. Barnsley Licensing Justices*, [1960] 2 Q.B. 167; *The King c.*

McCarthy, [1924] 1 K.B. 256; *Dimes v. Proprietors of the Grand Junction Canal* (1852), 3 H.L.C. 759, 10 E.R. 301; *Man O'War Station Ltd. v. Auckland City Council (Judgment No. 1)*, [2002] 3 N.Z.L.R. 577, [2002] UKPC 28; *Panton v. Minister of Finance*, [2001] 5 L.R.C. 132, [2001] UKPC 33.

Statutes and Regulations Cited

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Wilson, Bertha. "Decision-making in the Supreme Court" (1986), 36 *U.T.L.J.* 227.

MOTION FOR DIRECTIONS and MOTIONS TO VACATE a judgment of the Supreme Court of Canada, *Wewaykum Indian Band v. Canada*, [2002] 4 S.C.R. 245, 2002 SCC 79. Motions dismissed.

Michael P. Carroll, *Q.C.*, and *Malcolm Maclean*, for the appellants Roy Anthony Roberts et al.

John D. McAlpine, *Q.C.*, and *Allan Donovan*, for the respondents/appellants Ralph Dick et al.

J. Vincent O'Donnell, *Q.C.*, and *Jean Bélanger*, for the respondent Her Majesty the Queen.

Written submissions only by *Patrick G. Foy*, *Q.C.*, and *Angus M. Gunn, Jr.*, for the intervener the Attorney General of British Columbia.

Written submissions only by *Peter R. Grant* and *David Schulze*, for the interveners the Gitanmaax Indian Band, the Kispiox Indian Band and the Glen Vowell Indian Band.

The following is the judgment delivered by

THE CHIEF JUSTICE AND GONTHIER, IACOBUCCI, MAJOR, BASTARACHE, ARBOUR, LEBEL AND DESCHAMPS JJ. —

I. Introduction

1 The Wewaykum or Campbell River Indian Band ("Campbell River") and the Wewaikai or Cape

Sussex Justices, Ex parte McCarthy, [1924] 1 K.B. 256; *Dimes c. Proprietors of the Grand Junction Canal* (1852), 3 H.L.C. 759, 10 E.R. 301; *Man O'War Station Ltd. c. Auckland City Council (Judgment No. 1)*, [2002] 3 N.Z.L.R. 577, [2002] UKPC 28; *Panton c. Minister of Finance*, [2001] 5 L.R.C. 132, [2001] UKPC 33.

Lois et règlements cités

Loi sur l'accès à l'information, L.R.C. 1985, ch. A-1.
Loi sur les Indiens, L.R.C. 1985, ch. I-5.
Règles de la Cour suprême du Canada, DORS/2002-156, art. 3.

Doctrine citée

Conseil canadien de la magistrature. *Principes de déontologie judiciaire*. Ottawa : Le Conseil, 1998.
Wilson, Bertha. "Decision-making in the Supreme Court" (1986), 36 *U.T.L.J.* 227.

REQUÊTE SOLLICITANT DES DIRECTIVES et REQUÊTES EN ANNULATION de l'arrêt de la Cour suprême du Canada, *Bande indienne Wewaykum c. Canada*, [2002] 4 R.C.S. 245, 2002 CSC 79. Requêtes rejetées.

Michael P. Carroll, *c.r.*, et *Malcolm Maclean*, pour les appelants Roy Anthony Roberts et autres.

John D. McAlpine, *c.r.*, et *Allan Donovan*, pour les intimés/appelants Ralph Dick et autres.

J. Vincent O'Donnell, c.r., et *Jean Bélanger*, pour l'intimée Sa Majesté la Reine.

Argumentation écrite seulement par *Patrick G. Foy*, *c.r.*, et *Angus M. Gunn, Jr.*, pour l'intervenant le procureur général de la Colombie-Britannique.

Argumentation écrite seulement par *Peter R. Grant* et *David Schulze*, pour les intervenantes la Bande indienne Gitanmaax, la Bande indienne Kispiox et la Bande indienne de Glen Vowell.

Version française du jugement rendu par

LA JUGE EN CHEF ET LES JUGES GONTHIER, IACOBUCCI, MAJOR, BASTARACHE, ARBOUR, LEBEL ET DESCHAMPS —

I. Introduction

La bande indienne Wewaykum ou bande indienne de Campbell River (ci-après la « bande de

67 Of the three justifications for the objective standard of reasonable apprehension of bias, the last is the most demanding for the judicial system, because it countenances the possibility that justice might not be seen to be done, even where it is undoubtedly done — that is, it envisions the possibility that a decision-maker may be totally impartial in circumstances which nevertheless create a reasonable apprehension of bias, requiring his or her disqualification. But, even where the principle is understood in these terms, the criterion of disqualification still goes to the judge's state of mind, albeit viewed from the objective perspective of the reasonable person. The reasonable person is asked to imagine the decision-maker's state of mind, under the circumstances. In that sense, the oft-stated idea that "justice must be seen to be done", which was invoked by counsel for the bands, cannot be severed from the standard of reasonable apprehension of bias.

68 We emphasize this aspect of the criterion of disqualification in Canadian law because another strand of this area of the law in the Commonwealth suggests that some circumstances of conflict of interest may be enough to justify disqualification, whether or not, from the perspective of the reasonable person, they could have any impact on the judge's mind. As we conclude in the next section, this line of argument is not helpful to counsel for the bands in the present case.

C. *Reasonable Apprehension of Bias and Automatic Disqualification*

69 At the opposite end from claims of actual bias, it has been suggested that it is wrong to be a judge in one's own cause, whether or not one knows this to be the case. The idea has been linked to the early decision of *Dimes v. Proprietors of the Grand Junction Canal* (1852), 3 H.L.C. 759, 10 E.R. 301. More recently, in *Gough*, *supra*, at p. 661, Lord Goff stated that

> there are certain cases in which it has been considered that the circumstances are such that they must inevitably shake public confidence in the integrity of the admin-

De ces trois justifications de la norme objective de la crainte raisonnable de partialité, la dernière est la plus exigeante pour le système judiciaire, en ce qu'elle admet la possibilité que justice puisse paraître ne pas avoir été rendue, même lorsqu'elle l'a indubitablement été — c'est-à-dire qu'elle envisage qu'un décideur puisse être totalement impartial dans des circonstances faisant néanmoins naître une crainte raisonnable de partialité requérant qu'il soit déclaré inhabile. Cependant, même lorsque le principe est interprété ainsi, le critère de détermination de l'inhabilité revient toujours à l'état d'esprit du juge, quoique ce facteur soit considéré du point de vue objectif de la personne raisonnable. On demande à cette personne d'imaginer l'état d'esprit du juge, dans les circonstances pertinentes. En ce sens, l'idée maintes fois énoncée selon laquelle « justice doit paraître être rendue », qu'ont invoqué les avocats des bandes, ne peut être dissociée de la norme de la crainte raisonnable de partialité.

Nous insistons sur cet élément du critère de détermination de l'inhabilité en droit canadien parce qu'il existe, sur cet aspect du droit dans le Commonwealth, un autre courant voulant que certaines situations de conflit d'intérêts suffisent à justifier une déclaration d'inhabilité, indépendamment du fait que, du point de vue de la personne raisonnable, ces situations puissent ou non avoir une influence sur l'esprit du juge. Vu notre conclusion dans la prochaine section, cette argumentation n'est d'aucun secours aux avocats des bandes en l'espèce.

C. *Crainte raisonnable de partialité et inhabilité automatique*

Aux antipodes des demandes invoquant l'existence de partialité réelle, il a été avancé que nul ne peut être à la fois juge et partie dans une cause, et ce que la personne concernée en soit consciente ou non. On rattache cette thèse à une vieille décision, l'affaire *Dimes c. Proprietors of the Grand Junction Canal* (1852), 3 H.L.C. 759, 10 E.R. 301. Plus récemment, dans l'arrêt *Gough*, précité, p. 661, lord Goff a dit ceci :

> [TRADUCTION] . . . il existe des cas où l'on a estimé que les circonstances sont telles qu'elles ébranleraient inévitablement la confiance du public dans l'intégrité

istration of justice if the decision is to be allowed to stand. . . . These cases arise where a person sitting in a judicial capacity has a pecuniary interest in the outcome of the proceedings. . . . In such a case, . . . not only is it irrelevant that there was in fact no bias on the part of the tribunal, but there is no question of investigating, from an objective point of view, whether there was any real likelihood of bias, or any reasonable suspicion of bias, on the facts of the particular case. The nature of the interest is such that public confidence in the administration of justice requires that the decision should not stand.

de l'administration de la justice si la décision était maintenue. [. . .] Il s'agit des cas où une personne exerçant des fonctions judiciaires possède un intérêt pécuniaire dans l'issue de l'instance. [. . .] En pareils cas, [. . .] non seulement l'absence de partialité de la part du tribunal n'est-elle pas pertinente, mais il n'est pas question de se demander si, d'un point de vue objectif, il existait une probabilité réelle de partialité ou une crainte raisonnable de partialité eu égard aux faits de l'affaire en cause. La nature de l'intérêt est telle que la confiance du public dans l'administration de la justice commande que la décision ne soit pas maintenue.

This has been described as "automatic disqualification", and was recently revisited by the House of Lords in *R. v. Bow Street Metropolitan Stipendiary Magistrate, Ex parte Pinochet Ugarte (No. 2)*, [1999] 2 W.L.R. 272. There, the House of Lords dealt with a situation in which Lord Hoffmann had participated in a decision in which Amnesty International was an intervener, while sitting as a director and chairperson of a charity closely allied with Amnesty International and sharing its objects. In that context, it was found that the rule of "automatic disqualification" extended to a limited class of non-financial interests, where the judge has such a relevant interest in the subject matter of the case that he or she is effectively in the position of a party to the cause. As a result, Lord Hoffmann was disqualified, and the decision of the House of Lords was set aside, in a judgment that drew much attention around the world.

70 Ce genre de cas, qu'on a qualifié de situations d'« inhabilité automatique », a récemment été réexaminé par la Chambre des lords dans *R. c. Bow Street Metropolitan Stipendiary Magistrate, Ex parte Pinochet Ugarte (No. 2)*, [1999] 2 W.L.R. 272. Dans cet arrêt, la Chambre des lords a examiné une situation où lord Hoffmann avait participé à la décision d'une affaire dans laquelle Amnistie internationale était intervenante, alors qu'il siégeait comme administrateur et président d'un organisme de bienfaisance qui était intimement lié à Amnistie internationale et partageait les objectifs de celle-ci. Dans ce contexte, il a été jugé qu'une catégorie limitée d'intérêts non pécuniaires entraînent également l'application de la règle de l'« inhabilité automatique », par exemple lorsque le juge possède un intérêt à ce point pertinent à l'égard de l'objet de l'affaire qu'il se trouve effectivement dans la position d'une partie à la cause. Par conséquent, lord Hoffmann a été déclaré inhabile et la décision de la Chambre des lords a été annulée dans un jugement qui a suscité beaucoup d'attention à travers le monde.

A more recent decision of the English Court of Appeal suggests that this extension of the rule of automatic disqualification, beyond cases of financial interests, is likely to remain exceptional (*Locabail (U.K.)*, *supra*). Even so extended, the rule of automatic disqualification does not apply to the situation in which the decision-maker was somehow involved in the litigation or linked to counsel at an earlier stage, as is argued here.

71 Un arrêt plus récent de la Cour d'appel d'Angleterre semble indiquer que l'élargissement de l'application de la règle de l'inhabilité automatique à d'autres situations que celles mettant en jeu des intérêts pécuniaires restera vraisemblablement exceptionnel (*Locabail (U.K.)*, précité). Malgré cet élargissement, la règle de l'inhabilité automatique ne s'applique pas dans les cas où le décideur a, d'une certaine façon, participé au litige ou été en contact avec les avocats aux premiers stades de l'affaire, comme il est allégué en l'espèce.

Newfoundland Telephone Company Limited *Appellant*

v.

The Board of Commissioners of Public Utilities *Respondent*

INDEXED AS: NEWFOUNDLAND TELEPHONE CO. *v.* NEWFOUNDLAND (BOARD OF COMMISSIONERS OF PUBLIC UTILITIES)

File No.: 22060.

1991: November 7; 1992: March 5.

Present: La Forest, L'Heureux-Dubé, Sopinka, Gonthier, Cory, McLachlin and Iacobucci JJ.

ON APPEAL FROM THE COURT OF APPEAL FOR NEWFOUNDLAND

Administrative law — Apprehension of bias — Policy-making board — Board member expressing strong views as to issue board considering — Decision made after Board declined to remove member from panel — Extent to which an administrative board member may comment on matters before the board — Whether reasonable apprehension of bias — If so, whether decision void or merely voidable.

Respondent Board, whose members are appointed by cabinet subject only to the qualification that they not be employed by or have an interest in a public utility, regulates appellant. One commissioner, a former consumers' advocate playing the self-appointed role of champion of consumers' rights on the Board, made several strong statements which were reported in the press against appellant's executive pay policies before a public hearing was held by the Board into appellant's costs. When the hearing commenced, appellant objected to this commissioner's participation on the panel because of an apprehension of bias. The Board found that it had no jurisdiction to rule on its own members and decided that the panel would continue as constituted. A number of public statements relating to the issue before the Board were made by this commissioner during the hearing and before the Board released its decision which (by a majority which included the commissioner at issue) disallowed some of appellant's costs. A minority would

Newfoundland Telephone Company Limited *Appelante*

c.

The Board of Commissioners of Public Utilities *Intimée*

RÉPERTORIÉ: NEWFOUNDLAND TELEPHONE CO. *c.* TERRE-NEUVE (BOARD OF COMMISSIONERS OF PUBLIC UTILITIES)

N° du greffe: 22060.

1991: 7 novembre; 1992: 5 mars.

Présents: Les juges La Forest, L'Heureux-Dubé, Sopinka, Gonthier, Cory, McLachlin et Iacobucci.

EN APPEL DE LA COUR D'APPEL DE TERRE-NEUVE

Droit administratif — Crainte de partialité — Commission chargée de l'élaboration de politiques — Un membre de la Commission a exprimé des opinions bien arrêtées sur une question dont la Commission était saisie — Décision rendue après le refus de la Commission d'écarter ce membre de la formation étudiant la question — Dans quelle mesure un membre d'une commission administrative peut-il commenter des questions soumises à la commission? — Y a-t-il eu une crainte raisonnable de partialité? — Dans l'affirmative, la décision rendue était-elle nulle ou seulement susceptible d'annulation?

La Commission intimée, dont les membres sont nommés par le cabinet à la seule condition qu'ils ne soient pas employés par une entreprise de services publics et qu'ils n'aient aucun intérêt dans une telle entreprise, assure la réglementation de l'appelante. Un commissaire, ancien défenseur des droits des consommateurs qui a décidé de jouer ce même rôle au sein de la Commission, a fait, antérieurement à la tenue d'une audience publique par la Commission relativement aux frais de l'appelante, plusieurs déclarations, diffusées dans la presse, attaquant énergiquement les politiques de l'appelante en matière de rémunération de ses cadres. Au début de l'audience, l'appelante, invoquant une crainte de partialité, s'est opposée à ce que ce commissaire siège dans l'affaire. La Commission a conclu qu'elle n'avait pas compétence pour statuer sur les cas de ses membres et a décidé que la formation des commissaires resterait telle quelle. Pendant le déroulement de l'audience et avant que la Commission (à la majorité,

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have allowed these costs. Appellant appealed both the order of the Board and the Board's decision to proceed with the panel as constituted to the Court of Appeal.

The Court of Appeal found that the Board had complete jurisdiction to determine its own procedures and all questions of fact and law and that it declined to exercise its jurisdiction when it refused to remove the commissioner from the panel. Although the court concluded that there was a reasonable apprehension of bias, it held that the Board's decision was merely voidable and that, given that the commissioner's mind was not closed to argument, the Board's order was valid.

The issues under consideration here were: (1) the extent to which an administrative board member may comment on matters before the board and, (2) the result which should obtain if a decision of a board is made in circumstances where a reasonable apprehension of bias is found.

Held: The appeal should be allowed.

The duty of fairness applies to all administrative bodies. The extent of that duty, however, depends on the particular tribunal's nature and function. The duty to act fairly includes the duty to provide procedural fairness to the parties. That simply cannot exist if an adjudicator is biased. Because it is impossible to determine the precise state of mind of an adjudicator who has made an administrative board decision, an unbiased appearance is an essential component of procedural fairness. The test to ensure fairness is whether a reasonably informed bystander would perceive bias on the part of an adjudicator.

There is a great diversity of administrative boards. Those that are primarily adjudicative in their functions will be expected to comply with the standard applicable to courts: there must be no reasonable apprehension of bias with regard to their decision. At the other end of the scale are boards with popularly elected members where the standard will be much more lenient. In such circumstances, a reasonable apprehension of bias occurs if a board member pre-judges the matter to such an extent

ledit commissaire étant du nombre des majoritaires) ne rende sa décision refusant certains frais de l'appelante, le commissaire en question a fait plusieurs déclarations publiques concernant la question dont la Commission était saisie. La minorité était d'avis d'admettre ces frais. L'appelante a contesté devant la Cour d'appel l'ordonnance de la Commission et la décision de celle-ci de permettre que l'audience ait lieu devant la formation telle qu'elle était constituée.

La Cour d'appel a conclu que la Commission a une compétence absolue pour décider de ses propres procédures et pour statuer sur toutes questions de fait et de droit et que son refus d'écarter le commissaire de la formation constituait un refus d'exercer sa compétence. Bien que concluant à l'existence d'une crainte raisonnable de partialité, la cour a dit que la décision de la Commission était seulement susceptible d'annulation et que, comme le commissaire n'avait pas l'esprit fermé aux arguments, l'ordonnance de la Commission était valide.

Les questions en litige en l'espèce sont celles de savoir (1) dans quelle mesure un membre d'une commission administrative peut commenter les affaires dont la commission est saisie, et (2) ce qui devrait se passer si la décision d'une commission est jugée avoir été rendue dans des circonstances où il existait une crainte raisonnable de partialité.

Arrêt: Le pourvoi est accueilli.

Tous les corps administratifs sont soumis à l'obligation d'agir équitablement. L'étendue de cette obligation tient toutefois à la nature et à la fonction du tribunal en question. L'obligation d'agir équitablement comprend celle d'assurer aux parties l'équité procédurale, qui ne peut tout simplement pas exister s'il y a partialité de la part du décideur. Vu l'impossibilité de déterminer exactement l'état d'esprit d'une personne qui a rendu une décision d'une commission administrative, l'apparence d'impartialité constitue un élément essentiel de l'équité procédurale. Le critère à appliquer pour assurer l'équité consiste à se demander si un observateur relativement bien renseigné percevrait de la partialité chez un décideur.

Il existe une grande diversité de commissions administratives. Celles qui remplissent des fonctions essentiellement juridictionnelles devront respecter la norme applicable aux cours de justice: il ne doit y avoir aucune crainte raisonnable de partialité relativement à leur décision. À l'autre extrémité se trouvent les commissions dont les membres sont élus par le public, pour lesquelles la norme est nettement moins sévère. Dans leur cas, il y a crainte raisonnable de partialité si un membre de la

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that any representations to the contrary would be futile. Administrative boards that deal with matters of policy will be closely comparable to the boards composed of elected members. For those boards, a strict application of a reasonable apprehension of bias as a test might undermine the very role which has been entrusted to them by the legislature.

A member of a board which performs a policy-formation function should not be susceptible to a charge of bias simply because of the expression of strong opinions prior to the hearing. As long as those statements do not indicate a mind so closed that any submissions would be futile, they should not be subject to attack on the basis of bias. Statements manifesting a mind so closed as to make submissions futile would, however, even at the investigatory stage, constitute a basis for raising an issue of apprehended bias. Once the matter reaches the hearing stage a greater degree of discretion is required of a member.

The statements at issue here, when taken together, indicated not only a reasonable apprehension of bias but also a closed mind on the commissioner's part on the subject. Once the order directing the holding of the hearing was given, the Utility was entitled to procedural fairness. At the investigative stage, the "closed mind" test was applicable but once matters proceeded to a hearing, a higher standard had to be applied. Procedural fairness at that stage required the commission members to conduct themselves so that there could be no reasonable apprehension of bias.

A denial of a right to a fair hearing cannot be cured by the tribunal's subsequent decision. A decision of a tribunal which denied the parties a fair hearing cannot be simply voidable and rendered valid as a result of the subsequent decision of the tribunal. The damage created by apprehension of bias cannot be remedied. The hearing, and any subsequent order resulting from it, must be void. The order of the Board of Commissioners of Public Utilities was accordingly void.

commission préjuge l'affaire au point de rendre vain tout argument contraire. Les commissions administratives qui s'occupent de questions de principe sont dans une large mesure assimilables à celles composées de membres élus en ce sens que l'application stricte du critère de la crainte raisonnable de partialité risquerait de miner le rôle que leur a précisément confié le législateur.

Le membre d'une commission qui remplit une fonction d'élaboration des politiques ne devrait pas être exposé à une accusation de partialité du seul fait d'avoir exprimé avant l'audience des opinions bien arrêtées. Pourvu que ces déclarations ne témoignent pas d'un esprit à ce point fermé qu'il serait inutile de présenter des arguments contraires, on ne devrait pas pouvoir les attaquer en invoquant la partialité. Des déclarations traduisant un esprit fermé au point de rendre vain tout argument contraire justifieraient toutefois, même au stade de l'enquête, qu'on invoque la crainte de partialité. Au stade de l'audience, un membre d'une commission est tenu à une plus grande discrétion.

Prises ensemble, les déclarations en cause en l'espèce indiquent non seulement qu'il y avait une crainte raisonnable de partialité mais aussi que le commissaire avait l'esprit fermé. Une fois rendue l'ordonnance exigeant la tenue de l'audience, l'entreprise de services publics avait droit à l'équité procédurale. Si, au stade de l'enquête, c'était le critère de l'«esprit fermé» qui s'appliquait, à l'audience la norme devait être plus sévère. Aussi l'équité procédurale commandait-elle à ce stade-là que les commissaires se comportent de façon à ne susciter aucune crainte raisonnable de partialité.

Une décision subséquente du tribunal ne peut remédier à la négation du droit à une audience équitable. La décision d'un tribunal qui a refusé aux parties une audience équitable ne peut être simplement annulable et être validée ensuite par la décision subséquente du tribunal. Le préjudice résultant d'une crainte de partialité est irrémédiable. L'audience, ainsi que toute ordonnance à laquelle elle aboutit, doit être frappée de nullité. L'ordonnance de la Board of Commissioners of Public Utilities est en conséquence nulle.

Cases Cited

Considered: *Szilard v. Szasz*, [1955] S.C.R. 3; *Committee for Justice and Liberty v. National Energy Board*, [1978] 1 S.C.R. 369; *Old St. Boniface Residents Assn. Inc. v. Winnipeg (City)*, [1990] 3 S.C.R. 1170; *Save Richmond Farmland Society v. Richmond (Township)*, [1990] 3 S.C.R. 1213; *Cardinal v. Director of Kent*

Jurisprudence

Arrêts examinés: *Szilard c. Szasz*, [1955] R.C.S. 3; *Committee for Justice and Liberty c. Office national de l'énergie*, [1978] 1 R.C.S. 369; *Assoc. des résidents du Vieux St-Boniface Inc. c. Winnipeg (Ville)*, [1990] 3 R.C.S. 1170; *Save Richmond Farmland Society c. Richmond (Canton)*, [1990] 3 R.C.S. 1213; *Cardinal c.*

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Institution, [1985] 2 S.C.R. 643; **referred to**: *Nicholson v. Haldimand-Norfolk Regional Board of Commissioners of Police*, [1979] 1 S.C.R. 311; *Martineau v. Matsqui Institution Disciplinary Board*, [1980] 1 S.C.R. 602.

Statutes and Regulations Cited

Public Utilities Act, R.S.N. 1970, c. 322, ss. 5(1) [am. by S.N. 1979, c. 30, s. 1], (8), 6, 14, 15, 79, 83, 85, 86.

Authors Cited

Janisch, Hudson N. Case Comment: *Nfld. Light & Power Co. v. P.U.C. (Bd.)* (1987), 25 Admin. L.R. 196.

APPEAL from a judgment of the Newfoundland Court of Appeal (1990), 83 Nfld. & P.E.I.R. 257, 260 A.P.R. 257, 45 Admin. L.R. 291, dismissing an appeal from an order and from a ruling of the Board of Commissioners of Public Utilities. Appeal allowed.

James R. Chalker, Q.C., and *Evan J. Kipnis*, for the appellant.

Chesley F. Crosbie, for the respondent.

The judgment of the Court was delivered by

CORY J.—Two issues are raised on this appeal. The first requires a consideration of the extent to which an administrative board member may be permitted to comment upon matters before the board. The second, raises the question as to what the result should be if a decision of a board is made in circumstances where there is found to be a reasonable apprehension of bias.

The Factual Background

Pursuant to the provisions of *The Public Utilities Act*, R.S.N. 1970, c. 322, the Board of Commissioners of Public Utilities ("the Board") is responsible for the regulation of the Newfoundland Telephone Company Limited. Commissioners of the Board are appointed by the Lieutenant-

Directeur de l'établissement Kent, [1985] 2 R.C.S. 643; **arrêts mentionnés**: *Nicholson c. Haldimand-Norfolk Regional Board of Commissioners of Police*, [1979] 1 R.C.S. 311; *Martineau c. Comité de discipline de l'Institution de Matsqui*, [1980] 1 R.C.S. 602.

Lois et règlements cités

Public Utilities Act, R.S.N. 1970, ch. 322, art. 5(1) [mod. par S.N. 1979, ch. 30, art. 1], (8), 6, 14, 15, 79, 83, 85, 86.

Doctrine citée

Janisch, Hudson N. Case Comment: *Nfld. Light & Power Co. v. P.U.C. (Bd.)* (1987), 25 Admin. L.R. 196.

POURVOI contre un arrêt de la Cour d'appel de Terre-Neuve (1990), 83 Nfld. & P.E.I.R. 257, 260 A.P.R. 257, 45 Admin. L.R. 291, qui a rejeté un appel d'une ordonnance et d'une décision de la Board of Commissioners of Public Utilities. Pourvoi accueilli.

James R. Chalker, c.r. et *Evan J. Kipnis*, pour l'appelante.

Chesley F. Crosbie, pour l'intimée.

Version française du jugement de la Cour rendu par

LE JUGE CORY—Deux questions se posent dans le présent pourvoi. La première nécessite que la Cour examine dans quelle mesure un membre d'une commission administrative peut commenter les affaires dont la commission est saisie. Quant à la seconde, elle concerne ce qui devrait se passer si la décision d'une commission est jugée avoir été rendue dans des circonstances où il existait une crainte raisonnable de partialité.

Les faits

The Public Utilities Act, R.S.N. 1970, ch. 322, confie à la Board of Commissioners of Public Utilities («la Commission») la réglementation de la Newfoundland Telephone Company Limited. Les commissaires sont nommés par le lieutenant-gouverneur en conseil. La loi porte simplement que les

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witnesses and counsel by board members. Wells' statements, however, were such, that so long as he remained a member of the Board hearing the matter, a reasonable apprehension of bias existed. It follows that the hearing proceeded unfairly and was invalid.

The Consequences of a Finding of Bias

Everyone appearing before administrative boards is entitled to be treated fairly. It is an independent and unqualified right. As I have stated, it is impossible to have a fair hearing or to have procedural fairness if a reasonable apprehension of bias has been established. If there has been a denial of a right to a fair hearing it cannot be cured by the tribunal's subsequent decision. A decision of a tribunal which denied the parties a fair hearing cannot be simply voidable and rendered valid as a result of the subsequent decision of the tribunal. Procedural fairness is an essential aspect of any hearing before a tribunal. The damage created by apprehension of bias cannot be remedied. The hearing, and any subsequent order resulting from it, is void. In *Cardinal v. Director of Kent Institution*, [1985] 2 S.C.R. 643, at p. 661, Le Dain J. speaking for the Court put his position in this way:

> . . . I find it necessary to affirm that the denial of a right to a fair hearing must always render a decision invalid, whether or not it may appear to a reviewing court that the hearing would likely have resulted in a different decision. The right to a fair hearing must be regarded as an independent, unqualified right which finds its essential justification in the sense of procedural justice which any person affected by an administrative decision is entitled to have. It is not for a court to deny that right and sense of justice on the basis of speculation as to what the result might have been had there been a hearing.

In my view, this principle is also applicable to this case. In the circumstances, there is no alternative but to declare that the Order of the Board of Commissioners of Public Utilities is void.

ment juridictionnelles. Cette norme de conduite n'empêchera évidemment pas les commissaires de soumettre à l'interrogatoire le plus rigoureux possible témoins et avocats. Compte tenu toutefois de la nature des déclarations de Wells, une crainte raisonnable de partialité subsistait tant qu'il continuait à siéger en tant que commissaire dans l'affaire. Il s'ensuit donc que l'audience s'est déroulée de façon inéquitable et était en conséquence nulle.

Les conséquences d'une conclusion à la partialité

Quiconque comparaît devant une commission administrative a droit à un traitement équitable. Ce droit est à la fois distinct et absolu. Comme je l'ai déjà mentionné, du moment que la crainte raisonnable de partialité est établie, une audience équitable ou l'équité procédurale sont impossibles. S'il y a eu négation du droit à une audience équitable, la décision subséquente du tribunal ne peut y remédier. La décision d'un tribunal qui a refusé aux parties une audience équitable ne peut être simplement annulable et être validée ensuite par la décision subséquente du tribunal. L'équité procédurale est un élément essentiel de toute audience tenue devant un tribunal. Le préjudice résultant d'une crainte de partialité est irrémédiable. L'audience, ainsi que toute ordonnance à laquelle elle aboutit, est nulle. Dans *Cardinal c. Directeur de l'établissement Kent*, [1985] 2 R.C.S. 643, à la p. 661, le juge Le Dain, au nom de la Cour, s'est exprimé ainsi:

> . . . j'estime nécessaire d'affirmer que la négation du droit à une audition équitable doit toujours rendre une décision invalide, que la cour qui exerce le contrôle considère ou non que l'audition aurait vraisemblablement amené une décision différente. Il faut considérer le droit à une audition équitable comme un droit distinct et absolu qui trouve sa justification essentielle dans le sens de la justice en matière de procédure à laquelle toute personne touchée par une décision administrative a droit. Il n'appartient pas aux tribunaux de refuser ce droit et ce sens de la justice en fonction d'hypothèses sur ce qu'aurait pu être le résultat de l'audition.

À mon avis, ce principe s'applique également en l'espèce. Dans les circonstances, nous ne pouvons que déclarer nulle l'ordonnance de la Board of Commissioners of Public Utilities.

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APPENDIX B

Tab 1

CBC

Premier unmoved by Northern Pulp's ask for more time to close waste water facility

Pictou Landing First Nation chief not interested in extending deadline to close facility

Paul Withers · CBC News · Posted: Jan 31, 2019 10:33 AM AT | Last Updated: January 31

Premier Stephen McNeil has consistently said his government has no intention of extending the deadline contained in the Boat Harbour Act, which was passed in 2015. (CBC)

Owners of the Northern Pulp paper mill in Pictou, N.S., are seeking a one-year extension of a provincial law that aims to close the mill's waste effluent facility in January 2020.

Speaking at a Halifax news conference, Paper Excellence officials said the company is committed to righting a legacy of five decades of pollution. But the company says it needs

more time to build a new $130-million effluent treatment plant to replace the existing facility at Boat Harbour, N.S.

The Boat Harbour Act was passed in 2015 by Nova Scotia's Liberal government and requires the current facility to close by January 31, 2020 — one year from today. The move came after pressure from Pictou Landing First Nation, which is adjacent to the to the settling lagoons used to treat waste water.

The lagoons contain nearly 50 years worth of toxic waste, and it has been called one of the worst cases of environmental racism in Canada.

But Nova Scotia Premier Stephen McNeil is unmoved by the company's request.

"The deadline is the deadline," he told reporters Thursday.

The company says without an extension it will not operate the mill — but would not say it is prepared to close permanently.

"We will not operate illegally, but we do believe we will get there," Paper Excellence spokesperson Kathy Cloutier said.

McNeil seemed prepared for a shutdown of Northern Pulp for some period of time.

"The question would be for what period of time would the company be down."

A sign at Pictou Landing First Nation counts down to the date the current treatment facility is required to close under the province's Boat Harbour Act. (Michael Gorman/CBC)

McNeil says the province is looking at the worst-case scenario, in term of its liabilities, the status of financial assistance to Northern Pulp and other sawmills, worker pension plans and alternative markets for wood chips bought by Northern Pulp.

"We're working our way through that," he said.

Paper Excellence says it will begin construction on the new treatment facility as soon as it secures regulatory approval — even without an extension in place.

The mill's future and the way it treats 75 million litres of waste water each day is the subject of intense debate in northern Nova Scotia, especially in Pictou County where the mill has operated since 1967.

Come Jan. 31, 2019, the legislated deadline to shutter the Boat Harbour effluent treatment facility in Pictou County will be exactly one year away. In this week's Sound Off, Jean Laroche and Michael Gorman stand next to the portraits of premiers past at Province House and examine the history, broken promises and where all the major players stand right now. 2:28

With the closure of Boat Harbour looming, the company is proposing to build, own and operate an activated sludge treatment system next to the Northern Pulp mill with the treated effluent discharged by a diffuser pipe into the Northumberland Strait near Caribou, N.S.

Thursday's news conference coincided with Northern Pulp submitting its environmental assessment to the Nova Scotia government. The assessment will be publicly released in one week.

The proposal will be given a provincial Class 1 review, which takes about 50 days.

'The federal government is still considering a much lengthier review of its own, at the request of First Nations and the neighbouring province of Prince Edward Island,

Fishermen claim the proposed discharge pipe will harm the area's lucrative lobster fishery and have staged blockades to stop survey vessels working on a route for the pipe. Earlier this week, Northern Pulp issued a statement saying the fishermen have agreed to comply with a court injunction that prohibits them from blocking their vessels.

People gathered at Pictou Landing First Nation on Thursday participate in a round dance. The event marked the one-year countdown to the closure of the Boat Harbour treatment facility. (Michael Gorman/CBC)

The company maintains the system will meet federal standards and treated pulp mill effluent is discharged into fresh and salt water elsewhere.

Sawmill owner Robin Wilber of Elmsdale Lumber says the fate of the Nothern Pulp will affect the entire forest industry. Sawmills send bark and chips to the mill.

"No pulp mill, no saw mills, the farmer loses income from their woodlots. Its a hugely integrated industry from Yarmouth to Sydney," Wilber said

He says he understand frustration in Pictou County over pollution from the mill, but says the company deserves more time.

"Paper Excellence has only been around for a few years. There were four other previous owners who left a bad taste in everybody's mouth," he says.

"We need to give them a chance."

Durney Nicholas is a fisherman from the Pictou Landing First Nation. He attended the news conference and was not persuaded.

"The always say 'Give me more time,' but enough is enough," he said.

On Thursday, more than 500 people gathered in a gym on Pictou Landing First Nation to kick off the one-year countdown to the closure of Boat Harbour treatment facility, which it has opposed for decades.

In an emotional speech to a crowd of more than 500 people, Pictou Landing First Nation Chief Andrea Paul talked about the legacy of the Boat Harbour treatment facility and said its end would be the start of healing for the community. (Michael Gorman/CBC)

The ceremony included drumming and dancing, students read speeches and people signed declarations of support to uphold the current deadline.

"We're not moving the date. The date is the date," Chief Andrea Paul told reporters.

"We have one year left and Boat Harbour won't be used as an effluent dumping ground. We're very excited."

Paul was emotional as she addressed the crowd and talked about the legacy of Boat Harbour and what it's done to the environment.

People at the event in Pictou Landing react to a speech by Chief Andrea Paul. (Michael Gorman/CBC)

"They took away our right to fish, they took away our right to survival, they took away our health."

Acknowledging a memory wall at the back of the room, a display with the names and pictures of community members no longer alive to see this day, Paul said it would be a sacred day when the community gathers around Boat Harbour in one year to witness the stop of the effluent flow.

"What a powerful day that's going to be," she said. "Next year is going to be a beautiful day."

With files from Michael Gorman

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Featured

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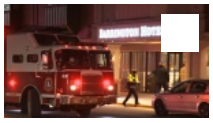
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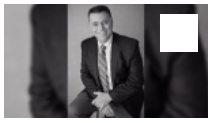
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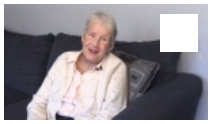
Happy homecoming for liver transplant patient

N.S. mill's future at risk without extension, Northern Pulp warns

Michael MacDonald, THE CANADIAN PRESS
Published Thursday, January 31, 2019 10:26AM AST
Last Updated Friday, February 1, 2019 8:16AM AST

HALIFAX -- The owners of a large Nova Scotia pulp mill are suggesting the operation will be forced to shut down -- threatening 300 jobs -- unless the province extends a legislated deadline for closing the highly polluted waste water facility at Boat Harbour.

The existing deadline is one year away -- Jan. 31, 2020. The company was originally given five years to design and build another treatment facility to replace the fetid lagoons near the Pictou Landing First Nation.

The lagoons contain nearly 50 years worth of toxic waste, which former Nova Scotia environment minister Iain Rankin has called one of the worst cases of environmental racism in Canada.

Speaking at a news conference Thursday, Northern Pulp spokeswoman Kathy Cloutier said the company got bogged down in the industrial approval process and it needs about another year to get the job done.

"Some will say they have heard this before, and look where we are now. We recognize this, and relish the opportunity to be the exception rather than the rule," she said, referring to the fact that the mill's previous owners routinely made cleanup promises they did not keep.

"We want to bring about a positive legacy that addresses environmental concerns. Despite best intentions, we have not always gotten it right in the eyes of the Mik'maq or in the eyes of our stakeholders."

Cloutier said if the province rejects the request, the mill will not break the law by continuing to dump effluent into Boat Harbour past the deadline. That means the mill would almost certainly be forced to shut down, at least temporarily.

However, she said the company is moving ahead with building its new $130-million treatment facility and pipeline, even if the province fails to grant an extension.

Premier Stephen McNeil has consistently said his government has no intention of extending the deadline in the Boat Harbour Act, legislation that was drafted in 2015 after a serious effluent spill at the Pictou Landing First Nation.

McNeil confirmed Thursday he had spoken with company officials, but he said he had not changed his mind.

"The deadline is the deadline," he said after a cabinet meeting. "We gave them five years."

However, the premier also said he would be open to hearing proposals from residents of the Pictou area, including the local Tory members of the legislature. He said if a consensus was reached on amending the act, that could be debated on the floor of the legislature.

Cloutier said a temporary shutdown is not a realistic option, especially in the winter months.

The premier said the province is already looking into a Plan B, which would involve dealing with the fallout from a permanent closure.

The chief of Pictou Landing First Nation, Andrea Paul, has said the deadline must not be extended. The 600 members of the band marked the beginning of an official one-year countdown during a ceremony Thursday morning.

Paul said the company should not have held its news conference on the same day as the First Nation's event.

"Northern Pulp has just shown us what their new era of improved Indigenous relations will look like," she said in a statement released late Wednesday.

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Nova Scotia First Nation starts official countdown on Boat Harbour

PHOTOS

The Northern Pulp Nova Scotia Corporation mill is seen in Abercrombie, N.S., on Wednesday, Oct. 11, 2017. (THE CANADIAN PRESS/Andrew Vaughan)

Durney Nicholas, a fisherman from Pictou Landing First Nation, said he wasn't impressed with what he heard at the news conference on Thursday.

"I'm not going to accept what they are saying," he said afterwards. "We're going to still say no. We're going to keep fighting, too ... Enough is enough."

P.E.I. Premier Wade MacLauchlan and other critics have said the project should be subjected to a more rigorous federal environmental assessment.

Cloutier said the company would welcome such scrutiny, but only if the shutdown deadline is extended.

Ronnie Heighton, president of the Northumberland Fishermen's Association, said his group has no reason to trust the company.

"As far as we're concerned, the date is the date," he said in an interview. "They just wasted time away."

The association is opposed to Northern Pulp's plan to build a pipeline that would dump more than 60-million litres of treated waste water daily into the Northumberland Strait.

The company has insisted the water will be largely unaffected within two metres of the pipeline's discharge point.

Heighton doesn't buy that.

"The stuff will still be there," said Heighton, whose group represents about 600 fishermen who fish for lobster, herring, crab, scallops and oysters. "We're talking about ... tonnes of solids per day. After about 30 years, the stuff will be on the surface."

The company confirmed Thursday it had submitted an environmental assessment application to the province for its new treatment and pipeline plan, which will include the use of a so-called Activated Sludge Treatment system.

Cloutier has said that of the 131 kraft pulp mills operating in North America, about 20 per cent use that system. The remaining 80 per cent use the lagoon system now in use at Boat Harbour. No other treatment system is used, she said.

The company has said the treated effluent it plans to pump into the Strait will meet federal regulations for emissions, but opponents say there's a lack of scientific evidence regarding how the waste will affect the long-term health of the waterway.

The 10 kilometre pipeline will travel from Abercrombie point, where the mill is located, across Pictou Harbour and then overland to the west of Pictou before extending into the Strait north of Caribou, N.S.

Built in 1967, the mill manufactures 280,000 tonnes of Northern Bleached Softwood Kraft pulp every year. Most of it is exported to make toilet paper and other paper products.

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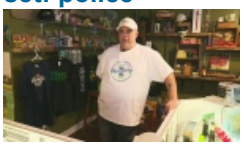

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Uproar in Nova Scotia over plan to dump pulp effluent into Northumberland Strait

By Joan Baxter in Analysis, Energy, Politics | July 25th 2018

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Pictou Landing Chief Andrea Paul addresses participants in the #NOPIPE rally on July 6, 2018 in Pictou, N.S., flanked by Mi'kmaq chiefs, fishers' group leaders and tourism operators from across three provinces. Photo by Gerard J. Halfyard

Kinder Morgan's Trans Mountain expansion may be hot in the media spotlight right now, but on the East Coast, another industrial storm is brewing.

Nova Scotia's Northern Pulp mill has proposed a 10-kilometre pipeline to transport up to 85 million litres of warm pulp effluent every day directly into the Northumberland Strait — a beautiful part of the Gulf of St. Lawrence and a lucrative fishing ground.

Public protest over this pulp pipe proposal has spawned the #NOPIPE movement, which has sown division among communities in Pictou County. #nspoli #novascotia

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The idea of dumping treated waste from the Northern Pulp's mill in Pict

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directly into such a rich ecosystem — without giving it an additional month to settle,

as it currently does in a lagoon before it is slowly released into the Strait — has many First Nations, fishers, citizens and local communities up in arms.

Earlier this month, Prime Minister Justin Trudeau turned his back on them as he declined to commit to a federal environmental assessment of the pipeline proposal, justifying his decision as respect for "provincial jurisdiction." In other words, the prime minister is satisfied that the Nova Scotia government can handle the assessment.

But with the province being responsible, through an indemnity agreement, for part of the project's design and cost — critics are worried that the pipeline won't receive a thorough, unbiased assessment. To boot, they add, the Northern Pulp mill's foreign corporate owners have troubling ties to illegal deforestation abroad.

Sowing division in Pictou County

The pipeline in question is for Northern Pulp's 51-year-old bleached kraft pulp mill in Pictou County on the north shore of Nova Scotia. If approved, it would be almost a metre in diameter and 10 kilometres long, carrying millions of litres of effluent and releasing it through six dispersal pipes into the Northumberland Strait.

The Northumberland Strait separates Prince Edward Island from New Brunswick and Nova Scotia in the Gulf of St. Lawrence; an extremely rich and sensitive fishing ground, on which thousands of people across the Maritimes depend for fisheries and tourism.

Critics of the project fear it would pollute coastal waters, harm crucial fish habitat and marine life, and put those vital industries at risk. As a result, the plan has sparked widespread opposition and public protest, spawning the hashtag, “#NOPIPE.” It has been condemned by fishermen, tourism operators and First Nations groups, sowing division in traditionally tight-knit communities in its wake.

The project also comes with a form of ultimatum for government regulators:

“No pipe equals no mill,” is how Kathy Cloutier, director of communications for Paper Excellence, the mill's parent company, put it to me in an email.

Paper Excellence acquired the Northern Pulp mill in 2011, and owns four other mills in Canada — three in British Columbia and one in Saskatchewan, as well as two in France. While the company has headquarters in Canada, its larger hold

3 stories left

of Paper Excellence B.V. operates as a subsidiary of Asia Pulp and Paper Group, and is based in the Netherlands.

Paper Excellence is the fifth largest foreign corporation that has owned the mill in Pictou since it opened in 1967, and has ties to a shocking history of ripping up endangered forests in Southeast Asia.

Northern Pulp's mill in Pictou County, N.S., which produces northern bleached softwood Kraft pulp, is seen in August of 2014. Photo by Gerry Farrell

A dismal overseas record

Paper Excellence is part of the corporate empire of the billionaire Widjaja family of Indonesia, which also owns Sinar Mas Group. Sinar Mas despite its denial, has ties to devastating fires and deforestation in Southeast Asia under its international trade name, Asia Pulp and Paper (APP), and the dubious distinction of being responsible for Asia's worst corporate default — US$ 13.9 billion in 2001 after a 20-per-cent plunge in global paper prices over three months.

APP pledged to clean up its act, following boycotts in 2012 of its paper products by several prominent corporate brands, as a result of its role in illegal logging in Indonesia. It adopted a “forest conservation policy,” developed with support from Greenpeace International to help it accomplish this, but in May 2018, af[illegible] emerged that APP was still responsible for destroying forests in Indone[illegible] Greenpeace ended all engagement with APP and Sinar Mas Group.

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None of this appears to have dampened relations between the Nova Scotia government, however, and the owners of the Northern Pulp mill. As has been the pattern for the past half-century, the province seems intent on doing the mill's bidding.

How Nova Scotia was captured by a pulp mill

In 2017, Nova Scotia's Department of Environment determined that the pipe warranted a "smaller in scale" Class I environmental assessment, which takes just 50 days and leaves the final approval decision to the minister of environment. Critics say the pipe should undergo a more thorough Class II assessment, which takes 275 days and involves an environmental assessment panel.

Among those calling for the Class II assessment are Karla MacFarlane, interim leader of the Nova Scotia Progressive Conservative Party, and Tim Houston, who represents Pictou East in the legislature and is vying for the leadership of the PC party in the October convention.

Before the decision to proceed with a Class I assessment had been made however, Nova Scotia's Department of Environment had concerns about the pipe plan. According to internal emails obtained through freedom of information legislation by Linda Pannozzo for *The Halifax Examiner*, officials were worried that the mill's plan to treat effluent on-site in a new activated sludge system, and then pump it through a pipe into the Strait, had the "potential for eutrophication," meaning excess nutrients could lead to oxygen depletion.

Then, the consultants working on the pipe proposal, KSH Solutions Inc, reminded Department of Environment officials that there was a "fixed completion date" for the project, and any delays stemming from public consultations were "of concern." The new system had to be operating by July 2019, so that by January 2020, the mill's effluent would no longer flow into, and settle in Boat Harbour, as it has done since 1967.

Boat Harbour is Nova Scotia's largest environmental contaminated site and an egregious example of environmental racism.

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An effluent aeration pond close to Boat Harbour in Nova Scotia is pictured on July 20, 2016. Photo by Joan Baxter

Threats of expropriation

In the 1960s, when the PC government of then-premier Robert Stanfield was pushing to get the pulp mill built, it engaged two government officials to convince the Pictou Landing First Nation to sign over Boat Harbour, their precious tidal estuary, to the government for mill effluent.

In his book, *We Were Not the Savages,* Mi'kmaq scholar Daniel Paul describes the way these officials obtained control of Boat Harbour as "full of deceit and maliciousness." The officials took the chief and a councillor from Pictou Landing First Nation to a non-functioning domestic sewage facility in New Brunswick in 1965**,** and told them the water in their estuary would be just as clear and clean as the fresh, spring-fed brook at the site. They were also told, he wrote, th

3 stories left

didn't sign an agreement allowing the government to use Boat Harbour for the mill's effluent, it would be expropriated.

Deceived and under pressure, the chief and councillor agreed, signing away the tidal estuary that had provided their First Nation community with much of their food for countless generations. Boat Harbour immediately became a toxic wasteland.

To entice Scott Paper to build the mill, the provincial government had already bestowed numerous expensive gifts on the American pulp and paper giant. Among them, as detailed in the the 1965 Scott Maritimes Limited Agreement and a report for the Nova Scotia cabinet in 1965, were: a causeway linking the Town of Pictou with the mill site on Abercrombie Point; a dam across a river to provide the mill with more than 100 million litres of fresh water daily; a 50-year lease on 230,000 acres of Crown land with rock-bottom stumpage rates; and a slew of generous tax breaks.

To top it off, on Sept. 30, 1970, the government of former Progressive Conservative premier G.I. Smith signed an unprecedented agreement with Scott Paper, in which the province agreed "at its cost," to "own, operate and maintain the Effluent Treatment System and continue to accept in such system all effluent from the mill."

Pouring millions into the mill

Over the years, successive provincial governments in Nova Scotia have lavished hundreds of millions of dollars on the mill in loans and grants. The federal government has also chipped in millions of dollars for environmental improvements.

Even that's not the end of the government largesse.

In 1995, the Liberal government of former premier John Savage signed an indemnity agreement "saving harmless" anyone who worked for the mill from all responsibility for environmental problems with its effluent. It also made the government — that is, the people of Nova Scotia — responsible for effluent and reconfigurations of the mill related to its treatment and disposal, forever.

As it stands, the effluent – an average of 80 million litres daily – flows from the mill through a pipe under inner Pictou Harbour, then comes onshore at Pictou Landing. There it goes into settling ponds, then an aeration basin for a week before it flows into the 350-acre Boat Harbour lagoon. It is released through a dam into a small cove in the Northumberland Strait, following up to a month of further settling.

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The new plan would remove that crucial last step: the effluent would be treated on-site in a new facility beside the mill and go directly into the Strait, without the settling of solids that currently happens in Boat Harbour.

In 2014, that effluent pipe ruptured, spilling 47 million litres of toxic effluent near sacred Mi'kmaq burial grounds. The people of Pictou Landing First Nation set up a blockade, joined by others concerned about the mill's air and water pollution over the years.

The mill was shut down while the pipe was replaced and the First Nation issued an ultimatum to the current Liberal government of Premier Stephen McNeil: legislate the closure of Boat Harbour.

One year later, McNeil's government, with the support of both opposition parties, passed the Boat Harbour Act, which stipulated that no effluent could flow into the lagoon after Jan. 31, 2020. After that, Boat Harbour would be remediated and restored to its former state.

For a time, there was optimism that the province would finally crack down on the mill for its poor environmental performance over the years.

Those hopes were dashed when, in late 2017, Northern Pulp announced its plan to pipe effluent directly into the Northumberland Strait, and the government decided to go with a Class I environmental assessment.

Appearing before the Public Accounts Committee of the Nova Scotia legislature in February, Deputy Environment Minister Frances Martin defended the Class I assessment as appropriate, claiming that, "while the effluent treatment plant will be a new plant and a new design, it is a modification to an existing undertaking and that is the pulp mill itself."

Northern Pulp, however, clearly states that it is designing and building a "new treatment facility."

This decision to go with the Class I assessment for the treatment facility became even more inexplicable when the Department of Environment announced that it was requiring the more extensive Class II assessment for the clean up of Boat Harbour.

Nova Scotia in a conflict of interest

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Like Kinder Morgan's embattled Trans Mountain expansion, the proposed pulp pipe is pitting provincial governments of similar political stripes against each other – in this case, two provincial Liberal governments in Nova Scotia and P.E.I.

Prince Edward Island Premier Wade MacLaughlan wrote McNeil and federal Environment and Climate Change Minister Catherine McKenna in January this year, demanding a “more comprehensive assessment” that involves his province.

In response, a spokesperson for the Nova Scotia government said that P.E.I. would have a chance to submit its comments once the proposal had been registered for a provincial environmental assessment. Given that such commenting is the right of every citizen, this response was a firm snub of one Liberal premier by another.

As a result of the government’s indemnity agreement with the mill, Nova Scotia taxpayers appear to be on the hook not just for the new effluent and disposal facility, but also the reconfiguration of the mill to accommodate the change. To date, neither Northern Pulp nor the Nova Scotia government has divulged the cost of the new facility or who will be paying for it. However, local media cite a 2015 letter from Northern Pulp to the government saying that the cost might be in “excess of $100 million.”

Nova Scotians will also cover the costs of the Boat Harbour clean up, estimated at $133 million and counting.

In 2002, the government of former premier John Hamm passed an Order in Council extending the mill’s lease for the use of Boat Harbour until 2030. Hamm now is chair of the board of Northern Pulp, and the mill manager, Bruce Chapman, has been reminding the province of this commitment, saying that Northern Pulp will expect to be compensated by the province for the loss of the use of Boat Harbour for 10 years.

Nova Scotia citizens may also have to compensate the mill for any lost profits if it has to be idled because of a delay in getting a new effluent system up and running.

This puts the provincial government in a conflict of interest, and the impossible position of trying to regulate and assess the new effluent system, while it is responsible for its costs and any losses incurred by its delay.

More than 50 years of protest

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Since the pipe plan was made public in late last year, thousands of citizens have mobilized against it. They have also launched a letter-writing campaign and an e-petition to convince Ottawa to undertake a federal environmental assessment.

On July 6, a land-and-sea rally to protest the pipe plan, organized by the Friends of Northumberland Strait, several fishers' associations and unions, the Pictou Landing First Nation, the Pictou Lobster Carnival, tourism operators and environmental groups, drew thousands of people to the waterfront, many on foot and others in an impressive flotilla of fishing boats.

Protesters at the rally, including First Nation chiefs from three provinces, called for a federal environmental assessment.

A few days later, McKenna told reporters she would not rule out a federal assessment, but that the decision would have to wait until the final proposal had been submitted to the province.

The same day, then-minister of fisheries and oceans Dominic LeBlanc told reporters that the responsibility for the environmental assessment lay with the province of Nova Scotia. On Trudeau's July 17 visit to northern Nova Scotia, McNeil defended the province's environmental assessment process, and the prime minister echoed this sentiment.

It was a profound disappointment to those who, like Chief Andrea Paul of Pictou Landing First Nation, had been counting on the federal government to do a thorough assessment of the pipe proposal.

3 stories left

A flotilla of civilian vessels takes part in the #NOPIPE land-and-sea rally against the Northern Pulp mill in Nova Scotia on July 6, 2018. Photo by Gerard J. Halfyard

Not giving up hope on Ottawa

In an email, a spokesperson for the Canadian Environmental Assessment Agency (CEAA) stated that even if a proposed project is not included in the list of activities that trigger federal assessments, it can be designated for one if the federal environment minister determines it “may cause adverse environmental effects or public concerns related to those effects."

So far, neither the mill nor the province has been able to demonstrate that the proposed pipe will not cause “adverse environmental effects” to the precious fishing areas of the Strait, suggesting that grounds for federal intervention do exist. Additionally, the federal government has “broad responsibilities for the stewardship and management” of all of Canada's oceans — including the Gulf of St. Lawrence — and by extension, the Northumberland Strait.

When Northern Pulp’s general manager and technical manager, togeth
consultant engineer in charge of the project, met with P.E.I’s Standing C

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Agriculture and Fisheries earlier this year, they were unable to answer basic questions about the potential effect of the effluent on lobsters and the Strait.

Earlier this month, Northern Pulp admitted that its proposal to lay the pipe along the bottom of Pictou Harbour and out into the Strait, which it had planned to submit to the province in the summer, would not work — something fishers had been saying all along.

Pictou Harbour, the company determined, was too shallow, a collapsed pier and shipwreck were in the way, and an alternate route and outfall for the pipe would have to be found, pushing the registration of the proposal back to the fall of 2018.

None of this reassures people worried about the proposed pipe. For the past 51 years, the provincial government has consistently failed to protect citizens and the environment from the harmful effects the mill has had on air, water, forests and human health.

Nova Scotia's auditor general has strongly criticized the province's environmental assessment process, saying that environmental "approvals are issued without consulting inspectors who know risks," and describing the monitoring of projects as "poor."

Citizens concerned about the pipe point out that the provincial government is a party to designing the treatment facility, and can hardly be considered an "unbiased judge" of the proposal.

This is why, despite Trudeau's refusal to commit to federal involvement, many continue to sign petitions, write letters, and pin their hopes on the federal government to step in and undertake an environmental assessment.

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July 25th 2018

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Joan Baxter

Suzanne Edgar | 6 months ago

As a new resident of Nova Scotia, this is very distressing news! Thanks for having the courage to report on the history of this issue. Let's hope we can get the federal government on board for a unbiased assessment.

David Huntley | 5 months ago

The code of ethics of Nova Scotia engineers states

“Hold paramount the safety, health and welfare of the public and the protection of the environment and promote health and safety within the workplace“

Other provinces have very similar statements in their codes.

It follows directly that no Professional Engineer should agree to work on any such project as this.

Gloria Prescott | 5 months ago

Very big conflict of interest with Nova Scotia and this pipeline for the paper mill! Federal environmental assessment is common sense. Here is hoping...

Betsy Cornwell | 5 months ago

This dismal history of the pulp industry has been repeated all over the world with greater or lesser but never benign results. It is unfortunate that Gutenberg's invention has had such a poisonous and unintended consequence - the devastation of our world's essential forests, the destruction of otherwise potable water and the life that depends on it.
It is even more dispiriting to consider that in all probability, most of what is written on it, is certainly not worth the residual costs of the paper on which it appears! Compute
was supposed to end the need for paper - instead, of course, computers and ph

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have only added to the hazardous waste of paper production.
An eccentric library worker I knew used to mutter as she went about her tasks that we should put a moratorium on publishing. More and more I subscribe to her viewpoint - too much of what winds up on paper is worthless, but then of, course so is 90% of what appears on media - probably including this dyspeptic opinion.
Nevertheless, I hope for the triumph of electronic communication which can enable most of us to delete, without waste, what we find irrelevant!

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THE GLOBE AND MAIL

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Thousands of Atlantic Canada residents from three provinces protest N.S. pulp mill's effluent plan

JESSICA LEEDER › ATLANTIC BUREAU CHIEF
PICTOU, N.S.
PUBLISHED JULY 6, 2018
UPDATED JULY 9, 2018

Thousands of demonstrators gathered on the waterfront in Pictou, N.S. on Friday, to protest a proposed plan to dump treated effluent from the controversial Northern Pulp mill into the Northumberland Strait.

DARREN CALABRESE

THE GLOBE AND MAIL

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a sprawling tract of land directly across from Pictou's waterfront.

Locals have waged a five-decade battle with the mill's owners to keep its emissions in check. However, the ante was raised recently when the mill began holding public meetings to disclose its plans to build a pipeline in the Northumberland, the body of water separating PEI from New Brunswick and Nova Scotia. It will dispose the "treated effluent" that results from the mill's process of manufacturing bleached kraft pulp into the strait, which attracts thousands of tourists each year and also supports thousands of fishing families, not only from nearby communities, but also in Prince Edward Island and in New Brunswick, which share access to it.

Northern Pulp is in the midst of conducting an environmental assessment on its effluent pipe plan, which is due to be submitted to the provincial government later this summer, said spokesperson Kathy Cloutier. The company has tried over the past several months, through community open houses and talks with fishermen, to reassure those who are concerned that there should not be any detrimental effects from its pipe plan.

"Shouldn't is not good enough – we've got to have total assurance," said Ronnie Heighton, a life-long fisherman.

There is deeply rooted concern about the mill's plan in and around Pictou, where friction is common due to the fact that many townspeople work for Northern Pulp.

Still, hundreds of residents have taken a "no pipe" position and have posted signs declaring that sentiment, including some with skulls and crossbones; other signs are urging people to "stop and think." The signs have been hung in shop windows, on telephone polls and amid flowering gardens.

"The protection of fishing in the Northumberland Strait is paramount," Pictou Mayor Jim Ryan

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At least one fishermen's organization has applied to Ottawa to have the pipe project designated for a federal environmental assessment – currently the province has jurisdiction – under the Canadian Environmental Assessment Act. Several other advocacy groups and hundreds of individuals have joined a letter-writing campaign in support of the application.

STORY CONTINUES BELOW ADVERTISEMENT

Friday's rally was peaceful and featured a flotilla of more than 150 fishing boats loaded with supporters who clogged Pictou's harbour after conducting a sail-by of the Northern Pulp mill with air horns blaring for effect. One of the boats ferried a contingent of Mi'kmaq leaders to shore, including Pictou Landing First Nations Chief Andrea Paul.

Wearing a traditional headdress, Ms. Paul made her way to the stage where, after addressing the audience. she broke down in tears at what she said was a historic show of solidarity.

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"We do not want this pipe in our waters," Ms. Paul said on stage at the rally. "We need to protect our resources. All of us have an inherent duty to do that."

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Phillip Crawley, Publisher

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Stellarton Council passes motion to send letter showing support for Boat Harbour extension

Brendan Ahern (brendan.ahern@ngnews.ca)
Published: Jan 14 at 11:14 p.m.
Updated: Jan 15 at 11:53 p.m.

The Boat Harbour treatment site, located near Pictou Landing. - File

'I thought we were beyond that stage of having these conversations about us without us': Pictou Landing First Nation Chief Andrea Paul

STELLARTON, N.S. - Stellarton town council voted in favor of sending a letter to Premier Stephen McNeil in support of an extension to the Boat Harbour 2020 deadline with three in favor and two opposed.

A letter written on behalf of former and current Northern Pulp employees had been sent to town council. The letter also contains three pages of signatures in support of an extension.

The matter was added to the agenda on the night of the town council's Jan. 14 meeting.

The letter asks that Stellarton town council draft a letter to McNeil requesting an extension to the Boat Harbour closure date in order to allow the company time to complete an environmental assessment and construct a new effluent treatment plant.

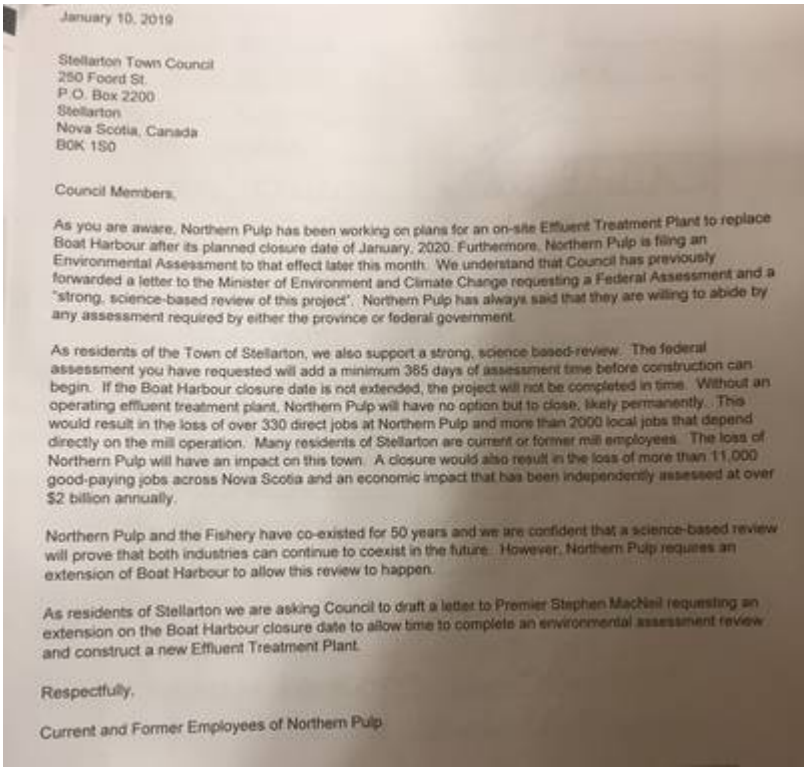
Stellarton town council has already sent a letter to the federal minister of Environment and Climate Change in support of a federal assessment for Northern Pulp's effluent treatment plan.

"I think we should send this letter in, if nothing else to stay neutral," said Deputy Mayor Bryan Knight emphasizing concerns that the Town of Stellarton could be drifting "too deep" into matter.

"My view is that we should send this letter and cut it off there and give both sides a chance to be heard," said Knight.

Common ground between the fishery and the pulp mill was the line that councillors Knight and Simon Lawand were walking when they spoke on the issue at a crowded town hall on Monday night. Former and current mill employees were in attendance at the meeting and used the open forum to speak for those in support of a Boat Harbour extension.

"What we're telling you right now is that if we don't show community support that we do want these jobs, we do want these people living in our towns, we do want to be a part of a contributing county, town, municipal unit," said Northern Pulp employee Tom Dewtie. "What can it hurt to by sending this letter to say, 'give them the time' so that both side can co-exist?"



January 10, 2019

Stellarton Town Council
250 Foord St.
P.O. Box 2200
Stellarton
Nova Scotia, Canada
B0K 1S0

Council Members,

As you are aware, Northern Pulp has been working on plans for an on-site Effluent Treatment Plant to replace Boat Harbour after its planned closure date of January, 2020. Furthermore, Northern Pulp is filing an Environmental Assessment to that effect later this month. We understand that Council has previously forwarded a letter to the Minister of Environment and Climate Change requesting a Federal Assessment and a "strong, science-based review of this project". Northern Pulp has always said that they are willing to abide by any assessment required by either the province or federal government.

As residents of the Town of Stellarton, we also support a strong, science based-review. The federal assessment you have requested will add a minimum 365 days of assessment time before construction can begin. If the Boat Harbour closure date is not extended, the project will not be completed in time. Without an operating effluent treatment plant, Northern Pulp will have no option but to close, likely permanently. This would result in the loss of over 330 direct jobs at Northern Pulp and more than 2000 local jobs that depend directly on the mill operation. Many residents of Stellarton are current or former mill employees. The loss of Northern Pulp will have an impact on this town. A closure would also result in the loss of more than 11,000 good-paying jobs across Nova Scotia and an economic impact that has been independently assessed at over $2 billion annually.

Northern Pulp and the Fishery have co-existed for 50 years and we are confident that a science-based review will prove that both industries can continue to coexist in the future. However, Northern Pulp requires an extension of Boat Harbour to allow this review to happen.

As residents of Stellarton we are asking Council to draft a letter to Premier Stephen MacNeil requesting an extension on the Boat Harbour closure date to allow time to complete an environmental assessment review and construct a new Effluent Treatment Plant.

Respectfully,

Current and Former Employees of Northern Pulp

Letter to Stellarton town council from current and former employees at Northern Pulp dated Jan 10.

Mayor Danny MacGillivray raised concerns over the fact that the letter does not mention any specific dates for how long Boat Harbour would need to remain open should the mill be given an extension.

"I'd also like to hear from Pictou Landing First Nation on what they think of the extension too before we want to have a vote on the letter," he said. "As a main stakeholder I think we should probably hear from them before making a decision."

No one from the Mi'kmaq community was present at the meeting and Pictou Landing First Nation Chief Andrea Paul said that her community had not been consulted.

"I had no knowledge whatsoever that they were doing this," said Paul in a phone interview. "I thought we were beyond that stage of having these conversations about us without us."

"It may not have changed tonight's outcome, but at least the opportunity would have been there to share our perspective."

On Jan. 9 Paul spoke at a the Municipality of Pictou County council meeting where council voted to pass a resolution honoring the Boat Harbour Act.

The letter from Northern Pulp employees to Stellarton town council was dated Jan. 10.

"When you get this close to the end and to see this type of political interference by Northern Pulp, I can honestly say I don't like it," said Paul.

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CBC

Province says it's not budging on Boat Harbour deadline

Northern Pulp says it needs more time to prepare the waste treatment facility that will replace Boat Harbour

Paul Withers · CBC News · Posted: Jan 16, 2019 8:49 PM AT | Last Updated: January 16

The Boat Harbour treatment facility is owned by the provincial government, which is on the hook for cleanup costs once the facility closes. (The Canadian Press)

The Nova Scotia government will not relax its January 2020 deadline to close the Boat Harbour wastewater effluent treatment facility, even though regulatory issues have delayed the start date for the massive cleanup project by months and perhaps even a year.

The delay is significant because Northern Pulp has asked the province to keep Boat Harbour open beyond the scheduled closing in order to continue treating 75 million litres of effluent

daily from its Pictou County pulp mill.

- **Boat Harbour cleanup expected to start in 2021**
- **Premier hopes 'cooler heads prevail' as pulp mill works on assessment**

The mill says it needs more time to prepare the waste treatment facility that will replace Boat Harbour.

Kathy Cloutier, a spokesperson for parent company Paper Excellence, said the remediation delay is more evidence of the pitfalls of setting deadlines before regulatory approval.

"We have asked and have said we need an extension," she told CBC News. "So, does this help? One would have to say yes. If they aren't ready and we need to use it, then we would prefer to do that."

Province still firm on deadline

But the province seems uninterested in accommodating the mill.

The Liberal government maintains it gave Northern Pulp plenty of notice the treatment facility's days were numbered when it passed a law to close Boat Harbour four years ago.

"The province remains committed to the legislated closure date of January 31, 2020, under the Boat Harbour Act," spokesperson Marla MacInnis said late Wednesday in an e-mailed statement.

The remediation project for Boat Harbour, and its timetable, is separate from the new treatment system that is being proposed by Northern Pulp to replace Boat Harbour.

That project is facing its own regulatory and environmental challenges.

"It's a big, complex problem," said Ken Swain, the project manager for the Boat Harbour cleanup. "It's a pretty complicated solution."

Nova Scotia on the hook

Since 1967, lagoons adjacent to the Pictou Landing First Nation have received tens of millions of litres of wastewater effluent per day from the nearby pulp mill.

The Boat Harbour treatment facility is owned by the provincial government, which is on the hook for the cleanup once the facility closes. The cost is forecast at $217 million.

The Boat Harbour remediation project has been subject to a number of delays. (Nova Scotia Government)

Controversy swirls over where the mill's latest owner, Northern Pulp, plans to discharge treated effluent when Boat Harbour closes.

Swain said the remediation is proceeding on the assumption Boat Harbour will close by Jan. 31, 2020, even if the Boat Harbour cleanup is not ready to proceed.

"We're probably gonna have to push that back," Swain said.

Cleanup expected to start in 2021

Swain points to the environmental assessment process. The cleanup project will undergo a Tier II provincial environmental assessment, which includes an independent review panel and public hearings. It can last up to 275 days.

Last week, the province submitted its plans to the Canadian Environmental Assessment Agency. The agency will decide in February whether the project should undergo a federal assessment.

Procurement will follow regulatory approval and take months longer.

"So what we would probably see in that instance is not being able to have the full-scale implementation started until perhaps early 2021," Swain said.

Boat Harbour cleanup plan

The plan is to dredge up to a million cubic metres of contaminated, watery sediment and pipe it to a pad where water will be removed for treatment.

Up to 500,000 cubic metres of solids will be moved to an existing and expanded containment cell on site.

- **Northern Pulp wins injunction against fishermen's blockade**
- **Forestry minister not ready to contemplate closure of Northern Pulp just yet**

"The biggest technical challenge is effectively removing that material off the bottom of Boat Harbour," said Swain.

"We want to figure out the most efficient and effective way of getting the lens of contaminated sludge off the bottom and taking as little as possible of the clean underlying harbour bottom."

Why a key pilot project was suspended

They are still looking for the right solution.

A protester wears a sou'wester during a July 2018 protest against Northern Pulp's plan to dump millions of litres of effluent daily into the Northumberland Strait. (The Canadian Press)

Last October, dredging began to test techniques, but the pilot project was suspended in December because cold weather froze pipes.

The pilot project will resume sometime in April or May.

What's in raw mill effluent?

In May 2017, the province awarded a $6.7-million contract to GHD, an international consulting firm, to come up with the detailed plan for the cleanup.

The plan submitted to the federal government on Jan. 7 is from GHD and Nova Scotia Lands, a provincial agency charged with environmental cleanup.

GHD determined the nature and extent of contamination.

It also compared raw effluent with provincial and federal standards.

"Results indicated both PCBs and dioxins and furans were below the applicable criteria, while metals exceed the marine criteria for barium, boron, cadmium, copper, lead, mercury, and zinc. Metals parameters reported to exceed the Provincial human health criteria were sodium and vanadium," the project description stated.

The good news

The contaminated sludge is 10 per cent solids and 90 per cent water. The goal is remove between 50 to 70 per cent of the water.

The good news so far is water removed from the sludge is relatively clean.

"It will need some treatment, but not to the extent that we initially were envisioning," Swain said.

"We know we have to deal with in excess of five million cubic metres of water during the full-scale implementation of the remediation, which is several thousand Olympic-size swimming pools. So it's a large volume, a big-cost driver."

How the forecast cost has increased

In 2018, the cost of the full cleanup was estimated at $217 million.

It has risen steadily since the initial estimate of $52 million in 2015, $88 million in 2016 and $133 million in 2017.

A new forecast is expected in mid-2019 after the pilot project is completed.

The goal of the cleanup is to return Boat Harbour tidal estuary to its original condition in 1967 which means removing all the contaminated sediment.

"We'll have to be clean," said Swain.

"At the end of the day what goes out needs to be in compliance with the Fisheries Act. So we cannot release any deleterious substances into the environment so we've got to get it all."

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Province in conflict of interest over Northern Pulp project, activists allege

'How can they be judge of the project, when it's their project?' asks Jill Graham-Scanlan

CBC News · Posted: Oct 04, 2018 1:48 PM AT | Last Updated: October 4, 2018

Friends of the Northumberland Strait want the Canadian Environmental Assessment Agency to take over a review of the project. (Andrew Vaughan/Canadian Press)

A group that opposes Northern Pulp's plan to dump effluent into the Northumberland Strait is calling on the Nova Scotia government to recuse itself from the controversial project's environment assessment process.

In September, Friends of the Northumberland Strait sent an eight-page letter to the provincial Environment Department and Environment and Climate Change Canada, urging the federal

government to conduct the assessment instead.

Jill Graham-Scanlan, the group's president, told CBC Radio's *Information Morning* that the province has several conflicts of interest and "is not in a position to make an unbiased determination" on whether the project should go ahead.

Demonstrators gathered in July to protest plans by Northern Pulp to run an effluent pipe into the Northumberland Strait. (Steve Lawrence/CBC)

The pulp mill in Pictou, N.S., plans to build a pipe that will send effluent far out into the Northumberland Strait. It will replace the current Boat Harbour facility that the province promised to close by 2020.

A design for the new facility hasn't been finalized yet, but once it is, it will have to go through a provincial environmental assessment.

- **Northern Pulp effluent pipe protest draws huge crowds on land and sea in Pictou**

- **Proposed Northern Pulp pipe route into ocean hits snag**

"The province needs to take a proactive approach on this," said Graham-Scanlan. "They need to recognize and acknowledge that they are in a conflict position and step back."

Paid $6M to Northern Pulp

Friends of the Northumberland Strait argues the province has a financial stake in the design and construction of the new facility, having already paid $6 million to Northern Pulp in 2017.

The government has said taxpayers will need to help pay for the new facility because the province is in a lease agreement with Northern Pulp.

"How can they be judge of the project, when it's their project?" asked Graham-Scanlan.

- **$6M in taxpayer dollars for N.S. effluent plant stinks, says opponent**
- **Fishermen worry Northern Pulp treatment plan will create 'dead zone'**

The group's letter to the federal and provincial governments also states the province "may face direct and significant financial consequences and litigation if it does not quickly approve the environmental assessment."

The group points to an indemnity agreement and memorandum of understanding the province signed in 1995 with the former owner of the mill.

In its letter, Friends of the Northumberland Strait write that “the stakes of this project are high. The Northumberland Strait is a valuable and delicate ecosystem." (Nic Meloney/CBC)

"That memorandum of understanding seems to imply that the province will do anything it can to make sure a new treatment facility is built," said Graham-Scanlan.

She said there are also concerns that a registered lobbyist for Northern Pulp now works for the government, and that the province seems to be co-operating with the company rather than providing information to concerned citizens.

Province says decision 'will be based on science'

In a statement to CBC News, the government said the environment is its first concern.

"Any decision will be based on science and the best available evidence," the Environment Department said.

"It is not the province's decision whether or not a federal environmental assessment should take place. We have determined that the Northern Pulp effluent treatment plant project requires a provincial Class 1 environmental assessment. The federal government would decide whether or not it will do its own EA as well."

If the federal government does decide to do its own assessment, that doesn't mean the province is required to bow out, but Graham-Scanlan hopes it will.

"What would compel the province to step back? Doing the right thing," she said.

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Nova Scotia's forest industry faces unknown future without Northern Pulp

Sawmill operators, woodlot owners contemplate effects of a potential Northern Pulp shutdown

Michael Gorman · CBC News · Posted: Jan 22, 2019 6:00 AM AT | Last Updated: January 22

Even with a purposely light touch, 25 per cent of the harvest on this private woodlot was still pulpwood. The low-grade product was sold to Northern Pulp. (Michael Gorman/CBC)

It was a few months ago that Jeff Bishop noticed a growing unease about the future of Nova Scotia's forest industry.

Bishop, the executive director of Forest Nova Scotia, was suddenly taking more and more calls. On the other line were concerned industry members, all taking stock of what the potential loss of the Northern Pulp mill in Pictou County would mean for their livelihoods.

As the legislated closure date of the mill's Boat Harbour treatment facility looms and no replacement approved, the future of the mill — which takes between 35 and 40 per cent of the pulpwood from the provincial market — remains murky.

While there are differing opinions on the mill in terms of its history, operation and environmental footprint, there is mostly consensus on the role it plays within the forestry industry, both direct and indirect.

Officials with the Northern Pulp mill have yet to file their application for an environmental assessment for a new effluent treatment facility. (The Canadian Press)

A 2016 economic impact study found 6,100 direct forestry jobs in the province and Bishop estimates at least 2,550 of those are people connected to wood that eventually finds its way to Northern Pulp in one form or another.

The top 11 sawmills in the province, which account for 96 per cent of the lumber made here, all have ties to Northern Pulp. More than 90 per cent of sawmill chips in the province end up

there.

- **Province says it's not budging on Boat Harbour deadline**
- **Forestry minister not ready to contemplate closure of Northern Pulp just yet**

Andrew Watters, general manager for Groupe Savoie's hardwood sawmill in Westville, said they get about 30 per cent of their logs from Northern Pulp. All their chips and bark go back to the pulp mill.

"It's a pretty good part of our business plan," he said. "That sawmill waste helps pay your bills. If you don't have a market for that it's pretty hard on the equation."

There are 50 people working at the Westville sawmill, which already struggles to get supply. As a result, the mill is only running one day a week — enough to keep employees' benefits in place and make pension contributions.

If Northern Pulp were to close, Watters estimates mill production would drop to between six to eight months of the year.

Jeff Bishop is executive director of Forest Nova Scotia. (CBC)

The links don't end there, said Bishop.

"There's hundreds — if not thousands — of landowners that sell wood on the market, whether directly to Northern Pulp themselves or through another supplier that Northern Pulp may work with," he said.

Because of how thin the margins can be in the forestry industry and how integrated things are, it is difficult for there not to be significant ripples if such a major player were to exit.

"The forestry industry is greatly dependent on each other and Northern Pulp is the most important link in this relationship," an official with Wagner Forest Management N.S. wrote in a November email to Premier Stephen McNeil and Lands and Forestry Minister Iain Rankin to voice concern about the potential loss of the mill.

Logs harvested in Colchester County are stacked and arranged based on their destination. Pulpwood goes to Northern Pulp, while stud logs will go to one of two lumber mills. (Michael Gorman/CBC)

It was urgency of a different kind in 2014 that led to the creation of the Boat Harbour Act.

That summer, a pipe leading from the mill to Boat Harbour was found to be leaking effluent. An agreement between the government and the Pictou Landing First Nation ended a blockade at the site and led to the passage of legislation in 2015, which called for Boat Harbour to be closed by the end of January 2020.

The bill was born out of the government's desire to do right by a community that for decades had been lied to, saw concerns go unaddressed and was subject to environmental racism.

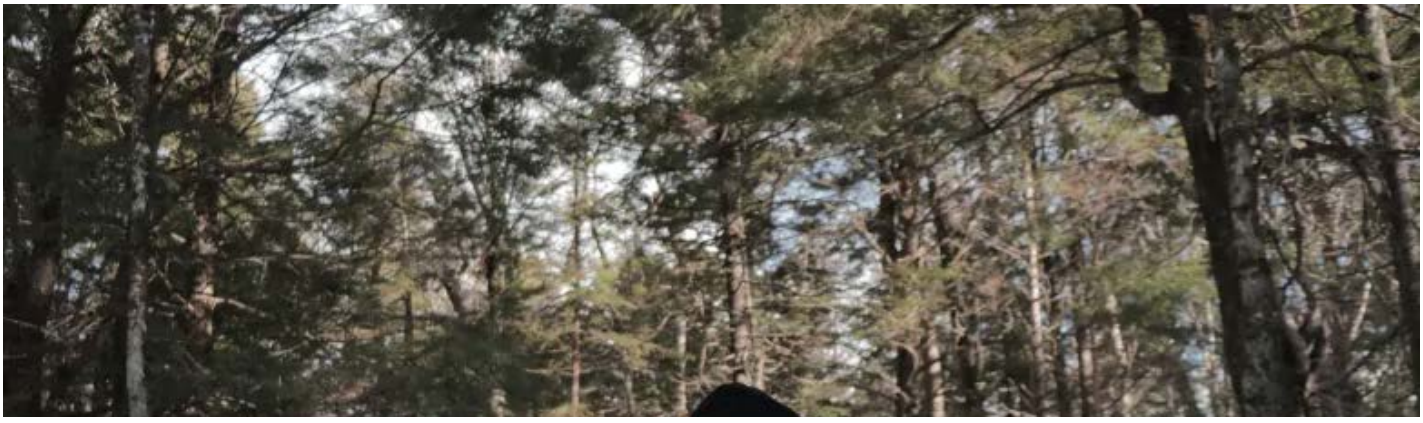
Recently, as the mill attempted to complete work for an assessment application to pump treated effluent into the Northumberland Strait, focus shifted to what the new treatment facility would mean for the fishing industry — something that's led to protests and created pitched tensions within Pictou County.

- **Tensions around Northern Pulp have local MP 'deeply concerned'**
- **Northern Pulp admits it is likely to miss 2020 effluent deadline**

Amid those tensions, and strong lobbying by the mill, McNeil has rejected calls to extend the closure deadline. The mill has had five years to prepare its plan, he's said, and he intends to keep his promise to the Pictou Landing First Nation.

People in the woods, meanwhile, wonder what it could mean for the future viability of their industry.

Last month, Rankin said the government wasn't at the point of considering a future without the mill, but people in the industry certainly are. The challenge for anyone pulling pulpwood from a block of land is there are few places for it to go.



Andy Kekacs is executive director of the Nova Scotia Woodlot Owners and Operators Association. (Michael Gorman/CBC)

"This is a phenomenal volume of wood for which there isn't much of another use," said Andy Kekacs, executive director of the Nova Scotia Woodlot Owners and Operators Association.

On this day, Kekacs is giving a tour of a recent cut on a private lot in Colchester County.

- **Northern Pulp to shut Boat Harbour waste treatment plant in 2020**

It's the very definition of soft touch forestry, with trees cut by chainsaw and lots of large trees with high-end value still standing, but with enough space between them so new trees can sprout up.

Even with this approach, 25 per cent of the wood removed was low grade and it all went to Northern Pulp. That money helps make the softer touch more economical.

Losing the mill would have a "significant disruption" on the industry, said Kekacs, one that would extend from sawmills to contractors in the woods, to people who drive trucks and the variety of businesses in rural communities sustained by the paycheques of those workers.

Greg Watson is manager of the North Nova Forest Owners Co-op. (Michael Gorman/CBC)

Greg Watson thinks about where else pulpwood could go as he watches a machine pile it high along a logging road in Denmark, Colchester County.

Watson, manager of North Nova Forest Owners Co-op, used to play in these woods as a kid. Today he's showing off what amounts to a restoration cut, a partial harvest that will help make the land and wood on it more valuable and allow for better regeneration.

Cutting wood like this isn't easy; it often takes more time and costs more money than simply knocking down a stand. But it reflects what landowners in the co-op want, said Watson.

Doing this kind of work, and the nature of Nova Scotia's forests, means crews working for the co-op pull out a lot of pulpwood. That pulpwood needs to go somewhere, and for North Nova right now that somewhere is Northern Pulp, which takes some sort of product from about half the jobs the co-op does.

"I don't think people are aware — and I'm not defending big industry or anything — but I don't know if people actually understand how much it takes," said Watson.

A harvester removes trees during a partial cut in Colchester County. (Michael Gorman/CBC)

The mill also provides North Nova with funding for silviculture work on partial harvests and planting and spacing.

Watson said anyone with ties to the mill is worried. It's the most pressure the sector has faced that he can remember. The co-op has 300 members and Watson and his team manage more than 28,000 hectares of land in Cumberland, Pictou and Colchester counties.

The ability of the team to work the woods has a direct effect on the co-op's woodlot owners, who treat their land as an investment.

Some take regular dividends in the form of firewood sales, for example, while others wait for the right time to use the proceeds of a cut to finance a major expense, such as the construction of a smaller home that keeps them in their community as they age.

"It's not just North Nova as a business," said Watson. "We help a lot of people. We've all got to live here. We've all got to find a solution here."

For many people in the forestry sector, the time to find that solution could be running out.

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Nova Scotia paying millions for Northern Pulp treatment plant design

Aaron Beswick (abeswick@herald.ca)
Published: Aug 21, 2018 at 7:40 a.m.

Northern Pulp is planning to build a replacement for the Boat Harbour treatment facility next to their location in Abercrombie. The current treatment facility will close in January 2020.

The province is paying for at least part of the design of Northern Pulp's new effluent treatment facility.

Tucked into the supplementary information of the Public Accounts document is a grant of $6,001,238.13 to Northern Pulp Nova Scotia Corporation from the Department of Transportation

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and Infrastructure Renewal.

It's for designing the facility that another arm of the provincial government will conduct an environmental assessment on.

Ronnie Heighton thinks there's a problem with that.

"It's a direct conflict of interest," said the River John fisherman and spokesperson for the Northumberland Fisherman's Association.

"How can a regulator and financer be trusted to do their own environmental assessment?"

Neither the provincial government nor Prime Minister Justin Trudeau think there's a problem with that.

Both McNeil and Trudeau have maintained that the province will

do the environmental assessment.

The province never issued a news release about funding the design.

After it was discovered by the Friends of the Northumberland Strait, a group opposed to Northern Pulp's plan to pump treated effluent into the body of water, The Chronicle Herald contacted the Department of Transportation and Infrastructure Renewal.

"The contribution allows negotiations with Northern Pulp to continue and will be credited towards any future agreement," said spokeswoman Marla MacInnis.

"This cost is part of a larger discussion with Northern Pulp which is yet to be concluded."

That larger discussion is who pays to build the replacement for Boat Harbour.

A 1995 indemnity agreement and lease renewed in 2002 by premier John Hamm's government — Hamm is now chair of Northern Pulp's board of directors — puts the taxpayer on the hook for cleaning up Boat Harbor and providing a treatment facility for the mill's effluent until at least 2030.

While the province isn't saying how much a replacement will cost, a 2015 letter by Terri Fraser, technical manager at Northern Pulp, to then Environment minister Randy Delorey warned a new facility would cost over $100 million.

"We expect taxpayers to be on the hook for half a billion by the time this is all finished," said Jill Graham-Scanlan, a Pictou lawyer and spokeswoman for Friends of the Northumberland Strait.

"We are at a loss to understand why the public and the fishermen are not considered stakeholders in this game of chicken. It's our money being used to pay for this project."

She takes the money for design work as a sign the province will be on the hook for the entire construction cost of the new effluent treatment facility.

MacInnis said it was just to keep the project moving to meet the Jan. 31 deadline for the closure of the existing facility mandated by the Boat Harbour Act passed by the legislature in 2015 to get the Pictou Landing First Nation to lift a blockade of Northern Pulp.

"Detailed engineering was one of the critical items required to build a potential replacement facility in time to meet the closure deadline of January 2020 for the existing facility," said MacInnis.

"This step was required to stay within that timeline and would be reviewed as part of the environmental assessment process."

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Nova Scotia fisherman says blockaders are being used as 'scapegoat' in fight with Northern Pulp

By **HALEY RYAN** StarMetro Halifax
Tues., Dec. 18, 2018

HALIFAX—A Pictou fisherman of 30 years says Northern Pulp Mill's successful injunction against those who've blocked mill survey boats is a blame tactic to hide the company's lack of proper waste plan.

Nearly 100 people from various environmental groups, Pictou Landing First Nation, Pictou area residents and other supporters rallied outside the Nova Scotia Supreme Court in Halifax amid blowing snow on Tuesday afternoon.

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Fishermen's supporters hold up anti-pipeline signs outside Nova Scotia Supreme Court Tuesday. Almost 100 people gathered outside the courthouse before lawyers for Northe company, Paper Excellence Canada, made arguments seeking an interim injunction to pı fishermen's blockades of survey work in the Northumberland Strait. (ZANE WOODFORI

The rally members said they were there to both support the fishermen named in the temporary injunction sought by Northern Pulp, and protest the mill's plan to pipe 62 million litres of treated waste, or effluent, each day directly into the Northumberland Strait between Nova Scotia and Prince Edward Island.

"If we allow it, our fisheries die," Pictou fisherman Donald Cheverie said in an interview, his gloved hands resting on a large sign reading 'No pipe in the strait.'

"It's poison."

Fishermen have been blocking the mill's survey boats from scouting for a potential pipe location since this spring, leading to the mill's move to file for a temporary injunction.

That was granted by Nova Scotia Supreme Court Justice Denise Boudreau on Tuesday, who

said the fishermen have the right to "lawful protest," but they don't have the legal right to block the survey vessels from doing their work.

Kathy Cloutier, a spokeswoman for Northern Pulp's parent company, Paper Excellence

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"Our hope was that the surveying would be allowed to occur without incident or obstruction, however actions indicated that the environmental assessment survey work would not proceed without the company seeking a court injunction," Cloutier wrote.

The proposed pipeline has been loudly contested by environmentalists, local fishermen, Hollywood actor Ellen Page of Halifax, the P.E.I. government and Indigenous residents of Pictou Landing First Nation near the Abercrombie, N.S. plant.

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Cheverie said local fishermen are so concerned about the pipe because the N.S. fisheries industry has "a lot at stake," while he said Northern Pulp could "walk away scot-free" since the province is left with any cleanup.

The wider Gulf of St. Lawrence fisheries region is home to lobster and crab fisheries that brought in over $1.2 billion worth of catch in 2016.

Right now, the effluent is treated in a basin system where effluent flows through a pipe from the mill to Boat Harbour and then to Boat Harbour Basin, iPolitics reported in an October piece about the mill. There, it mixes with other rivers and streams that flow in there. It is retained for up to 30 days before being discharged into the saltwater at the Pictou Landing shoreline.

shoreline.

Now that the mill is losing Boat Harbour as an effluent destination — the 2015 Boat Harbour Act set Jan. 31, 2020 as the cut-off date — it has to go somewhere, hence the debate around the possible new pipeline into the strait.

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In response to environmental concerns around the proposed effluent pipeline, Cloutier said in an email last week that treated effluent is "non-toxic." Since the bleached kraft pulp mill started in 1967, effluent has been flowing into the Northumberland Strait with "both our fisheries and forest industries coexisting," Cloutier wrote.

"Effluent of today is not the quality of decades past. Significant improvements have been made over the years. The proposed new form of treatment technology will be an Activated Sludge Treatment (AST) system. The new system will see no untreated effluent (wastewater) leave the mill property," Cloutier said Tuesday.

But Cheverie said the mill's position is "another lie," and any effluent that goes into the strait would be worse than what's currently coming out of Boat Harbour because there it has about 30 to 40 days to settle, and the new system would pump effluent out every day.

Donald Cheverie, a Pictou, N.S. fisherman of 30 years, rallied outside Nova Scotia Supreme Court on Dec. 18, 2018 in support of the other fishermen named in the injunction sought by Northern Pulp. (ZANE WOODFORD/STARMETRO)

The mill has already said it likely won't be able to meet the legislated Boat Harbour deadline,

and it hasn't yet submitted an environmental assessment application for a new effluent pipe into the ocean.

For Cheverie, he believes the fishermen have every right to protest the mill's actions by

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"They're trying to use us as a scapegoat. They had five years to do something, and they've done nothing in five years. So trying to blame it on six fishermen? It's absurd," Cheverie said.

"They have no plans on doing anything. They're after an extension to keep Boat Harbour open. If they had any intentions of doing anything with the pipe, you think they would have started four years ago?

Cheverie said Northern Pulp should take up a closed loop treatment system for their effluent if they changed their pulp process (which would keep effluent out of the ocean), but Cloutier said such a "zero effluent" plan is not an option for the mill in the proposed new effluent treatment facility.

Cloutier said a zero effluent bleached kraft mill "does not exist at this time," and that concept "is not seen as being technically nor economically achievable in the foreseeable future."

Tuesday's rally was largely peaceful, although there were some tense moments between four counter-protestors carrying signs saying 'support Northern Pulp effluent cleanup' and those who were anti-pipeline. They raised signs in each other's faces, and threw up middle fingers as they leaned around the handful of Halifax police officers who separated the groups.

One man yelled "go back to Pictou Landing" in reference to the First Nation, in the direction of a group of men which included some Indigenous protesters.

Ben Chisholm of Antigonish, N.S. is a pipefitter who does business with Northern Pulp and was one of the four counter-protestors. He said they wanted to show support for the mill to remain open, since the company provides a lot of work and income to the construction industry in the area.

Chisholm said he believes Northern Pulp will have a "properly engineered plan" for their proposed pipeline and effluent, and it will be subject to any rules set out by an environmental assessment.

"The government will be checking it all the time, so if it's not up to standard then they can step in and do something," Chisholm said.

He also added that while he's glad to see Boat Harbour will be cleaned up, the effluent that has left the basin over the past 50 years "didn't hurt the fisheries ever" and said "there was

never a fish killed.”

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Nicole MacKenzie of Friends of the Northumberland Strait believes the proposed plan to pump effluent into the ocean will not only physically hurt the fisheries industry, but also create a negative perception that will hurt N.S. exports. (ZANE WOODFORD/STARMETRO)

However, Nicole MacKenzie from the Friends of the Northumberland Strait group said she believes the proposed plan to pump effluent into the ocean will not only physically hurt the fisheries industry, but likely create a negative perception that will hurt N.S. exports.

MacKenzie said even if mill effluent meets regulations it can still have harmful effects on aquatic life and habitat, or could also cause the fish and lobster to move away from the area—not to mention create a harmful perception that would damage the reputation of Nova Scotia’s seafood reputation.

“You don’t have to have a dead lobster to kill the industry,” MacKenzie said.

A court hearing at a later date will consider a longer-term injunction.

With files from The Canadian Press

Haley Ryan is a Halifax-based reporter covering women's issues and advocacy. Follow her on Twitter: @hkryan17

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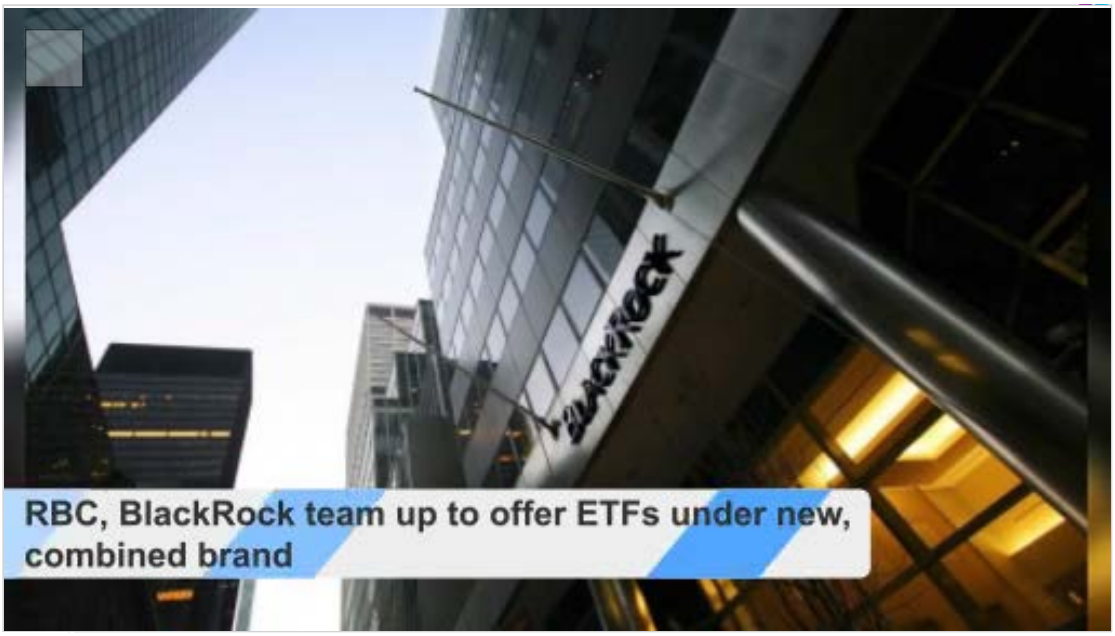

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Canada January 28, 2019 10:19 am Updated: January 28, 2019 5:27 pm

Nova Scotia First Nation starts official countdown on Boat Harbour

By Staff The Canadian Press

Fishing boats pass the Northern Pulp mill as concerned residents, fishermen and Indigenous groups protest the mill's plan to dump millions of litres of effluent daily into the Northumberland Strait in Pictou, N.S., on Friday, July 6, 2018.

THE CANADIAN PRESS/Andrew Vaughan

A Nova Scotia First Nation is taking a pointedly direct approach to ensuring that a highly polluted waste water treatment facility on its land is shut down.

Under legislation passed in 2015, the provincial government has committed to closing the Boat Harbour facility by Jan. 31, 2020 – one year from this week – and the Pictou Landing First Nation plans to mark the beginning of an official countdown on Thursday.

The First Nation, which is near Pictou, N.S., has organized a “One Year Countdown” event, which is expected to include traditional drumming, dancing, prayers, smudge ceremony and speeches.

The waste water is mainly treated effluent from the Northern Pulp mill, where a proposed plan would see more than 62 million litres per day pumped directly into the Northumberland Strait once Boat Harbour is closed.

That decision has enraged local fishermen, who have staged large protests and prevented the mill’s seismic survey work on the Strait.

READ MORE: ‘Stop it at all costs’: The blockade of Northern Pulp Mill continues

On Monday, Northern Pulp issued a statement saying the fishermen have agreed to comply with a court injunction that prohibits them from blocking seismic survey vessels hired by the mill.

The mill was granted an interim injunction by a Nova Scotia Supreme Court judge in December.

Northern Pulp now says it has reached an agreement with the protesters, saying it will allow the company’s work to proceed in the Strait, Pictou Harbour and Caribou Channel.

“Northern Pulp, and owner Paper Excellence, are pleased that the legal action by Northern Pulp has been resolved to Northern Pulp’s satisfaction through an agreement and the anticipated issuance by the court of a permanent injunction,” the company said in a statement.

The company declined to comment on the latest developments.

WATCH: Thousands gather to protest pulp mill in Pictou

In a brief statement, the fishermen said they accepted the judge’s decision and the pending issuance of a permanent injunction.

Northern Pulp is expected to return to court Tuesday to seek the long-term injunction.

The company is also expected to submit an environmental approval application to the provincial Environment Department later this week.

The company has said the treated effluent it plans to pump into the Strait will meet federal regulations for emissions, but opponents say there’s a lack of scientific evidence regarding how the waste will affect the long-term health of the lucrative lobster and crab fisheries.

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CBC

Northern Pulp wins injunction against fishermen's blockade

Judge says fisherman have right to lawful protest, but don't have right to block survey vessels

The Canadian Press · Posted: Dec 18, 2018 3:04 PM AT | Last Updated: December 18, 2018

People protesting the proposed Northern Pulp effluent pipe gathered Tuesday outside Nova Scotia Supreme Court in Halifax. (Preston Mulligan/CBC)

A Nova Scotia judge has granted a temporary injunction to stop fishermen from blocking survey boats hired to examine a route for a pulp mill's effluent pipeline.

Nova Scotia Supreme Court Justice Denise Boudreau decided the fishermen have the right to "lawful protest," but they don't have the legal right to block the survey vessels from doing their work.

Lawyers for the Northern Pulp mill in northern Nova Scotia argued that their project was being unlawfully held back by the fishermen's blockades.

Before the decision was handed down, about 80 people gathered outside the Halifax courthouse to protest the proposed pipeline that would pump treated waste directly into the Northumberland Strait near Abercrombie, N.S.

Kathy Cloutier, a spokesperson for Northern Pulp's parent company, Paper Excellence Canada, confirmed the mill was seeking an interim injunction to prevent blockades of the survey work in the Northumberland Strait.

A group of fishermen has stated they would block any survey boats from entering the strait.

The plan to pump treated effluent from its Abercrombie, N.S., mill into the strait has raised the ire of the fishermen, the P.E.I. government and even Hollywood actor Ellen Page, who is from Halifax.

Hundreds of boats joined a protest in July against Northern Pulp's proposed route for its effluent pipe. (Nic Meloney/CBC)

The wider Gulf of St. Lawrence fisheries region is home to lobster and crab fisheries that brought in over $1.2 billion worth of catch in 2016.

The Nova Scotia government has committed to stopping the flow of effluent to the heavily polluted Boat Harbour lagoon by Jan. 31, 2020. The lagoon is next to the Pictou Landing First Nation.

Outside the Halifax courtroom, the protesters carried signs that said "No pipe in the Strait," and they chanted "All I want for Christmas is no pipe."

- **Northern Pulp alleges death threats in legal action against fishermen**
- **McNeil plea for peace triggers protest in Pictou County**

Warren Francis, a 49-year-old fisherman and member of the Pictou Landing First Nation, said before the ruling was made that other protests would follow if an injunction is granted.

"I don't think it will stop us," he said. "My First Nation will have to step it up ... We don't want a pipeline in that strait ... I really hope it doesn't come down to violence."

Ben Chisholm, a 65-year-old business agent for the pipefitters union, said he came to the courthouse to support the mill's position because millions of dollars in economic activity could be lost if the mill closed.

"There's more support for keeping the mill open and cleaning it up than there is for closing it," he said, as the protest chants rang out nearby.

"Any time a big plant closes in an area, it's followed by poverty. There's nothing to replace this."

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Northern Pulp to soon file effluent plan

Premium content

Adam MacInnis (amacinnis@ngnews.ca)

Published: Jan 04 at 8:23 p.m.
Updated: Jan 05 at 9:05 a.m.

The Northern Pulp mill is seen in Abercrombie in 2017. - The Canadian Press

Northern Pulp will register its plans for replacing the Boat Harbour treatment facility with Nova Scotia's Department of Environment by the end of January, triggering the start of the provincial environmental assessment.

Despite the fact the mill hasn't yet been able to have a survey crew complete their work, the project will be registered using existing data, says Kathy Cloutier, director of communications for Paper Excellence, which owns Northern Pulp.

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"That is a heavily surveyed area, so there is data we're able to rely on, although our preference would have been our own updated survey."

Fishermen opposed to the plans of pumping treated effluent into the Northumberland Strait repeatedly blocked the survey boat from doing work in the area. A judge issued a temporary injunction last month to prevent fishermen from stopping the survey boat from doing work.

Cloutier didn't rule out the possibility of the survey work being completed before the end of January, but said it would depend on availability of the boat, weather and safety.

The plans Northern Pulp submits will include the primarily land-based route for the pipe carrying treated effluent from Abercrombie Point, which will empty in the area off Caribou Point. Northern Pulp had considered a route that would have emptied in the area of the Northumberland Strait off of Pictou Road. But there were concerns about that, including ice scours as well as a shipwreck that made the mill look elsewhere.

The Caribou route is the mill's preferred option for various reasons, including the volume and depth of water in that location, which would improve the mixing of the treated effluent flowing out with the water in the strait, Cloutier said.

"It's a better disbursement area and a shorter in-water pipe which answers some of the concerns raised by the community and others," she said.

While the initial route would have required building between 10 kilometres and 13 kilometres of pipe underwater, this route will only have about three kilometres underwater.

According to Clouthier, one of the biggest advantages of the new treatment facility over the existing one is that no untreated effluent will leave Northern Pulp's property on Abercrombie Point. With the existing system that's been in operation since the mill opened, untreated effluent is piped from the mill at Abercrombie Point to the Boat Harbour treatment facility near Pictou Landing where it is treated before being released into Boat Harbour and then flows out to the Northumberland Strait.

The provincial government says the new treatment facility would fall into the class 1 environmental assessment category, which would take about 60 days to complete. It hasn't been determined whether a federal environmental assessment, which could take much longer, will be required.

Cloutier said the company believes the project will meet the requirements of the environmental assessment. "We are confident in the project and the science."

Engineers and design teams are currently trying to work on a feasible timeline for completion of the project, she said.

The company has already said it will not be able to meet the deadline of January 2020 to close the existing Boat Harbour facility. It is lobbying the province to extend the deadline. Cloutier said the extension is supported by those who understand the importance of the mill to the forestry industry and overall economy of the province.

"This is an extension that is necessary to provide the time to complete construction," she said.

It would be impossible to keep the mill going even under a hot idle without a treatment facility, she said.

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Northern Pulp is not even considering the option of temporarily closing at this point, Cloutier said. No time of year would be optimal if they did have to shut it down, she said, but winter would particularly

be difficult. “It would be a ripple effect from suppliers to contractors to the port of Halifax almost instantly.”

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CBC

Northern Pulp taking legal action to stop survey boat blockades

Some Northumberland Strait fishermen have been blocking survey boats over effluent pipe proposal

Anjuli Patil · CBC News · Posted: Dec 05, 2018 5:48 PM AT | Last Updated: December 5, 2018

Paper Excellent Canada says it had no choice but to pursue legal action. (Nic Meloney/CBC)

Northern Pulp is taking legal action to put an end to blockades that have prevented survey boats from doing work for a proposed effluent pipe in the Northumberland Strait.

On Wednesday, Paper Excellent Canada announced it has initiated legal action as a response to fishermen in the Northumberland Strait blocking the survey boats as a protest. The company said it had no choice.

"Clearly our hope was that the surveying would be allowed to occur without incident or obstruction," said Kathy Cloutier, director of corporate communications for Paper Excellence Canada.

"However actions indicated that the environmental assessment survey work would not proceed without the company seeking a court injunction."

- **Stephen McNeil hopes fishermen will end blockade of Northern Pulp survey boats**
- **'We'll block them,' fisherman says of Northern Pulp survey boat**

Cloutier said the company supports people's rights for free expression, but said the blockades have moved into "an unsafe realm in terms of obstruction and/or threats."

"Then it became necessary — unfortunately — to look at avenues such as court injunctions. These are skilled professionals who have been contracted to perform a function and should be allowed to do so," Cloutier said.

Cloutier said the court documents have been filed and said a court date is scheduled for Dec. 18.

In the meantime, Cloutier said survey boats will remain docked until the process is completed.

Darryl Bowen, a fisherman from Caribou, N.S., doesn't think an injunction will stop blockades.

"There's a lot of fishermen on this shore and unless it's an injunction against every fisherman in the Northumberland Strait, there will be somebody there blocking them if they come back," Bowen said.

With files from Paul Withers and Jean Laroche

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CBC

Northern Pulp effluent pipe protest draws huge crowds on land and sea in Pictou

'When we sell Nova Scotia to the world, we're selling it as 'Canada's Ocean Playground,' says Pictou resident

CBC News · Posted: Jul 06, 2018 12:00 PM AT | Last Updated: July 6, 2018

Demonstrators gathered on Friday to protest plans by Northern Pulp to run an effluent pipe into the Northumberland Strait. (Steve Lawrence/CBC)

Hundreds of people from all three Maritime provinces gathered Friday in Pictou, N.S., to protest Northern Pulp's plan to put an effluent pipe into the Northumberland Strait.

Many chanted "No pipe, no way" as they marched from the local arena to the town's waterfront. Organizers estimated at least 1,000 people attended the protest.

Dozens of fishing boats and pleasure craft sailed into Pictou Harbour, some flying the Mi'kmaq Grand Council flag.

"We are the voice of this water, we are the voice of everything that lives in this water," said Andrea Paul, who was on board one of the vessels and is chief of Pictou Landing First Nation.

The pipe is supposed to replace the 140-hectare waste-water lagoon at Boat Harbour, which the government has promised to close by 2020.

The replacement would discharge about 70 million litres of treated effluent a day via a subsea pipe directly into the Northumberland Strait, several kilometres from the mill.

For 50 years, pulp mill waste water — from several mill owners — has been piped under the East River into the Boat Harbour lagoon. From there, it is aerated in settling ponds before being released about a week later into the Northumberland Strait.

Kayla Hounsell
@KaylaHounsell

One of the organizers of today's rally says it's emotional to see it all come together after months of planning. She says, "Pictou County's dirty little secret is coming out."

30 7:36 AM - Jul 6, 2018

See Kayla Hounsell's other Tweets

Jill Graham-Scanlan, president of Friends of the Northumberland Strait, told CBC's *Information Morning* that even though the effluent is being treated, it's still industrial waste.

"It'll contain all kinds of toxins — metals and other nasty substances that we in no way want flowing out into the clean, pristine waters of our Northumberland Strait and into rich fishing grounds," she said.

The plan for a new pipe hit a snag this week when recent sonar imaging showed the proposed route of the pipe and its outfall position will have to change due to a shipwreck, evidence of ice scouring, a shoal and a collapsed pier in the area.

Hundreds of people were at the waterfront in Pictou. (Nic Meloney/CBC)

The company is looking for a modification to the proposed route, not a new route, Kathy Cloutier, a Northern Pulp spokesperson, said in an email.

She said whatever Northern Pulp decides, the mill's "commitment to the community and environment will not be compromised."

The mill directly employs 330 people, and supports another 1,500 or so jobs in the forestry sector.

Mike van den Heuvel, a science professor at the University of Prince Edward Island, says it's a mistake to blame changes in the Northumberland Strait, including loss of biodiversity, solely on Northern Pulp.

There are hundreds of creeks and rivers, some carrying sediment and pesticides, flowing into the Strait, he told CBC's *Mainstreet Halifax.*

He says the portion of the mill's nutrient input into the strait is tiny, probably less than one per cent overall.

"Is there nutrients coming out of the mill? Yes. But it's not very much, when you consider it all as a whole."

Van den Heuvel, who studies the effects of agriculture and chemical use on freshwater and coastal environments, said the new treatment proposed for the effluent, based on the design, should be an improvement.

You won't be able to detect the wastewater plume more than 100 or 200 metres away from the pipeline, he said.

- **Proposed Northern Pulp pipe route into ocean hits snag**

Proposed plan puts Canada's Ocean Playground 'at risk'

Wes Surrett, general manager at the Pictou Lodge Beach Resort, said the proposed plan for the effluent pipe risks turning off tourists.

"When you're selling tourism, you're selling a brand and when we sell Nova Scotia to the world, we're selling it as 'Canada's Ocean Playground,' and here on the Northumberland Strait we sell our beautiful, sandy beaches, our warm swimmable waters and our fresh, local seafood," he told CBC's *Information Morning*.

"It is our belief that this proposed plan puts all of that at risk and once you tarnish that brand, then we're very concerned what that might do to potential tourism dollars down the road."

Some of the dozens of boats at the protest. (Nic Meloney/CBC)

Premier Stephen McNeil told reporters outside Province House on Thursday that government must find balance between what's good for the economy and what's good for the environment.

"There are those, though, that are always on opposite sides ... those that would prefer that there is no development and there's others who believe there should be development with no rules," said McNeil.

- **Environment Department official defends speedier Northern Pulp assessment**
- REPORTER'S NOTEBOOK **An 'unnerving' walk on Boat Harbour's contaminated floor**

"Our job is always to strike the balance to make sure that we protect the environment for future generations at the same time providing economic opportunity for those who are currently working in the economy of Nova Scotia."

He said how much the province will be contributing to the new treatment facility hasn't been finalized yet.

The Northern Pulp mill is shown in the background. (Nic Meloney/CBC)

More rigorous environmental assessment

Graham-Scanlan said she disagrees with the government's decision to "fast-track" the province's environmental assessment process by only requiring a Class I assessment on the replacement effluent pipe project, which she said isn't rigorous enough.

"So there's only a 30-day period for the public to view the plan and provide its comments to the environment minister. At that time, the environment minister has only 20 days to review all of the public concerns, review Northern Pulp's proposal and at the end of that 20 days the environment minister makes their decision," she said.

Some people in the area want the federal government to intervene and do a more thorough environmental assessment. (Nic Meloney/CBC)

Graham-Scanlan said she's asking the federal government to take over the environmental assessment process through the Canadian Environmental Assessment Agency.

"We believe that that process will be much more rigorous and give the due attention that this project requires," she said.

- **Taxpayers won't likely shoulder full cost of Boat Harbour replacement, minister says**

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With files from Information Morning

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Northern Pulp confirms effluent leak at Pictou Landing

Leak reported Sunday morning, a day after annual maintenance shutdown began

Anjuli Patil · CBC News · Posted: Oct 21, 2018 4:30 PM AT | Last Updated: October 21, 2018

There was an effluent leak from Northern Pulp on Sunday. (Andrew Vaughan/Canadian Press)

Northern Pulp says it has taken immediate action to remedy an effluent leak in Pictou Landing, N.S., reported Sunday morning.

The leak was reported a day after the company began its annual maintenance shutdown Saturday, according to Kathy Cloutier, director of communications for Paper Excellence Canada.

"Northern Pulp was not in production at the time of the leak," Cloutier told CBC News in an email.

Cloutier said the company was made aware of a possible effluent leak at 9:20 a.m. The leak was confirmed about 30 minutes later and the flow was stopped.

"Northern Pulp officials instantly notified First Nations and authorities of the incident," Cloutier said.

"Representatives from Northern Pulp will continue to work with agencies throughout the coming days."

Cloutier said Northern Pulp has arranged for a third-party environmental consultant to be at the site Sunday afternoon "for assessment and development of a path forward plan."

This leak is downstream of the area where a 2014 leak occurred, Cloutier said.

- **Province in conflict of interest over Northern Pulp project, activists allege**
- **Northern Pulp fined $225K for 'toxic' pulp mill effluent leak**
- **Northern Pulp ordered to contain, clean up effluent spill**

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UPDATED

Northern Pulp and fishermen agree to permanent injunction to allow survey work

N.S. mill granted interim injunction in December to stop fishermen from blocking survey vessels

The Canadian Press · Posted: Jan 28, 2019 12:01 PM AT | Last Updated: 32 minutes ago

Hundreds of boats from the three Maritime provinces joined a rally last July against Northern Pulp's plan to put an effluent pipe into the Northumberland Strait. (Nic Meloney/CBC)

A Nova Scotia First Nation is taking a pointedly direct approach to ensuring that a highly polluted waste water treatment facility on its land is shut down.

Under legislation passed in 2015, the provincial government has committed to closing the Boat Harbour facility by Jan. 31, 2020 — one year from this week — and the Pictou Landing First Nation plans to mark the beginning of an official countdown on Thursday.

The First Nation, which is near Pictou, N.S., has organized a "One Year Countdown" event, which is expected to include traditional drumming, dancing, prayers, smudge ceremony and speeches.

The waste water is mainly treated effluent from the Northern Pulp mill, where a proposed plan would see more than 62 million litres per day pumped directly into the Northumberland Strait once Boat Harbour is closed.

That decision has enraged local fishermen, who have staged large protests and prevented the mill's seismic survey work on the Strait.

On Monday, Northern Pulp issued a statement saying the fishermen have agreed to comply with a court injunction that prohibits them from blocking seismic survey vessels hired by the mill.

The mill was granted an interim injunction by a Nova Scotia Supreme Court judge in December.

Several boats flying the Grand Council Flag of the Mi'kmaq Nation preparing for a rally in the waters off Pictou in July, 2018. (Nic Meloney/CBC)

Northern Pulp now says it has reached an agreement with the protesters, saying it will allow the company's work to proceed in the Strait, Pictou Harbour and Caribou Channel.

"Northern Pulp, and owner Paper Excellence, are pleased that the legal action by Northern Pulp has been resolved to Northern Pulp's satisfaction through an agreement and the anticipated issuance by the court of a permanent injunction," the company said in a statement.

The company declined to comment on the latest developments.

In a brief statement, the fishermen said they accepted the judge's decision and the pending issuance of a permanent injunction.

Northern Pulp is expected to return to court Tuesday to seek the long-term injunction.

The company is also expected to submit an environmental approval application to the provincial Environment Department later this week.

The company has said the treated effluent it plans to pump into the Strait will meet federal regulations for emissions, but opponents say there's a lack of scientific evidence regarding how the waste will affect the long-term health of the lucrative lobster and crab fisheries.

- **Boat Harbour deadline won't move but McNeil says he's open to legislature debate**
- **Nova Scotia's forest industry faces unknown future without Northern Pulp**

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Northern Pulp admits it is likely to miss 2020 effluent deadline

'We are at risk of missing the timelines by a few months,' Paper Excellence executive says

Paul Withers · CBC News · Posted: Nov 13, 2018 8:33 PM AT | Last Updated: November 14, 2018

Two boats joined a rally in July against a plan by Northern Pulp, shown in the background, to put an effluent pipe into the Northumberland Strait. (Nic Meloney/CBC)

The owners of a pulp and paper mill in Pictou County, N.S., say it's unlikely a new effluent treatment pipeline will be ready in time for the government-imposed deadline of January 2020.

"We are at risk of missing the timelines by a few months," said Jean-Francois Guillot, vice-president of operations at Paper Excellence, which owns Northern Pulp.

"At this point, it's risky," he said. "I don't think so. We can have effluent treatment working by January 2020, it's just the discharge point, we kind of have to do backflips to make that happen."

The deadline matters because the mill's provincial industrial approval expires Jan. 30, 2020, and a functioning effluent treatment system is required.

"If we don't have an industrial permit, we have to stop the mill," Guillot said. "What do we do at that time? What do we do with the employees? What do we do with the asset itself?

"So, yes, we are asking ourselves those questions. For us, it's not how we walk away — it's how we can make it work."

Jean-Francois Guillot, Paper Excellence's vice-president of operations, says Northern Pulp is likely to miss a January 2020 deadline for a new effluent treatment system, but wants to continue operating in Nova Scotia. (Dave Laughlin/CBC)

Guillot said the company intends to submit an environmental assessment at the end of January 2019 for a new pipeline outfall in the Northumberland Strait four kilometres outside Caribou.

That document will provide more detail on when the company believes a new system will be operational.

"We want to stay in Nova Scotia," Guillot said. "We are convinced it can be workable."

Mill fate rests on effluent treatment

The treatment and release of an estimated 70-million litres of effluent each day is key to the mill's continued operation. It has prompted protests and blockades from fishermen who object to the discharge of treated effluent anywhere in the Northumberland Strait.

The impasse is the result of legislation passed by the Nova Scotia government to close the 140-hectare treatment lagoons at Boat Harbour by January 2020.

- **McNeil plea for peace triggers protest in Pictou County**
- **Effluent pipe leak renews opposition to Northern Pulp plan for waste pipeline to Northumberland Strait**

The Indigenous community has complained for decades about the effluent flowing through its land.

The closure date was a personal commitment from Premier Stephen McNeil, who has shown no sign of budging.

Boat Harbour compensation deal reached?

Guillot also said Northern Pulp has reached a "tentative agreement on compensation" with the province over the pending closure of the existing treatment facility at Boat Harbour.

The government leases the facility to the company for waste-water treatment.

When it passed legislation to close the facility, it effectively tore up a lease agreement with the company to keep it running until 2030.

"The province and ourselves came to an agreement about, OK, how it is going to work out," Guillot said. "We talk about compensation. Both sides are OK with it. Most of the issues now are making sure to make that happen. It's not a question of money."

The province has disputed the characterization that there is arrangement in place with Northern Pulp and its parent company.

"Government has been meeting with the company to discuss what could be fair compensation given the early termination of the Boat Harbour lease, however, there is no agreement in place at this time," Marla MacInnis, communications spokesperson, said in an email response to CBC News.

First site abandoned

In December 2017, Northern Pulp announced it would build a treatment plant on its property next to the mill at Abercrombie Point and pipe it about 11 kilometres to a dispersal point outside Pictou Harbour.

But the proposed site was abandoned after surveys revealed ice scouring could destroy the six-nozzle diffuser at the discharge point — not to mention require the burying of significant sections of pipeline along the route.

Mill defends new outfall site

Guillot claims the Caribou location in deeper water offers improved mixing and dispersion.

Much is already known about water conditions, according to the company, because of dredging for the Bay Ferries run between Caribou and Wood Islands, P.E.I.

"The treated effluent, when it goes into the ocean — it's really just dissolving or disappearing," he said.

The company said the Caribou location can meet federal water quality guidelines that require temperature and salinity to return to background levels within 100 metres of the outfall.

It has not yet provided modelling data for the proposed location.

Modelling animation of dispersal at Boat Harbour, based on a 30-day tide cycle in July 2016, shows effluent dispersal largely hugs the coast with fingers of effluent extending into the Northumberland Strait.

Guillot said the company is in discussion with the provincial government about obtaining a right-of-way to use the Pictou Causeway as a pipeline route toward Caribou.

"Nobody has closed the door at this point."

50 years of broken pipes and promises

The company is unlikely to win over local fishermen in the Strait who have boiled down their fight down to No Pipe in the Strait.

Groups representing fishermen say they aren't surprised that Northern Pulp will miss the deadline.

Fishing boats gathered to block survey boats hired by Northern Pulp earlier this month. (Submitted)

"To say that they will only miss the deadline by a few months seems wildly optimistic. It doesn't even reflect the advice of their own consultants," Allan McCarthy of the Northumberland Fishermen's Association said in a news release.

"It is the position of our working group, representing over 3,000 fishermen from Nova Scotia, Pictou Landing First Nation, P.E.I., and New Brunswick, that Boat Harbour must close on schedule. All parties in the ... legislature voted in favour of the Boat Harbour Act in 2015. We call on all parties to honour that act now," he said.

"If you think tensions are high now, you don't want to think about what could happen if MLAs do not honour the Boat Harbour Act."

Pictou Landing First Nation won't consider extending the deadline, said Chief Andrea Paul.

"Our community has lived with polluted air and water, broken promises and broken pipes for over 50 years. Boat Harbour is closing on schedule and we expect nothing less. We have also made it clear that we oppose dumping treated pulp effluent anywhere in the Northumberland Strait."

'Collateral damage'

Guillot said the division between the two sides could have long-term effects.

"The scare tactics, I'm OK with that. It's a free country but people have to realize what is the collateral damage that goes with that," he said.

It was the only explicit reference he made to the economic consequences of a mill closure.

"If people are prepared to live with the conditions of having no mill, there is nothing I can do. That's not the outcome we are looking for."

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'No pipe' protest forging new alliances along Northumberland Strait

Aaron Beswick (abeswick@herald.ca)
Published: Jul 05, 2018 at 3:58 p.m.
Updated: Jul 06, 2018 at 9:16 a.m.

Capt. Beverley Denny is one of the Pictou Landing First Nation fishers who will take a boat to protest the proposed Northern Pulp effluent pipe. - Aaron Beswick

First Nations no longer alone in battle over effluent

“There is an irony here,” says Mi’kmaq historian Daniel Paul as he talks about rallies to stop Northern Pulp from pumping its treated effluent into the Northumberland Strait.

“If they all care so much now, why didn’t they come forward 50 years ago.”

A broad spectrum of fishermens’ groups, environmental activists and concerned citizens have joined together under the NOPIPE banner to force the federal government to step in and order a larger scientific review of the pulp mill’s plan. For many though, the only choice is to stop it.

But decades ago, there were only the voices of the First Nations community that could be heard in opposition.

Back in 1981 Chief Raymond Francis walked into Daniel Paul's office and said he wanted to sue the province.

Francis was chief of the Pictou Landing First Nation that had watched the saltwater lagoon behind the community poisoned by the effluent piped into it from the kraft pulp mill at Abercrombie Point.

Paul was the district superintendent for the then Department of Indian and Northern Affairs.

"I told him you are going after the wrong people because the title of reserve lands is vested in the federal crown," recalled Paul.

In effect, Paul told the chief to sue his own boss – the federal government.

Ultimately, along with a $35-million settlement the federal government accepted that it had failed in its fiduciary responsibility to protect the Pictou Landing First Nation from a broad based campaign by provincial and municipal officials to get it to accept the effluent from the kraft pulp mill built at Abercrombie Point.

As part of the discovery process the court case heard from the community elders who told of how they feared reprisals from the broader white community if they stood against a project that would bring jobs to Pictou County.

"Just imagine what the public reaction would have been against these already racially oppressed people if they had said no, thus preventing the establishment of an industry which had the potential to employ, either directly or indirectly, thousands of non-Indians," wrote Paul in his history book We Were Not the Savages.

It wasn't until the pipe carrying untreated effluent to Boat Harbour ruptured in June 2014 and the band blockaded the site that the provincial government was forced to negotiate a closure of the treatment site.

Now work was underway cleaning up the Boat Harbour treatment site, which is owned by the province and leased to the mill, in anticipation of the 2020 closure date enshrined in legislation as part of the deal that saw the band lift its blockade.

"Right smack in the middle of where we fish lobster," said fisheries director Wayne Denny of where Northern Pulp's new proposed pipe will 'diffuse' its treated effluent into the Northumberland Strait.

"They killed everything behind us and now they're going to kill everything in front of us," said Denny.

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The irony for Pictou Landing, which owns 22 lobster licences and 420,000 pounds of crab quota, is the deal that will see Boat Harbour remediated will now see the effluent treated on shore and pumped

into the strait.

And there's not a lot of trust for the promises from the mill that the new pipe won't harm a fishery that directly employs 70 community members seasonally and brings in about $4 million in gross revenues.

Those numbers don't include the six lobster licenses privately held by community members.

Denny doesn't take reassurance from the requirement that Northern Pulp get an environmental assessment for the proposed replacement effluent treatment plant.

And Paul doesn't expect him or anyone in Pictou Landing to have much trust in the processes established by the federal and provincial governments that are supposed to see science, rather than political pressure, be the primary arbiter of whether projects continue.

"They were told they were going to be able to use Boat Harbour for recreation and swimming and fresh water fishing before they started pumping that effluent in there 50 years ago," said Paul.

"Now you're back there telling these people 'we're going to pump the water out into the strait and there's not going to be negative effects'. It's rather hard to get people to believe you when they have been grossly and viciously lied to over and over."

On Friday, July 6, the lion's share of Pictou Landing's fleet will be joining the flotilla in Pictou Harbour.

Watch online Friday for #No Pipe rally coverage

Many other residents plan on joining the land-based march.

Though his community fought largely alone for so long, Denny now welcomes the support of the broader non-aboriginal community.

"Now it's going to affect them too," said Denny.

"It's everybody's livelihood now."

(http://www.iheartradio.ca/big-dog-100-9)

NO PIPE COURTHOUSE RALLY IN HALIFAX TUESDAY

(/Author/Author/Mandy Wood)
MANDY WOOD
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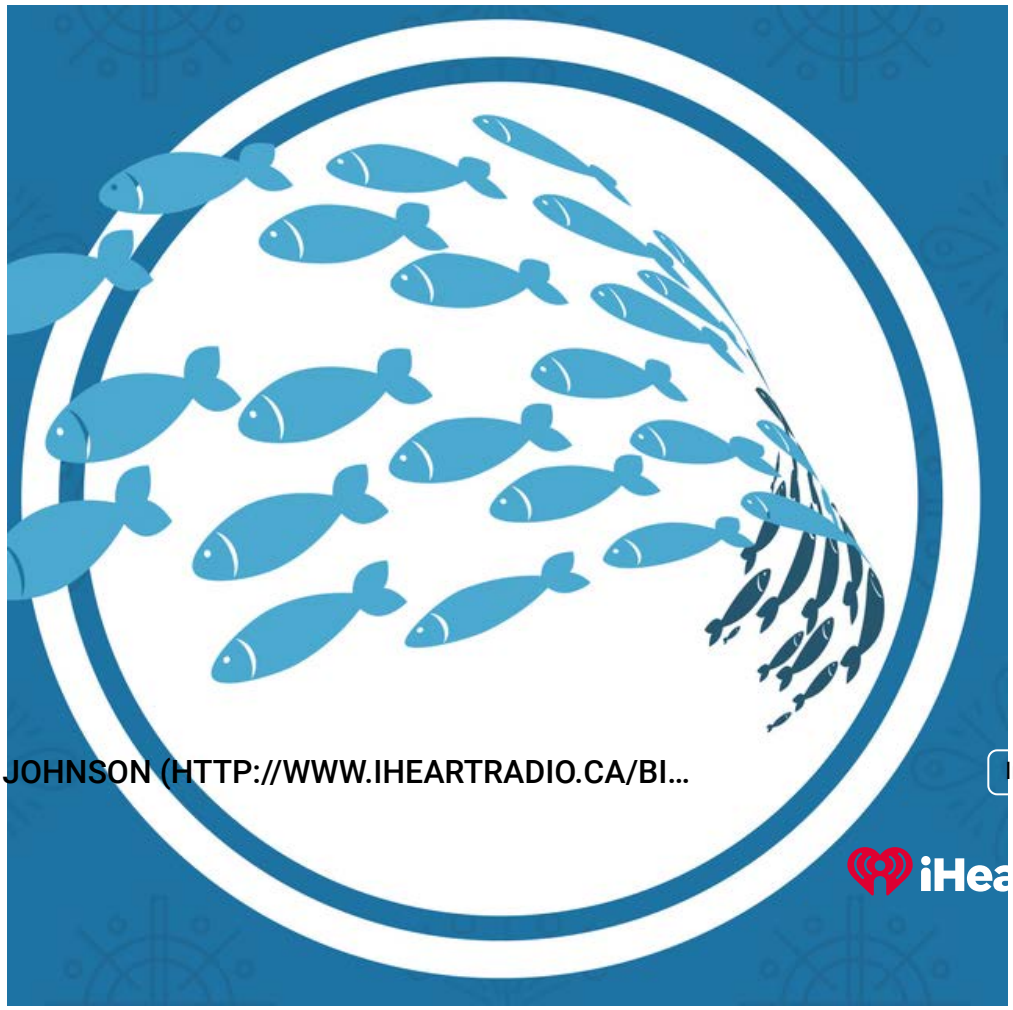

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Photo: Friends of The Northumberland Strait logo (Facebook)

A number of people are planning to rally outside a Halifax courthouse Tuesday afternoon to show their support for fishermen named in legal action against them by Northern Pulp.

The mill is seeking an interim injunction to prevent blockades or obstructions of survey work in the Northumberland Strait as it works on a route for an effluent pipe.

Friends of The Northumberland Strait, the group behind the rally, says Northern Pulp has also filed for a claim of damages against the fishermen.

The plan to dump treated effluent from the Abercrombie mill into the Strait has raised the ire of local fishermen, the Pictou Landing First Nation, the P.E.I. government and even Hollywood actor Ellen Page, who is from Halifax.

The wider Gulf of St. Lawrence fisheries region is home to lobster and crab fisheries that brought in over $1.2 billion worth of catch in 2016.

Tuesday's rally outside of the Nova Scotia Supreme Court on Upper Water St. is scheduled for 1 p.m.

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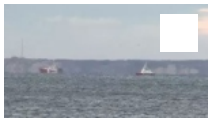
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N.S. pulp mill expected to miss 2020 deadline to close Boat Harbour

The Northern Pulp mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017. (THE CANADIAN PRESS/Andrew Vaughan)

THE CANADIAN PRESS
Published Wednesday, November 14, 2018 6:23PM AST

ABERCROMBIE POINT, N.S. -- A controversial pulp mill in northern Nova Scotia is facing delays with its new wastewater system, making it likely to miss the provincial deadline of January 2020 to stop using a polluted lagoon.

The Northern Pulp mill has been sending untreated effluent to a First Nation reserve for more than half a century, something the province's former environment minister called one of the worst cases of environmental racism in Canada.

Under provincial legislation, the kraft pulp mill has less than 15 months to overhaul how it processes wastewater.

Kathy Cloutier, a spokeswoman for Paper Excellence Canada, which owns the Abercrombie Point mill, says the setback is due to a delay with a pipeline.

She says the new wastewater treatment facility will meet the deadline, but that a new outfall discharge pipe will take longer.

Despite the delays, Cloutier says once the new treatment plant is operational, untreated effluent will no longer leave the mill.

"Currently (since 1967) untreated effluent travels through a pipe to the Boat Harbour Treatment Facility where it receives treatment and is then discharged as treated effluent into the Northumberland Strait," she said in an email.

"The new system will see effluent treated at the facility on mill property. No untreated effluent will flow through any pipe as is the case today."

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Northern Pulp's new proposal comes one day after effluent leak

The new system is slated to replace Boat Harbour, a toxic wastewater lagoon on the edge of Pictou Landing First Nation.

The delay was met with consternation among local community groups, fishermen and an Indigenous leader, who called on the mill to close Boat Harbour on schedule.

"Our community has lived with polluted air and water, broken promises and broken pipes for over 50 years," Chief Andrea Paul of Pictou Landing First Nation said in a statement.

"Boat Harbour is closing on schedule and we expect nothing less. We have also made it clear that we oppose dumping treated pulp effluent anywhere in the Northumberland Strait."

Allan McCarthy of the Northumberland Fisherman's Association said it's not a surprise that Northern Pulp will miss the deadline.

He said it seems "wildly optimistic" to say they are only a few months behind schedule.

McCarthy, who represents more than 3,000 fishermen from across the Maritimes, suggested the delay could cause increased strain between fishermen, the government and the mill.

"If you think tensions are high now, you don't want to think about what could happen if MLAs do not honour the Boat Harbour Act," he said.

A group of Northumberland Strait fishermen have said they will block any survey boats from entering the strait. Earlier this month, Premier Stephen McNeil encouraged fishermen to end the blockade of survey boats hired to examine a route for an undersea effluent pipe.

Although the mill initially suggested the effluent would be carried by polyethelyne pipe across Pictou Harbour and released through six dispersal pipes into the ocean, it's now examining an alternate route.

Cloutier said Northern Pulp is studying a primarily land-based route with an outfall point at Caribou.

"We are taking the time required to complete studies with regard to the alternate option as initial findings show that Caribou offers improved mixing/dispersion" compared to the original route proposed, she said.

The fishermen's group questioned the new route, saying Northern Pulp does not have answers to essential questions and the required reports and tests have not been completed.

The group said the new route would travel along the Pictou causeway, through a traffic rotary, pass through two watersheds and enter the Northumberland Strait at Caribou.

"We have seen that after mistakes are made, it can take a very long time to correct them," McCarthy said.

"Harming an ecosystem has long term effects."

- By Brett Bundale in Halifax

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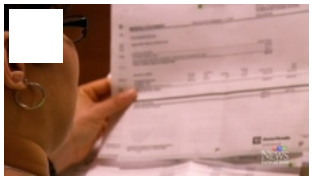

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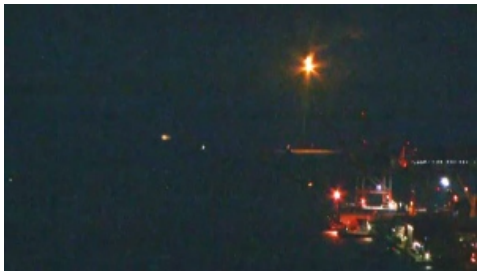

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N.S. paper mill asks for public help as protests mount, Ellen Page criticizes

The Northern Pulp Nova Scotia Corporation mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017. The CANADIAN PRESS/Andrew Vaughan

Michael Tutton , The Canadian Press
Published Friday, November 16, 2018 1:34PM EST
Last Updated Friday, November 16, 2018 4:20PM EST

PICTOU, N.S. -- A Nova Scotia pulp mill is asking for public support for more time to build an effluent pipeline to the ocean, even as one of the province's best-known Hollywood actors steps up her criticism of the plant.

Kathy Cloutier, a spokeswoman for parent company Paper Excellence, said the Northern Pulp mill is hoping people and groups in the province's forestry industry will issue public declarations in support of an extension for the effluent pipe project.

She said people who work in forestry realize the major impact it would have on the sector if the 330-employee mill can't operate because it can't discharge its treated waste into the Northumberland Strait.

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Fishing boats converge on Nova Scotia harbour as part of effluent pipe protest

N.S. fishermen to block mill's survey vessel from entering Northumberland Strait

"It will need to be vocal so that the premier feels that extending the deadline is something the community, the industry and politicians would support," said the spokeswoman.

Her appeal came as the province's lands and forestry minister, Iain Rankin, made it clear his government won't change the Jan. 30, 2020, deadline to shut down the Boat Harbour treatment lagoon at the Pictou Landing First Nation.

"We made a commitment to that community. The act passed with all party support. It gave the mill five years to switch to a different effluent treatment facility so Boat Harbour could cease to operate. And we continue to expect that," said Rankin.

Meanwhile, Ellen Page, a Halifax-born actor who played roles in "Inception," "Juno," "X-Men" and numerous other films, tweeted this week in support of Joan Baxter's book "The Mill: Fifty Years of Pulp and Protest."

Baxter's book traces 50 years of citizen criticism of the mill's environmental impact and efforts to have government do more to protect human and environmental health. It also examines the tactics the province originally used to convince the Pictou Landing First Nation to sign off on the deal allowing pollution to flow to Boat Harbour.

Page refers to Baxter's work as a "must read," and she retweeted comments by a few of her 1.2 million Twitter followers who are critical of the impact of the plant's emissions.

"Did it make me sad and angry? Yes. Did it also inspire me greatly? Yes," Page tweeted of the book.

After reading Cloutier's comments to The Canadian Press, Page again tweeted Friday, writing: "The ... statements in this article are classic tactics used for decades to avoid taking responsibility for the horrific effect on the environment and claiming the effluent is safe when it's not." She again urged her followers to read Baxter's book.

Cloutier said the company has been making environmental improvements over the past decade.

Earlier this year, the firm completed the $36.9-million replacement project for the stack known as a precipitator. It uses static electricity to remove solid chemical particles from air emissions, and critics acknowledge the work has led to a significant improvement in air quality.

She said the company "acknowledges the history," but believes the new treatment plant project represents an opportunity.

Cloutier also said the bleached kraft mill is the backbone of the province's forestry industry because there is a close relationship between sawmills, pulp mills and paper factories.

"Removing that would have catastrophic effects. It's not a scare tactic. It's an actual fact," she said.

The spokeswoman notes the factory purchases 95 per cent of wood chips produced by the province's saw mills.

"Traditionally those chips and bark are often the difference between breaking even, a loss and having a revenue," she said, adding that Northern Pulp's closure would have a "widespread impact."

Fishermen have said they object to the distribution of treated effluent in their traditional fishing grounds due to uncertainty over the impact.

The company's public presentation says effluent emissions include organic halides, which encompass compounds ranging from chloroform to complex organic molecules such as dioxins and furans, but it says it's "well below World Bank guideline(s) for pulp mills."

It also notes the effluent emissions result in suspended solids -- ranging from clay, sand, silt, organic matter and particulates -- but says the levels will meet Canadian Council of the Ministers of Environment guidelines for aquatic marine life.

In an interview via texts, Baxter criticized the environmental review process the province has set up for the effluent pipeline, arguing the province is in a conflict of interest and there is a lack of independent oversight in the process.

She said the province -- which owns the Boat Harbour facility and leases it to Paper Excellence -- has a legal indemnity agreement that may require it to pay the company for lost profits if it can't operate due to a change in the status of the Boat Harbour facility.

"I think it (the pipeline) should go for a federal assessment," she wrote.

"I agree with the fishermen and the Friends of Northumberland Strait (a citizen group opposed to the pipeline proposal) that the province is in a conflict of interest because of the indemnity agreement."

Rankin said he's aware of the legal agreement, but he again pointed to the Boat Harbour Act, "which does state that the effluent treatment facility can no longer be discharged into the harbour."

Asked if the legislation would trump the contract, he said he didn't want to speculate on "what could happen 14 months from now" -- and added he still expects the company to meet the existing deadline.

Karla MacFarlane, a local Progressive Conservative member of the legislature, said in an interview that her party agrees with the Liberals that no further delays in ending the flow of effluent into Boat Harbour are acceptable.

"The Progressive Conservative Party agrees and honours that the deadline is 2020," she said.

Ellen Page
@EllenPage

This is a MUST READ. Did it make me sad and angry? Yes. Did it also inspire me greatly? Yes. @joan_baxter has written a phenomenal book and I encourage all (particularly Nova Scotian's)… instagram.com/p/BqF0TjghPwd/…

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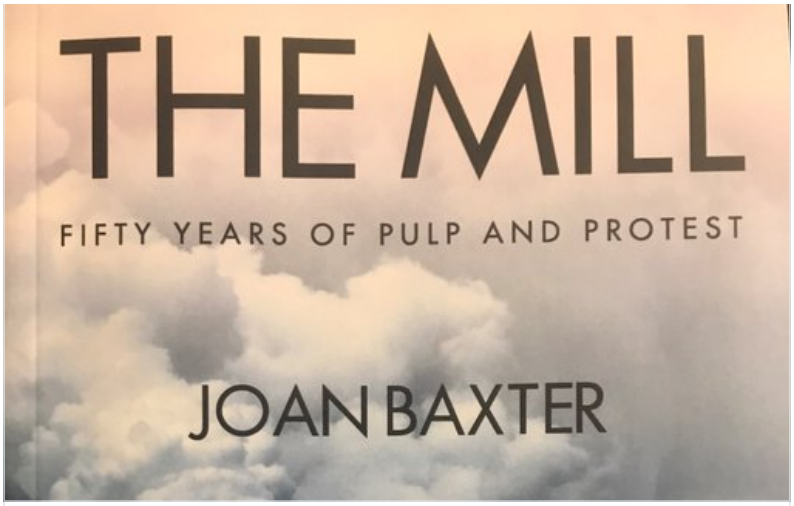

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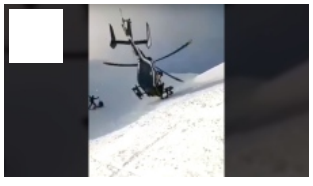

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Canada November 5, 2018 7:53 am Updated: November 5, 2018 10:59 am

N.S. fishermen to block Northern Pulp's survey vessel from entering Northumberland Strait

By Michael Tutton The Canadian Press

Fishing boats pass the Northern Pulp mill as concerned residents, fishermen and Indigenous groups protest the mill's plan to dump millions of litres of effluent daily into the Northumberland Strait in Pictou, N.S., on Friday, July 6, 2018. A group of fishermen from several ports along the Northumberland Strait say they will block a survey boat hired by Northern Pulp from entering the strait to do work on a proposed new route for an effluent pipe. THE CANADIAN PRESS/Andrew Vaughan

A group of Northumberland Strait fishermen say they will block a survey boat hired by the Northern Pulp mill from entering the strait to do work on a proposed new route for an effluent pipe.

Darryl Bowen, a fisherman from Caribou, N.S., said in a telephone interview on Monday he will make sure his boat or another fishing vessel is placed in front of the survey vessel if it attempts to leave Pictou's harbour in northeastern Nova Scotia.

READ: Northern Pulp mill confirms effluent leak near Pictou Landing

The 48-year-old fisherman says his group has a number of fishing boats available to move quickly to block the survey vessel if it attempts to leave.

"If they try to get out, we're just going to keep getting in front of them so that they can't get by us," he said, adding there were six or seven boats in the one-kilometre long harbour mouth.

"They won't get by … We'll block them," said Bowen.

However, a spokeswoman for Northern Pulp said the survey vessel isn't currently in the water, and that the company doesn't plan on doing anything that will jeopardize the safety of its contractor's employees.

Kathy Cloutier, director of communications at the mill's parent company, Paper Excellence Canada, said in an email that, "Safety within Paper Excellence Canada and its facilities is paramount."

"When situations occur, we will seek guidance and work with authorities to ensure the safety of all involved."

She said there have been discussions over the past week between Northern Pulp, contract survey crew and leadership of fisheries groups, and she added, "the information survey crew members are seeking to obtain is data that may be of benefit to various interested parties."

WATCH: Thousands gather to protest pulp mill in Pictou

Bowen said the protest by fishermen from several ports started Monday but will continue as long as necessary to prevent the survey from taking place.

He said the view of the fishermen is that it's safer to prevent the surveyors from entering the strait than having the vessel go out on open water and be confronted by hostile fishing boats, as occurred recently.

"The last time they got out there, we went up (to them) and it didn't take long for them to run back to shore," said Bowen, who fishes lobster, crab and scallops.

Though the Northern Pulp mill near Pictou provides key jobs for the town of about 3,000 residents, its pipeline plan has raised concerns about the impact on the lobster fishery, other seafood businesses and protected areas along the coast.

Under provincial legislation, the mill has until 2020 to replace its current wastewater treatment plant in Boat Harbour, and Premier Stephen McNeil has confirmed he is sticking with that deadline.

After years of pumping 70 million litres of treated waste daily into lagoons on the edge of the nearby Pictou Landing First Nation reserve, Northern Pulp wants to pipe it directly into the strait that separates Nova Scotia from P.E.I.

The lagoons contain nearly 50 years worth of toxic waste, which former Nova Scotia environment minister Iain Rankin has called one of the worst cases of environmental racism in Canada.

Paper Excellence, of Richmond, B.C., has said the mill and its 300 employees will be out of work unless it can build a pipeline to the strait.

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McNeil plea for peace triggers protest in Pictou County

'We haven't done anything really unlawful,' says lobster fisherman

Paul Withers · CBC News · Posted: Nov 09, 2018 12:48 PM AT | Last Updated: November 9, 2018

Fishing boats gathered to block survey boats hired by Northern Pulp on Friday. (Submitted)

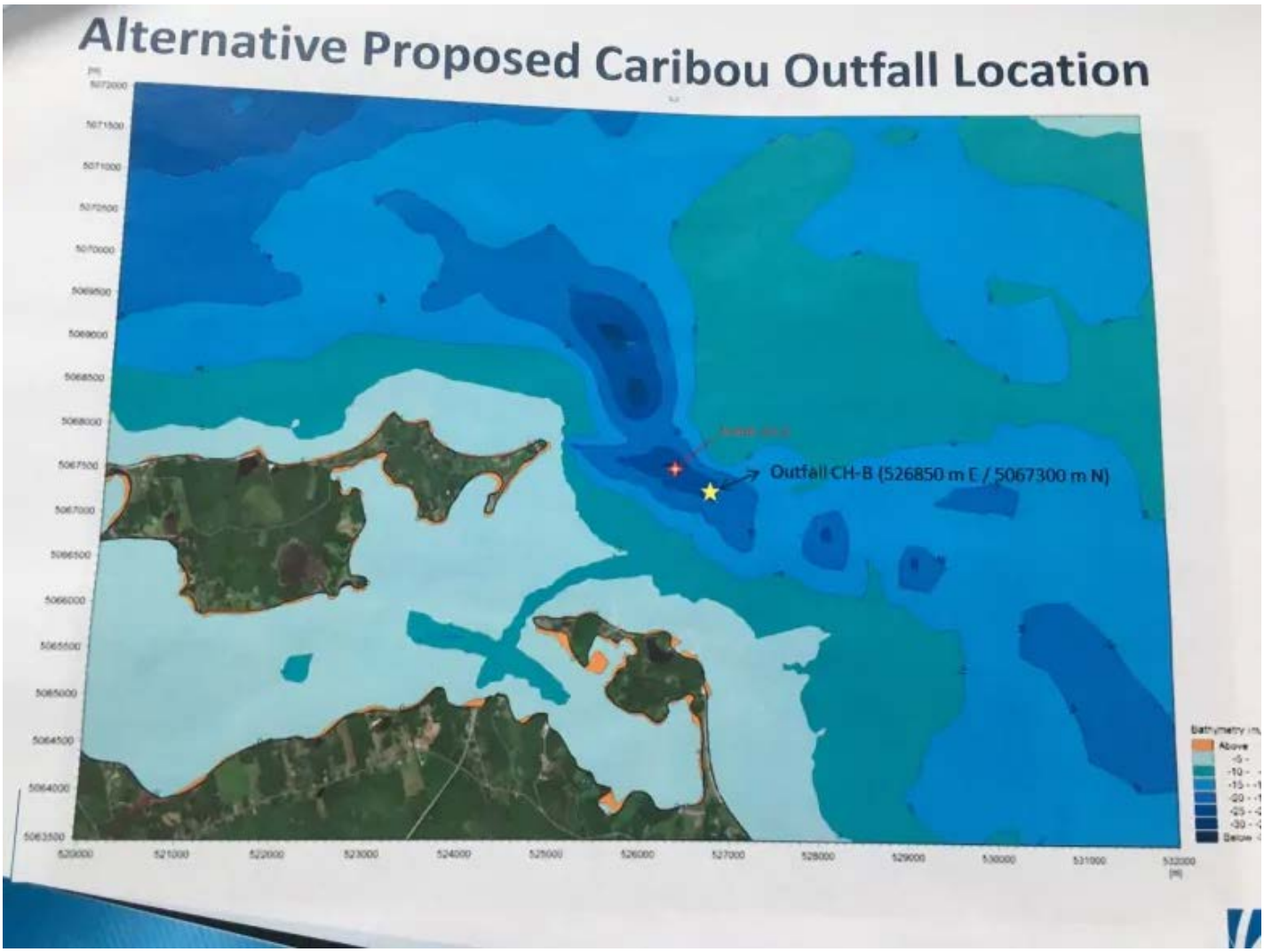
Fishermen in Pictou County sent a message to Nova Scotia Premier Stephen McNeil Friday morning.

Dozens took to the water after McNeil suggested they end a blockade of a survey boat hired to find an undersea route for a pulp mill effluent pipe.

"Premier McNeil's comments kind of struck a nerve with the fleet," said Caribou fisherman Darryl Bowen, who took part in the sunrise demonstration.

"There was probably 40 boats showed up in Pictou Harbour to send a message. We're not backing down and that's that."

Northern Pulp wants to release treated effluent into the Northumberland Strait after its current wastewater treatment system at Boat Harbour closes in 2020.



A map, showing the outfall of the proposed undersea effluent pipeline, which fishermen say they were provided by the owner of Northern Pulp during a meeting at the end of October. (Submitted)

This week, fishermen have headed off the vessel hired to find a route.

"When you have people out there trying to do lawful business that people are preventing them from doing it, its always a concern," McNeil said Thursday.

Lobster fisherman Ben Anderson, who fishes in nearby Pugwash, makes no apologies.

"We haven't done anything really unlawful," said Anderson, who called the action a peaceful demonstration.

- **Effluent pipe leak renews opposition to Northern Pulp plan for waste pipeline to Northumberland Strait**

Fishermen said they are watching the harbour around the clock for any move by the survey boat.

There is no intention to call off any blockade.

"We told them last year there's going to be no pipe in the Strait and we're not backing down," Bowen said. "We have to protect our industry at all costs. We are prepared to do that."

Fishermen say the survey boat has stayed off the water in recent days.

A spokesperson for Paper Excellence Canada, the owner of Northern Pulp, said in a statement to CBC News that safety is paramount.

"When situations occur, we will seek guidance and work with authorities to ensure the safety of all involved," Kathy Cloutier said.

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Lack of public consultation ahead of Northern Pulp's submission of Environmental assessment sparks backlash

Brendan Ahern (brendan.ahern@ngnews.ca)
Published: Jan 16 at 2:13 p.m.

An aerial view of the Town of Pictou, with the Northern Pulp mill across the harbour. August 21, 2014. - Christian Laforce

Pictou

Northern Pulp's decision not to hold public consultations before filing its environmental assessment has received blowback from groups representing Northumberland fishermen.

In a statement issued from Friends of the Northumberland Strait, the group decries the company's decision, stating that, "Concerned citizens and fishermen say they are appalled that Northern Pulp

does not plan to hold any open houses or public consultation before filing for environmental assessment."

The statement emphasizes Northern Pulp's past promise to hold further open house events designed to keep the public up to date on the company's plan.

"We were told Northern Pulp were wanting to be transparent during this process," said Friends of the Northumberland Strait president Jill Graham-Scalan in an interview. "They had promised us during that time that as the studies they were conducting on the route and the receiving waters were completed that they would be making those studies available to the public."

An addendum to Northern Pulp's water receiving study was posted after the press release, but Graham-Scalan says that this is not the level of transparency that was promised form the company back in December 2017.

With the company's environmental assessment being submitted at the end of January, Graham-Scalan says that it could be difficult to properly analyze the information and provide feedback.

"Not only do we have to read it, we have to absorb and reply to it," she said. "That 30-day period is the only period of time that the public has to come up to speed on the proposal and respond to the province in a way that is complete."

Northern Pulp has cited 'significant' delays and a need to move forward under an impending deadline as it's reason for filing the assessment without holding the open houses.

"We've experienced a significant number of delays through the fall in attempting to get some of the information compiled," said Northern Pulp director of communications, Kathy Cloutier. "We're at a point now where we want the project to move forward."

Cloutier added that the blockades Pictou Harbour by strait fishermen of the company's survey boat was a major factor in the need to push ahead to make up for the lost time.

When asked if the incomplete survey of the sea-floor will impact the quality of environmental data submitted to the province, Cloutier said that the only gaps will have to do with the pipe's construction.

"There may be some constructability gaps, but the environmental assessment will be a complete document."

"Another major factor to delays is the number of studies and expanded studies that were done," said Cloutier. "When the process began there were seven studies that we were aware that we'd need to submit for an environmental assessment. Since then we've moved from seven to 17, to 20, we're now at 28."

The validity of that data revealed in those studies will then be determined by the provincial assessment.

After Jan 31. Cloutier says that that information will be in the hands of the public and the provincial government.

"I can't speak to a government process, but what I can say is that there will be time for people to submit comment, and that will help the minister."

The statement issued by Friends of the Northumberland Strait remains skeptical that Northern Pulp's assessment will accurately measure the outfall's effect on marine life in the strait.

"Knowing the composition of the treated effluent they plan to release is critical," wrote president of the Northumberland Fishing association Carl Allen. "We've asked for this information for almost a year, and have never received it. If the effluent is as harmless as Northern Pulp tells the public, why haven't they provided the information?"

CBC

Independent senators tell Trudeau to act on 'dangerous' Northern Pulp plan

Mike Duffy leads call for federal environmental study on project to pour effluent into Northumberland Strait

Paul Withers · CBC News · Posted: Nov 27, 2018 6:00 AM AT | Last Updated: November 27, 2018

The Northern Pulp mill manufactures 280,000 tonnes of kraft pulp annually and supplies pulp to manufacture common household products such as tissue, towel and toilet paper, writing and photo copy paper. (The Canadian Press)

Mike Duffy is among four independent senators from Nova Scotia and Prince Edward Island demanding a full federal environmental assessment of the plan to release treated pulp mill effluent into the Northumberland Strait.

The senators say Northern Pulp's "dangerous project" could damage the fishery in the Maritime provinces and Quebec's Magdalen Islands.

"Ottawa has no choice but to step in immediately and do a complete environmental impact study," Duffy said in a statement delivered in the senate chamber Monday.

He was speaking on behalf of Nova Scotia independent Senator Dan Christmas and two other independents from P.E.I.: Brian Francis and Diane Griffin.

Paper Excellence must change mill

Paper Excellence, owner of the Northern Pulp mill in Pictou County, N.S., wants to discharge about 70 million litres of treated effluent a day into the strait at a spot several kilometres from shore at Caribou.

The company was forced to come up with a new treatment plan after Nova Scotia ordered the shutdown of its current treatment facility, which has been running for 50 years next to the Pictou Landing First Nation.

Last week in an interview with CBC News, the company admitted it will not meet the province's 2020 shutdown deadline.

Paper Excellence now says it will need an extension to the Boat Harbour Act to get its project through a provincial review, construction and commissioning.

Griffin said with the fishery and tourism industry potentially at risk in several provinces, the environmental review should not to be left to Nova Scotia alone.

About more than jobs

"It would seem really strange that one province should have a say," the senator said.

"There's more than the livelihood of the pulp workers here. It's not that we are against the pulp workers. I really think there needs to be a more serious look at an inland resolution for the effluent. Not to simply say take the cheapest route, which is to shove the pipe out into the strait."

A protester wears a Sou'wester in July as concerned residents, fishermen and Indigenous groups protest Northern Pulp's plan to dump millions of litres of effluent daily into the Northumberland Strait. (The Canadian Press)

The senators stepped in after meeting a group of fishermen in Ottawa last Thursday, including Gordon Beaton from Nova Scotia.

He's happy to see them flex their muscles. "They were all independent senators and they wore that kind of proudly. They really felt they could take this on as just something in the national interest, in a non-partisan way."

For Beaton, it's more evidence that the "No Pipe" campaign led by fishermen and the Pictou Landing First Nation is working.

"It's really found traction. The community is behind it and you see support building from other provinces obviously. Even these senators are interested in not allowing some sort of environmental disaster in the Northumberland Strait," Beaton said.

Northern Pulp defends plan

Griffin said weighing in on this project fits the role of Canadian senators to represent their region, offer sober second thought, and a protect minority interests.

"This is a case where on all three of those roles we have every right, in fact a duty, to speak up," the senator said.

But Northern Pulp said its plan to treat wastewater on site is a "significant improvement" over the existing system at Boat Harbour. It gets untreated wastewater that is carried several kilometres through an underwater pipe before it filters through a series of aeration and settling lagoons and the effluent flows through the reserve into the Northumberland Strait.

"The new system will see no untreated effluent [wastewater] leave the property. Effluent will be fully treated prior to leaving the site. That is a significant improvement," Paper Excellence spokesperson Kathy Cloutier said in an e-mailed response to Duffy's statement.

Paper Excellence says there are 131 similar kraft mills operating in North America. Of those, 20 percent use the system it is proposing and 80 percent use a system similar to the one in use at Boat Harbour.

"No other treatment process is used to treat kraft mill effluent," Cloutier said. "Northern Pulp has thoroughly investigated treatment options available to bleached kraft mills. Technical options available must include an outfall discharge in order for Northern Pulp to operate. It is not a question of cost — it is one of available technology."

The company says what emerges from the pipe is non-toxic and meets federal environmental standards.

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In Nova Scotia, a dispute between fishermen and a pulp mill escalates with a stand-off at sea

By **ANTONIA NOORI FARZAN** The Washington Post
Thu., Oct. 25, 2018

Across from the fishing pier in Pictou, Nova Scotia, smokestacks pump out billowing clouds of white smoke that drift over the choppy water. The Northern Pulp mill sits on one side of the harbor, churning out pulp that's used to make toilet paper and paper towels. On the other, fishermen who make a living catching lobster, crab, herring, and mackerel tie up their boats.

The fishing piers and the pulp mill represent two of the area's major industries. But recently, they've been embroiled in conflict. Late last year, Northern Pulp announced plans to pipe chemically-treated wastewater into the Northumberland Strait. Fishermen have argued that doing so would effectively destroy their livelihood, while the company has said that its pipe is designed to minimize the impact on fishing areas.

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Fishing boats loaded with lobster traps head from Eastern Passage, N.S. in a 2012 file photo. Many in the lobster fishing community are concerned with Northern Pulp's plan to dump millions of litres of effluent daily into the Northumberland Strait. (ANDREW VAUGHAN / THE CANADIAN PRESS)

On Tuesday, a showdown took place after fishermen spotted a boat that they believed was doing preliminary survey work on behalf of the pulp mill.

A fleet of fishermen met the vessel about two miles offshore and confronted the crew, then escorted them back to its dock, the Canadian Broadcasting Corp. reported.

Allan MacCarthy, a fisherman who has been an outspoken opponent of the planned effluent pipe, was the first to reach the survey boat.

"I said to them, 'You better get out of here because the ones that are following me aren't going to be as nice as I am,'" he told the CBC. "I just told the guys in the boat, 'Your job is not worth this. Get out of here. Get that boat back to Pictou.'"

Read more:

Northern Pulp confirms leak, immediate response at Pictou mill

Fishing together on Nova Scotia's north coast to protest pulp mill's plan to dump effluent

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MacCarthy told the CBC five other fishing boats joined him to escort the boat back to the harbor while another 20 stood by, ready to get involved if necessary.

When he reached the survey boat, "there was a little foolish talk back and forth," he told the Chronicle Herald. "But when the other boats started coming out of Caribou, they left the area."

Northern Pulp told the CBC, "At all times, the safety of employees, contractors and their employees is our first priority. When situations occur, we will seek guidance and work with authorities to ensure the safety of all involved."

Though the Northern Pulp mill near picturesque Pictou, N.S., provides much-needed jobs for the town of about 3,000 residents, its plan to dump millions of litres of effluent daily into the Northumberland Strait has raised concerns about the impact on the lobster fishery, other seafood businesses and protected areas along the strait. (ANDREW VAUGHAN/THE CANADIAN PRESS)

A spokesperson for the Royal Canadian Mounted Police told the CBC that officers had been called to the pier due to a "potential for conflict," but that no offenses had been committed.

By the afternoon, the boat had been hauled out of the water, locals noted on Facebook.

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"I don't want to see anybody get hurt," MacCarthy told the CBC. "I didn't want to see anybody go to jail for Northern Pulp. But that's the way fishermen are talking, that this is not going to end well."

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Federation of Nova Scotia Woodland Owners throws support behind Northern Pulp

The News
Published: Dec 08, 2018 at 11:08 a.m.

File Photo

The Federation of Nova Scotia Woodland Owners, a province-wide organization whose purpose is to champion the interests of private woodlot owners, has issued a release to express its support for the continued operation of the Northern Pulp mill at Abercrombie Point.

In a release the federation stated that the mill provides vital jobs for the rural economy of the province, jobs in harvesting and silviculture, in trucking, and in the equipment and other industries. "The mill buys sawdust, bark, and other byproducts from the province's sawmills, and this revenue in some cases provides enough income for the sawmill to survive," it states.

The release also notes that Northern Pulp, in turn, is the largest supplier of logs to the sawmills and warns that if that source vanishes, the sawmills – and the jobs and income they provide – will likely perish as well.

“This would essentially spell the end of the forest industry west of the Canso Causeway.”

The Federation stated that it is fully aware of the need to operate the mill in a responsible fashion in relation to the environment.

“When the mill was put into operation half a century ago, anti-pollution measures were inadequate; this was characteristic of most or all industrial operations of that era.”

But it stated that over the years, a series of increasingly stringent regulations have been placed upon the mill, and that process continues.

“The Federation supports the efforts of the owner and staff of Northern Pulp, and the government agencies involved, to bring the mill into environmental compliance, and we hope that all parties will exercise the necessary patience and tolerance to see it through.”

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Ripple effect: Forestry industry anxiously watching Northern Pulp developments, fear potential impacts on sector

'Challenges ahead': Northern Pulp committed to staying in Pictou County despite timeline crunch

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Environment minister still waiting on Northern Pulp's plans regarding Boat Harbour

Jan 11, 2019 5:18 AM by: Matthew Moore

The Northern Pulp Nova Scotia Corporation mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017. THE CANADIAN PRESS/Andrew Vaughan

HALIFAX - The province's environment minister is still awaiting to hear from Northern Pulp regarding their plans for Boat Harbour, as the company has one year until its closure.

Environment minister Margaret Miller said she is expecting to get a submission by months end.

"I know staff has been working with them and we're expecting something at the end of the month but we haven't received anything yet or any clear indication of what exactly is coming in," she said.

In an emailed statement, Northern Pulp indicated the mill will register the project with the province this month.

NDP leader Gary Burrill said Northern Pulp continues to let down residents of the province.

"If you were to write a text about bad corporate citizenship, Northern Pulp would probably be chapter one."

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KB

Ken Burrows Jan 11, 2019 2:03 PM

The Northern Pulp mill must be shut down no matter what the economic cost is to the province. The harm that mill has caused to people, wildlife and the environment is beyond calculation. The government must not allow that toxic poisonous mill to continue.

MG

Morris Givner Jan 11, 2019 8:21 PM

It is of paramount importance that the Nova Scotia Government mandates that the Northern Pulp Mill and all others must not pollute the Northumberland Strait and all waters around all industrial plants .The reason: all life is harmed by the chemical pollutants from pulp mills. Once sea life is decimated by man-made chemicals,over fishing or turbines,it will never recover. We should learn from the Federal Government's decision making and stupidity which ruined the Newfoundland Cod industry. Currently,B.C. Salmon is threatened because of human- made pollution and inroads into the essential waters required for salmon reproduction and growth.

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Ellen Page steps up attack on Nova Scotia pulp mill's effluent pipeline

Alex Cooke, The Canadian Press
Published Monday, December 10, 2018 7:52AM EST
Last Updated Monday, December 10, 2018 9:57AM EST

HALIFAX -- Hollywood actor Ellen Page is doubling down on her criticism of a Nova Scotia pulp mill, rallying her 1.4 million Twitter followers against its plan to build an effluent pipeline into the ocean.

"Nova Scotia government MUST stop its corporate welfare for company that is literally destroying the province," the Halifax-born movie star tweeted Monday about the Northern Pulp mill.

"Enough is enough."

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N.S. paper mill asks for public help as protests mount, Ellen Page criticizes

N.S. fishermen to block mill's survey vessel from entering Northumberland Strait

Fishing boats converge on Nova Scotia harbour as part of effluent pipe protest

PHOTOS

Fishing boats pass the Northern Pulp mill as concerned residents, fishermen and Indigenous groups protest the mill's plan to dump millions of litres of effluent daily into the Northumberland Strait in Pictou, N.S., on Friday, July 6, 2018. (THE CANADIAN PRESS / Andrew Vaughan)

The plan to dump treated effluent from the company's Abercrombie, N.S., mill into the Northumberland Strait has raised the ire of fishermen, environmentalists and the P.E.I. government.

Page has been waging a Twitter campaign against Northern Pulp for weeks, often retweeting criticism of the mill.

Last month, Page, who starred in "Inception," "Juno," "X-Men" and numerous other films, tweeted in support of author Joan Baxter's book "The Mill: Fifty Years of Pulp and Protest," which traces decades of criticism of the mill's environmental impact.

It also examines the tactics originally used to convince the Pictou Landing First Nation to sign off on the deal allowing pollution to flow to Boat Harbour.

"Did it make me sad and angry? Yes. Did it also inspire me greatly? Yes," Page tweeted of the book.

A Nova Scotia Supreme Court judge ruled last week the province must consult with the Pictou Landing First Nation on any funding of Northern Pulp's effluent treatment facility.

Justice Timothy Gabriel said if the province becomes a financial backer of the treatment plant, that raises questions on whether the level of funding will mean "upgraded safeguards" in light of what the Mi'kmaq community has endured.

He said if the government consults on environmental aspects of the plant's construction, it should take a "holistic" approach and also consult on the financing it is willing to provide.

Premier Stephen McNeil has hinted that his government will appeal the ruling, saying he would "have more to say" on the matter.

Also last week, Northern Pulp said it's taking legal action after fishermen blocked survey boats hired to examine a route for the proposed pipeline.

Kathy Cloutier, a spokeswoman for Northern Pulp's parent company Paper Excellence Canada, said the mill has initiated action seeking an interim injunction to prevent blockades or obstructions of the survey work in the Northumberland Strait.

"Our hope was that the surveying would be allowed to occur without incident or obstruction, however actions indicated that the environmental assessment survey work would not proceed without the company seeking a court injunction," Cloutier said in an email.

But Allan MacCarthy of the Northumberland Fishermen's Association called the legal action "frivolous," saying: "The fishermen have stated all along there will be no pipe in the Northumberland Strait. We are not backing down from that."

The wider Gulf of St. Lawrence fisheries region is home to lobster and crab fisheries that brought in over $1.2 billion worth of catch in 2016.

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Department of Lands and Forestry employees are lobbying the government to delay cleanup of Boat Harbour

Morning File, Friday, January 25, 2019

JANUARY 25, 2019 BY TIM BOUSQUET LEAVE A COMMENT

News

1. Scott Brison

Scott Brison. Photo: Jennifer Henderson

Writes Jennifer Henderson:

> “Being the President of the Treasury Board is a bit like peeing in a dark suit,” chuckles Scott Brison.“It gives you a warm feeling, but nobody notices.”
>
> Brison, the Liberal Member of Parliament for Kings-Hants, resigned his Cabinet post a couple of weeks ago and, after 22 years in public life, announced he would not be standing for re-election. Wednesday, he gave the keynote address at the Atlantic Conference on Public Administration. “Scott Brison Unplugged” was an irreverent and inspiring pep talk to an audience of mostly masters students and civil servants.

Click here to read “Scott Brison Unplugged: outgoing MP encourages students to join public service.”

This article is for subscribers. Click here to subscribe.

2. St. Mary’s River

Photo: Joan Baxter

“For many years, when the St. Mary’s River Association (or SMRA) held meetings in Sherbrooke on Nova Scotia’s Eastern Shore, the group members’ purpose was primarily to report on the headway they were making in their efforts to achieve their vision of ‘Health for our river, the Atlantic salmon and our community,'” reports Joan Baxter:

> For many years, when the St. Mary’s River Association (or SMRA) held meetings in Sherbrooke on Nova Scotia’s Eastern Shore, the group members’ purpose was primarily to report on the headway they were making in their efforts to achieve their vision of “Health for our river, the Atlantic salmon and our community.”
>
> Members would gather in the St. Mary’s Education and Interpretive Centre, which volunteers from the community built in 2001 with financial help from supporters of their cause.
>
> The interpretive centre, which doubles as a salmon museum, is a testament to the storied history of the river. It is filled with exhibits of fly-fishing gear through the ages, photos of species at risk such as wood turtles, and of huge Atlantic salmon specimens that could once

be caught in the river. There is also a display devoted to famous anglers who have fished in the river over the decades, including the legendary American baseball player, Babe Ruth.

St. Marys Centre fly-fishing exhibit. Photo: Joan Baxter

Since it was formed in 1979, SMRA volunteers have worked on countless projects to try to improve the health of the river and the local economy that revolves around it. The aim, according to SMRA president Scott Beaver, is to restore the river and the salmon population to a state that will permit a catch-and-release fishing season in the river.

In 2017, 60,000 salmon fry and 21,000 sea trout fry were released into the St. Mary's River, and SMRA also promoted recreational and tourism opportunities in and around the river.

In recent years, with financial support from the Department of Fisheries and Oceans and other sponsors, SMRA has worked on $1 million worth of restoration on almost 20 kilometres of river habitat. It is the only river in Nova Scotia with a salmon recovery plan.

SMRA members stocking river. Photo: SMRA

> Past issues of SMRA's annual newsletters offer a glimpse of the astounding amounts of unpaid time, energy, and enthusiasm that people in rural communities devote to trying to make their small parts of the world better and healthier places. The tone of the newsletter is always upbeat, the reports brimming with optimism and positivity.
>
> The SMRA meeting held this week was not.

Baxter goes on to relate that SMRA fears the proposed Cochrane Hill gold mine will poison the river and destroy the recovering salmon fishery, and so the group and others river friends have organized a "No Open Pit Excavation" (NOPE) campaign in opposition to the mine.

Click here to read "Friends of St. Mary's River say 'NOPE' to Atlantic Gold."

This article is not behind the paywall, but come on, subscribe anyway; it costs real money to put this stuff together.

3. Naturalists sue to protect endangered species

From the Healthy Forest Coalition via Nova Scotia Forest Notes:

> Wildlife biologist Bob Bancroft and nature organizations launch legal action for Nova Scotia's species at risk
>
> Mr. Bob Bancroft and three of Nova Scotia's naturalists' societies say it is time to ask the courts to intervene on behalf of Nova Scotia's most at-risk wildlife and plants.
>
> "The Department of Lands and Forestry has mandatory legal obligations under the Endangered Species Act that have not been fulfilled," explains retired Acadia University biology professor Dr. Soren Bondrup-Nielsen, president of Blomidon Naturalists Society, one of the parties to the legal proceedings. "We're simply asking the Court to tell our government to do what it is already required to do by law."
>
> In court documents filed today, the applicants allege that the Department of Lands and Forestry (formerly the Department of Natural Resources) has failed to meet its legal obligations with respect to 34 species, including mainland moose, wood turtle, bank swallow, and a host of other species designated at risk in Nova Scotia.

“The Department has not yet identified core habitat for our mainland moose, a requirement that is now over-due by more than a decade,” says wildlife biologist Bob Bancroft, president of the Federation of Nova Scotia Naturalists (also known as Nature Nova Scotia).

The legal documents allege that the Department of Lands and Forestry has not yet identified a single acre of core habitat of threatened and endangered species, despite the legal requirement to do so under the Endangered Species Act.

Other short-comings noted in the documents include failures to appoint recovery teams and create recovery plans within the time-frames required under the Act.

“This is a rule of law case,” notes Jamie Simpson, lawyer for the applicants. “The Act requires the Minister of Lands and Forestry to do certain things towards the recovery of species at risk in Nova Scotia. We are asking the Court to uphold the rule of law and require the Department to abide by the Act.”

The Department’s short-comings with respect to species at risk has been reported several times. In 2015, the East Coast Environmental Law Association published a report calling on the Department to address the alleged violations of the Species at Risk Act. In 2016, the Office of the Auditor General of Nova Scotia published a review of the Department’s track-record on species at risk, noting the alleged failure to fulfill mandatory requirements under the Act.

4. Boat Harbour

The aeration pond at Boat Harbour. Photo: Joan Baxter

The Executive Committee of the Nova Scotia Forest Technicians Association has sent a letter to all the groups members, urging members to lobby the government for an extension on the deadline for ending Northern Pulp's piping of mill effluent into Boat Harbour. The letter reads:

> Dear NSFTA Members,
>
> As your executive, we are graciously asking for your help in order to show a collective voice in support of Northern Pulp and an extension to the January 2020 Boat Harbour Act deadline. The extra time is necessary for Northern Pulp to complete the construction of a new, environmentally responsible onsite treatment system. Those opposed to the project have been very vocal and our government needs to hear the voices of the people who are in support of Northern Pulp and their vitally important role within the forest industry. If you would like to help, you can simply send an e-mail to your local MLA with a message urging an extension amendment to the January 2020 Boat Harbour Act Deadline (please see link below to access MLA contact information). Also, attached is an example of a letter that can be used as a message and sent directly to Premier Stephen McNeil. Without Northern Pulp our $2.1 billion forest industry is at risk and along with it the livelihood of thousands of workers including many forestry professionals.
>
> Respectively,

Your NSFTA Executive Committee

Membership in the Forest Technician Association is limited to “graduates of a school/college of Forest Technology, recognized by the NSFTA.”

All well and good; this is a free country, people can say what they want…

However.

Is it a problem that one person on the Executive Committee — Rick Andrews — is also an employee of the provincial Department of Lands and Forestry?

And although they didn’t sign the letter, along with Andrews, five other department employees — David Steeves, Derek Gilby, Jim Rudderham, Cheryl Rudderham, and Ian Gunn — sit on NSTFA’s Board of Directors?

I’ll let others debate the ethics of government employees lobbying the political establishment on issues related to their public service careers — school teachers might have some interest in this — but however that debate falls out, this sure looks to me like “regulatory capture.” It’s long been said the regulatory regime at the old Department of Natural Resources, now Lands and Forestry, is in the pockets of the forest industry, and the Forest Technicians’ letter supports that argument.

Government

No public meetings.

On campus

Dalhousie

Chemistry Under Pressure (Friday, 1:30pm, Room 226, Chemistry Building) — Eva Zurek from the State University of New York, Buffalo, will speak.

Accra as a “Fetish Capital”(Friday, 3:30pm, Room 1170, Marion McCain Building) — Jonathan Roberts from Mount Saint Vincent University will speak.

Mount Saint Vincent

Cultural challenges for Chinese professionals in Canadian workplaces (Friday, 2pm, Keshen-Goodman Library) — Tianyuan Yu will speak.

In the harbour

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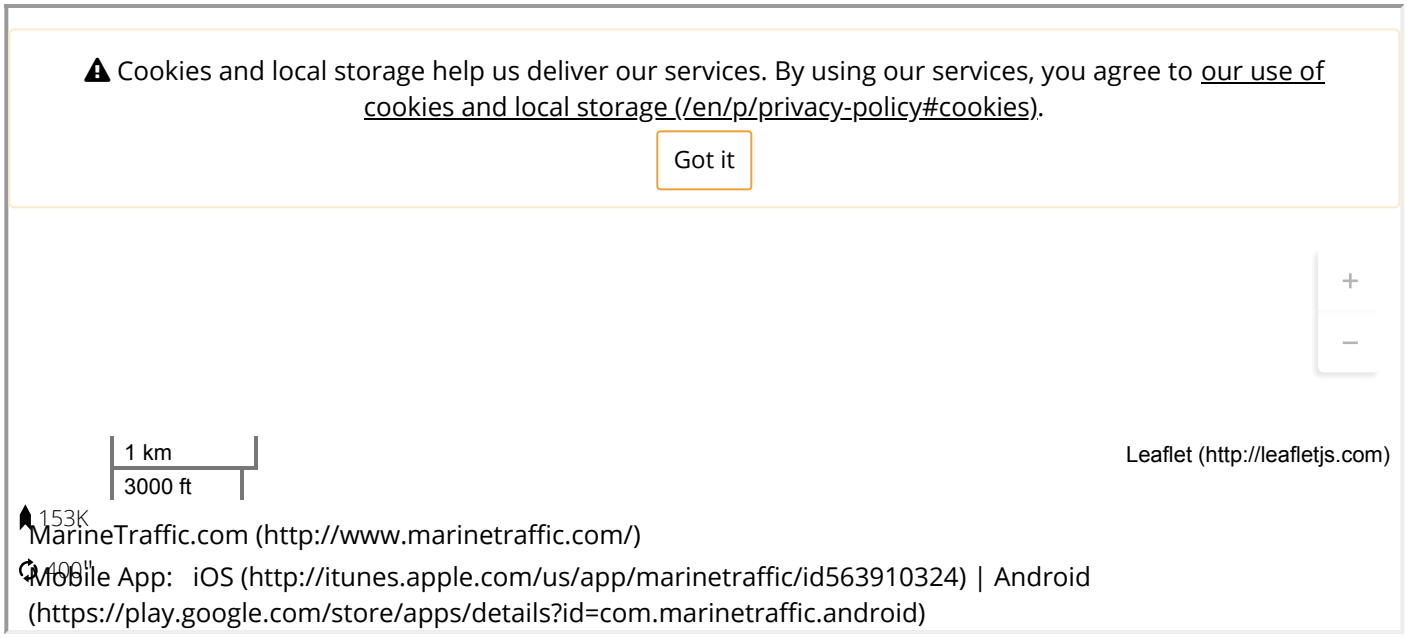
Got it



06:00: **ZIM Monaco**, container ship, arrives at Pier 42 from Valencia, Spain
07:00: **Onego Rio**, cargo ship, moves from anchorage to Pier 28
07:00: **Oceanex Sanderling**, ro-ro container, moves from Pier 41 to Autoport
10:00: **Horizon Star**, offshore supply ship, arrives at Dartmouth Cove from the offshore
11:30: **Oceanex Sanderling** moves back to Pier 41
16:30: **ZIM Monaco** sails for New York
16:30: **Nolhanava**, ro-ro cargo, sails from Pier 36 for Saint-Pierre

Footnotes

I should've had guest writers for this week's Morning File as well. Still working on something.

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TAGGED WITH: BOAT HARBOUR, BOAT HARBOUR ACT, BOB BANCROFT, CHERYL RUDDERHAM, DAVID STEEVES, DEPARTMENT OF LANDS AND FORESTRY (DLF), DEREK GILBY, EAST COAST ENVIRONMENTAL LAW ASSOCIATION, HEALTHY FOREST COALITION, IAN GUNN, JAMIE SIMPSON, JIM RUDDERHAM, NORTHERN PULP MILL EFFLUENT, NOVA SCOTIA FOREST NOTES, NOVA SCOTIA FOREST TECHNICIANS ASSOCIATION (NSFTA), RICK ANDREWS, SOREN BONDRUP-NIELSEN

LEAVE A REPLY

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DEAD WRONG

A botched police investigation and a probable wrongful conviction shed light on the murders of dozens of women in Nova Scotia.

This is a multi-part series still in publication. Click here to go to the DEAD WRONG home page.

ABOUT THE HALIFAX EXAMINER

The Halifax Examiner was founded by investigative reporter Tim Bousquet, and now includes a growing collection of writers, contributors, and staff. Above, top row, left to right: Russell Gragg, Jennifer Henderson, Admin person extraordinaire Iris, Tim Bousquet, Stephen Kimber, Linda Pannozzo, Evelyn White, Katie

Toth. Bottom row: Erica Butler, Tempa Hull, El Jones More about the Examiner.

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us" January 28, 2019

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January 27, 2019

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Environment December 3, 2018 5:10 pm Updated: December 3, 2018 5:11 pm

Court rules that Nova Scotia must consult Mi'kmaq on financing of Northern Pulp effluent plant

By Staff The Canadian Press

The Northern Pulp Nova Scotia Corporation mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017.

The Canadian Press/ Andrew Vaughan

A Nova Scotia Supreme Court decision says the province must consult with a Mi'kmaq community about how public money is provided to a pulp mill that has sent its effluent into an estuary near the band for five decades.

Justice Timothy Gabriel ruled Friday that if the province becomes a financial backer of Northern Pulp's effluent treatment plant, that raises questions on whether the level of funding will mean "upgraded safeguards" in light of the what the people of Pictou Landing First Nation have endured.

Gabriel said if the government consults on environmental aspects of the plant's construction, it should take a "holistic" approach and also consult on the financing it is willing to provide.

He said the two issues are linked, giving the example of how funding could be tied to a system of penalties based on whether emission and effluent discharge targets are reached by the new system.

READ MORE: Pressure mounts on Ottawa to review N.S mill's contentious effluent pipeline

The judge concluded the Crown has a duty to consult with the first nation, including on the issue of whether funding should be provided at all.

"The consultations between the parties must necessarily include … whether the province should fund the construction and design of the effluent treatment plan and pipeline, and, if so, what form that financing will take," he wrote.

Provincial legislation requires the closure of effluent flowing to a facility at the heavily polluted Boat Harbour lagoon by Jan. 31, 2020.

The commitment was made by Stephen McNeil's government in 2015 to the Pictou Landing First Nation after five decades of the waste water flowing into the estuary on the edge of the Pictou Landing First Nation.

The province has also indicated it is in discussions with Northern Pulp regarding Crown funding for the treatment facility for effluent from the bleached kraft mill at Abercrombie Point, N.S., though the amount it may contribute remains unclear.

Brian Hebert, the lawyer for the Pictou Landing First Nation, said in an interview that the court decision means the band can demand information about how the money provided by the province would extend the life of the plant – and what impact that might have in terms of potential air pollution.

A spokesman for the Office of Aboriginal Affairs says the province is reviewing the judge's decision and "considering the direction from the court as we look at next steps in the ongoing consultation with Pictou Landing First Nation."

"Justice Gabriel's decision did dismiss the First Nation's claims of procedural unfairness and noted the novel nature of the issue raised, and that both parties sought guidance from the court in good faith," wrote spokesman Gary Andrea.

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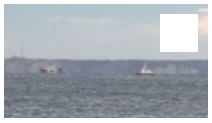
Featured


Search underway after vessel sinks off Halifax

News and weather update: Tuesday Jan 29, 2019

Clean-up effort continues in Sussex

Wild weather damage at N.S. cemetery

Longtime police dog hangs up his collar

Mid-winter ice rescue training

Boat Harbour deadline won't move but open to legislature debate: Premier

The Northern Pulp mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017. (THE CANADIAN PRESS/Andrew Vaughan)

THE CANADIAN PRESS
Published Thursday, January 24, 2019 5:35PM AST
Last Updated Thursday, January 24, 2019 6:43PM AST

HALIFAX -- Nova Scotia's premier says he has no intention of changing a legislated deadline to close the Northern Pulp mill's wastewater treatment plant in Boat Harbour -- but he is open to debating proposed changes in the legislature.

Stephen McNeil said any changes to the January 2020 deadline would have to evolve out of a community consensus in Pictou County, and would have to be brought to the floor of the legislature by the area's Opposition members.

In the meantime, McNeil said the government will keep its word to stick to the deadline.

"What I've said is if the community could come together and find some resolution and they want an adjustment, they need to put that on the floor. Other than that we're moving forward," he said following a cabinet meeting Thursday.

The heavily polluted treatment lagoon is on the edge of the Pictou Landing First Nation, and Chief Andrea Paul is on the record as being opposed to changing the date, something McNeil acknowledges.

"She's been very clear and we've been clear, said McNeil. "All I'm saying is, if people have changed their mind about what they voted on ... let's have a conversation about it. I haven't changed mine."

Progressive Conservative Leader Tim Houston said he believes the government is looking for political cover after creating a "jam" it doesn't know how to get out of.

"The government realizes that they have created a mess and they are trying to spread it around," said Houston, who added the company has also played a role in what's "become a mess."

McNeil maintains the company has had plenty of time to deal with legislation that was passed in May 2015.

Houston, who is MLA for Pictou East, said while there may be a scenario where he would bring forward an amendment to the deadline, he doesn't know what that could be at this point. He said he is willing to look at any new information that comes forward.

"As we stand here today I don't have any information that suggests the deadline should be moved."

The province is still waiting for an environmental assessment application from the mill on its plan to pump millions of litres of effluent through a system of pipe into the Northumberland Strait.

Mill officials have said in the past that no pipe would mean no mill.

In an interview earlier this week, Kathy Cloutier, a spokeswoman for Northern Pulp's parent company, Paper Excellence Canada, said it plans to submit its application with the provincial Environment Department either on or before Jan. 31.

Cloutier said the application won't include seismic testing of the proposed outfall area because ice in the Strait has likely delayed the survey work until early in the spring.

"The seismic goes more with the constructability aspect," said Cloutier. "So the environmental assessment will be filed as a complete document and then if there is some follow-up it would be around that construction aspect. The science is there for the actual location."

Environment Minister Margaret Miller said Thursday the mill's application documents will be made public within a week of being received.

A 30-day public consultation process would then kick in, to be followed by a 20-day review period by the department.

"We're going to look at the submission as it is," said Miller. "At the end of the process I have the opportunity to either deny the application, to approve it with conditions, or to send it back and ask for more information."

MOST WATCHED

Clean-up effort continues in Sussex

News and weather update: Tuesday Jan 29, 2019

CTV News at Six Atlantic for Monday, Jan. 28, 2019

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MPs navigating their way around new House of Commons

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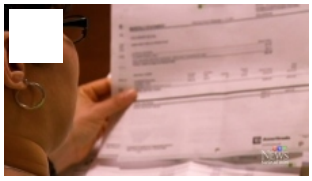

Many millennials struggling to save for retirement: study

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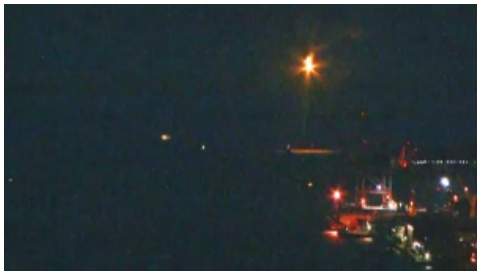

UPDATED

Search underway for missing person after 12-metre vessel sinks off Halifax

A search is underway for a missing person after a 12-metre vessel sank off Devils Island at the mouth of Halifax harbour early Tuesday.

LIVE UPDATES: Oland murder trial to hear more about father's extramarital affair

System failed five children discovered in horrific neglect case: N.B. report

Fluctuating weather wreaks havoc on headstones at Lower Sackville cemetery

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Environment November 6, 2018 3:39 pm Updated: November 6, 2018 7:40 pm

'Stop it at all costs': The blockade of Northern Pulp Mill continues

By Alexander Quon
Online Producer/Reporter Global News

WATCH: For the second day in a row, fishermen have successfully rebuffed a survey ship from leaving Boat Harbour in an attempt to chart a route for the planned effluent pipe. Silas Brown has the details.

The blockade of a pulp mill in Nova Scotia continued on Tuesday with fisherman from the surrounding area of Pictou, N.S., saying they'll do whatever it takes to stop a controversial waste pipe.

For the second day in a row, fishermen have successfully rebuffed a survey ship from leaving Boat Harbour in an attempt to chart a route for the planned effluent pipe, which would carry waste away from the Northern Pulp mill into the Northumberland Strait.

"We were hoping it wasn't going to come to this, but apparently it is and we're ready to do whatever we have to do," said Darryl Bowen, 48, a fisherman from Caribou, N.S., taking part in the blockade.

> "We'll stop it at all costs."

READ MORE: N.S. fishermen to block Northern Pulp's survey vessel from entering Northumberland Strait

Last month, a survey vessel was guided back to shore by Bowen and other fishermen who fear that the waste pipe will critically harm the fishery between Nova Scotia and Prince Edward Island.

"Our livelihoods are at stake here. If they destroy the ecosystem of the Northumberland Strait, we're done for generations," Bowen said.

> "They can pump Boat Harbour out, they can clean that. You can't drain the Northumberland Strait."

On Tuesday, the blockade was joined by fishermen from Pictou Landing First Nation, which borders on Boat Harbour.

Warren Francis says his band has been dealing with waste from the Northern Pulp Mill from his entire life.

The mill pumps 70 million litres of treated waste daily into lagoons on the edge of the reserve.

"Even our health issues on the reserve are pretty bad, like with breathing disorders and asthma, and I attribute that to Boat Harbour and the air quality that we're getting right from the lagoon. Now they want to take it from our backyard and move it to our front yard," Francis said.

Francis says all the fisherman in the area stand together in opposition to the pipe and are calling on the province to look after its people.

The lagoons contain nearly 50 years' worth of toxic waste, which former Nova Scotia environment minister Iain Rankin has called one of the worst cases of environmental racism in Canada.

"Who is the government looking after?" he asked.

> "Are they looking after corporations from across the world, or people from their own backyards?"

Under provincial legislation, the mill, which employs approximately 300 residents in the Pictou area, has until 2020 to replace its current wastewater treatment plant in Boat Harbour, and Premier Stephen McNeil has confirmed he is sticking with that deadline.

Paper Excellence, of Richmond, B.C., has said the mill's employees will be out of work unless it can build a pipeline to the strait.

Bowen says the blockade will continue until the harbour freezes for the winter, at which point work will be stopped.

—With files from The Canadian Press and Silas Brown

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CBC

$6M in taxpayer dollars for N.S. effluent plant stinks, says opponent

'It's a conflict of interest, a direct conflict of interest,' says fishermen's association president

CBC News · Posted: Aug 20, 2018 8:41 PM AT | Last Updated: August 20, 2018

Nova Scotia taxpayers have contributed $6 million toward early work on a new effluent treatment facility that would replace the Boat Harbour plant. (Jeorge Sadi/CBC)

Nova Scotia taxpayers have contributed $6 million toward design work and engineering studies for a new wastewater treatment plant that will handle effluent discharged from the Northern Pulp paper mill in Pictou County.

Those against the plan to dump what comes out of the facility into the Northumberland Strait are not happy the province is picking up part of the cost.

"It's a conflict of interest. A direct conflict of interest," said Ronnie Heighton, a lobster fisherman and president of the Northumberland Fishermen's Association.

- **Taxpayers won't likely shoulder full cost of Boat Harbour replacement, minister says**

Heighton said it isn't right for the Liberal government to pay for part of the treatment facility when it is also in charge of conducting an environmental assessment of the project.

Environmental impact

He and other opponents are worried over the effluent's impact on the environment.

"It's going to smother the bottom. There will be no fish living. It'll just be a dead zone in the Northumberland Strait," Heighton said.

- **Fishermen worry Northern Pulp treatment plan will create 'dead zone'**

The plant will replace the existing, government-owned Boat Harbour effluent treatment facility, which the province has promised to close by Jan. 31, 2020.

The province said it needs to contribute taxpayer money toward the new plant because it's in a lease agreement with Northern Pulp. Under the Boat Harbour Act, the existing plant must be closed 10 years before the lease ends.

Lease agreement

"The contribution allows negotiations with Northern Pulp to continue and will be credited toward any future agreement," said Marla MacInnis, a spokesperson for the provincial Department of Transportation and Infrastructure Renewal.

The $6-million figure "is part of a larger discussion with Northern Pulp which is yet to be concluded."

MacInnis said the department is working "to find a solution which ensures an environmentally friendly and economically sustainable future" for Pictou Landing First Nation, the Pictou area, Northern Pulp and others.

Ottawa's role

Heighton, however, thinks the federal government should be in charge of the environmental assessment — not the province.

- **Feds could get involved in Northern Pulp assessment**

"We can't trust the provincial government," Heighton said. "This has to go to the feds. At least they'll be somewhat independent."

A spokesperson for Northern Pulp told CBC negotiations are ongoing between the company and the province and that the final cost of the effluent treatment plant has yet to be determined.

There is also no deal on who will pay for it or own it once it's built.

See more articles from CBC Nova Scotia

---

with files from Jean Laroche

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Public Accounts

Volume 3 — Supplementary Information

For the fiscal year ended March 31, 2018

NOVA SCOTIA

Public Accounts

Volume 3 — Supplementary Information

For the fiscal year ended March 31, 2018

NOVA SCOTIA

The *Public Accounts Volume 3—Supplementary Information* is produced in accordance with the Finance Act, which requires an annual reporting of all sums paid from the Province's General Revenue Fund during the fiscal year. In this publication, payments are reflected on a cash basis and include Tangible Capital Asset Acquisitions.

Accounts Payable, Tangible Capital Assets, and other adjustments are indicated to reconcile cash payments with the accrued charges to departmental expense appropriations. The appropriations are prepared on a gross basis with no netting of General Revenue Fund revenues, recoveries, or fees and other charges.

Transfers to (or from) other Accounts indicate that a portion of the payments have been charged to other accounts/departments.

Accumulative payments to individuals and suppliers within the fiscal year are reported as follows:
Salaries – $25,000 and over;
Travel – $3,500 and over; and
All other payments – $5,000 and over.

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Published in conventional and electronic form by
Communications Nova Scotia

ISSN 0702-8148 (Print)
ISSN 1916-9612 (Online)

PRINTED IN CANADA

Public Accounts

Volume 3 - Supplement to the Public Accounts
for the fiscal year ended March 31, 2018

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NOVA SCOTIA

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Wood, Lewis	5,744.73
Wood, Robert J	13,052.09
Woodworth, Laura Lee	6,578.78
Woodworth, Paul	9,732.53
Woolley, J Locke	5,882.47
Yeadon, Christina	11,642.05
Youden, William A	11,170.78
Accounts Under $3,500	812,242.70
Accounts Payable Adjustments	(24,187.10)
	$4,434,334.29

Grants and Contributions:

Aboriginal Affairs	$50,000.00
Bay Ferries Ltd	13,964,393.00
Bicycle Nova Scotia	5,000.00
Canadian Association of Provincial Safety Councils Safety Services Nova Scotia	10,000.00
Child Safety Link	72,000.00
Ecology Action Centre	64,100.00
Injury Free Nova Scotia Society	16,000.00
Municipality of the County of Inverness	250,000.00
Northern Pulp Nova Scotia Corp	6,001,238.13
Public Policy Forum	12,500.00
Public Service Commission	5,000.00
Transport Canada	1,000,000.00
Transportation Association of Canada	15,804.00
Accounts Under $5,000	11,278.32
Accounts Payable Adjustments	(2,198,416.13)
	$19,278,897.32

Other:

2 Men and a Ladder Wood Construction Contracting	$12,978.11
3006877 Nova Scotia Ltd	6,006.32
3051308 Nova Scotia Ltd	7,424.11
3237342 Nova Scotia Ltd	12,762.23
3277176 Nova Scotia Ltd	11,310.00
3278919 Nova Scotia Ltd	8,825.01
3M Canada Inc	255,227.87
9030-5814 Quebec Inc	79,692.50
98599 Canada Ltd	13,150.00
A & A Roofing (2016) Ltd	12,800.00
A & P Transmission & Automotive Repair Ltd	42,677.61
A and A Aggregates Ltd	61,780.38
A B Mechanical Ltd	351,198.34
A F Theriault & Son Ltd	708,831.77
A G Delaney Distributors Ltd	27,801.55
A H Roy & Associates Ltd	120,542.49
A Mackenzie Security Ltd	57,167.33
A W Leil Cranes & Equipment (1986) Ltd	27,626.48
A+ Quality Cleaners Inc	5,660.00
A-1 Building Cleaning Ltd	42,280.17
A-1 Refuse	21,216.02
A-1 Tires Ltd	27,049.85
Aaffinity Contracting & Environmental Ltd	207,681.91
Abbey's Smart Move Ltd	25,720.00
Abbott Brown Architects Inc	17,532.42
Aberdeen Paving Ltd	4,836,482.07
Able Engineering Services Inc	84,175.58
Absolute Traffic Services Ltd	446,330.40
Acadia Crushed Stone	25,927.09
Acadia Roofing & Contracting Ltd	47,928.67
Acadia University	80,964.00
Acart Equipment Ltd	148,887.07
Access Contracting Ltd	14,477.00
Ace Machining Ltd	22,580.75
Acklands-Grainger Inc	87,292.69
ACROW Ltd	484,601.13
Action Car and Truck Accessories	20,827.68
ADESA Auctions Halifax	192,324.00
ADT Security Services Canada Inc	7,668.89
Advanced Drainage Systems Inc	128,200.19
Advanced Energy Management Ltd	29,621.95

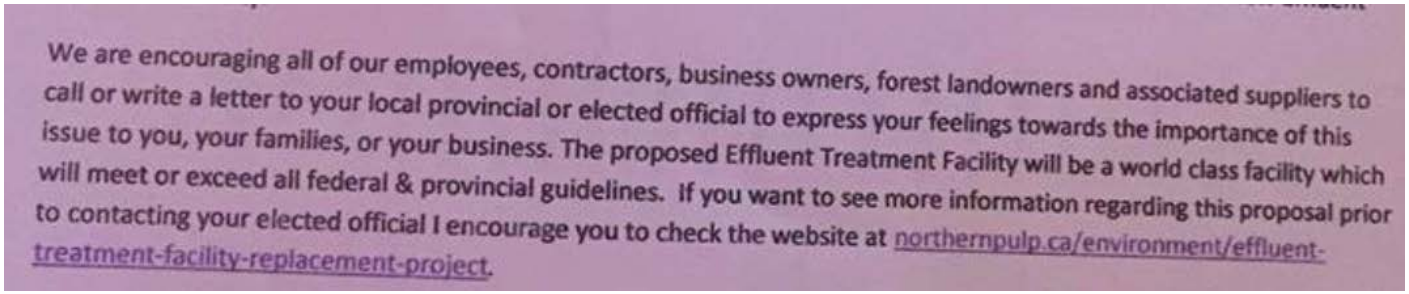
Northern Pulp, Scotsburn Lumber, and U.S. tariffs

Morning File, Tuesday, January 8, 2019

JANUARY 8, 2019 BY TIM BOUSQUET 9 COMMENTS

News

1. Northern Pulp, Scotsburn Lumber, and U.S. tariffs


We are encouraging all of our employees, contractors, business owners, forest landowners and associated suppliers to call or write a letter to your local provincial or elected official to express your feelings towards the importance of this issue to you, your families, or your business. The proposed Effluent Treatment Facility will be a world class facility which will meet or exceed all federal & provincial guidelines. If you want to see more information regarding this proposal prior to contacting your elected official I encourage you to check the website at northernpulp.ca/environment/effluent-treatment-facility-replacement-project.

Last month, Scotsburn Lumber sent out a letter encouraging “all our employers, contractors, business owners, forest landowners and associated suppliers to call or write a letter to your local or elected official” to express support for Northern Pulp Mill and its efforts to continue operating after the deadline for stopping the dumping of mill effluent into Boat Harbour.

The letter is signed by four Scotsburn execs: general manager Mark Baillie, procurement manager Donald Hume, controller Tracey Ferguson, and purchaser Scott Standen.

You can read the entire letter here.

There is of course nothing improper about people contacting government officials to express their concerns one way or another on any public matter, including the mill. But the letter caused me to wonder about the relationship between Scotsburn Lumber and Northern Pulp Mill, and so I spent considerable time over the holidays researching the history of each company, and in particular how the provincial government has financially supported the mill and perhaps, by extension, the forest industry generally.

Northern Pulp Mill. Photo: Halifax Examiner

The pulp mill has existed for many decades, but on April 28, 2009, Neenah Paper Company of Canada instructed Stewart McKelvey to incorporate Northern Pulp Nova Scotia Corporation “on our behalf.” Neenah was owned by two U.S.-based private equity firms — Blue Wolf Capital and Atlas Holdings — and the board of directors of the Northern Pulp consisted of various people from Georgia associated with the timber industry and New York financiers.

In 2011, the mill was sold to Paper Excellence, and in June 2011 the directorship of Northern Pulp Nova Scotia Corporation shifted to people associated with the timber industry in British Columbia and, importantly, the Widjaja family in Indonesia (which owns Paper Excellence). Former premier John Hamm was also a director.

The next year, the closed lumber mill in Scotsburn was resurrected. Reported CTV:

> Owners of the Northern Pulp Nova Scotia Pulp Mill in Abercrombie Point are hoping that acquiring the Ligni Bel sawmill will help to ensure a steady supply of woodchips, as the Northern Pulp mill requires a steady supply of woodchips in order to make its bleached kraft pulp.
>
> The Ligni Bel sawmill in nearby Scotsburn used to supply Northern Pulp with woodchips, but it shut down last November when over half of its wood supply was lost due to the closure of the NewPage paper mill in Point Tupper, N.S.
>
> Now, an affiliate of Northern Pulp has started the process to purchase the Ligni Bel sawmill.

I worked through the directorship history of both companies (Northern Pulp and Scotbsburn Lumber) from 2012 to the present, and found that management of the companies was intertwined. Here are two examples:

G. Wayne Gosse

• Officer and director with Scotsburn from July 17, 2012 to June 20, 2013
• Officer with Northern Pulp from September 12, 2008 to June 20, 2013
• Director of Northern Pulp from December 8, 2009 to June 20, 2013, and then again from August 29, 2013 to March 16, 2017

Andreas Kammenos

• President of Scotsburn from May 22, 2014 to July 28, 2014
• Director of Scotsburn from August 29, 2013 to July 28, 2014
• President of Northern Pulp from August 29, 2013 to April 2, 2015
• Throughout that period, Kammenos was a vice-president at Paper Excellence.

There are more connections that are harder to nail down: shared addresses and the like, but I think those two make the point.

I mean, it makes sense, right? Northern Pulp needed a steady supply of pulp, so bought the local sawmill.

Throughout, Northern Pulp was getting and continues to get considerable financial support from the provincial government — in fact, so much financial support that I'm sure I've missed a lot of it. But here's what I've been able to piece together. First, let me just list the payments to either Northern Pulp or Scotsburn as reported in Public Accounts, with payments listed by department ("G&C" means "grants and contributions"):

2009
Northern Pulp Nova Scotia Corp
DNR: (G&C): 587,559.14
DNR: 109,742.44
Total: 697,301.58

2010
Northern Pulp Nova Scotia Corp
DNR: (G&C): 180,407.00
DNR: 160,184.14
Total: 340,591.14

2011
Northern Pulp Nova Scotia Corp
DNR: (G&C) 445,395.00
DNR: 9,760.27
Total: 455,155.27

2012

Northern Pulp Nova Scotia Corp

DNR (G&C): 79,629.85

DNR: 4,541,077.27

Total: 4,620,707.12

2013

Northern Pulp Nova Scotia Corp

DNR: (G&C): 522,604.50

DNR: 196,732.00

Total: 719,336.50

2014

Northern Pulp Nova Scotia Corp

Labour: 37,500.00

DNR (G&C): 969,837.64

DNR: 733,125.66

Total: 1,740,463.30

Scotsburn Lumber Ltd

Labour: 12,500.00

DNR: 159,458.94

Total: 171,958.94

2015

Northern Pulp Nova Scotia Corp

Economic & Rural Development: 61,411.25

Labour: 42,500.00

DNR (G&C): 445,652.49

DNR: 570,066.81

Total: 1,119,630.55

Scotsburn Lumber Ltd

DNR: 100,410.89

Total 100,410.89

2016

Northern Pulp Nova Scotia Corp

Labour: 16,540.00

DNR (G&C): 602,527.17

DNR: 78,719.53

Total: 697,786.70

Scotsburn Lumber Ltd

Labour: 20,000.00

DNR: 127,772.94

Total: 147,772.94

2017

Northern Pulp Nova Scotia Corp

Labour: 14,660.00

DNR (G&C): 457,143.68

DNR: 399,498.03

TIR: (G&C) 144,980.00

Total: 1,016,281.71

Scotsburn Lumber Ltd

Labour: 12,500.00

DNR (G&C): 160,742.26
Total: 173,242.26

2018
Northern Pulp Nova Scotia Corp
Labour: 29,076.50
DNR (G&C): 464,481.45
DNR: 31,353.38
TIR (G&C): 6,001,238.13
Total: 6,526,149.46

Scotsburn Lumber Ltd
Labour: 5,000.00
DNR: (G&C) 141,394.13
Total: 146,394.13

That's somewhat more than $18 million in public money paid to Northern Pulp and about three-quarters of a million paid to Scotsburn Lumber since 2009.

I asked each department about the expenditures. Department of Labour spokesperson Shannon Kerr got back to me the very next day, with this chart:

Fiscal Year Public Accounts		Program	Division	Northern Pulp	Scotsburn Lumber	Grand Total
	2014	START	ENS	(37,500)	(12,500)	(50,000)
Total April 1 2013 - March 31 2014				**(37,500)**	**(12,500)**	**(50,000)**
	2015	Apprenticeship START	Apprenticeship	(5,000)		(5,000)
	2015	START	ENS	(37,500)		(37,500)
Total April 1 2014 - March 31 2015				**(42,500)**	**-**	**(42,500)**
	2016	CO-OP	Youth Initiatives	(6,540)		(6,540)
	2016	START	ENS	(10,000)	(20,000)	(30,000)
Total April 1 2015 - March 31 2016				**(16,540)**	**(20,000)**	**(36,540)**
	2017	Apprenticeship START	Apprenticeship	(5,000)	(12,500)	(17,500)
	2017	CO-OP		(9,660)		(9,660)
Total April 1 2016 - March 31 2017				**(14,660)**	**(12,500)**	**(27,160)**
	2018	Apprenticeship START	Apprenticeship	(17,500)	(5,000)	(22,500)
	2018	CO-OP	Youth Initiatives	(11,577)		(11,577)
Total April 1 2017- March 31 2018				**(29,077)**	**(5,000)**	**(34,077)**
				(140,277)	**(50,000)**	**(190,277)**

I assume most large companies (and a lot of small ones) are taking advantage of these worker development programs.

Likewise, Transportation and Infrastructure Renewal spokesperson Marla MacInnis got back to me lickety-split, in just two hours, about the very large TIR payments to Northern Pulp. She wrote:

> This is a contribution towards detailed design and engineering studies for a potential replacement effluent treatment facility.
>
> The amount was determined based on estimates by design consultants. The overall total for design and engineering studies is $6.146 million. $6,001,238.13 flowed in fiscal 2017-2018, while $144,980.00 began this work in 2016-2017 and can be found on page 326 of Public Accounts.
>
> The contribution allows negotiations with Northern Pulp to continue and will be credited towards any future agreement. This cost is part of a larger discussion with Northern Pulp which is yet to be concluded.

The payments were never announced publicly, but the CBC found them tucked into Public Accounts. Wrote John Laroche:

> Nova Scotia Premier Stephen McNeil insisted Thursday there was no attempt to hide a $6-million payment last year to Northern Pulp, despite the fact his government only disclosed the information as a single-line item in a 351-page document on July 26.
>
> The payment is contained in volume three of the supplementary estimates filed to officially close the books on the 2017-18 fiscal year.

I appreciate the work of government spokespeople — we reporters can be demanding with our requests, and for the most part the spokespeople respond quickly and professionally. So I thank Kerr and MacInnis for their help.

Alas, I had less luck with Department of Natural Resources spokesperson Bruce Nunn. I emailed Nunn on December 17, asking "Can you tell me what those [DNR] payments were for? I'm guessing that that information will be self-explanatory in terms of the difference between 'grants and contributions' and 'other,' but if not, could you elaborate?"

It's been 22 days, and I've had no response from Nunn. So your guess is as good as mine as to why DNR has paid Northern Pulp $10 million or so.

But wait… that list of *payments* to Northern Pulp doesn't include provincial *loans* to the company. Joan Baxter has provided me with the results of a Freedom of Information request she made related to the loans, for which she was provided this chart:

FOIPOP 2017-03648-BUS – Loans to Northern Pulp and Affiliates

12(1)(a)
17(1)

File #	Recipient	Authorized	Status	Interest Rate	Term	Amount Forgiven
300246	Northern Pulp NS	$15,000,000	in good standing (amended 2013)	NS 10-year borrowing rate plus [redacted] (amended to NS 10-year rate plus [redacted])	10 years commencing July 1, 2009 (amended to 10 years commencing January 1, 2013)	n/a (fully repayable loan)
300273	Northern Timber NS	$75,000,000	in good standing	NS 30-year borrowing rate plus [redacted]	30 years commencing March 12, 2010	n/a (fully repayable loan)
300338	Northern Pulp NS	$14,700,000	in good standing	NS 10-year cost of funds plus [redacted]	10 years commencing January 1, 2013	n/a (fully repayable loan)
300337	Northern Pulp NS	$2,500,000	in good standing	No interest (forgivable with conditions)	10 years commencing January 1, 2013	$0
300336	Northern Pulp NS	$3,600,000	paid in full as scheduled on August 1, 2016	NS cost of funds plus [redacted]	4 years commencing October 1, 2013	n/a (fully repayable loan)
300335	Northern Pulp NS	$900,000	incentive earned June 25, 2015	No interest (incentive earnable when conditions met)	n/a	$900,000 incentive earned

Comments Baxter:

> The total amount loaned or granted to the mill in that period, for which I had requested details (terms, payment rate, etc – all redacted), was $111.7 million.
>
> The $75 million, 30-year loan in 2010 (for the land purchase of 475,000 acres from Neenah Paper) had a hidden gift to Northern Pulp (owned by NY companies Blue Wolf Capital and Atlas Holdings at the time) of $7 million, because the province bought back as part of the same deal 55,000 acres of land at $300 per acre, whereas NP had paid only $172.63 per acre. This is detailed on page 179 in [her book, *The Mill*].
>
> There was also the $28.1 million federal grant from Peter MacKay and the Harper government in "green transformation" money in January 2011, just before the mill was acquired by Paper Excellence from two US private equity companies.
>
> I recap some of the in-kind and financial gifts over the years between pages 215 and 219 in the book.

A few million here, a few million there, pretty soon we'll be talking real money.

But of even further interest is how all this money going to Northern Pulp affects lumber exports.

This issue came up explicitly in a January 25, 2013 letter from Duff Montgomerie, then the deputy minister of Nova Scotia's Department of Natural Resources, to Pedro Chang, the deputy CEO of Northern Pulp.

Wrote Montgomerie: "Although Northern Pulp does not own and control Scotsburn Lumber, we need to ensure that any support of Northern Pulp does not indirectly support Scottsburn Lumber under the Softwood Lumber agreement." He goes on to say that the province's and Northern Pulp's lawyers have

figured out how to move forward “without putting the trade agreements at risk.” Alas, the details of that arrangement were redacted from the copy of the letter we obtained.

You can read the letter here.

This looks, well, sketchy. It appears that while *Northern Pulp* may not “own and control Scotsburn Lumber,” the Widjaja family controls both Northern Pulp and Scotsburn through different holding companies. So the legal control is one level up, but the actual management coordination is, or at least was, right there through the persons of Andreas Kammenos and G. Wayne Gosse, as I detailed above.

So, despite Montgomerie’s statement to the contrary, did the payments to Northern Pulp amount to backdoor subsidization of Scotsburn Lumber, and were the payments actually in violation of the Softwood Lumber agreement? I don’t know. I’ve asked Zoltan van Heyningen, the executive director of the U.S. Lumber Coalition, for comment, but he hasn’t responded.

The Softwood Lumber Agreement expired in 2015. In 2016, the U.S. Department of Commerce determined that the Canadian softwood lumber industry was being unfairly subsidized by Canadian governments, and therefore imposed a subsidy margin of 3.34% to 18.19% on Canadian lumber, depending on the firm. Nova Scotian firms, including Scotsburn Lumber, were excluded from the penalty tariffs.

I’ve asked Mark Baillie, the general manager at Scotsburn Lumber, for comment; as of publication time, he hasn’t responded.

Update, 2:30pm: Mark Baillie responds:

> I am not sure how or why the letter was forwarded to you, but you should also be aware that all other sawmills in the province are starting to voice their concerns about a potential mill

closure and the impacts this would have on their business and the forestry industry in general.

As for the corporate relationship, the sawmill was purchased in 2012 by Northern Pulp and was re-sold in May of 2014. Scotsburn Lumber Ltd. the same as all other sawmills in the province, have contracts to sell their by-products to Northern Pulp and other Fiber agreements.

2. Pictou council on Northern Pulp

The aeration pond at Boat Harbour. Photo: Joan Baxter

Last night, the Pictou County Municipal Council voted on a resolution supporting the Boat Harbour Act and closure of Boat Harbour by January 31, 2020.

The resolution was brought forward by Deputy Warden Wayne Murray, and reads as follows:

> RESOLUTION
>
> WHEREAS, after a leak of 47 million litres of pulp effluent onto Pictou Landing First Nation land and nearby waters in 2014, the Boat Harbour Act was passed with all party support in the Nova Scotia Legislature in May 2015, ending the use of Boat Harbour for wastewater effluent reception and treatment on January 31, 2020;
>
> WHEREAS Pictou Landing First Nation has consistently stated its desire and expectation that the Boat Harbour Act be honoured and that Boat Harbour close as scheduled on January 31, 2020;
>
> WHEREAS Pictou Landing First Nation welcomes public support for the closing of Boat Harbour as scheduled;
>
> BE IT RESOLVED by the Municipal Council for the Municipality of the County of Pictou that Council support the stated position of Pictou Landing First Nation to honour the Boat Harbour Act and that the Boat Harbour Effluent Treatment Facility close as scheduled on January 31, 2020.

Someone who attended the meeting supplied the following account:

Pictou Landing First Nation Chief Andrea Paul made an impassioned and powerful speech to the council.

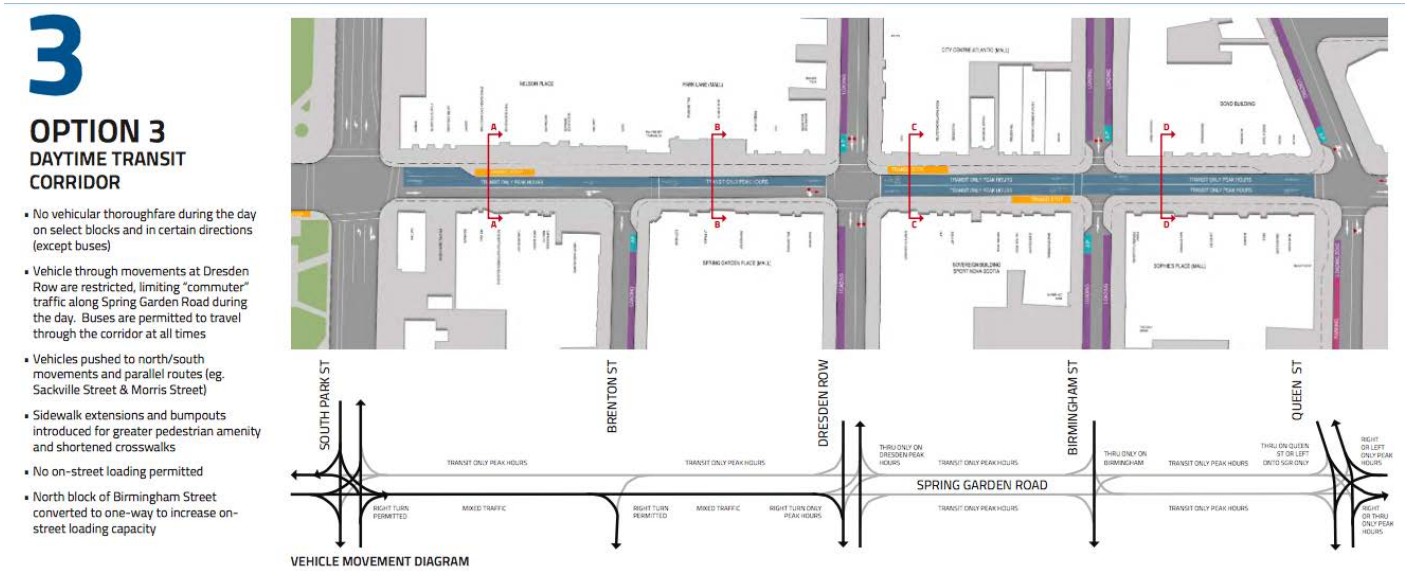
There was a lot of discussion about the resolution, and fairly widespread agreement that the mill shouldn't close, that there must be a solution somewhere, and that by supporting the Boat Harbour Act, legislation that has already been passed provincially, the council would not be voting against industry or mill jobs.

But in the end, the council voted in favour of the resolution to support the Boat Harbour Act, and the closure date of January 31, 2020.

Those who voted against the resolution were: Randy Palmer, Andy Thompson and David Parker.

Those who voted to support the resolution were: Wayne Murray (Deputy Warden who introduced the resolution), Darla MacKeil, Deborah Wadden, Ronnie Baillie, Chester Dewar, Peter Boyles and Larry Turner.

3. Spring Garden Road



The city yesterday released three proposed options for the redesign of Spring Garden Road between Barrington and Robie Streets, although the most radical potential changes are between South Park and Queen Streets, where potentially cars and trucks will be eliminated completely during the day time.

I tried to work through the document to summarize the options, but they're just too complex for me this morning. You can see the three options here (large PDF), or read Zane Woodford's summary here.

I don't have strong opinions about the proposed rebuild (anything we can do for the pedestrian experience is helpful) except to note that the entire neighbourhood around Spring Garden Road and Robie Streets is going to be an absolute mess for three or four years as the mini-Manhattan is constructed between Carleton Street and Robie Street. That construction is going to disrupt the entire peninsula, and especially the Spring Garden Road corridor. I know planners think these are different projects, that the building construction near Robie Street has nothing to do with the relatively minor construction needed to implement the changes a few blocks east, but I plead with them to consider the psychic disruption for a pedestrian walking from, say, the Central Library to the main Dalhousie campus.

4. Taxi driver charged with sexual assault

A police release from yesterday:

> Police have charged a taxi driver with sexual assault in relation to an incident that occurred in Halifax over the weekend.
>
> At approximately 5:45 a.m. on January 6 police responded to a report of a sexual assault that had occurred a short time earlier in Halifax. A taxi driver drove a female to a residence in Halifax and sexually assaulted her while she was in the vehicle.
>
> To protect the identity of the victim, we are not releasing the address where the sexual assault occurred.
>
> As a result of the investigation, officers arrested the taxi driver at a residence in Halifax without incident at approximately 3:30 that afternoon.
>
> A 36-year-old Halifax man was charged with sexual assault and was released to appear in Halifax Provincial Court at a later date.
>
> Sexual assault investigations are very complex. As part of our victim-centered, trauma-informed approach to sexualized violence, we work closely with victims to ensure they're willing to proceed with a police investigation, which includes giving a statement about the incident and providing a description of the suspect if possible. Police must also ensure the victim's privacy is upheld and well-being is fully considered; officers have been taking these measures since first speaking with the victim, and we're now in a position to report this incident to the public.

5. Violence

Yesterday's RCMP release is disturbingly detailed:

> **January 7, 2019, Yarmouth, Nova Scotia** . . . On January 4 just before 8 p.m., an injured 17-year-old female entered a convenience store in Yarmouth. She was bleeding, had several injuries to her face and hands, and was screaming. Staff at the store called 911 for assistance. Police and paramedics attended the scene and the victim was transported to hospital via EHS.
>
> The investigation has determined that the victim was picked up in blue Hyundai Tucson (small SUV) with Nova Scotia licence plate GGA 153, on Cliff St. by one female on a pretense, when the assaults began. Three people were in the back of the vehicle unbeknownst to the victim, and they started hitting her and punching her in the head.
>
> They drove to Leighton St. in Hebron where the victim was further assaulted, including being dragged out of the vehicle, thrown to the ground and kicked and punched in the head. They then went to another person's residence on Baker St. They then drove to the NSLC on Starrs Rd., and the victim went into the store with one of the suspects. They got back in the vehicle, and drove to another location on Green St. where the assaults continued and the owner of a dog tried to get it to attack her. The suspects then poured water all over her face and down her throat. She was dragged to the car by her hair. With a total of six people in the vehicle, they left that location and went to the convenience store on Hwy. 3. The victim who had been between two people in the backseat, was able to flee the vehicle, run to the store, and get help.
>
> This was a targeted incident and the victim and suspects were known to one another. One suspect was arrested that evening, and two other females were arrested on January 5 and 6. They are facing Aggravated Assault and Assault with a Weapon charges. The two remaining suspects were arrested this morning.

Government

City

Tuesday

Burnside Zoning Review – Public Open House, Case 21808 (Tuesday, 12pm and 4pm, in the building named after a bank, 259 Commodore Drive, Dartmouth) — Burnside is going to be turned into Shangri-La.

Halifax and West Community Council (Tuesday, 6pm, City Hall) — among other items, the council will consider a two-storey addition to the Delmore Buddy Daye Learning Institute at the corner of Cornwallis and Maitland Streets.

Wednesday

Audit and Finance Standing Committee (Wednesday, 10am, City Hall) — nothing terribly interesting on the agenda, but these are the sort of meetings where they add wild shit at the last minute because they think no one is watching.

North West Planning Advisory Committee (Wednesday, 7pm, Silver and Gold Room, Sackville Heights Community Centre) — here's the agenda.

Province

Tuesday

No public meetings today.

Wednesday

Public Accounts (Wednesday, 9am, Province House) — because the McNeil government doesn't want the opposition to ask untoward questions, all the committee does anymore is look at the Auditor General's reports. Ho-hum. This week, that means questions about the May 2018 report on Grant Programs.

On campus

Dalhousie

Tuesday

Trustworthy and novel dietary guidelines: Early results of systematic reviews on red and processed meat (Tuesday, 12pm, Room 409, Centre for Clinical Research) — Bradley Johnston from Dalhousie and Regina El Dib from Estadual Paulista University (Unesp), Brazil, will speak.

SURGE: Nova Scotia's newest sandbox (Tuesday, 2pm, Room 2660, Life Sciences Centre) — I wrote about this yesterday.

Wednesday

Biomolecular interactions at the cell surface: My journey from helpful hormones to the deadly plague (Wednesday, 4pm, theatre A, Tupper Medical Building) — Kyungsoo Shin, from Sanford Burnham Prebys Medical Discovery Institute, San Diego, will speak.

Mount Saint Vincent

Wednesday

Elder Albert Marshall and Cheryl Bartlett

Two-Eyed Seeing (Wednesday, 11am, Multipurpose Room, Rosaria Student Centre) — Elder Albert Marshall, Cheryl Bartlett, and other Indigenous and Non-Indigenous "Knowledge Holders" present a workshop, free to Mount faculty, students and staff, $75 for public. Includes lunch. Register here. More info here.

Transforming Teaching and Learning Through Etuaptmumk [Two-Eyed Seeing] (Wednesday, 7pm, Multipurpose Room, Rosaria Student Centre) — Info: foodsecurity@msvu.ca

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In the harbour

⚠ Cookies and local storage help us deliver our services. By using our services, you agree to our use of cookies and local storage (/en/p/privacy-policy#cookies).

Got it

157K

568

MarineTraffic.com (http://www.marinetraffic.com/)

Mobile App: iOS (http://itunes.apple.com/us/app/marinetraffic/id563910324) | Android (https://play.google.com/store/apps/details?id=com.marinetraffic.android)

18:00: **Thorco Liva**, cargo ship, moves from Pier 9 to Bedford Basin anchorage

No arrivals or departures listed as of 9am.

Footnotes

I dislike winter.

The Halifax Examiner is an advertising-free, subscriber-supported news site. Your subscription makes this work possible; please subscribe.

FILED UNDER: FEATURED

COMMENTS

Ken Donnelly says
January 8, 2019 at 12:13 pm

Tremendous work on the money being given and loaned to Northern Pulp and Scotsburn Lumber. I look forward to more enlightenment as you get more responses to you queries.

Has Nunn taken a vow of silence?

Log in to Reply

Peter Ritchie says
January 8, 2019 at 1:55 pm

I thought Mr. Nunn billed himself as ‘Mr. Nova Scotia Know-it-all’; it would appear that while he may claim to know it all, he doesn’t seem particularly eager to share what he knows about the skulduggery at LAF (formerly DNR).

Excellent work, Tim and Joan.

Log in to Reply

rangeroad says
January 8, 2019 at 1:03 pm

Great work on the Northern Pulp racket, Tim. That is a serious amount of cash-ola being funnelled around from the province and those companies. Many people have been wondering what the stumpage fees the province has been paying Westfor, and what other 'incentives' might be coming Westfor's way for their exclusive contract to log crown land. Perhaps worth looking into if you can?

Log in to Reply

Barbara Darby says
January 8, 2019 at 1:33 pm

Terrific work. Follow the money.

Log in to Reply

Yulinyhz says
January 8, 2019 at 11:05 pm

Agreed! Over 20 million$ tax dollars to these 2 companies in 10 years… So this is like the Yarmouth ferry except it pollutes more, deforests and directly employs more people? Great. Bring on the gold mines, fracking, space ports, convention centres and stadiums. The future will be bold/innovative/disruptive/collaborative/bleak.

Log in to Reply

Colin May says
January 8, 2019 at 2:25 pm

Governments have alaways propped up employment by providing direct/indirect financial assistance/incentives to employers. I doubt it will ever change because it is mainly an argument over which industries get the assistance/subsidy.

Log in to Reply

Colin May says
January 8, 2019 at 3:26 pm

Look what popped up in a email to me from Linkedin :

Huawei Technologies
Public Relations Director
Huawei Technologies · Markham, Ontario, Canada

LinkedIn
Easy Apply

Log in to Reply

scott adamson says
January 8, 2019 at 8:36 pm

Great to read coverage of the Council actions last night (Municipality of Pictou County). Impressed that the Examiner stated clearly the resolution and identified who supported the resolution and who did not. I attended the meeting, and, if my recollection is correct, Warden Robert Parker also supported the resolution.
Credit to the entire Council for unanimously agreeing to hear from Chief Paul- this was necessary as her name was not put on the agenda as a presenter until after the deadline for such things had gone by.
After Andrea Paul had made her presentation, she made the rounds of the Council itself and shook hands with each of the councillors, including the three that did not support the resolution pertaining to sticking to the hard date for the closure of Boat Harbour.
There is leadership at the local level that could possibly have an answer to the pulp effluent problem – an answer that might satisfy all parties.

As several councillors mentioned last night- 'Where's the leadership from the province of Nova Scotia?' The classification of this as a class one assessment was made by a deputy-minister. It was the wrong designation, yet the political leadership in the province supported it, and the existing government is simply letting things unfold as the locked-in process grinds away.

What chance does this display of local leadership have when any option other than a pipe into the Northumberland Strait has never been entertained seriously?

Log in to Reply

Trackbacks

Tall Timber, Trade and Trump… and a Tracking Technology Technicality – Tree Frog creative says:
January 8, 2019 at 12:09 pm

[…] In Business news: the China trade war is taking its toll on hardwood producers; and a PR effort for Northern Pulp is […]

Log in to Reply

Tall Timber, Trade and Trump… and a Tracking Technicality – Tree Frog creative says:
January 8, 2019 at 12:11 pm
[…] In Business news: the China trade war is taking its toll on hardwood producers; and a PR effort for Northern Pulp is […]

Log in to Reply

LEAVE A REPLY

You must be logged in to post a comment.

DEAD WRONG

A botched police investigation and a probable wrongful conviction shed light on the murders of dozens of women in Nova Scotia.

This is a multi-part series still in publication. Click here to go to the DEAD WRONG home page.

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The Halifax Examiner was founded by investigative reporter Tim Bousquet, and now includes a growing collection of writers, contributors, and staff. Above, top row, left to right: Russell Gragg, Jennifer Henderson, Admin person extraordinaire Iris, Tim Bousquet, Stephen Kimber, Linda Pannozzo, Evelyn White, Katie Toth. Bottom row: Erica Butler, Tempa Hull, El Jones More about the Examiner.

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RECENT POSTS

Fixing freedom of information in NS (and jails), pulp mill politics, and plastics – all that, and more. January 16, 2019

Nova Scotia needs a JAIL hotline January 15, 2019

SageCrowd, Ogden Pond, and alleged corporate crime January 15, 2019

The city still doesn't have a living wage ordinance, but the need for it hasn't gone away January 14, 2019

UARB submission raises safety concerns about Alton Gas project January 14, 2019

COMMENTING POLICY

All comments on the Halifax Examiner are subject to our commenting policy. You can view our commenting policy here.

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Grant, Hunter A

From: MacInnis, Marla J
Sent: August 22, 2018 1:47 PM
To: Porter, Gary S
Cc: Trainor, Royden
Subject: RE: Issue Summary: Northern Pulp

No worries, Gary. Thanks!

From: Porter, Gary S
Sent: Wednesday, August 22, 2018 1:47 PM
To: MacInnis, Marla J <Marla.MacInnis@novascotia.ca>
Cc: Trainor, Royden <Royden.Trainor@novascotia.ca>
Subject: Re: Issue Summary: Northern Pulp

I am good with the messages. I can't be at the briefing though as I am out of the office and out of town.

Sent from my iPhone

On Aug 22, 2018, at 12:39 PM, MacInnis, Marla J <Marla.MacInnis@novascotia.ca> wrote:

> Hi Gary and Royden,
>
> We've been asked to provide a brief issue summary on Northern Pulp to CNS/Premier's Office ahead of post-cabinet scrums tomorrow. Any concerns with this? I added a new message to the bottom as well.
>
> **Daily Issues Summary (Advice to Ministers) July 22, 2018**
>
> **Lead: Department of Transportation and Infrastructure Renewal**
>
> **Issue: Northern Pulp**
>
> The Northumberland Fisherman's Association issued a news release this week outlining concerns with the Province providing $6 million to Northern Pulp for design of the proposed new effluent treatment facility. This money was listed as a grant in Public Accounts 2017-2018.The Association is concerned the provincial government cannot conduct an unbiased environmental assessment when they are funding the project.
>
> **Messages**
>
> - The Government of Nova Scotia is committed to the closure of the existing Boat Harbour Effluent Treatment Facility, which it owns, by Jan. 31, 2020. The Boat Harbour Act requires the closing of this facility ten years earlier than the lease between the Province and Northern Pulp.

Intended for Public Use

- We are working to find a solution which ensures an environmentally and economically sustainable future for the Pictou Landing First Nation, the Pictou area, Northern Pulp and other stakeholders.

- This has required a contribution towards detailed design and engineering studies for a potential replacement effluent treatment facility. The contribution allows negotiations with Northern Pulp to continue and will be credited towards any future agreement.

- This cost is part of a larger discussion with Northern Pulp which is yet to be concluded. Final construction costs could be north of $100 million.

- The Department of Transportation and Infrastructure Renewal is not involved in the Department of Environment's independent environmental assessment process.

Marla MacInnis
Media Relations Advisor, Province of Nova Scotia
Transportation and Infrastructure Renewal | Service Nova Scotia
t: 902-424-1750 | c: 902-499-6428 | e: marla.macinnis@novascotia.ca

Intended for Public Use

[Advice to Executive Council] DRAFT

Memorandum
to the Executive Council

Number:
Dept.:
Date:

Title: Northern Pulp – Effluent treatment facility negotiation mandate

Submitted By: Honourable Lloyd Hines, Minister, Transportation and Infrastructure Renewal

Prepared By: Bonnie Rankin, Director of Policy

Reviewed By: Diane Saurette, Executive Director, Finance and Strategic Capital and Infrastructure Planning
Royden Trainor, Senior Executive Director, Policy and Planning

Deputy Minister: Paul LaFleche, Ph. D., P. Geo

SUMMARY:

[redacted] 13(1) 14(1)

CURRENT SITUATION AND PURPOSE FOR THIS REQUEST

The *Boat Harbour Act* mandates the closure of the Boat Harbour Effluent Treatment Facility (the Facility) by January 31, 2020, which will require either:

1. A new effluent treatment system to be commissioned and operating; or
2. The Northern Pulp Mill to cease operations.

There are a number agreements in place which define the current relationship between the Province and the Mill including (a) the *Scott Maritimes Limited Agreement Act*; (b) a Memorandum of Understanding dated December 1, 1995; (c) water supply agreement dated December 31, 1995; (d) a lease agreement dated December 1, 1995; and (e) an indemnity agreement dated December 31, 1995. In addition, by acknowledgement dated May 12, 2008 the Province provided an assurance that these agreements were in good standing and would continue to benefit the Mill.

The lease agreement between the Province (as owner) and the Mill for the use of the Boat Harbour Effluent Treatment System has a termination date of December 31, 2030, however, the enactment of the *Boat Harbour Act* in 2015 effectively shortened the period which the Mill may use the facility by ten years and eleven months.

[redacted] 13(1) 14(1)

[redacted] 13(1) 14(1)

[redacted] Treasury and Policy Board had approved cost sharing for the preliminary design of the replacement facility, now complete, including a Receiving Water study of the Outfall, and hiring a consultant to undertake an Environmental Assessment, including stakeholder consultations and Aboriginal engagement, and preparation of an Environmental Assessment Report that is necessary for the registration for a Class I Environmental Assessment [redacted]. Nova Scotia Department of Environment has announced this project as a Class I Environmental Assessment since it is a modification to an existing undertaking. [redacted] 13(1) 14(1)

[redacted] Treasury and Policy Board approved a contribution of up to $8 million for a detailed design and engineering study for a replacement effluent treatment

Intended for Public Use

facility

[redacted]

13(1)
14(1)

Intended for Public Use

[redacted]

13(1)
14(1)

BACKGROUND

In the mid-1960s, the Province of Nova Scotia agreed to provide fibre and water to the Abercrombie Point Pulp Mill (currently Northern Pulp Mill, or the Mill) and to treat wastewater effluent from the Mill. This relationship was set out in the *Scott Maritimes Limited Agreement Act*.

In the 1960s, the Province situated and started operations of the Boat Harbour Effluent Treatment Facility (the Facility) when the Mill started operations. In 1995, the Mill took over the Facility operations, by lease with the Province of Nova Scotia, until December 31, 2030.

In June 2014, following a break in the effluent pipeline between Northern Pulp Mill and the Facility, the Pictou Landing First Nation (the Band) established a peaceful blockade preventing pipeline repair. As the pipeline is part of the Facility owned by Nova Scotia, an Agreement in Principle was negotiated which required the Province of Nova Scotia to agree to enact a timeline for closure of the Facility for which the Band agreed to dismantle the blockade.

The *Boat Harbour Act* was subsequently founded in the outcome of negotiations between the Band and provincial officials, which were carried out during late 2014 and early 2015. As a result of these negotiations, the date of January 31, 2020 had been determined as the date of closure of the Boat Harbour Effluent Treatment Facility for the reception and treatment of effluent from the Northern Pulp Mill. [redacted]

13(1)
14(1)

[redacted]

13(1)
14(1)

The Province has contractual commitments to provide water to Northern Pulp until March 2021 and to lease the Boat Harbour Effluent Treatment Facility to Northern Pulp until December 30, 2030. In addition, the Province entered into an MOU, Indemnity Agreement and an Acknowledgement Agreement, concerning the commitments and obligations of the parties in respect of the Mill's operations, and the liabilities of the Province in this regard.

The *Boat Harbour Act* has introduced a legislated date of January 31, 2020 after which the Boat Harbour Effluent Treatment Facility may no longer be used to receive and treat effluent from the Mill. The Act also limits claims related to the cessation of use of the Boat Harbour Effluent Treatment Facility [redacted]

13(1)
14(1)

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13(1)
14(1)

KEY ISSUE

13(1)
14(1)

JURISDICTIONAL REVIEW
Not relevant.

ASSESSMENT OF ALTERNATIVES / RISK ASSESSMENT/MITIGATION

13(1)
14(1)

Intended for Public Use

13(1)
14(1)

[redacted]

Intended for Public Use

PROPOSED ACTION AND TIMING

13(1)
14(1)

[redacted]

FINANCIAL IMPACT

1. Does this submission require either of the following approvals under the *Finance Act*?

   Section 77 requires a report from the Minister of Finance and Treasury Board before entering into a net debt obligation (formerly 59C of the *Provincial Finance Act*)

13(1)
14(1)

[redacted]

Section 78 requires Treasury and Policy Board approval before undertaking an operating obligation.

13(1)
14(1)

[redacted]

2. Is this an In-Year Funding request (is there a current year impact which cannot be absorbed in the existing appropriation)?

13(1)
14(1)

[redacted]

3. Briefly describe the financial request by completing the following table:

Initiative	Fiscal Year	Fiscal Year	Fiscal Year
[redacted]			

13(1)
14(1)

4. Is new operating funding required?

13(1)
14(1)

[redacted]

Additional operating funding required	Fiscal Year	Fiscal Year	Fiscal Year
[redacted]			

13(1)
14(1)

5. Is new capital funding required?

13(1)
14(1)

[redacted]

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Additional capital funding required	Fiscal Year	Fiscal Year	Fiscal Year
[redacted]			

13(1) 14(1)

6. Is there third party funding associated with this request?

13(1) 14(1) [redacted]

7. Will this proposal impact a Revenue stream of the Province?

13(1) 14(1) [redacted]

8. Are additional FTEs required?

13(1) 14(1) [redacted]

9. Provide any further comments on the financial impact that have not been covered above

13(1) 14(1) [redacted]

INFORMATION TECHNOLOGY
Is there a technology component to this request?

13(1) 14(1) [redacted]

GOVERNMENT-WIDE IMPLICATIONS

13(1) 14(1) [redacted]

CONSULTATION
Is Aboriginal consultation required?

13(1) 14(1) [redacted]

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13(1)
14(1)

[redacted]

Indicate what consultations, if any, that were undertaken with

13(1)
14(1)

[redacted]

If yes to either of the above, has the Department of Intergovernmental Affairs been consulted?

13(1)
14(1)

[redacted]

EFFICIENCY/PRODUCTIVITY
Not applicable.

LEGAL IMPLICATIONS

13(1)
14(1)

[redacted]

POLICY LENSES

13(1)
14(1)

[redacted]

RECOMMENDATION

13(1)
14(1)

[redacted]

Respectfully submitted,

Halifax, Nova Scotia

Date May 15, 2018

Honourable Lloyd Hines
Minister, Transportation and Infrastructure Renewal

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Communications Plan [Template] Advice to Executive Council

Plan Title: Northern Pulp – Effluent Treatment Facility negotiation mandate
Department: Transportation and Infrastructure Renewal
Accompanying: R&R RFL X MEC
Date: May 11, 2018
Prepared by: Brett Loney

Narrative: Northern Pulp and the Province have been working to find the best available solution for a new effluent treatment facility. We are working to ensure the best environmentally-sustainable solution to ensure inclusive economic growth.

Background/Context:

13(1)
14(1)

The Province has legal commitments to provide water to Northern Pulp until March 2021 and to lease the Boat Harbour effluent treatment facility to Northern Pulp until December 30, 2030.

13(1)
14(1)

Stakeholder/Key Audience Analysis:

Stakeholder	Reaction	Analysis

13(1)
14(1)

13(1)
14(1)

[redacted]

Research: The province commissioned a telephone survey conducted by Corporate Research Associates in summer 2014. A clear majority of Nova Scotians (62%) supported the Mill's continued operation. Residents of Pictou County were slightly less likely to support Northern Pulp's continued operation, with 50% mostly or completely opposing, and were more likely to want the Mill shut down until required changes to the Mill were complete. Support for government funding of the Mill was low overall, and only if funds are invested well. Only a few Nova Scotians supported additional aid being provided while the Mill is in violation of environmental regulations. The range of funding considered reasonable varied with 31% of Nova Scotians identifying less than $5-million (19% indicated no government funding). Overall, Pictou County residents were more likely to express concerns about the Mill's operation, more likely to agree the Mill should be shut down, more likely to believe no funding should be provided to the Mill, and more aware of the Ministerial Order that was in place at the time of the survey in relation to the Mill's environmental impact and emission violations.

Overall, the issue of replacing Northern Pulp's Effluent Treatment Facility has been controversial and received moderate and ongoing media coverage, particularly in Pictou County.

Strategy: [redacted]

13(1)
14(1)

Three Key Messages:

13(1)
14(1)

[redacted]

Issues:

13(1)
14(1)

[redacted]

Roll-out: To Be Determined

Links to Government Priorities, Departments, and/or Agencies: Department of Natural Resources, Nova Scotia Business Inc., Department of Environment

Objectives & Evaluation: We will follow and evaluate media coverage and any social media on these negotiations.

Sent to Executive Assistant:
Approved by Managing Director: Tara Walsh, May 14, 2018
Approved by Deputy:
Approved by Minister:

Intended for Public Use

SUPREME COURT OF NOVA SCOTIA

Citation: *Pictou Landing First Nation v. Nova Scotia (Aboriginal Affairs)*, 2018 NSSC 306

Date: 20181130
Docket: Hfx No. 474934
Registry: Halifax

2018 NSSC 306 (CanLII)

Between:

Pictou Landing First Nation

Applicant

v.

Her Majesty the Queen in Right of the Province of Nova Scotia as represented by the Minister of Aboriginal Affairs

Respondent

Judge: The Honourable Justice D. Timothy Gabriel

Heard: July 25, 2018, in Halifax, Nova Scotia

Counsel: Brian Hebert, for the Applicant
Sean Foreman and Diane Rowe, for the Respondent

2018 NSSC 306 (CanLII)

By the Court:

Introduction

[1] Northern Pulp Nova Scotia Corporation ("Northern Pulp") owns and operates a bleached kraft pulp mill and associated facilities located at Abercrombie Point, Pictou County. This latter has been referred to by the parties as "the mill" and I will continue to refer to it as such within the body of these reasons.

[2] Pictou Landing First Nation ("PLFN") has applied for Judicial Review of a decision of the office of Provincial Minister of Aboriginal Affairs to deny consultation with respect to the issue of whether the Province will or should fund the construction of a new effluent treatment facility at Boat Harbour, Pictou County, Nova Scotia. For the reasons which follow, the application is granted.

Background

[3] The mill presently includes an effluent treatment facility which has been operating since 1967. It is adjacent to Boat Harbour. I will refer to the presently existing facility as "the Boat Harbour treatment facility".

[4] The *Boat Harbour Act*, 2015 c. 4 ("*BHA*"), provides in part as follows:

> 3. On and after the earlier of January 31, 2020, and the date on which the Northern Pulp Nova Scotia Corporation ceases to use the facility, the use of the facility for the reception and treatment of effluent from the mill must cease.
>
> [Emphasis added]

[5] Key words contained in s. 3 are referenced in the interpretation provisions set out in s. 2:

> In this Act,
>
> (a) "effluent" has the same meaning as in the Pulp and Paper Effluent Regulations (Canada), as amended from time to time;
>
> (b) "Facility" means the Boat Harbour Effluent Treatment Facility, comprising

> (i) the effluent treatment system located at 340 and 580 Simpson Lane, Pictou Landing, in the County of Pictou, and consisting of two settling basins, an aerated stabilization basin, the former stabilization lagoon and all appurtenances thereof necessary to permit the receipt and disposal of effluent from the Mill, and
>
> (ii) the pipeline for the transmission of effluent from the Mill to the settling basins, which commences at a standpipe located at 260 Granton Abercrombie Branch Road, Abercrombie Point, in the County of Pictou, leads under the East River and discharges into the settling basins;
>
> (c) "Mill" means the Northern Pulp Mill, a bleached kraft pulp mill located at 260 Granton Abercrombie Branch Road, Abercrombie Point.

[6] As the Province indicates in its brief:

> 4. Northern Pulp is in the planning stages to formally apply for Environmental Assessment ("EA") approval pursuant to Part IV of the *Environmental Act* for the design, construction and operation of a new Effluent Treatment Facility ("ETF") to replace the existing Boat Harbour Treatment Facility, which must be closed as required by the *Act* ("the pending ETF Application").
>
> 5. The Province is currently engaged in active consultation with the PLFN regarding the Pending ETF Application. The Province has confirmed $70,000.00 in capacity funding to support PLFN's meaningful participation in that process.

[7] The Province continues:

> 7. The Province has disclosed it is also engaged in confidential discussions directly with Northern Pulp regarding potential crown funding that may be provided to support construction of the new ETF (the "Potential Crown Funding"). No such decision has yet been made.
>
> 8. PLFN takes the position that any such Potential Crown Funding to Northern Pulp by the Province is a separate "decision" that triggers an independent duty to consult with PLFN, as this decision "will have the effect of continuing the operation of the Mill beyond January 30, 2020" and therefore further impact the asserted rights and interests asserted by PLFN.
>
> 9. The Province disagrees that any decision to provide some form of Potential Crown Funding would be a "decision" or "action" that itself

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> triggers an independent duty to consult with PLFN. Simply put, Potential Crown Funding to Northern Pulp does not meet the established legal test to trigger consultation, as any such potential decision or action itself does not authorize continued operation of the Mill beyond January 30, 2020 (as claimed by PLFN) and therefore has no additional or potential adverse impact on the rights and interests asserted by PLFN.
>
> [Emphasis in original]

[8] After reminding me that the Boat Harbour Treatment Facility and the circumstances of Boat Harbour have been publicly referred to by provincial spokespersons in the past "as an example of environmental racism" (*Applicant brief, para. 7*), PLFN goes on to point out:

> 8. The Mill requires a new treatment facility if it is to continue operating. A new treatment facility, if built, will allow the Mill to be operated for many years to come and will mean the continued release of contaminants from the Mill during the pulping process during that period. Those contaminants, some of which are toxic, will find their way to Pictou Landing First Nation and will be breathed in by the men, women and children living there.
>
> 9. The Province of Nova Scotia is considering financial assistance to Northern Pulp to assist with the construction of the new treatment facility being proposed by Northern Pulp.
>
> 10. The Province is currently consulting with Pictou Landing First Nation on the pending decision of the Province to approve the effluent treatment facility under the *Environmental Act*. The consultation focuses on the physical impacts of the design, construction and operation of the new effluent treatment facility. As such it is not focused on emissions from the ongoing pulping operations at the Mill.
>
> 11. The Province has denied Pictou Landing First Nation's request to expand the present consultation to include the funding decision, suggesting that the decision cannot lead to any adverse impacts and therefore does not trigger the duty to consult.

[9] The record filed in conjunction with this matter is miniscule. It contains merely two documents. The first is a letter from Brian Hebert (counsel for PLFN) dated January 11, 2018, seeking confirmation of the scope of consultation and capacity funding for PLFN. The second consists of a letter from the Nova Scotia Office of Aboriginal Affairs ("OAA") to Brian Hebert, PLFN counsel, in response to his January 1, 2018 letter, confirming the scope of the consultation regarding the

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Northern Pulp ETF and the quantum of capacity funding for consultation ($70,000.00). This second letter is dated February 26, 2018.

[10] The second letter was written by Beth Lewis, OAA's consultation advisor. Although OAA agreed to provide funding to accommodate consultation upon potential physical impacts to Treaty Rights in relation to the design, construction and operation of the ETF, they would not commit to do so with respect to whether the Province will finance the actual construction of it.

[11] As Ms. Lewis puts it (*Record, tab. 2*):

> The current act of consultation is focussed upon potential physical impacts to Aboriginal and Treaty Rights associated with the design, construction, and operation of the proposed ETF. The intent of the ETF is to mitigate or eliminate harm to the environment by the industrial operations of the mill.
>
> A decision by the Province in regards to any or partial funding of the ETF does not create a new impact on Aboriginal or Treaty. The Province may provide information to PFLN [sic] in the event that any decision regarding funding is made, in keeping with the spirit of maintaining transparent communication on the project. (*letter, Beth Lewis, consultation advisor, Nova Scotia of Aboriginal Affairs, February 26, 2018, Record, tab 2*)
>
> [Emphasis added]

[12] An affidavit of Andrea Paul was filed by PLFN in conjunction with this application. Extrinsic evidence not before the original decision maker is not usually permitted on a judicial review application. In this case, the proffered affidavit addresses the allegations of the lack of procedural fairness extended to PLFN, and (by implication) the incompleteness of the record.

[13] Andrea Paul is Chief of the Pictou Landing First Nation. Her affidavit was filed on June 13, 2018. In both her affidavit and *viva voce* testimony, she referred to a number of matters of which she has been advised. Included was her understanding (*Paul affidavit, para. 2*) as follows:

> It is my understanding based on various discussions with representative of Northern Pulp and the Province that without provincial funding, the new treatment facility and the new pipeline will not be built.

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[14] Moreover, she goes on to indicate that she has been advised by Bruce Chapman, General Manager of Northern Pulp, to the effect that, without the new treatment facility and the new pipeline, the mill cannot operate after January 31, 2020, which is, as we have seen from the *Boat Harbour Act*, the latest date mandated for the closure of the current Boat Harbour treatment facility.

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[15] Among other things, Chief Paul refers to an article in the *Journal of Environmental Quality* indicating that certain of the airborne contaminants to which the PLFN community has been exposed since 1967 continue to pose deleterious health risks for its members. If the lifetime of the mill is extended beyond 2020 the adverse environmental effects will continue to be experienced by the community for the duration of the extension. She concludes, in paras. 10 and 11 of her affidavit:

> 10. I have also reviewed parts of an air dispersion modelling study that was prepared by Stantec Consulting Ltd. for Northern Pulp and filed with the Nova Scotia Department of Environment to satisfy condition 6 II d) and 6 III e) and f) of industrial approval number 2011-076657. I attach a true copy of this study as Exhibit "C" to this my Affidavit. This study is also a source of my belief that the Mill emits a number of pollutants and that the prevailing winds carry these pollutants toward Pictou Landing First Nation. The study was provided to Pictou Landing Fist Nation by the Nova Scotia Department of Environment.
>
> 11. I have examined the record provided by the Respondent in this matter and must say that I am disappointed that the Province took so little information into account when responding to our request for consultation on this issue. This affidavit and the exhibits attached are intended to provide a fuller background to our request and this is my belief that this information is available to the Respondent within its own records.

[16] Chief Paul alleges, among other things, that the Province did not consider the information available to it (of which the exhibits to her affidavit comprise merely examples) in determining whether to consult with PFLN on the issue of whether to not to fund the new ETF. In other words, the Province ought to have consulted these and other materials when determining whether the decision to fund, in and of itself, by extending the lifetime of the mill, might have a potential adverse impact upon PFLN lands and/or treaty rights. This is because (PLFN argues) without government funding, the ETF will not be built, and if the new ETF is not built, the mill will be forced to close. This is in accord with PLFN's best

interest, because of the adverse health effects upon the community of the airborne contaminants which the Mill will continue to churn out, even with a new ETF.

Issues

[17] The following issues are engaged:

1. Was PLFN treated in a procedurally fair manner by OAA?
2. Was the Province's determination that it has no duty to consult with PLFN (as to whether it will fund the ETF) correct?

Analysis

1. Was PLFN treated in a procedurally fair manner by OAA?

   a. *The affidavit of Andrea Paul dated June 13, 2018*

[18] Reference has previously been made to Chief Paul's affidavit. Fundamentally, the assertions made by PLFN in relation to procedural unfairness are summarized in that affidavit.

[19] First, we find in paras. 6 – 8:

> 6. The concern that our community has always had has been the quality of the air that we breathe. We have suffered odors from the Boat Harbour Treatment Facility for 50 years. This has caused constant fear about the effect of this on our health, especially our elders' and children's health. For many years we were told by various government officials that even though the sulphur compounds we smelled were very horrible smelling, they did not pose any health risks. However, according to an article by Susan Schiffman and C. M. Williams entitled, "*Science of Odor as a Potential Health Issue*" published in the *Journal of Environmental Quality* 34:129-138 (2005), exposure to foul smelling sulphur compounds can lead to adverse health impacts in communities exposed to them even though the exposure levels are below the level that could cause physical harm. I attach as Exhibit "A" to this my Affidavit a true copy of Schiffman article.
>
> 7. With the closure of the Boat Harbour Treatment Facility, one source of these sulphur compounds will be removed - and our community is thankful for that. But as we look toward the future we must also be concerned about the long-term impact of the operation of the Mill on our community, including adverse impacts from the airborne contaminants coming from the Mill itself. We have never had an opportunity to study

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> and understand these long terms impacts as we have to date been so focused on the closure of the Boat Harbour Treatment Facility.
>
> 8. However, the Province is now in the process of determining whether to fund the New Treatment Facility and New Pipeline. If it does, the Mill will be operating for many years to come. In deciding whether to fund the New Treatment Facility and New Pipeline, we believe that the Province must take into account the potential impact of its decision on Pictou Landing First Nation. It is for this reason that we asked for a formal consultation with the Province in respect of this important decision.

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[20] As we have also seen, Chief Paul refers, in other portions of her affidavit, to information that she received from the Executive Director of Corporate Initiatives at Nova Scotia Department of Transportation and Infrastructure Removal. She cites this information, and other discussions held with Bruce Chapman, General Manager for Northern Pulp, as the basis for her conclusion that without the new ETF and pipeline the mill will be forced to close after January 30, 2020. This is because, without Provincial funding, the facility will not be built.

[21] As is apparent from para. 6 (cited above) Chief Paul also references an article by Schiffman and Williams published in *The Journal of Environmental Quality* in 2005 "*Science of Odor as a Potential Health Issue*". She attaches as Exhibit "A" a copy of the Schiffman article. She also makes reference in para. 9 to a research article published by Tony Walker of Dalhousie University at the School for Resource and Environmental Studies entitled "*Pilot Study Investigating Ambient Air Toxic Emissions in Our Canadian Kraft Pulp and Paper Facility in Pictou County, Nova Scotia*" and published in *Environmental Science and Pollution Research* in 2017.

[22] Chief Paul cites both articles as the bases for her belief that the mill emits several thousand tons of pollutants annually, including "toxic volatile organic chemicals" and that they are carried on prevailing winds to other places in Pictou County, including Pictou Landing First Nation. This article is also attached as an exhibit to her affidavit.

[23] Chief Paul cites the fact that this article was based upon data collected by the Nova Scotia Department of Environment at the Granton, Nova Scotia air monitoring site, which is operated by that Department. She draws attention to "parts of an air dispersion modelling study that was prepared by Stantec Consulting for Northern Pulp and filed with the Nova Scotia Department of Environment to satisfy conditions 6(ii)(d) and 6(iii)(f) of the Industrial Approval

2011-076657". She adds that the study was provided to PLFN by the Nova Scotia Department of the Environment itself. (*Paul affidavit, para. 10*)

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[24] In para. 11 she concludes:

> 11. I have examined the record provided by the Respondent in this matter and must say that I am disappointed that the Province took so little information into account when responding to our request for consultation on this issue. This affidavit and the exhibits attached are intended to provide a fuller background to our request and it is my belief that this information is available to the Respondent within its own records.

[25] The Applicant extrapolates from this that the Band was denied procedural fairness by the failure of the Province to consider all relevant information before making its decision. Information readily available to the Province, some of which was included in Chief Paul's affidavit, was not considered, the Applicant contends.

[26] As the Applicant puts it:

> 58. Whatever else procedural fairness entails, fairness requires the Minister to consider all relevant information before making a decision. The affidavit evidence establishes that information within the control of the Province establishes that the Mill does emit toxic and carcinogenic pollutants and that the prevailing winds carry these pollutants to the Pictou Landing First Nation. <u>While these adverse impacts have been occurring for many years, the decision of the Province to fund the new treatment facility will mean that these effects will continue to occur beyond January 30, 2020</u>. As discussed above, the adverse impacts beyond that date will be causally connected to the Province's decision to fund the new treatment facility and pipeline, if it decided to do so.
>
> 59. These are serious consequences and the concerns of Pictou Landing First Nation appear on the affidavit evidence to be justified. The First Nation deserves a fuller review by the Minister before dismissing the request for consultation out of hand.
>
> [Emphasis added]
> (*Applicant's brief*)

[27] The Applicant refers to the court statement in *Haida Nation* (*Haida Nation v. British Columbia (Minister of Forests)*, (2004) SCC 73) that "the foundation of the duty to consult is found in the Crown's honour. The goal of reconciliation,

suggests that the duty arises when the Crown has knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it". (*Haida Nation, para. 35*)

[28] According to the Applicant, "it follows from this that the Province is required to consider all of the information that bears on the question that is in its possession or available to it". (*Applicant's reply brief, para. 27)*

[29] The Applicant further submits that it may be impractical or impossible for a First Nation to access the information available to the government, such as any representations Northern Pulp may have made to the Province by way of an economic case. Therefore, the Applicant argues, the honour of the Crown would suggest that the Crown should consider all extraneous information available to it (some examples of which Chief Paul has provided) before deciding whether a duty to consult as to potential funding exists. (*Applicant's reply brief, paras. 29 and 30)* By necessary implication, that additional information should form part of the record because it was available to the Province before it made its decision.

[30] With respect, I am unable to accept the Applicant's contentions in this regard. First, I have serious reservations with respect to many portions of Chief Paul's affidavit. It is replete with references to conversations that she has had with various named and unnamed individuals, and contains further submissions as to conclusions that she has drawn on the basis of those conversations with respect to the potential adverse effects of the emissions of the mill (and, by extension, the potential for adverse effects as a result of the new mill with the ETF under discussion), and also the <u>impossibility</u> of the new ETF being built without government funding.

[31] We are not dealing here with evidence concerning ancient practices, customs and traditions of Mi'kmaq people before written records existed. There is, therefore, no basis for a departure from the "…evidentiary standards that would be applied, for example, in a private law torts case…" (*R. v. Van der Peet*, [1996] 2 SCR 507 – para.68).

[32] Second, it does not appear to me that the Province is denying the potential physical impacts to Treaty Rights of the mill (even with a new ETF) in any event. What it appears to be saying is that these potential airborne physical impacts are part of the <u>present</u> operation of the mill – funding of a new ETF will not result in any new impact in that respect.

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[33] Moreover, the Province has implicitly conceded that an improper design or construction of the "new" ETF could have a potential physical impact (albeit, as a result of the discharge of effluent, rather than airborne pollution). It acknowledges that PLFN has a legitimate interest in the specifications to which the new ETF is to be subject. In fact, it reminds the court repeatedly that these are the very things that it is prepared to consult about, and for which it has put up $70,000.00 in capacity funding. This will, it argues, enable the PFLN to meaningfully consult with respect to these very concerns.

[34] The Province's argument, in a nutshell, is to the effect that there are no "new" physical impacts to Treaty Rights which could even potentially arise merely out of the decision as to whether it should fund the project or not.

[35] Finally, there is no indication in the record (specifically, in the letter written at the outset by counsel for PLFN (Tab 1)) to any of the specific material cited by Chief Paul, in her affidavit.

[36] As a result, PLFN's claim that there was a denial of procedural fairness, or that the record is incomplete, is somewhat inchoate under the circumstances. The Applicant has provided no authority – beyond general references to the honour of the Crown – to support the position that the Crown had a duty in this situation to bring forward any and all information in its possession bearing upon the operation of the mill. The Province's reply was responsive to the letter from the Applicant's counsel. It is not clear what the principal basis would be to find a breach of procedural fairness in these circumstances.

[37] As a consequence, I conclude that there is no substance to the Applicant's assertion of procedural unfairness in relation to this matter.

[38] That being said, although I cannot conclude on the basis of the evidence before me that a new ETF will not be built without Provincial funding, I can conclude, upon the facts:

> a) that the current Boat Harbour Treatment Facility is an integral part of the current operation of the mill as a whole (*BHA*, s. 2(b));
>
> b) that the current Boat Harbour Treatment Facility must close no later than January 31, 2020 (*BHA*, s. 3);
>
> c) that the new ETF which will replace the existing facility will be integral to the continued operation of the mill, beyond January 31, 2020

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> (it must replace those functions discharged by the current Boat Harbour Treatment Facility (described in *BHA*, s. 2(b));
>
> d) each additional potential source of funding that is available for the project makes it incrementally more likely that the new ETF project will come to fruition; and
>
> e) that as a consequence, a Provincial decision to fund the project, even if it is not the only potential source of funding, would make it incrementally more likely that the mill will remain open and be able to continue operations past 2020.

2. Was the Province's determination that it had no duty to consult with PLFN (as to whether it will fund the new ETF) correct?

a. *The scope of the duty*

[39] The Supreme Court of Canada has described the duty to consult in many cases. We may begin with *Delgamuukw v. British Columbia*, [1997] 3 S.C.R. 1010. Therein, Chief Justice Lamer, speaking for the court, said that:

> …Aboriginal title encompasses within it a right to choose to what ends a piece of land can be put … This aspect of aboriginal title suggests that the fiduciary relationship between the Crown and aboriginal peoples may be satisfied by the involvement of aboriginal peoples in decisions taken with respect to their lands. There is always a duty of consultation. Whether the aboriginal group has been consulted is relevant to determining whether the infringement of aboriginal title is justified, in the same way that the Crown's failure to consult an aboriginal group with respect to the terms by which reserve land is leased may breach its fiduciary duty at common law … The nature and scope of the duty of consultation will vary with the circumstances. In occasional cases, when the breach is less serious or relatively minor, it will be no more than a duty to discuss important decisions that will be taken with respect to lands held pursuant to aboriginal title. Of course, even in these rare cases when the minimum acceptable standard is consultation, this consultation must be in good faith, and with the intention of substantially addressing the concerns of the aboriginal peoples whose lands are at issue. In most cases, it will be significantly deeper than mere consultation. Some cases may even require the full consent of an aboriginal nation, particularly when provinces enact hunting and fishing regulations in relation to aboriginal lands.

[40] This duty to consult has been expansively discussed by the court in subsequent decisions. Although this is a non-exhaustive list, some of these cases

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include *Taku River Tlingit First Nation v. British Columbia (Project Assessment Director),* 2004 SCC 74, *Clyde River (Hamlet) v. Petroleum Geo-Services Inc.*, 2017 SCC 40, and *Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage*), 2005 SCC 69 ("*Mikisew Cree 2005*")

[41] In "*Mikisew Cree 2005*", Justice Binnie, writing for the court, incorporated earlier remarks by Chief Justice Beverly McLachlin in *Haida Nation*:

> … The content of the process is dictated by the duty of the Crown to act honourably. Although *Haida Nation* was not a treaty case, McLachlin C.J. pointed out, at paras. 19 and 35:
>
> > 19. The honour of the Crown also infuses the processes of treaty making and treaty interpretation. In making and applying treaties, the Crown must act with honour and integrity, avoiding even the appearance of "sharp dealing" (Badger, at para. 41). Thus in Marshall, supra, at para. 4, the majority of this Court supported its interpretation of a treaty by stating that "nothing less would uphold the honour and integrity of the Crown in its dealings with the Mi'kmaq people to secure their peace and friendship".
> >
> > ...
> >
> > 35. But, when precisely does a duty to consult arise? The foundation of the duty in the Crown's honour and the goal of reconciliation suggest that the duty arises when the Crown has knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it.
>
> [Emphasis added]

[42] Justice Binnie went on to point out (at para. 55 of *Mikisew Cree 2005*) that the duty to consult is "triggered at a low threshold, but adverse impact is a matter of degree, as is the extent of the Crown's duty".

[43] In the recently decided *Mikisew Cree First Nation v. Canada (Governor General in Council)* 2018 SCC 40 ("*Mikisew Cree 2018"*), many of the Justices had opportunity to further elaborate upon the concepts of the "honour of the Crown" and the "duty to consult". For example, Justice Karakatsansis wrote with respect to the former:

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> 23. The honour of the Crown is always at stake in its dealings with Aboriginal peoples (*R. v. Badger*, [1996] 1 S.C.R. 771, at para. 41; Manitoba Metis, at paras. 68-72). As it emerges from the Crown's assertion of sovereignty, it binds the Crown qua sovereign. Indeed, it has been found to apply when the Crown acts either through legislation or executive conduct (see *R. v. Sparrow*, [1990] 1 S.C.R. 1075, at pp. 1110 and 1114; *R. v. Van der Peet*, [1996] 2 S.C.R. 507, at para. 231, per McLachlin J., as she then was, dissenting; Haida Nation; Manitoba Metis, at para. 69).
>
> 24. As this Court stated in Haida Nation, the honour of the Crown "is not a mere incantation, but rather a core precept that finds its application in concrete practices" and "gives rise to different duties in different circumstances" (paras. 16 and 18). When engaged, it imposes "a heavy obligation" on the Crown (*Manitoba Metis*, at para. 68). Indeed, because of the close relationship between the honour of the Crown and s. 35, the honour of the Crown has been described as a "constitutional principle" (*Beckman v. Little Salmon/Carmacks First Nation*, 2010 SCC 53, [2010] 3 S.C.R. 103, at para. 42). That said, this Court has made clear that the duties that flow from the honour of the Crown will vary with the situations in which it is engaged (*Manitoba Metis,* at para. 74). Determining what constitutes honourable dealing, and what specific obligations are imposed by the honour of the Crown, depends heavily on the circumstances (*Haida Nation*, at para. 38; *Taku River*, at para. 25; *Rio Tinto Alcan Inc. v. Carrier Sekani Tribal Council*, 2010 SCC 43, [2010] 2 S.C.R. 650, at paras. 36-37).
>
> [Emphasis added]

[44] As to the latter, she continued:

> 25. The duty to consult is one such obligation. In instances where the Crown contemplates executive action that may adversely affect s. 35 rights, the honour of the Crown has been found to give rise to a justiciable duty to consult (see e.g. *Haida Nation, Taku River, Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage)*, 2005 SCC 69, [2005] 3 S.C.R. 388, and *Little Salmon*). This obligation has also been applied in the context of statutory decision-makers that -- while not part of the executive - - act on behalf of the Crown (*Clyde River (Hamlet) v. Petroleum Geo-Services Inc.*, 2017 SCC 40, [2017] 1 S.C.R. 1069, at para. 29). These cases demonstrate that, in certain circumstances, Crown conduct may not constitute an "infringement" of established s. 35 rights; however, acting unilaterally in a way that may adversely affect such rights does not reflect well on the honour of the Crown and may thus warrant intervention on judicial review.

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> 26. The duty to consult jurisprudence makes clear that the duty to consult is best understood as a "valuable adjunct" to the honour of the Crown (*Little Salmon*, at para. 44). The duty to consult ensures that the Crown acts honourably by preventing it from acting unilaterally in ways that undermine s. 35 rights. This promotes reconciliation between the Crown and Aboriginal peoples first, by providing procedural protections to s. 35 rights, and second, by encouraging negotiation and just settlements as an alternative to the cost, delay and acrimony of litigating s. 35 infringement claims (*Clyde River*, at para. 1; *Haida Nation,* at paras. 14 and 32; *Mikisew Cree*, at para. 63).
>
> 27. The duty to consult has been recognized in a variety of contexts. For example, in *Haida Nation*, this Court recognized a duty to consult when the Crown contemplated the replacement and transfer of tree farm licences that had the potential to affect asserted but unproven Aboriginal rights. In *Mikisew Cree [No. 1]*, the Court recognized that the contemplation of "taking up" lands under Treaty No. 8 could adversely affect the Mikisew's rights under the treaty and thus required consultation. Crown conduct need not have an immediate impact on lands and resources to trigger the duty to consult. This Court has recognized that "high-level management decisions or structural changes to [a] resource's management" may also trigger a consultative duty (*Carrier Sekani,* at para. 47; see also para. 44). However, to date, the duty to consult has only been applied to executive conduct and conduct taken on behalf of the executive.
>
> [Emphasis added]

[45] Next, Justice Abella:

> 60. But the honour of the Crown is not itself a cause of action. Rather, it speaks to the way in which the Crown's specific obligations must be fulfilled (*Manitoba Metis Federation*, at para. 73). These obligations vary depending on the circumstances. In negotiating and applying treaties, the Crown must act with integrity and honour, and avoid even the appearance of sharp dealing (*Haida Nation*, at para. 19; *Badger*, at para. 41; *R. v. Marshall,* [1999] 3 S.C.R. 456, at para. 4). Where the government enacts regulations that infringe on Aboriginal rights, the honour of the Crown demands that those measures be justified (*Sparrow*, at p. 1109). And when the government contemplates conduct that might adversely affect Aboriginal or treaty rights, the honour of the Crown gives rise to a duty to consult and accommodate.

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> 61. Grounded in the honour of the Crown, the duty to consult arises from the assertion of Crown sovereignty and aims to advance the process of reconciliation (*McCabe*, at p. 90; *Haida Nation*, at paras. 45 and 59). It serves an important role in the "process of fair dealing and reconciliation that begins with the assertion of sovereignty and continues beyond formal claims resolution" (*Haida Nation*, at para. 32). Where the duty arises, it requires meaningful consultation between the government and the affected group. This means a meaningful effort by the government to act in a manner that is consistent with the honour of the Crown in that particular context (Dwight G. Newman, *Revisiting the Duty to Consult Aboriginal Peoples (2014)*, at pp. 88-89). Consultation obligations can be viewed as falling on a spectrum, which accommodates the different contexts in which more or less consultation is necessary to fulfill its purpose (*Newman*, at p. 89; *Haida Nation*, at para. 43).
>
> 62. I see this duty as being more than a "means" to uphold the honour of the Crown. The obligation arises because it would not be honourable to make important decisions that have an adverse impact on Aboriginal and treaty rights without efforts to consult and, if appropriate, accommodate those interests. The Crown must act honourably in defining the rights guaranteed by s. 35 and in reconciling them with other societal rights and interests. This implies a duty to consult (*Haida Nation*, at para. 20). The question is not whether the duty to consult is appropriate in the circumstances, but whether the decision is one to which the duty to consult applies.
>
> [Emphasis added]

[46] As to the duty to consult, Justice Abella continued:

> 70. …the Court affirmed that the Crown's obligation to consult and accommodate Indigenous groups arises independently from its obligation to justify infringements of Aboriginal and treaty rights. In the duty to consult context, the controlling question is not whether the limit on rights is justified, but "what is required to maintain the honour of the Crown and to effect reconciliation between the Crown and the Aboriginal peoples with respect to the interests at stake" (*Haida Nation*, at para. 45). In this sense, the trilogy represents a shift towards mutual reconciliation between Aboriginal and Crown sovereignty, and a further step towards embracing the honour of the Crown as a limit on Crown sovereignty in relation to Indigenous peoples (Mark D. Walters, "*The Morality of Aboriginal Law*" (2006), 31 Queen's L.J. 470, at pp. 513-14).
>
> [*Haida Nation, Taku River, and Mikisew*]
> [Emphasis added]

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[47] Finally, Justice Rowe noted:

> 157. This Court stated in *Rio Tinto* that any potential for adverse impact as a result of Crown conduct will trigger the duty to consult and accommodate. The Court further stated that the duty may arise with respect to "high-level managerial or policy decisions" (para. 87). The policy decisions at issue in *Rio Tinto* were made by the executive in regards to a particular development project; in that case, the impugned decision concerned the sale of power produced from a hydroelectric dam on the Nechako River. The Court's statement needs to be understood in the context in which it was made; it does not support the proposition that a duty to consult is constitutionally mandated in the law-making process. This is reinforced by the requirement that the impugned decision would result in potential adverse impacts. This Court held that there must be a "causal relationship between the proposed government conduct or decision and a potential for adverse impacts on pending Aboriginal claims or rights" (para. 45 (emphasis added)). Counsel for the Mikisew rely heavily on the reasons given by this Court in *Rio Tinto*. But *Rio Tinto* does not support the conclusion that the duty to consult must apply to the legislative process. In fact, this Court explicitly left open the question of whether "government conduct" attracting the duty to consult includes the legislative process (para. 44).
>
> [Emphasis in original]

[48] Earlier Chief Justice McLaughlin had summarized the criteria which will engage the duty to consult in *Rio Tinto Alcan Inc. v. Carrier Sekani Tribal Council*, 2010 SCC 43. They consist of:

1. Actual or constructive knowledge by the Crown of a potential Aboriginal claim or right;
2. Contemplated Crown conduct; and that
3. The proposed conduct or decision may have an adverse impact upon Aboriginal claim or right.

[49] With respect to the first element:

> 40. To trigger the duty to consult, the Crown must have real or constructive knowledge of a claim to the resource or land to which it attaches: *Haida Nation*, at para. 35. The threshold, informed by the need to maintain the honour of the Crown, is not high. Actual knowledge arises when a claim has been filed in court or advanced in the context of negotiations, or when a treaty right may be impacted: *Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage),* 2005 SCC 69, [2005]

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> 3 S.C.R. 388, para. 34. Constructive knowledge arises when lands are known or reasonably suspected to have been traditionally occupied by an Aboriginal community or an impact on rights may reasonably be anticipated. While the existence of a potential claim is essential, proof that the claim will succeed is not. What is required is a credible claim. Tenuous claims, for which a strong prima facie case is absent, may attract a mere duty of notice…
>
> 41. The claim or right must be one which actually exists and stands to be affected by the proposed government action. This flows from the fact that the purpose of consultation is to protect unproven or established rights from irreversible harm as the settlement negotiations proceed …

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[50] It is difficult to separate the second and third elements, which are centered around the need for potential impact upon Treaty right or claims by the Crown conduct in question. In addressing this point, the Chief Justice continued:

> 43. This raises the question of what government action engages the duty to consult. It has been held that such action is not confined to government exercise of statutory powers … This accords with the generous, purposive approach that must be brought to the duty to consult.
>
> 44. Further, government action is not confined to decisions or conduct which have an immediate impact on lands and resources. A potential for adverse impact suffices. Thus, the duty to consult extends to "strategic, higher level decisions" that may have an impact on Aboriginal claims and rights … Examples include the transfer of tree licences which would have permitted the cutting of old-growth forest (*Haida Nation*); the approval of a multi-year forest management plan for a large geographic area (*Klahoose First Nation v. Sunshine Coast Forest District (District Manager*), 2008 BCSC 1642, [2009] 1 C.N.L.R. 110); the establishment of a review process for a major gas pipeline (*Dene Tha' First Nation v. Canada (Minister of Environment*), 2006 FC 1354, [2007] 1 C.N.L.R. 1, aff'd 2008 FCA 20, 35 C.E.L.R. (3d) 1); and the conduct of a comprehensive inquiry to determine a province's infrastructure and capacity needs for electricity transmission (An Inquiry into British Columbia's Electricity Transmission Infrastructure & Capacity Needs for the Next 30 Years, Re, 2009 CarswellBC 3637 (B.C.U.C.)).
>
> [Emphasis added]

[51] As to “adverse effect” the court continued:

> 45. The third element of a duty to consult is the possibility that the Crown conduct may affect the Aboriginal claim or right. The claimant

must show a causal relationship between the proposed government conduct or decision and a potential for adverse impacts on pending Aboriginal claims or rights. Past wrongs, including previous breaches of the duty to consult, do not suffice.

46. Again, a generous, purposive approach to this element is in order, given that the doctrine's purpose, as stated by Newman, is "to recognize that actions affecting unproven Aboriginal title or rights or treaty rights can have irreversible effects that are not in keeping with the honour of the Crown" (p. 30, citing *Haida Nation*, at paras. 27 and 33). Mere speculative impacts, however, will not suffice. As stated in *R. v. Douglas*, 2007 BCCA 265, 278 D.L.R. (4th) 653, at para. 44, there must an "appreciable adverse effect on the First Nations' ability to exercise their aboriginal right". The adverse effect must be on the future exercise of the right itself; an adverse effect on a First Nation's future negotiating position does not suffice.

47. Adverse impacts extend to any effect that may prejudice a pending Aboriginal claim or right. Often the adverse effects are physical in nature. However, as discussed in connection with what constitutes Crown conduct, high-level management decisions or structural changes to the resource's management may also adversely affect Aboriginal claims or rights even if these decisions have no "immediate impact on lands and resources": Woodward, at p. 5-41. This is because such structural changes to the resources management may set the stage for further decisions that will have a direct adverse impact on land and resources. For example, a contract that transfers power over a resource from the Crown to a private party may remove or reduce the Crown's power to ensure that the resource is developed in a way that respects Aboriginal interests in accordance with the honour of the Crown. The Aboriginal people would thus effectively lose or find diminished their constitutional right to have their interests considered in development decisions. This is an adverse impact: see Haida Nation, at paras. 72-73.

48. An underlying or continuing breach, while remediable in other ways, is not an adverse impact for the purposes of determining whether a particular government decision gives rise to a duty to consult. The duty to consult is designed to prevent damage to Aboriginal claims and rights while claim negotiations are underway: *Haida Nation,* at para. 33. The duty arises when the Crown has knowledge, real or constructive, of the potential or actual existence of the Aboriginal right or title "and contemplates conduct that might adversely affect it": *Haida Nation*, at para. 35 (emphasis added). This test was confirmed by the Court in *Mikisew Cree* in the context of treaty rights, at paras. 33-34.

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[Emphasis added]

[52] I conclude that the duty to consult as described in the authorities (of which such as *Mikisew Cree 2005*, *Mikisew Cree 2018*, *Haida Nation* and *Carrier Sekani* are examples) is a derivative of the honour of the Crown. It confines the duty to consult to adverse effects flowing from the specified Crown action at issue – not to the larger adverse effects of the project of which it is a part. "The subject of the consultation is the impact on the claimed rights of the current decision under consideration" (see *Carrier Sekani*, para. 53 [emphasis in original]).

[53] A "generous, purposive approach" is adopted when the question of causation is considered, but merely speculative impacts will not suffice (*Carrier Sekani*, para. 46*)*. The process is grounded in the Crown's duty to act honourably. In any decision as to whether to consult or not, the Crown's honour must infuse the process. It must also be seen to be acting with such honour. Even the appearance of "sharp dealing" must be avoided (*Haida Nation*, para. 19).

[54] I am also mindful of *Chippewas of the Thames First Nation v. Enbridge Pipelines Inc.*, 2017 SCC 41, in which the court said that:

> It may be impossible to understand the seriousness of the impact of a project on s. 35 rights without considering the larger context… Cumulative effects of an ongoing project, and historical context, may therefore inform the scope of the duty to consult…(*Chippewas of the Thames,* para. 42)

b. What is the proper standard of review?

[55] The parties both begin with the assertion that an application for judicial review is the appropriate mechanism by which to seek a determination as to whether there has been a breach of the duty to consult. I agree.

[56] Indeed, the summary provided in *Pimicikamuk v. Manitoba*, 2014 MBQB 143, in my respectful view, accurately reflects the current law in this respect:

> 48. Administrative law remedies have been provided for by the Supreme Court of Canada in respect of alleged failures to comply with the duty of consultation. In other words, where a First Nation or Aboriginal community alleges a failure of the Crown to discharge its duty of consultation, the issue is normally determined pursuant to administrative law principles in the context of a judicial review.

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[57] The court in *Pimicikamuk* continues:

> 49. In *Haida*, the Supreme Court of Canada has directed the courts to review the consultation process on a standard of reasonableness. As it relates to the government's initial assessment of the existence or extent of the duty, the Supreme Court in *Haida* has directed the courts to review that assessment on the correctness standard to the extent that "the issue is one of pure law and can be isolated from issues of fact". See *Haida*, *supra*, at para. 61-63; *Rio Tinto*, *supra*, at para. 64; *Hupacasath First Nation v. British Columbia (Minister of Forests)*, 2008 BCSC 1505 at para. 187, 173 A.C.W.S. (3d) 330; *Ahousaht Indian Band v. Canada (Minister of Fisheries and Oceans)*, 2014 FC 197 at para. 34.

[58] The Applicant has argued:

> 43. Accordingly, in the present case the Applicant acknowledges that the standard of reasonable [sic] applies to the decision itself subject to the application of the higher standard of correctness where errors of law can be isolated. This is consistent with the leading case on judicial review of administrative tribunals in *Dunsmuir v. New Brunswick*, 2008 SCC 9.
>
> *(Applicant's brief, para. 43*)

[59] With respect, here the court is not being asked to review a completed process of consultation replete with an extensive activity record. If it were, this would ordinarily trigger the application of a more deferential or relaxed standard (one of reasonableness).

[60] Rather, in circumstances such as this, the extant case law frames the applicable standard of review as one of correctness. Either the duty to consult exists or it does not.

[61] This accords with the recent decision of *Mi'kmaq of Prince Edward Island v. Prince Edward Island* [2018] PESC 20, where the court stated:

> 62. There are three points at which the standard of review is to be considered. They include when a tribunal is determining the existence of a duty to consult, deciding the extent of consultation required (as per the *Haida* spectrum), and assessing the extent of consultation that occurred. While McLachlin C.J. expressed that the existence or extent of the duty to consult or accommodate is a legal question in the sense that it defines a legal duty, she immediately went on to express, in para. 61 of *Haida*, that a contextual assessment of the factual background may lead to deference being shown even with respect to deciding on the two questions of the

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> existence and extent of the duty to consult. In other words, she allowed for reasonableness to be the standard of review to apply to the determination of those questions, depending upon the circumstances of each case.
>
> 63. At the hearing of this matter, in line with the conclusion in *Ahousaht*, all counsel submitted the applicable standard of review was correctness in respect of assessing both the existence and extent of the duty to consult and accommodate, and reasonableness with respect to assessing whether the Province met their duty to consult to the extent required. I will review the decisions upon the basis of these suggested standards of review.
>
> [Emphasis added]

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[62] I conclude that the appropriate standard of review to be applied herein is one of correctness.

c. Is the Crown's decision not to consult with respect to the possibility of its funding of the new ETF correct?

[63] The Province does not deny that the first element set forth in *Carrier Sekani* "knowledge of a potential Aboriginal claim or right" exists. Rather it maintains that the central issues concern the second and third elements. These latter, taken together, raise the question of whether the contemplated conduct (which is to say, the potential funding decision) might adversely affect an Aboriginal claim or right so as to trigger a duty to consult.

[64] Among other authorities, the Province refers to *Buffalo River Dene Nation v. Saskatchewan (Minister of Energy and Resources)*, 2015 SKCA 31, wherein it was determined that the posting for sale and eventual grant of mining exploration permits with respect to Treaty lands did not suffice to trigger a duty to consult.

[65] In *River Dene*, the court concluded that the Applicant had not shown a causal link between the granting of the permit and any possible impact upon its rights. The court held that the sale of the permits, on its own, could not lead to adverse impacts. This was because more regulatory requirements had to be met before any actual entry, exploration, mineral extraction or other activity upon or involving the First Nation land could occur. It also meant that the decision was not of the "strategic, higher level" kind referred to in *Haida Nation* and *Carrier Sekani*.

[66] As to the threshold for consultation, Caldwell, J.A. stated in *River Dene*:

> 91. … The duty to consult is triggered at a low threshold, but it must remain a meaningful threshold - the applicant has to establish some sort of appreciable or discernible impact flowing from the impugned Crown conduct before a duty to consult in relation to that impact will arise. This is both logical and practical because there has to be something for the Crown and the Aboriginal group to consult about -- the duty to consult is, at core, a practical doctrine. Put another way, it makes little sense for the duty to consult to arise where, as the Chambers judge concluded here, there is nothing to consult about, i.e., nothing to reconcile.
>
> 92. What I mean by this is that, here, Buffalo River DN has not established that a foreseeable impact on Treaty 10 lands (and, consequently, on its members' hunting, trapping, and fishing rights) could possibly arise without the occurrence of a subsequent or second-stage approval from the Crown. However, once any form of surface access is contemplated, then actual impact on Treaty 10 land becomes possible. It is at this point in the process that the Permit-Holder is required to provide a plan for its proposed exploration or development of minerals lying under the surface of Treaty 10 lands. It is at this point that the Crown and Buffalo River DN would have something meaningful, in the sense of quantifiable, to consult about, to reconcile. And, indeed, the Crown seems to acknowledge that it would have a duty to consult with Buffalo River DN if this matter were to reach this point in the regulatory process.
>
> [Emphasis added]

[67] The key feature, it seems to me, upon which *River Dene* turned, was the inability of the (then) currently contemplated action, which is to say, the transfer of the permits *simpliciter*, to have any type of impact upon the area in question. In fact, such impact would simply not be possible, without something further. This "something" was the requirement for permission by the permit holder (whoever it might be at the relevant time) to submit a plan, and undergo an approval process (a "next step") with respect to its proposed exploration or exploitation of the minerals below Treaty lands.

[68] This next step was required whether the current ownership of the permit remained extant, or whether the permit was transferred, as proposed. This status quo remained whether current or new permit owner(s) took that next step – either would have to undergo the regulatory process before there was any possibility of physical impact upon Treaty lands. It was, therefore, not until this "next step" was

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taken that consultation was required. Quite literally, there was nothing to consult about when it came to the mere sale of the mining exploration permits in question.

[69] The Respondent argues that the situation in the case at bar is apposite. In essence, the Province (in paraphrase) says "Look, any new ETF which replaces the existing Boat Harbour Treatment Facility triggers a need for an Environmental Assessment approval pursuant to Part IV of the *Environment Act.* We have agreed, therefore, that the pending ETF application including its design and specifications, should be (and is) the subject of active consultation with PLFN. We have provided $70,000.00 in capacity funding so that PLFN may have meaningful participation in the process". (*see Respondent brief, para. 4 – 5*)

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[70] It is this process (the Province continues) which has the potential to impact upon Treaty Rights *a propos* potential impacts on the environment. However, the question of whether it is the Province or some other entity who actually funds the new ETF (if it is approved) cannot (in and of itself) have <u>any</u> physical impact upon Treaty Rights.

[71] This arguement misses the mark, in my respectful view, for a number of reasons. First, we know that the process of consultation does not <u>require</u> the Crown to accede to the views of the Applicant.

[72] Could the Crown proceed (after consultation) with a particular design or construction of the new ETF against the strong opposition of PLFN? It could, conceivably. But if it did so, and then also provided the very funding by which the new ETF was to become a reality, would that too, be compatible with the honour of the Crown?

[73] Where the Crown is required to consult it must do so meaningfully. Would the act of funding a project opposed by PLFN reflect on the "meaningfulness" of the antecedent efforts of the Crown to consult? "Meaningful consultation" requires a:

> "… meaningful effort by the government to act in a manner that is consistent with the honour of the Crown in that particular context".
>
> (*Mikisew Cree 2018*, para. 61 per Abella, J.)

[74] Second, does the potential involvement of the Crown in the funding of the new ETF make it more or less likely that the required *Environmental Act* approval will ultimately be granted? While (as the Respondent points out) it would be a

different "department" of the Crown involved in the approval process, it would essentially boil down to the Crown (wearing one hat) being called upon to determine whether a project which the Crown (wearing another hat) has funded, passes muster. This will do nothing to assuage whatever cynicism has been engendered in the past by the already significant environmental impact which has been visited upon Treaty lands and environs by the mill and its facilities to date.

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[75] Further, and as we have seen, the duty to consult, when is arises, flows from the Honour of the Crown. This honour "binds the Crown *qua* Soverign". (*Misikew Cree 2018*, per Karakatsansis, J., para. 23) We have seen that even the appearance of sharp dealing is to be avoided. In my view, Treaty people are entitled to treat with the Crown as though it speaks with one voice.

[76] To put it more bluntly, in the event that the Province were to become the lender financing the project, it would have a very tangible interest in Northern Pulp's success. That company's success would become directly related not only to the Province's prospect of recovering its investment, but also as to its prospect of (possibly) making a profit upon it.

[77] Related to this is the practical question of what quantity of "sunk costs" would the Province be required to invest if it funds the project, before the project is submitted for environmental approval. At a minimum, someone must draw up design specifications and plans, and undertake the work ancillary to this before approval is requested. Will the increasing extent of this sunk cost create increasing incentive for all Crown departments to keep the mill operating? While past wrongs do not create a new impact, they may certainly inform the imperative need for transparency and consultation in relation to all aspects of the present process.

[78] As we have seen from *Carrier Sekani*, the potential for adverse impact suffices to trigger a duty to consult (para. 44). It is clear that the duty extends to "strategic, higher level decisions" that may have an impact upon the claim or right (*Rio Tinto*, para. 47). The Province's interest as lender funding the new ETF will undoubtedly influence "higher level" strategic decision making.

[79] Indeed, if one accepts (as I do) that the longer the mill continues to operate the longer that treaty rights may potentially be impacted by the discharge of effluent from a improperly designed ETF or, even if properly designed, by a subsequent malfunction of same, then one accepts that the best case scenario, from the vantage of PLFN, would be the closure of the mill and the ETF in its entirety. If the Province is to become the lender, not only is it providing the means by which

the ETF will be built, but it will have an interest to insure that the mill will continue to remain in operation into the future so as to at least recover the taxpayers' investment.

[80] In addition, Part IV of the *Environment Act* (and Regulations enacted pursuant thereto) contains standards which must be achieved in order to obtain approval of the project as a whole. If the Province funds, will it fund to the extent necessary to merely achieve minimal (often less expensive) standards, or is it prepared to consult with the PLFN as to whether, in the unique circumstances of what the people in this area have endured, upgraded (more expensive) safeguards should be implemented?

[81] In *Dene Tha' First Nation v. Canada (Minister of Environment),*2006 FC 1354, aff'd 2008 FCA 20, (*Dene Tha'*) the federal government began designing a regulatory and environmental review procedure in anticipation of the MacKenzie Gas Pipeline ("MGP") project without consulting the Dene Tha'.

[82] At the Federal Court level, the Court rejected the Crown's argument that there was no duty to consult at that stage, observing that:

> 100. …conduct contemplated here is the construction of the MGP. It is not, as the Crown attempted to argue, simply activities following the Cooperation Plan and the creation of the regulatory and environmental review processes. These processes, from the Cooperation Plan onwards, were set up with the intention of facilitating the construction of the MGP. It is a distortion to understand these processes as hermetically cut off from one another. The Cooperation Plan was not merely conceptual in nature. It was not, for example, some glimmer of an idea gestating in the head of a government employee that had to be further refined before it could be exposed to the public. Rather, it was a complex agreement for a specified course of action, a road map, which intended to *do* something. It intended to set up the blue print from which all ensuing regulatory and environmental review processes would flow. It is an essential feature of the construction of MGP.
>
> …
>
> 106. The precise moment when the duty to consult was triggered is not always clear. In *Haida*, the Court found that the decision to issue a Tree Farm License (T.F.L) gave rise to a duty to consult. A T.F.L. is a license that does not itself authorize timber harvesting, but requires an additional cutting permit. The Court held that the "T.F.L. decision reflects the strategic planning for utilization of the resource" and that "[d]ecisions

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made during strategic planning may have potentially serious impacts on Aboriginal right and title". [Emphasis added. See *Haida* paragraph 76]

107. From the facts, it is clear that the Cooperation Plan, although not written in mandatory language, functioned as a blueprint for the entire project. In particular, it called for the creation of a JRP to conduct environmental assessment. The composition of the JRP was dictated by the JRP Agreement, an agreement contemplated by the Cooperation Plan. The composition of this review panel and the terms of reference adopted by the panel are of particular concern to the Dene Tha'. In particular, the Dene Tha had unique concerns arising from its unique position. Such concerns included: the question of the enforceability of the JRP's recommendations in Alberta and funding difficulties encountered by the Dene Tha' as result of its not qualifying for the "north of 60 funding programs" (a funding program apparently available only to those First Nations bands north of the 60 degrees parallel). The Dene Tha' also had other issues to discuss including effects on employment, skill levels training and requirements and other matters directly affecting the lives of its people.
108. The Cooperation Plan in my view is a form of "strategic planning". By itself it confers no rights, but it sets up the means by which a whole process will be managed. It is a process in which the rights of the Dene Tha' will be affected.

[Emphasis added]

[83] When *Dene Tha'* reached the Appellate level, the Federal Court of Appeal observed:

9. This case turns entirely on its own facts. Having regard to the evidence on the record, it was open to Justice Phelan to find as a fact that, given the unique importance of the Mackenzie Gas Pipeline, and the particular environmental and regulatory process under which the application for approval of the Mackenzie Gas Pipeline would be considered by the Joint Review Panel and the National Energy Board, the process itself had a potential impact on the rights of the Dene Tha'. It was also open to him to find as a fact that, at some point during the period from 2002 and 2004, it was sufficiently certain that there would be an application for approval of the Mackenzie Gas Pipeline that the obligation to consult was triggered. He was not required, as a matter of law, to conclude that no consultation obligation arose until the formal application for approval was filed. The test framed by the Supreme Court of Canada in the cases cited above does not dictate such a rigid or inflexible approach.

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[Emphasis added]

[84] A consideration of the above factors, and others, makes it seem very implausible that a government decision to fund a new effluent treatment facility less than fourteen months before the statutorily mandated closure of the existing facility and the expiry of the mill's industrial approval, would not carry with it a potential for further adverse effect on PLFN's right to occupy lands already polluted by the Boat Harbour Treatment Facility. The new adverse impacts would include the increased likelihood of a new ETF being built (in the short term) and of the mill remaining open (in the longer term) prompted by (at least the appearance of) the interest of the Province to either recover its investment or profit from it. Provincial involvement in funding would set the stage for further decisions that have (at the very least) the potential to impact the "strategic, higher level decisions" of the Province in precisely the manner contemplated by *Rio Tinto* (para. 47).

[85] Finally, the bifurcation of issues ("design and construction" from the "actual funding" of the ETF) artificially compartmentalizes a process which, in my view, should be treated more holistically.

[86] One (obvious) example, arises from the legitimate concern on the part of PLFN (presumably the Province as well – hence the consultation with respect to the design and construction) about the potential for deleterious effects upon the environs, which could potentially result from an inadequate design of the ETF. Separation of the potential funding issue would result in the loss of an opportunity for the two sides to discuss whether the financing (if it was to be provided by the Province) should or could be tied into a system of penalties and/or rewards for achieving and/or failing to achieve proposed emission or effluent discharge targets. This may (potentially) impact upon the likelihood that these targets would be attained.

[87] Put differently, and unlike the situation in *River Dene*, it seems clear to me that the parties have plenty to consult about with respect to the topic of the potential Provincial funding of the new ETF. Some of the discussion points have been noted herein. Beyond these earlier comments (which serve as examples only), it would not be appropriate for the court to circumscribe or exhaustively attempt to define the parameters or the topics encompassed by the Province's duty to consult in relation to this potential funding. Such discussions cannot be isolated or hermetically sealed off from the overall design and approval process, in any event, for the reasons noted above.

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Conclusion:

[88] The application is granted. The consultations between the parties must necessarily include *inter alia* whether the Province should fund the construction and design of the ETF and pipeline, and, if so, what form that financing will take.

[89] This application had some novel aspects to it. It is one in relation to which each side sought guidance from the court in good faith. I decline to award costs to either party as a result.

Gabriel, J.

2018 NSSC 306 (CanLII)

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Hfx. No. 483516

Supreme Court of Nova Scotia

Between:

NORTHERN PULP NOVA SCOTIA CORPORATION

Plaintiff

and

EDWIN DONALD SHAW, ALLAN FRANCIS MACCARTHY, CHAD MACCARTHY, DARRYL WAYNE BOWEN, BEN ANDERSON, PAUL SCOTT MUSICK, BRADLEY ELMER MACDONALD, JANE DOE AND JOHN DOE

Defendants

AFFIDAVIT OF TERRI FRASER
SWORN ON NOVEMBER 30, 2018

I, **Terri Fraser**, of Stellarton, in the County of Pictou, make oath and say as follows:

1. **THAT** I am the Technical Manager of Northern Pulp Nova Scotia Corporation's pulp mill located at Abercrombie Point, Pictou County (the "Mill").

2. **THAT** I am the project lead for the project to design and construct a replacement effluent treatment facility at the Mill and have personal knowledge of the facts deposed to herein except where stated to be based on information and belief.

3. **THAT** a pulp mill has been in operation at the Abercrombie Point location since 1967. From 1967 to 1995 the effluent produced by the Mill was treated at the Boat Harbour Effluent Treatment Facility (the "Boat Harbour ETF") which was owned and operated by Her Majesty the Queen in right of the Province of Nova Scotia (the "Province").

4. **THAT** on December 1, 1995 the Province and Scott Maritimes Limited, a predecessor in title of the current owner of the Mill, Northern Pulp Nova Scotia ("Northern Pulp"), entered into a Memorandum of Understanding ("MOU") to "restate and restructure" their contractual relationship in relation to the Boat Harbour ETF. A copy of the MOU is attached hereto as Exhibit "A" to this my Affidavit.

5. **THAT** one of the components of the restated and restructured contractual relationship was a Lease, which is attached to this my Affidavit as Exhibit "B". Pursuant to the Lease, the Boat Harbour ETF was leased by the Province to Scott Maritimes Limited for a term of ten years.

6. **THAT** by a Lease Extension Agreement made October 22, 2002 between the Province and Scott Maritimes Limited's successor in title and interest, Kimberly-Clark Inc., the Lease Agreement was amended to extend the term for a further period of 25 years after the initial 10 year term. Consequently, the Lease would expire on December 31, 2030. A copy of the Lease Extension Agreement is attached hereto as Exhibit "C" to this my Affidavit.

7. **THAT** Northern Pulp acquired the Mill in 2008 from Neenah Paper Company of Canada, a successor in title and interest of Kimberly-Clark Inc. and Scott Maritime Limited. By an Acknowledgement Agreement dated May 12, 2008, the Province acknowledged, agreed and confirmed that all of the benefits of the MOU and the Lease, as amended by the Lease Extension Agreement, accrued to Northern Pulp. A copy of the Acknowledgement Agreement is attached as Exhibit "D" to this my Affidavit.

8. **THAT** on April 17, 2015 the bill to enact the *Boat Harbour Act* was introduced in the Legislature. The purpose of the Act was to force the closure of the Boat Harbour ETF by January 31, 2020.

9. **THAT** Northern Pulp was not consulted about the consequences of the enactment of the *Boat Harbour Act* nor the closure data specified in the Act before the bill was introduced. Northern Pulp was merely advised that the bill would be introduced on April 16, 2015.

10. **THAT** I was a member of the group of Northern Pulp representatives that appeared before the Law Amendments Committee on April 27, 2015 to present Northern Pulp's perspective on the consequences of the bill and in particular, the short period of time allowed in the bill to identify, design and construct an effluent treatment facility to replace the Boat Harbour ETF.

11. **THAT** no change was made to the closure date as set out in the bill. When the *Boat Harbour Act* received Royal Assent the date for closure remained January 31, 2020.

12. **THAT** at or about the time the bill was proceeding through the legislative process, Northern Pulp was appealing the terms and conditions proposed in the new Industrial Approval issued March 9, 2015. An Industrial Approval is required under the *Environment Act* in order to operate the Mill.

13. **THAT** among the conditions in the Industrial Approval were conditions for a new alternative effluent treatment system. I was informed by representatives of Northern Pulp's consulting engineers (KSH Solutions, Ekono, and Callan Brooks Inc.) and did, and

14. **THAT** an appeal from the Industrial Approval was initiated by Northern Pulp on April 9, 2015. After the appeal was initiated there were many discussions with representatives of Nova Scotia Environment ("NSE").

15. **THAT** the conditions of particular concern to Northern Pulp were deleted in accordance with the decision of the Minister of Environment dated February 8, 2016. Northern Pulp thereupon withdrew its appeal on March 15, 2016.

16. **THAT** in the late spring of 2016 Northern Pulp suggested to the Province that they work together to explore how best to replace the Boat Harbour ETF. The Province agreed and its officials were involved in the preparation of a request for proposal ("RFP") for the delivery of engineering studies, evaluation of the submissions and the selection of the successful proponent. The RFP was issued on September 30, 2016.

17. **THAT** on December 28, 2016 the Province and Northern Pulp entered into an agreement to share the cost of preliminary engineering studies for a replacement ETF.

18. **THAT** the studies were to be done in two phases. The first phase involved the consideration of all aspects of effluent generation at the Mill, the review of the technologies available to treat the effluent, and the identification of the optimum technical approach to the treatment of the effluent. The second phase involved the development of cost estimates for the cost to construct a new ETF.

19. **THAT** KSH Solutions was retained to perform the engineering studies. It recommended that a new ETF use Activated Sludge Treatment ("AST"). In comparison to Aerated Stabilization Basin ("ASB") technology used at the Boat Harbour ETF, AST has high-rate removal efficiencies and good process flexibility.

20. **THAT** under Phase 2, KSH Solutions produced a cost estimate for the effluent treatment facility itself that was considered to be accurate to within +/- 10 percent. The estimate for the pipeline that was to extend from the new ETF to a diffuser did not have the same degree of accuracy. The cost estimate for the pipeline and diffuser was considered to be accurate within +/- 20 or 30 percent.

21. **THAT** the estimates were received from KSH Solutions in the fall of 2017.

22. **THAT** Northern Pulp and the Province began discussing how the cost of the new ETF should be shared in September 2017. Those discussions continue today.

23. **THAT** at or about the same time, namely in the fall of 2017, Northern Pulp and the Province worked together to identify a consultant to prepare environmental assessment studies. Dillon Consulting Ltd. was retained and it began its work on October 2, 2017.

24. **THAT** by August 2017, Stantec Engineering, as a subcontractor to KSH Solutions, had completed a receiving water study for the Pictou Roads location. Pictou Roads is an area of the Northumberland Strait just outside the limits of Pictou Harbour.

25. **THAT** at public consultation meetings held in December 2017, Pictou Roads was identified as the proposed diffuser location. The proposed location at Pictou Roads of the diffuser is shown on the attached chart (Exhibit "E").

26. **THAT** Northern Pulp and the Province entered into a second Contribution Agreement on December 13, 2017. The purpose of this agreement was to allow detailed engineering work to be done, the environmental studies to continue, and allow major equipment to be purchased.

27. **THAT** Northern Pulp signed a contract with the equipment vendor, Veolia Water Technologies in March, 2018. The vendor had to be selected in order to permit detailed engineering design work to proceed.

28. **THAT** usually detailed engineering design work is completed before many of the environmental assessment studies are undertaken. However, because time until the date of closure stipulated by the *Boat Harbour Act* was very short, it was determined by Northern Pulp and the Province that the environmental assessment studies and detailed design work must proceed in parallel.

29. **THAT** in the early spring of 2018, after ice break-up, marine investigations were undertaken by Northern Pulp's subcontractor, CSR GeoSurveys Limited ("CSR"). In May those investigations revealed that there were areas of ice scour on the bottom of the Pictou Roads area of the Northumberland Strait, in the area that was originally thought suitable for the diffuser.

30. **THAT** the presence of evidence of ice scour at 11 metre depths suggested that ice could damage the diffuser. The pipeline designer recommended looking for an alternative location for the diffuser in deeper water.

31. **THAT** the diffuser is a device affixed to the end of the treated effluent pipeline that would diffuse the outflow from the pipeline in the most beneficial way.

32. **THAT** the receiving water study available in August 2017 was preliminary because it was necessary to conduct further, in-water studies before it could be finalized. The in-water studies would involve the use of sonar equipment to obtain a profile of the bottom and sub-bottom of the Strait, video of the proposed route of the pipeline for the purpose of habitat assessment and geotechnical investigations to evaluate the state of the bottom needed for the detailed design of the marine portion of the pipeline.

33. **THAT** following receipt of the recommendation from the pipeline designer, Northern Pulp directed CSR to survey alternative pipeline routes to deeper water. Three extensions of the route in the Pictou Roads location were examined.

34. **THAT** the length of the extensions were so long (several kilometres) that it became apparent that a pipeline overland route from the Mill to Caribou and from there into the Caribou Channel might be viable. This route was considered to be beneficial because it would

    (a) avoid known lobster fishing grounds;
    (b) allow for access to deeper water to mitigate the potential for ice damage to the diffuser; and
    (c) reduce the length of the pipeline to be installed in a marine environment – four kilometres as opposed to fourteen or fifteen for the extended Pictou Road route.

35. **THAT** receiving water studies were performed by Stantec for two locations off Caribou in the Caribou Channel. Those two locations were less than 500 metres apart. At one location the water depth was 20 metres and at the other 25 metres. It was determined that the 20 metre depth location exhibited better flow dynamics. The proposed location of the diffuser in the Caribou Channel is marked on the attached chart (Exhibit "F").

36. **THAT** at the end of September 2018, it was determined that the Caribou Channel was the preferred location for the diffuser.

37. **THAT** a number of meetings were held between December 2017 and the fall of 2018 with representatives of the Pictou Landing First Nation ("PLFN") and local fishers. The representatives advised that they "fished all over" but did not provide any specific locations for their respective fisheries.

38. **THAT** at these meetings the fishers stated that they had formed a "Fishers Working Group" which included PLFN, local fishers and fishers from Prince Edward Island. A concern was expressed that the treated effluent may contaminate lobsters and that even one contaminated lobster would harm the Canadian lobster "brand".

39. **THAT** at a meeting with the fishers on October 22, 2018, I was asked by the Fishers Working Group when the in-water work (called hereafter "survey work") would begin. I advised them that it would likely begin the following day, October 23, 2018.

40. **THAT** the survey work that was to have commenced on October 23, 2018 is necessary to finalize the pipeline routing and confirm the diffuser location, complete the receiving water study for the Caribou Channel location and allow for the continuation of the marine pipeline engineering. It is also important to provide information for Northern Pulp's environment assessment submission and to enable Fisheries and Oceans Canada ("DFO") to evaluate the effects, if any, of the construction of the marine section of the pipeline.

41. **THAT** I am informed by Colin Toole of CSR, the contractor engaged by Northern Pulp, and do verily believe that as a result of the actions of the owners or operators of fishing boats, CSR have been prevented from conducting the survey work.

42. **THAT** because the time available to design, construct and commission a new ETF is so short, it is absolutely essential that the survey work is done as soon as possible. Construction of a new ETF cannot begin until an environmental assessment approval has been received from the Nova Scotia Minister of Environment and DFO provides its view on the impact of pipeline construction on fish habitat.

43. **THAT** the survey results, in particular the video of the route, must be submitted to DFO as part of a request for review. Once the request for review is received, they determine if the construction of the pipeline may cause a significant adverse effect on fish habitat. If DFO determines that construction of the pipeline may cause a significant adverse effect on fish habitat, they would require Northern Pulp to follow a different and more time consuming process to consider avoidance, and offsetting measures.

44. **THAT** any delay in the provision of the survey data would cause the submission of a request for review to DFO to be delayed, it would also cause a delay in the detailed engineering work. These delays have severely impaired Northern Pulp's ability to have a new ETF facility constructed and commissioned in the most expeditious way possible.

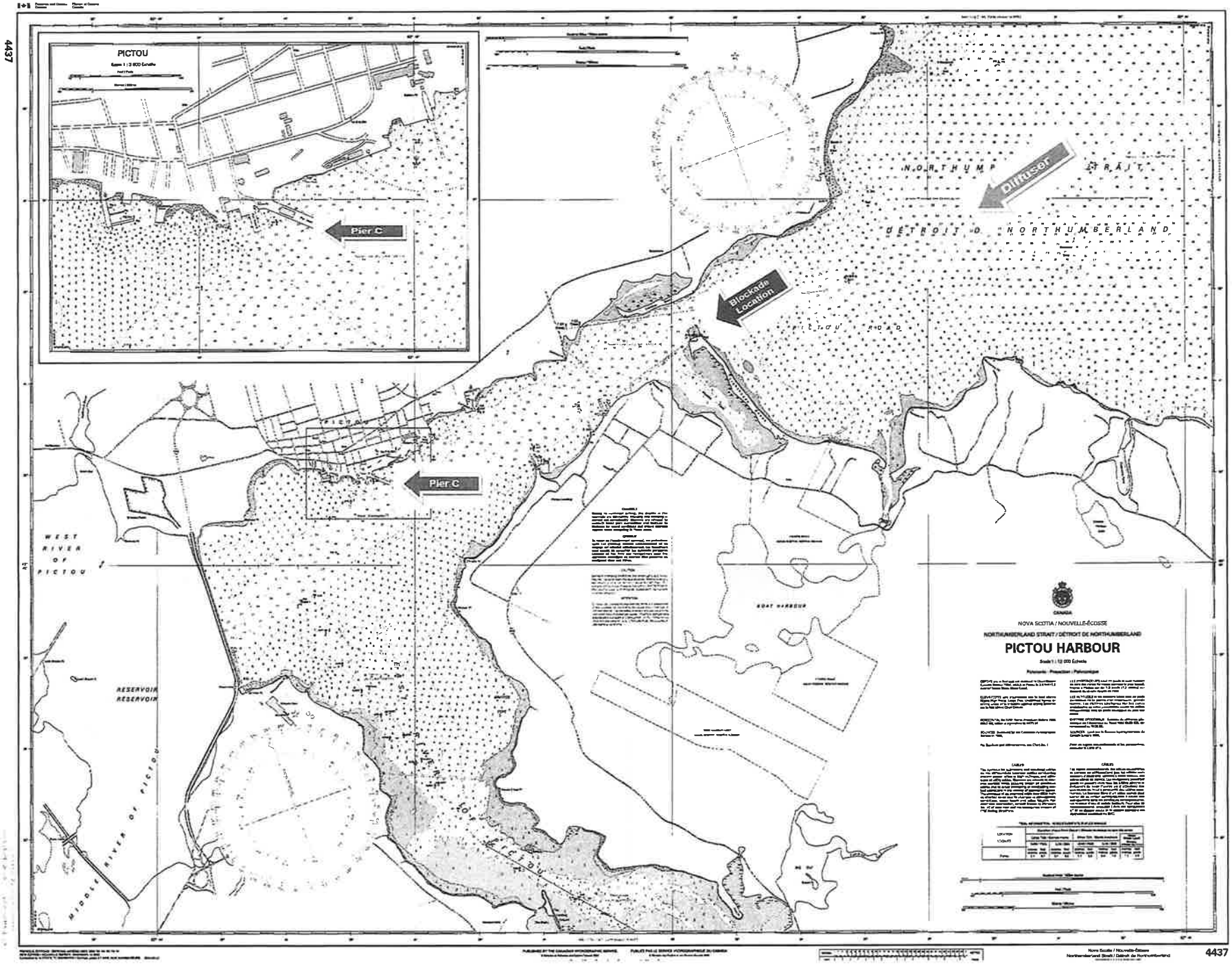
45. **THAT** I believe that sufficient survey work can be done in December and January, weather conditions permitting, to enable environmental assessment submissions to be prepared and to allow detailed engineering to proceed.

SWORN TO before me at New Glasgow, Nova Scotia, this 30th day of November, 2018.

A Notary Public or Barrister of the Supreme Court of Nova Scotia

Terri Fraser
TERRI FRASER

MARLIE KNOWLTON
A Commissioner of the
Supreme Court of Nova Scotia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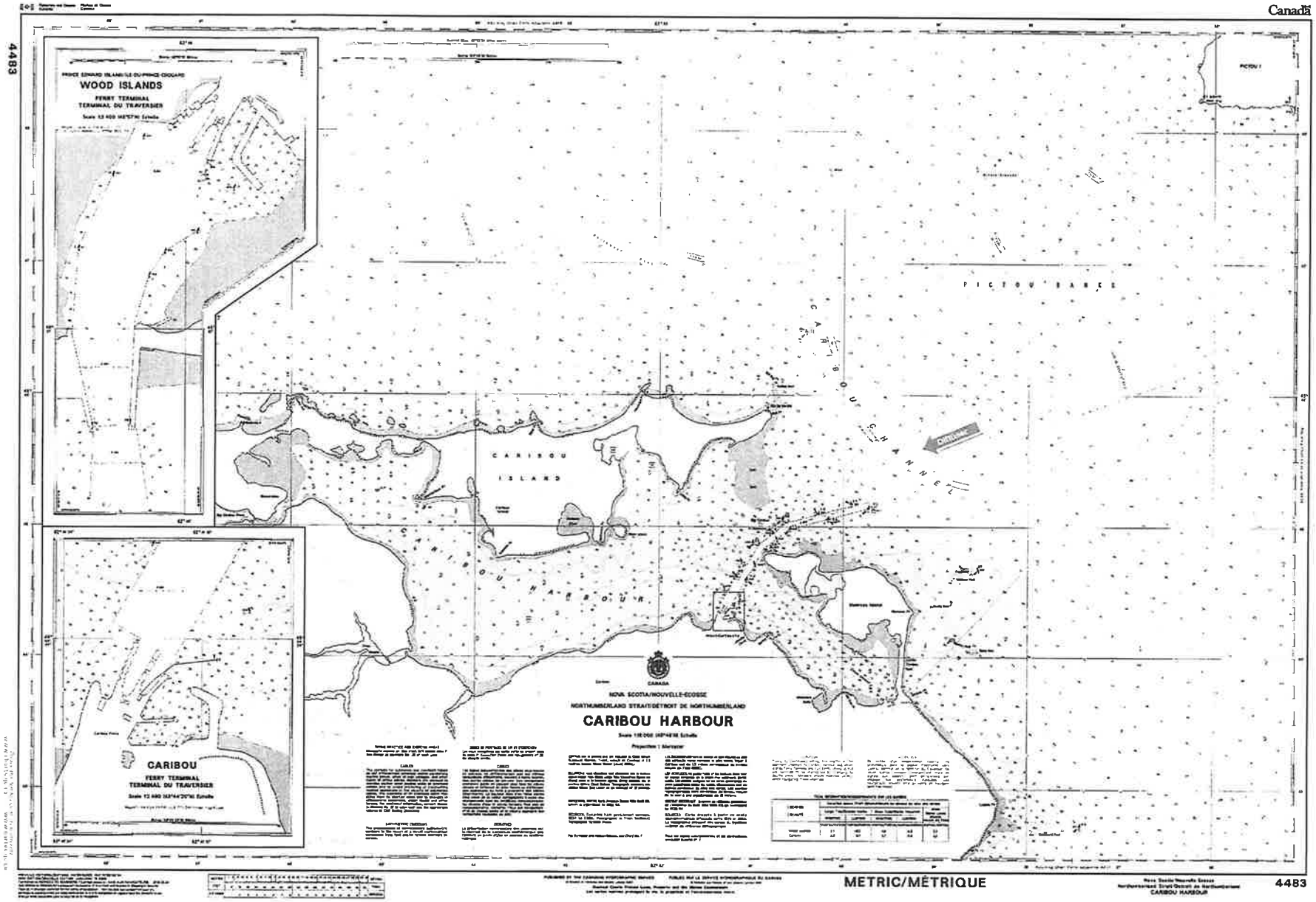
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Politics February 7, 2019 10:39 am Updated: February 7, 2019 3:40 pm

Northern Pulp mill formally registers controversial effluent treatment project

By Keith Doucette The Canadian Press

The Northern Pulp Nova Scotia Corporation mill is seen in Abercrombie, N.S. on Wednesday, Oct. 11, 2017.

THE CANADIAN PRESS/Andrew Vaughan

Northern Pulp has formally registered its project to replace the effluent treatment facility in Boat Harbour with Nova Scotia's Environment Department.

More than 1,700 pages of environmental assessment documents submitted by the mill were published Thursday on the department's website.

The mill says its proposal will have no significant environmental impact.

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The formal move kicked off the 30-day public comment period for the controversial project that includes a new, 15.5-kilometre-long pipeline that will carry millions of litres of treated wastewater to the Northumberland Strait.

Northern Pulp called the registration a “significant milestone” for a project it says is “vital to the continued operation of Northern Pulp, anchor to Nova Scotia’s forest industry.”

> “We all have the same goal which is to see Boat Harbour returned to its natural state,” said Bruce Chapman the mill’s general manager.

“We simply need more time to carry out due diligence in each phase from environmental assessment, to construction and commissioning of this new facility.”

However, Premier Stephen McNeil has said he has no intention of changing a legislated deadline to close Boat Harbour by Jan. 31, 2020.

McNeil has also said that he would debate changes to the deadline in the legislature if they evolve out of a community consensus in Pictou County and are brought forward by the area’s Opposition members.

Boat Harbour's current heavily polluted treatment lagoon is on the edge of the Pictou Landing First Nation.

Despite the province's stated position on the deadline, the company has set out a construction schedule it estimates will take 21 months from the time it gets the required permits and approvals that would allow construction to begin this spring.

It says the effluent treatment facility, pipeline and marine outfall for the effluent would all be fully operational during the "fourth quarter of 2020."

The plan calls for a biological activated sludge treatment facility to be purchased from Paris-based Veolia Water Technologies, to be located on company property not far from the existing plant.

The documents say the effluent pipeline would be constructed within the right of way and "predominately within the existing road shoulder" of Highway 106 for about 11.4 kilometres, then enter waters near the Northumberland Ferries terminal.

The pipe would continue for about 4.1 kilometres through Caribou Harbour to the Northumberland Strait, where the effluent would be discharged through an engineered diffuser.

At a diameter of 900 millimetres, the high density polyethylene pipe will be buried for the majority of the route. It will be above ground to cross the spillway of the Pictou Causeway, where it will be suspended and attached to the exterior of the bridge.

It will be buried adjacent to the navigation channel for the Northumberland Ferries and be weighted down using concrete collars. The company says it's anticipated the marine portion of pipe will be placed in a three-metre deep open-cut trench which will be backfilled with existing material.

The end of the effluent pipe consists of an outfall with a three-port diffuser at a depth of 20 metres. The diffuser pipe will be approximately 50 metres long, with three outlets spaced 25 metres apart.

READ MORE: Permanent injunction stops Nova Scotia fishermen's blockade of Northern Pulp

The outfall will be capable of discharging up to 85 million litres of effluent per day.

The company says the treated effluent it plans to pump into the Strait will meet federal regulations for emissions, but opponents including local fishermen contend there's a lack of scientific evidence regarding how the waste will affect the long-term health of the lucrative lobster and crab fisheries.

Water quality for the diffuser will reach ambient conditions within less than two metres from the diffuser, the documents say, "in terms of total nitrogen, total phosphorus, TSS, DO, pH, and salinity." They say water colour will return to ambient conditions within five metres of the diffuser.

> "Thus, significant residual effects to water quality or sediment quality as a result of treated effluent discharge are not likely."

The company also says modelling results have indicated that there are few traces of “relatively high diluted effluent” after 30 days.

“Based on the results of this assessment, with planned mitigation and using best practices to avoid or minimize adverse effects, the wastewater treatment facility’s effect on the environment during all phases is rated as not significant,” the company said in its news release.

The public has until March 9 to submit comments by mail or via an online forum. Environment Minister Margaret Miller is to decide whether the project can be granted conditional environmental assessment approval by March 29.

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The Advocate PICTOU COUNTY'S WEEKLY SINCE 1893

Northern Pulp Seeks Extension

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February 6, 2019 Chris Muise

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The clock is ticking for the Boat Harbour wastewater treatment facility in Pictou Landing. The Boat Harbour Act passed in 2015 stipulates that the facility must be closed by the end of January next year.

Northern Pulp, however, is seeking an extension.

The company, alongside the Paper Excellence Group, held a press conference in Halifax on Jan. 31 — exactly one year before the deadline stipulated in the Boat Harbour Act — announcing it is seeking a change in the legislation to allow for the time needed to open a new, state-of-the-art wastewater treatment facility.

"We all have the same goal, and that is to see Boat Harbour returned to its natural state," says Kathy Cloutier, director of Corporate Communications for Paper Excellence. "We simply need a bit more time to assure the time and due diligence to carry out each phase."

Before this announcement, Cloutier — alongside Paper Excellence CEO Vice President, Operations East Jean Francois Guillot and Northern Pulp Nova Scotia Corporation General Manager Bruce Chapman — detailed the company's stated efforts since the passing of the Boat Harbour Act, as well as the pitfalls they faced, which they say included unachievable goals and resistance by the fishing community.

Also discussed were the scientific merits of the proposed $130-million treatment facility, which would use an Activated Sludge Treatment (AST) system, which mills across Canada use today. Paper Excellence says that with this system, no untreated waste water would leave the Northern Pulp site.

The question on reporters' minds was, of course, 'how much time are we talking about?'

"What we're looking at today…we're talking about a year, in the whereabouts of a year," says Guillot. Cloutier explained that this year would be to allow for the environmental assessment, construction commissioning, and in general just assuring that they've dotted their i's and crossed their t's.

While Northern Pulp and Paper Excellence seemed confident that the extension would be approved and that they will, as Cloutier said, "be the company that works with Pictou Landing First Nation" and "changes this legacy…that we have acquired," Pictou Landing First Nation member Durney Nicholas has heard it all before.

"They lied to us the first day, and probably are still lying," says Nicholas, who attended the press conference. "They've promised a lot of stuff, and none of them, didn't work."

Cloutier says that Northern Pulp and Paper Excellence are committed to working with Pictou Landing First Nation to find a compromise that works for them as rights-holders, as well as the paper mill's stakeholders.

"We respect everyone's opinions," says Cloutier. "I do believe that, with continued and ongoing conversations, we will reach a goal that everyone is comfortable with."

When asked what Northern Pulp would do if the bid for an extension fails and the January 2020 deadline is maintained, Cloutier said the company would respect the law.

"We will not operate illegally," Cloutier says, while not clarifying for questioning reporters if that would mean the loss of jobs or the closure of the paper mill. "We would not contravene that act if there's no extension."

Jeff Bishop, executive director of Forest Nova Scotia, says he appreciates that the community has been waiting 50 years for a resolution.

"I understand completely where the Pictou Landing First Nation is coming from," says Bishop. "They have been, over the years, told different things by different governments and different owners of this mill. So it's not surprising to hear, when there is a solid date in place with the Boat Harbour Act, that they would like to stick to that."

Even so, Bishop says that the forestry sector of Nova Scotia is deeply interconnected, with saw mills selling excess wood to paper mills, and the 25,000-30,000 tree lot owners selling wood to the market to make ends meet. He says that the loss of the Northern Pulp facility over failure to secure an extension would send ripples across the province.

"The successful continued operation of Northern Pulp is a large piece… of the economy of this province," says Bishop.

"Not to disregard for a second the impact that that community has felt by the operation of the facility right next door — their literal own back yard — these decisions that are to come in the coming weeks and months impact the entire economy of this province, and well-being of a number of communities. Including theirs."

Whether or not the extension is accepted, Nicholas just wants this whole affair to be over.

"Get it done as soon as possible now, I guess," he says. "It's taken a long time. I remember when it started, I was only a young fella, myself. Hopefully someday, I see clear water again over there."

Kathy Cloutier, director of Corporate Communications for Paper Excellence, speaks during the Northern Pulp press conference. (Muise photo)

Paul talks Boat Har…

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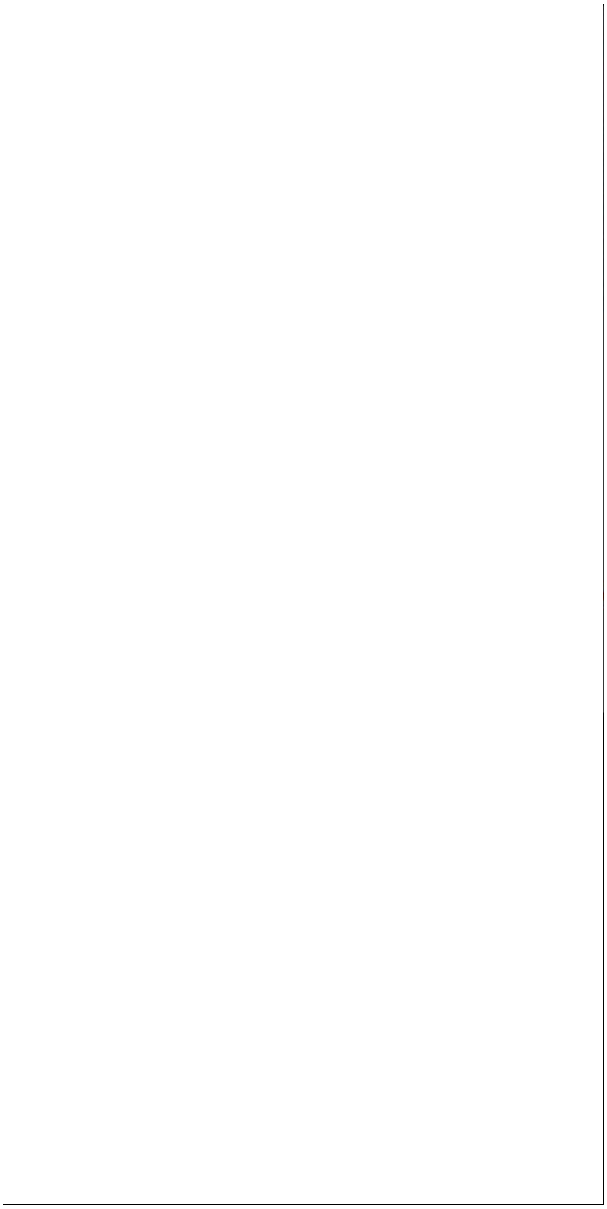

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February 21 @ 7:00 pm - 8:00 pm

In Joyful Song

February 22 @ 7:00 pm - 8:00 pm

Community Luncheon

February 24 @ 12:00 pm - 1:30 pm

View All Events

ABOUT US

21 George Street, Pictou, Nova Scotia
+1 (902) 485-8014 | editor@pictouadvocate.com

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NOVA SCOTIA
Business
Office of the Deputy Minister

1660 Hollis Street
Centennial Building, Suite 600
PO Box 2311
Halifax, NS B3J 3C8
Canada

902 424-2901 T
902 424-0514 F
novascotia.ca

June 8, 2017

[redacted]

Dear [redacted]

Re: You are entitled to part of the information you requested – 2017-03648-BUS

The Department of Business received your application for access to information under the *Freedom of Information and Protection of Privacy Act* on March 29, 2017.

In your application, you requested a copy of the following records:

> *Current status (repayment, interest rates, forgiveness requests) on loans by JobsFund / NSBI to Northern Pulp totalling $107 million from 2009 to 2013: (1) 2009, $15 million (2) 2010, $75 million (3) more than $20 million [$3.6 million + $5.2 million + $12 million of which $2.5 million forgivable.*
>
> *Clarified Mar 30, 2017 that this is to include records containing the following information:*
> - *whether the loans are being repaid and/or are they in good standing*
> - *interest rates for each loan*
> - *have any forgivable amounts been forgiven, and if so when*
> - *timelines for repayment*
> - *for any loans that have been renegotiated, the renegotiated amounts and/or timelines*

You are entitled to part of the information requested. However, we have removed some of the information from this record according to subsection 5(2) of the *Act.* The severed information is exempt from disclosure under the Act for the following reasons:

- Section 12: information which could harm intergovernmental relations or information received in confidence from another government.
- Section 17: information the release of which would have a detrimental financial or economic impact on NS.

. . . . /2

The remainder of the information is enclosed.

You have the right to ask for a review of this decision by the Information Access and Privacy Commissioner (formerly the Review Officer). You have 60 days from the date of this letter to exercise this right. If you wish to ask for a review, you may do so on Form 7, a copy of which is attached. Send the completed form to the Information Access and Privacy Commissioner, P.O. Box 181, Halifax, Nova Scotia B3J 2M4.

Please be advised that a de-identified copy of this disclosure letter and the attached response to your FOIPOP application will be made public after 14 days. The package will be posted online at: https://foipop.novascotia.ca.The letter will not include your name, address or any other personal information that you have supplied in the course of making your application under FOIPOP.

Please contact James McLean at 902-424-3773 or by e-mail at james.mclean@novascotia.ca, if you need further assistance in regards to this application.

Sincerely,

Murray Coolican
Deputy Minister

Attachment

FOIPOP 2017-03648-BUS – Loans to Northern Pulp and Affiliates

12(1)(a)
17(1)

File #	Recipient	Authorized	Status	Interest Rate	Term	Amount Forgiven
300246	Northern Pulp NS	$15,000,000	in good standing (amended 2013)	NS 10-year borrowing rate plus [redacted] (amended to NS 10-year rate plus [redacted])	10 years commencing July 1, 2009 (amended to 10 years commencing January 1, 2013)	n/a (fully repayable loan)
300273	Northern Timber NS	$75,000,000	in good standing	NS 30-year borrowing rate plus [redacted]	30 years commencing March 12, 2010	n/a (fully repayable loan)
300338	Northern Pulp NS	$14,700,000	in good standing	NS 10-year cost of funds plus [redacted]	10 years commencing January 1, 2013	n/a (fully repayable loan)
300337	Northern Pulp NS	$2,500,000	in good standing	No interest (forgivable with conditions)	10 years commencing January 1, 2013	$0
300336	Northern Pulp NS	$3,600,000	paid in full as scheduled on August 1, 2016	NS cost of funds plus [redacted]	4 years commencing October 1, 2013	n/a (fully repayable loan)
300335	Northern Pulp NS	$900,000	incentive earned June 25, 2015	No interest (incentive earnable when conditions met)	n/a	$900,000 incentive earned

Tab 10

THIS MEMORANDUM OF UNDERSTANDING made this 1st day of December, 1995

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services (hereinafter referred to as "Nova Scotia")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of Nova Scotia (hereinafter referred to as "Scott")

RECITES/WHEREAS:

1. As an inducement to encourage the development of the pulp industry in Pictou County, Nova Scotia and to encourage the introduction and expansion of other industries therein, Nova Scotia agreed to develop and operate an effluent treatment facility at Boat Harbour, Pictou County, Nova Scotia;

2. Scott Paper Company, through a subsidiary, Scott Maritimes Pulp Limited (now Scott), constructed a kraft pulp mill at Abercrombie Point, Nova Scotia, (the "Mill") which went into production on or about the 1st day of September, 1967;

3. Nova Scotia and Scott entered into an Agreement dated the 30th day of September, 1970 (the "1970 Agreement") which sets out the terms and conditions and respective obligations of the parties with respect to the operation and use of the Boat Harbour Effluent Treatment Facility and the supply of water to the Mill;

4. Pursuant to the 1970 Agreement, Nova Scotia is obliged to operate the Boat Harbour Effluent Treatment facility and supply water to the Mill for which Scott pays a set fee;

5. The 1970 Agreement is for a term of twenty-five (25) years commencing October 1, 1970, and is renewable at the instance of either party, subject to negotiation or arbitration of certain terms;

6. Scott gave notice of renewal of the 1970 Agreement to Nova Scotia on the 24th day of February, 1995 and such renewal was acknowledged by Nova Scotia by letter dated March 30, 1995;

7. Pursuant to Section 37(2) of the *Fisheries Act* (Canada) the Minister of Fisheries and Oceans has required Nova Scotia to submit a plan for the future operation of the Boat Harbour Effluent Treatment Facility and Nova Scotia desires to submit a plan which will result in the immediate closure of part of the Facility and a definitive termination date for the remainder of the Reconfigured Facility;

8. Given existing and planned improvements to the Facility, that part of the Facility known as the Stabilization Basin is no longer required for the operation of the Facility after the upgrades are satisfactorily completed; it will at a designated date following the leasing of the Reconfigured Facility no longer form part of the effluent treatment system and it will remain in the possession and control of Nova Scotia who shall have responsibility for its Remediation;

9. Nova Scotia and Scott have agreed to restate and restructure their contractual relationship as it regards the Facility so that, after the Reconfigured Facility is no longer required for effluent treatment Nova Scotia will be in a position to close the entire Facility and the parties have further agreed that Nova Scotia shall have no operational responsibility for the Reconfigured Facility (except those incidental to its position as Landlord of the Reconfigured Facility) after December 31, 1995, and Scott shall have no obligation or liability for the Remediation of all or any part of the Facility which obligation and liability shall be assumed by Nova Scotia;

10. Nova Scotia has agreed to indemnify and hold the Indemnified Parties, as defined in Schedule 4 hereof, harmless for claims which may be made against them as a result the existence of or past operation of the Facility and all other claims which may be made against

the Indemnified Parties following Scott leasing the Reconfigured Facility, except for claims arising directly out of Scott's operation of the Reconfigured Facility after the date of transfer (as more particularly set out herein);

11. The parties have agreed to the renewal of the Water Supply portion of the 1970 Agreement on the terms set out herein.

NOW THEREFORE THIS MEMORANDUM OF UNDERSTANDING WITNESSES:

ARTICLE 1 - DEFINITIONS

1.01 In this Memorandum of Understanding, including the Recitals, the following terms have the following meanings unless the context otherwise requires:

a. "ASB" means the aerated stabilization basin forming part of the Facility as shown on the Plan attached hereto as Schedule "1";

b. "1970 Agreement" means an Agreement dated the 30th day of September, 1970, between Nova Scotia and the Company pursuant to which Nova Scotia constructed and is presently operating the Facility;

c. "Environmental Laws" means all applicable laws, statutes, ordinances, rules, by-laws, guidelines, treaties, and Regulations, and all applicable directives, rules, standards, requirements, policies, orders, judgments, injunctions, or decrees which have the force of law or which are capable of having the force of law, with respect to environmental or health matters including, without limitation, the following: the *Fisheries Act* (Canada), the *Canadian Environmental Protection Act*, the *Canadian Environmental Assessment Act*, the *Transportation of Dangerous Goods Act* (Canada), the *Navigable Waters Protection Act* (Canada), the *Environmental Act* (Nova Scotia), the *Occupational Health and Safety Act* (Nova Scotia), the *Indian Act* (Canada), and any Regulations or guidelines made pursuant to the foregoing;

d. "Facility" means the effluent treatment system which consists of a pipeline for the transmission of effluent from the Mill commencing at a standpipe located on Scott's property at Abercrombie Point, Pictou County, Nova Scotia, and leading under the East River and discharging into settling ponds at Boat Harbour, the Settling Ponds, ASB and the Stabilization Basin and all other appurtenances affixed or appended thereto, more particularly depicted on the Plan attached hereto as Schedule 1 and all related lands and facilities necessary to permit the receipt and lawful disposal of effluent from the Mill commencing at the said stand pipe;

e. "Mill" means Scott's mill as that term is defined in subsection (c) of Section 2 of Chapter 15 of the Statutes of Nova Scotia, 1965.

f. "Point C" means the effluent outfall of the Reconfigured Facility as shown on the Plan attached as Schedule 1;

g. "Reconfigured Facility" means the Effluent Treatment System which consists of a pipeline for the transmission of effluent from the Mill commencing at a standpipe located on Scott's property at Abercrombie Point, Pictou County, Nova Scotia, and leading under the East River and discharging into Settling Ponds at Boat Harbour, the Settling Ponds, and ASB and discharging into Boat Harbour at Point C (which Point C shall become the "Effluent Outfall" of the Reconfigured Facility after the upgrades contemplated herein are satisfactorily completed and the Reconfigured Facility can be operated in compliance with Environmental Laws at Point C) and all other appurtenances affixed or appended thereto, more particularly depicted on the Plan attached hereto as Schedule 2 and all lands and facilities necessary to permit the receipt and lawful disposal of effluent from the Mill, commencing at the said standpipe;

h. "Remediation" means all studies and work required or recommended to fully rectify and remedy any adverse environmental condition at the Facility or any part thereof;

i. "This Memorandum" means this Memorandum of Understanding including the Recitals and the following Schedules:

Schedule 1 - Plan of Facility
Schedule 2 - Plan of Reconfigured Facility
Schedule 3 - Work Plan
Schedule 4 - Draft Water Supply Agreement
Schedule 5 - Indemnity Wording

j. "Settling Ponds" means that area depicted as "Settling Ponds" consisting of the settling pond and the emergency spill pond on the Plan of Facility attached as Schedule 1;

k. "Stabilization Basin" means that area depicted as "Stabilization Basin" on the Plan of Facility attached as Schedule 1;

l. "Work Plan" means the list of work to be done at the Facility by Nova Scotia annexed hereto as Schedule 3.

1.02 Headings

The headings of the Sections and Articles to this Agreement are inserted for convenience of reference only and shall not affect the construction or interpretation of any provision of this Agreement.

1.03 Number and Gender

Words importing the singular shall include the plural and vice versa and words importing the masculine gender shall include the feminine and neuter and vice versa.

ARTICLE 2 - PURPOSE

2.01 Nova Scotia and Scott have negotiated in good faith and have agreed on the significant, major and substantive components of their contractual relationship which are to be translated into a series of documents including the following:

(1) Water Supply Agreement;
(2) Lease Agreement between Nova Scotia and Scott (the "Lease");
(3) Indemnity Agreement;
(4) Such other agreements, deeds or assurances as may be required to ensure the lawful operation of the Facility or Reconfigured Facility, as the case may be;

all of which documents are collectively referred to in this Memorandum of Understanding as the "Legal Documentation".

2.02 Nova Scotia and Scott acknowledge that the Legal Documentation will require finalization between the lawyers of the respective parties as to form and content but that the significant, major and substantive components have been agreed to between Scott and Nova Scotia.

2.03 This Memorandum of Understanding is entered into by the parties to confirm their respective positions, undertakings and agreements which have been reached as of the date hereof.

2.04 The parties agree that the Legal Documentation shall be so drafted to reflect and contain the significant, major and substantive components as have been agreed to by the parties.

2.05 The parties agree to instruct their respective counsel and to give such direction as is necessary to proceed as diligently and expeditiously as possible and in good faith to complete the Legal Documentation.

ARTICLE 3 - WATER SUPPLY AGREEMENT

3.01 The following constitutes the significant, major and substantive components of the agreement between the parties with respect to water supply:

(a) The water supply portions of the 1970 Agreement shall be renewed on a cost recovery basis for a term of 25 years;

(b) The rate for water shall be $18.53 per million imperial gallons for the period from October 1, 1995 until April 1, 1996;

(c) Subject to the water fee credit program (set out herein), the fee for water supplied to the Mill for a five-year term commencing on April 1, 1996 shall consist of an annual base charge of $157,124 payable in equal quarterly instalments and a commodity charge of $64.84 per million imperial gallons;

(d) The annual base charge and commodity charge will be subject to renegotiation at the end of the four-year period commencing April 1, 1996 and every five years thereafter for the duration of the 25-year term and the charges shall reflect the reasonable cost of supplying the water taking into consideration the following components:

1. wages and salaries;
2. power;
3. general supplies;
4. fuel;
5. equipment repairs;
6. building maintenance;
7. rentals;
8. short term borrowings;
9. debt servicing costs.

all in relation to the operation of the Middle River Facility.

(e) All other provisions of the 1970 Agreement relating to the Supply of Fresh Water to the Mill shall apply including, without limitation, paragraphs 1(a), 1(d), 2(c), 3 and 7;

(f) For a ten year term, Scott shall be entitled to an annual environmental improvement credit of up to 25% of the commodity charge payable under the Water Supply Agreement to an annual maximum of $100,000 provided the credited amounts are used for:

(i) in-plant improvements wholly or partly designed to improve emissions, including effluent or air quality, decrease water consumption on a per ton basis or otherwise be directed at non-regulatory environmental enhancement to approach progressive systems closure;

(ii) the planning, approval and construction of new secondary treatment to replace the Boat Harbour System; or

(iii) emission-related research.

The following criteria shall apply to the credits available under paragraph (f)(i):

- a maximum of 10% of the credit may be used for project administration;
- a maximum of 25% of the credit may be applied to project design;
- actual project undertaking measures must be at least 65% of the credit;
- all projects are subject to the prior approval of the Nova Scotia Department of Environment, which approval shall not be unreasonably withheld. Unless otherwise notified by the Department of Environment, approval shall be deemed to be given sixty (60) days after the request is made.

(g) The Water Supply Agreement shall be substantially in the form annexed hereto as Schedule 4 subject to such reasonable amendments or additions as may be agreed upon between the parties acting in good faith.

ARTICLE 4 - EFFLUENT TREATMENT AGREEMENT

4.01 The following constitutes the significant, major and substantive components of the agreement between the parties with respect to effluent treatment.

(a) The parties agree to the renewal of the 1970 Agreement as it relates to effluent treatment, on current terms for the period from September 30, 1995 until December 31, 1995.

(b) Nova Scotia agrees to lease the Reconfigured Facility to Scott as it exists on December 31, 1995 (subject to upgrades contemplated herein) for a term of ten years commencing on January 1, 1996 for a rent of One Dollar ($1.00).

(c) (i) Scott shall have no liability, responsibility or obligation whatsoever arising out of, or in any way related to the operation of the Facility up to December 31, 1995 and Nova Scotia expressly agrees to assume all liabilities, responsibilities and obligations whether known or unknown relating to or in any way arising out of the use of the Facility up to December 31, 1995, and for greater certainty, Nova Scotia agrees to provide an indemnity substantially in the form annexed hereto as Schedule 5 in favour of Scott and the Indemnified Parties (as defined therein).

(ii) Scott shall assume responsibility for the Operation of the Facility after December 31, 1995, and subject to the obligation to undertake the clean up program referred to in Article 4.01(f) Scott shall have no liability, responsibility or obligation whatsoever for Remediation of the Facility.

(d) Nova Scotia agrees to undertake a clean-up program with respect to the Facility prior to the commencement of the Lease with Scott, which clean-up program shall include the work listed on the Work Plan. If a pipeline and diffuser is required by any level of government during the term of the Lease it shall be installed at the sole expense of Nova Scotia.

(e) Nova Scotia agrees to pay the cost of installation of the necessary equipment to establish Point C as the lawful effluent outfall and the cost of upgrading the aeration capacity of the Facility up to a maximum cost of One Million Seven Hundred and Fifty Thousand Dollars ($1,750,000.00) so that the facility has reliable, installed aeration capacity of up to 1,600 hp. It is agreed that Scott or its agents will engineer, manage and complete the conversion of the effluent outfall and upgrading of the aeration capacity of the Facility. It is further agreed that Scott shall be entitled to payment from Nova Scotia of costs incurred by it in converting the outfall and upgrading the aeration capacity of the Facility upon presentation of invoices for work or material to Nova Scotia, within thirty (30) days of presentation of invoices. For the purposes of this subarticle, "upgrading the aeration capacity of the Facility" includes, without limitation, engineering studies, opinions on compliance, the purchase and installation of new aerators, the upgrading of electrical equipment, and the purchase of such other equipment or the performance of such other work as may be required, in Scott's discretion.

(f) Scott shall be required to undertake a clean-up program with respect to the Facility at the termination of the Lease, which clean-up program shall consist of the removal of sludge from the Settling Ponds and the ASB and restoration of the Reconfigured Facility to the state it was in at the commencement of the Lease, reasonable wear and tear excepted. For greater certainty, it is agreed that Scott shall have no obligation or responsibility to restore the Stabilization Basin, which restoration will be undertaken by Nova Scotia in its sole discretion;

(g) It is mutually agreed that Nova Scotia shall have no ongoing responsibility for the operation of the Reconfigured Facility following December 31, 1995 (except for those responsibilities that arise as landlord) but Nova Scotia shall remain responsible for Remediation of the Reconfigured Facility at the expiration of the term of the Lease and Nova Scotia shall remain in possession of and responsible for the Stabilization Basin and Nova Scotia agrees not

to render the Stabilization Basin a tidal estuary and waters frequented by fish until the Stabilization Basin has been remediated by it in accordance with applicable Environmental Laws;

(h) As soon as is practical, Nova Scotia agrees to reduce the water level in the Stabilization Basin to eliminate any alleged trespass of the waters therein beyond the ordinary high water mark of the former Boat Harbour. Such reduction shall be done in accordance with applicable Environmental Laws;

(i) Nova Scotia agrees that the Lease shall include all fixtures and equipment currently at the Facility and Nova Scotia agrees to grant to Scott an irrevocable option to purchase fixtures and equipment used at the Facility for its depreciated value at the end of the term of the Lease.

(j) Nova Scotia agrees to grant to Scott an option to purchase the pipeline commencing at a standpipe located on Scott's property at Abercrombie Point, Pictou County, Nova Scotia and leading under the East River to the point where the shores of Pictou Landing meet the East River or such other portion of the pipeline and appurtenant lands as may be agreed, for a purchase price of One Dollar ($1.00), which option may be exercised at any time prior to December 31, 2006.

(k) Nova Scotia agrees to obtain all required permits, consents, approvals and letters of authorization for the continued operation of the Reconfigured Facility as of the date of transfer, and Nova Scotia will assign all such permits, consents, approvals and letters of authorization and obtain such consents to assignments as may be required. Nova Scotia agrees to impose operating limits on the Facility which reflect and do not exceed or apply more stringently than the standards set out in the Pulp and Paper Effluent Regulations (Canada) and further agrees to obtain all required federal government approvals, if any, to permit the continued operation of the Reconfigured Facility as contemplated in this Agreement

(l) Nova Scotia agrees to use its best efforts to assist Scott obtain all necessary permits, consents and approvals to permit the construction and operation of a replacement effluent treatment facility to replace the Facility at the expiration of the term of the Lease.

(m) In the event that easements are required for the operation of a replacement effluent treatment facility, Nova Scotia agrees:

(i) to grant such easements as may be reasonably required over lands of Her Majesty, the Queen in right of the Province of Nova Scotia at fair market value as determined by an accredited appraiser;

(ii) to use its best efforts to assist Scott to obtain any such easements required over private lands;

(n) Nova Scotia agrees that Scott shall be entitled to use the Landfill owned by Nova Scotia adjacent to the Reconfigured Facility during the term of the Lease for ordinary maintenance of the Facility and that the Landfill has sufficient capacity for such use by Scott;

(o) Nova Scotia agrees that the Lease shall not include the Landfill (notwithstanding Scott's right of use set out above) nor shall it include any former landfill or dump sites, which sites shall remain in the possession and control of Nova Scotia;

(p) This Memorandum of Understanding and the indemnities contemplated herein shall enure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

(q) Neither party shall be held responsible for any losses resulting if the fulfillment of any terms hereunder shall be delayed or prevented by civil disorders, wars, acts of enemies, acts of God, or by any other cause which could not be reasonably forseen and prevented and which are not within control of the party whose performance is interfered with, and which by the exercise of reasonable diligence, said party is unable to prevent or eliminate.

(r) The parties hereto shall do such further acts, execute and deliver such further documents and give such further assurances as may be necessary or desirable to give full effect to this Memorandum and the indemnities contemplated herein and to ensure the continued lawful operation of the Facility or Reconfigured Facility as the case may be. Furthermore,

should the federal Pulp and Paper Effluent Regulations change during the term of the Lease either through enactment of revisions or by judicial interpretation, Nova Scotia agrees to execute and deliver such further documents, including without limitation, deeds with repurchase options, as may be reasonably required for the lawful operation of the Reconfigured Facility during the term of the Lease or should Scott become lawfully permitted to operate the Reconfigured Facility without being a tenant thereof Nova Scotia agrees to accept a surrender of lease, at Scott's option.

IN WITNESS WHEREOF the parties hereto have set their hands and affixed their seals the day and year first above written.

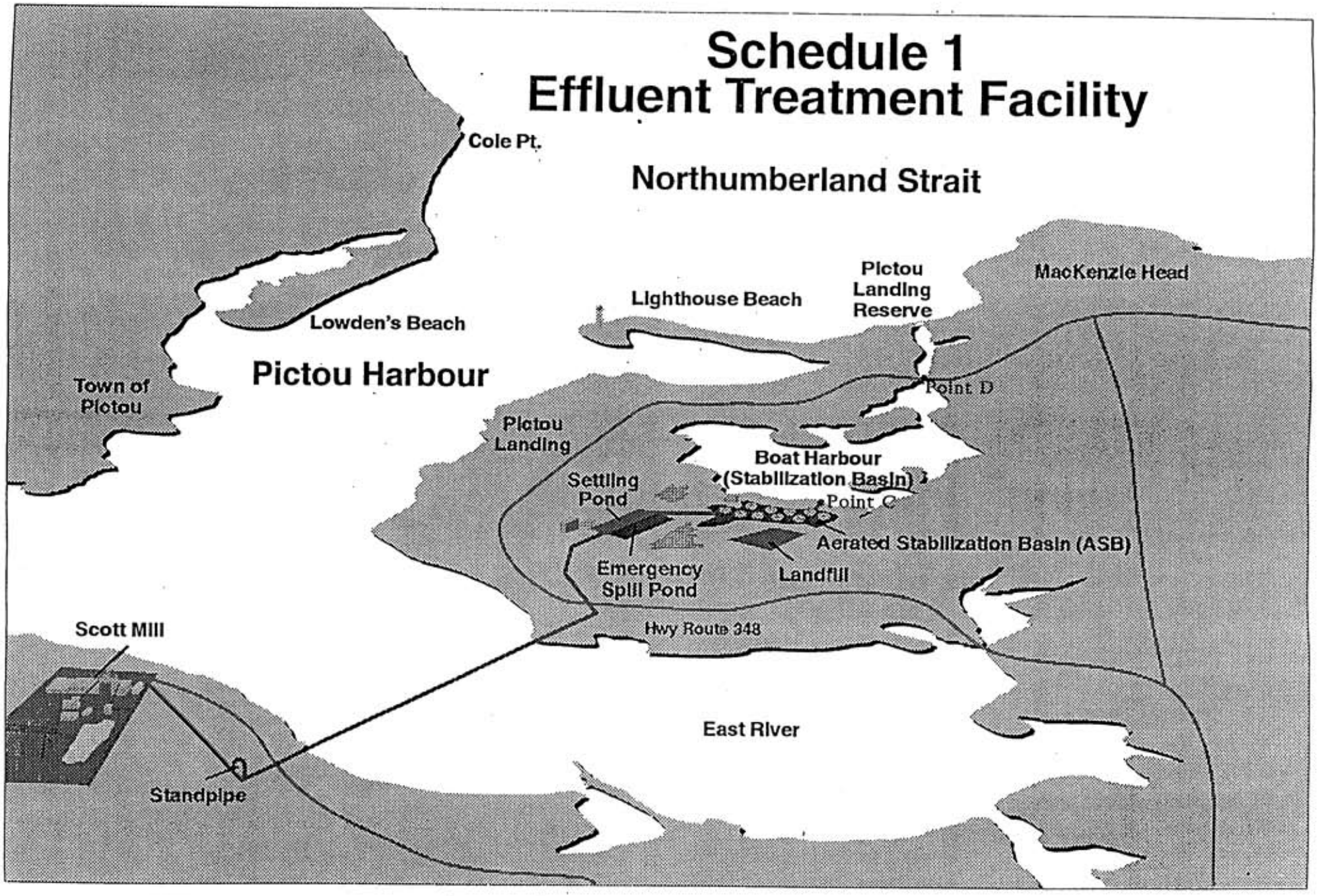
SIGNED, SEALED AND DELIVERED in the presence of:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, AS REPRESENTED BY THE MINISTER OF SUPPLY AND SERVICES

SCOTT MARITIMES LIMITED

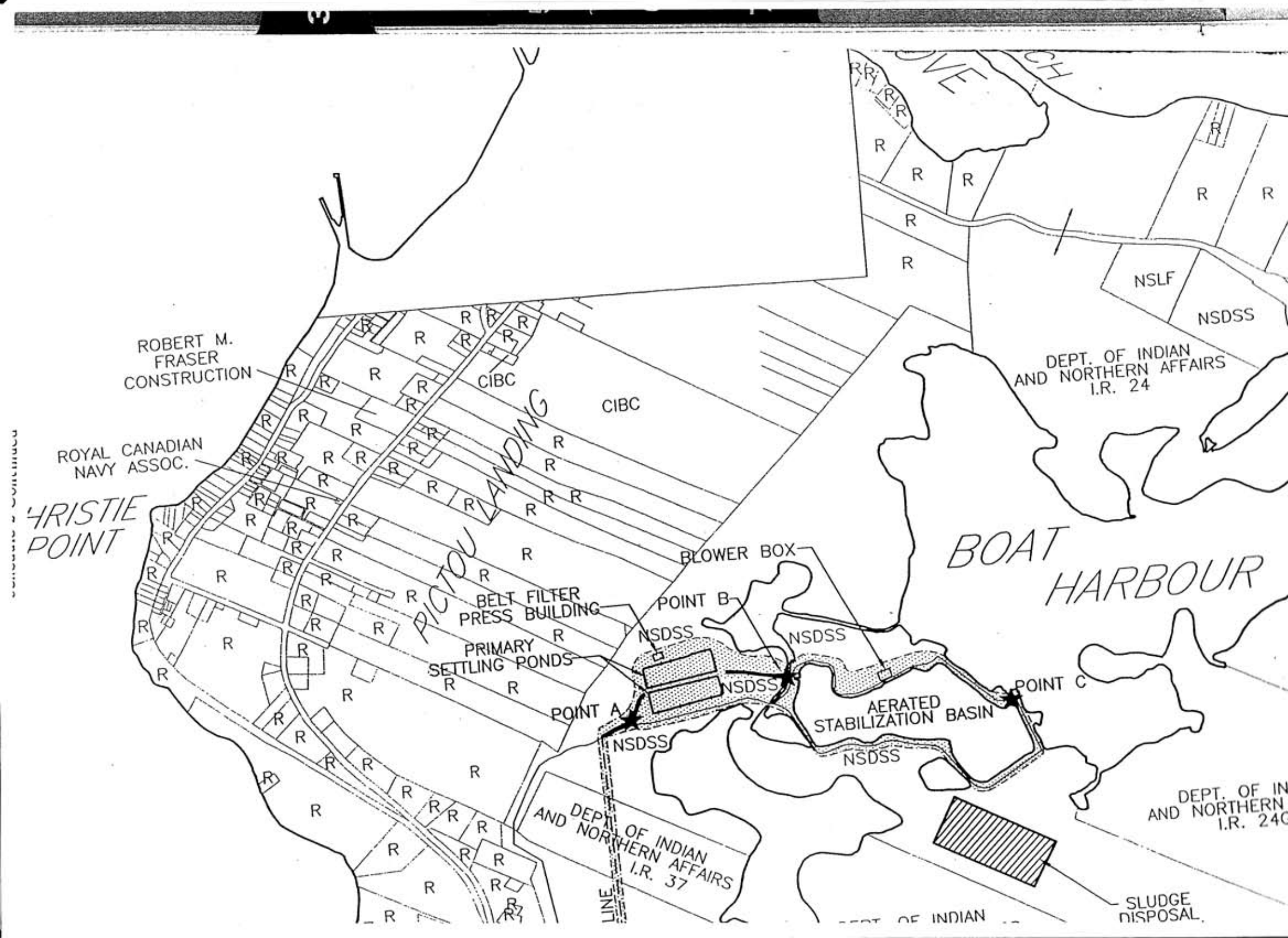
Per:

[515698.13]


Schedule 1
Effluent Treatment Facility
Cole Pt.
Northumberland Strait
Lighthouse Beach
Pictou Landing Reserve
MacKenzie Head
Lowden's Beach
Pictou Harbour
Town of Pictou
Point D
Pictou Landing
Boat Harbour (Stabilization Basin)
Settling Pond
Point C
Aerated Stabilization Basin (ASB)
Emergency Spill Pond
Landfill
Scott Mill
Hwy Route 348
East River
Standpipe

Schedule 2

The Leased Premises consist of the pipeline for the transmission of effluent commencing at a Standpipe located on Scott's property at Abercrombie Point, Pictou County. and leading under the East River and discharging into settling ponds at Boat Harbour together with the shaded area on the attached plan together with a right-of-way over the existing roadway to the Sludge Disposal Cell.


ROBERT M. FRASER CONSTRUCTION
ROYAL CANADIAN NAVY ASSOC.
CHRISTIE POINT
PICTOU LANDING
CIBC
CIBC
NSLF
NSDSS
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 24
BOAT HARBOUR
BLOWER BOX
POINT B
BELT FILTER PRESS BUILDING
PRIMARY SETTLING PONDS
NSDSS
NSDSS
NSDSS
NSDSS
NSDSS
POINT A
POINT C
AERATED STABILIZATION BASIN
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 37
LINE
SLUDGE DISPOSAL
DEPT. OF IN
AND NORTHERN
I.R. 24

SCHEDULE 3 - WORK PLAN

Below are the required improvements to the Boat Harbour Effluent Treatment Facility to be undertaken by Nova Scotia:

- Removal of sludge from the Settling Ponds by December 31, 1995;
- Installation of proper inlet and outlet devices for Settling Ponds by December 31, 1995;
- Removal of sludge from ASB by September 1, 1996; *
- Completion of Cycle I of the environmental effects monitoring program required under the Pulp and Paper Effluent Regulations (Canada) in accordance with the Regulations. Scott will be responsible for the continuing environmental effects monitoring program.

* As the removal of sludge from the ASB will occur while the Reconfigured Facility is subject to the Lease to Scott it is agreed:

1. Nova Scotia will take all measures necessary to complete the removal of sludge in a manner which does not interfere with the lawful operation of the Reconfigured Facility by Scott and shall fully consult with Scott before undertaking any such work;

2. Nova Scotia will indemnify and hold harmless the Indemnified Parties against all claims, demands, charges, penalties or fines which may be made against the Indemnified Parties arising directly or indirectly out of the removal of sludge from the ASB by Nova Scotia.

Schedule 4

THIS **WATER SUPPLY AGREEMENT** made in duplicate this 30th day of June, 1995,

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Environment as approved by Order in Council 95- dated the ____ day of _____, 1995.

(hereinafter referred to as "Nova Scotia")

- and -

SCOTT MARITIMES LIMITED, a body corporate

(hereinafter referred to as "Scott")

WITNESSES:

WHEREAS Scott operates a Mill at Abercrombie, in the County of Pictou, Province of Nova Scotia, for the purpose of manufacturing bleach kraft pulp.

AND WHEREAS by an Agreement dated the 30th day of September, 1970, (the "1970 Agreement") the parties contracted, inter alia, for the supply of water to the Mill;

AND WHEREAS pursuant to the 1970 Agreement the Province covenanted and agreed to supply water to the Mill as follows:

> "On March 31, 1967, and on each day thereafter a minimum of 25 million Imperial Gallons per day."

AND WHEREAS the 1970 Agreement may be renewed at the instance of either party upon giving notice;

AND WHEREAS on the 24th day of February, 1995, Scott gave notice to the Province of its intent to renew the Agreement;

AND WHEREAS the parties hereto have agreed to the following terms to replace the 1970 Agreement:

NOW THEREFORE IN CONSIDERATION of One Dollar ($1.00) and other good and valuable consideration the parties agree as follows:

ARTICLE I - DEFINITIONS

1.01 Definitions

In this Agreement, including the Recitals, the following terms have the following meanings unless the context otherwise requires:

(a) "Agreement" means this Agreement including the recitals and the following Schedules:

(i)

(b) "Fresh Water" means water suitable for the manufacture of bleach kraft pulp;

(c) "Water Supply System" means a reservoir for the storage of water at the mouth of the Middle River and including a dam, dam gates, fish ladders, a pump house and a water pumping system, and a pipeline for the transmission of water, and such additional or alterative facilities, including West River Reservoir, as are necessary to enable the Province to supply fresh water to the Mill as herein provided.

ARTICLE II - COVENANTS OF THE PROVINCE

2.01 The Province covenants and agrees that:

(a) It will at its cost, own, operate and maintain the Water Supply System and continue to supply up to 25 million Imperial Gallons of Fresh Water per day to the Mill, provided however that the Province shall not be responsible for the removal of sodium chloride, colour or turbidity to the extent that such or due to conditions existing in or about the Middle River as of the date hereof;

(b) It will be liable for any interruption or cessation of services to be provided by it hereunder caused by any negligent act or omission of the Province, its servants, agents, contractors or employees, but the Province will not be liable for any interruption or for the cessation of the services due to a cause beyond the control of the Province which the Province shall have exercised due diligence to prevent, eliminate or terminate to the extent that it could reasonably do so;

ARTICLE III - COVENANTS OF THE COMPANY

3.01 The Company covenants and agrees that:

(a) Until April 1, 1996, it will pay to the Province for Fresh Water Eighteen Dollars and Fifty-Three Cents ($18.53) per million Imperial Gallon or One Hundred Thousand Dollars ($100,000) per year, whichever is greater;

(b) For the term commencing April 1, 1996, and running for four (4) years, it will pay to the Province for Fresh Water a commodity charge of $65.84 per million Imperial Gallons plus an annual base rate of $157,124 and

(c) It will measure the quantities of Fresh Water consumed and will pay the Province at the aforesaid rate for the quantities of Fresh Water consumed. The Province reserves the right to verify such measurements using its own equipment.

3.02 Payments under clauses (a) and (b) of Section 3.01 shall be made quarterly not in advance from the effective date of this Agreement and any necessary adjusting payment will be made once yearly commencing one (1) year after the effective date of this Agreement.

3.03 For the purposes of this Article, years shall be deemed to commence on the 1st day of April of every year.

ARTICLE IV - WATER FEE CREDIT PROGRAM

4.01 For a ten year term, Scott shall be entitled to an annual environmental improvement credit of up to 25% of the commodity charge payable hereunder to an annual maximum of $100,000 provided the credited amounts are used for:

(a) in-plant improvements wholly or partly designed to improve emissions including effluent or air quality, decrease water consumption on a per ton basis or otherwise be directed at non-regulatory environmental enhancement to approach progressive systems closure;

(b) the planning, approval and construction of new secondary treatment to replace the Boat Harbour System; or

(c) emission-related research.

The following criteria shall apply to the credits availed under paragraph 4.0(a):

- a maximum of 10% of the credit may be used for project administration;
- a maximum of 25% of the credit may be applied to project design;
- actual project undertaking measures must be at least 65% of the credit;

- the annual maximum of $100,000 per year shall be non-cumulative.

ARTICLE V - TERM OF AGREEMENT

5.01 This Agreement shall be in force for a term commencing on the date hereof and expiring on the 31st day of March, 2021, except that the amount paid for Fresh Water shall be subject to adjustment and the parties shall negotiate the price to be paid on a cost recovery basis for Fresh Water for every five (5) year term and if they are unable to reach agreement, the dispute or difference shall be referred to a Board of Arbitration constituted and appointed in accordance with Agreement.

5.02 If the parties are unable to agree on the price to be paid for Fresh Water hereunder, either party may notify the other in writing of its desire to refer such dispute or difference to a Board of Arbitration and it shall in such notice name its representative to the Board within ten (10) days of the receipt of such notice, the other party shall notify the first party in writing of the name of its representative to the Board. The two representatives shall appoint a third arbitrator and he shall be appointed chairman of the Board. The Arbitrator shall proceed expeditiously to adjudicate the dispute. The *Arbitration Act* shall apply to this arbitration clause and in particular to the appointment of a second member and third member of the Board of Arbitration if the party required to appoint a representative of the Board fails to do so as herein provided; and if the two representatives of the parties named to the Board fail to meet and appoint a third member to be chairman as herein provided.

ARTICLE VI - MISCELLANEOUS

6.01 Notices

All notices given pursuant to this Agreement shall be in writing and given by mail, fax or personal delivery to the parties as follows:

Name of Party	Scott Maritimes Limited
Address	P.O. Box 549D New Glasgow, NS B2H 5E8
Fax No.	902-752-5404
Attention:	Mr. Gerry Byrne, President

with a copy to:

	McInnes Cooper & Robertson 1601 Lower Water Street P.O. Box 730 Halifax, NS B3J 2V1
Fax No.:	902-425-6350
Attention:	Bernard F. Miller

Name of Party:	Minister of Environment
Address:	5th Floor, 5151 Terminal Road P.O. Box 2107 Halifax, NS B3J 3B7
Fax No.:	902-424-0644
Attention:	Deputy Minister, Wayne J. Grady

or to such other address, fax number or officer of a party as that party may notify the other party from time to time.

6.02 Effective Time of Notice

Notices shall be deemed given upon the earlier of the following:

(1) If mailed, on the fifth Business Day following deposit in the mails;

(2) If given by fax, on transmission;

(3) On receipt.

6.03 Governing Law

This Agreement shall be governed by and construed in accordance with the laws of Nova Scotia and the laws of Canada applicable therein.

6.04 Assigns

This Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

6.05 Amendments

This Agreement represents the entire agreement between the parties and may be amended only in writing signed by all parties affected thereby.

6.06 Further Assurances

The parties hereto shall do such further acts, execute and deliver such further documents and give such further assurances as may be necessary or desirable to give full effect to this Agreement.

IN WITNESS WHEREOF the parties hereto have set their hands and affixed their seals the day and year first above written.

SIGNED, SEALED AND DELIVERED in the presence of:

Sharon P. Burrows

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply of Services

Per: Gerald J. O'Malley

SCOTT MARITIMES LIMITED

Per: G. A. Byrne

SCHEDULE 5

Indemnity by Nova Scotia in Favour of Indemnified Parties

Notwithstanding any other provision in any Agreement between the parties, Nova Scotia shall indemnify and hold Scott Maritimes Limited and Scott Paper Company and their respective officers, directors, shareholders, employees, agents, consultants, advisors and their respective heirs, successors (including successors in title), assigns and legal representatives, shareholders, and their respective officers, directors, shareholders, employees, agents, consultants and advisors (hereinafter referred to as the "Indemnified Parties") harmless from and against any and all:

(a) liabilities, losses, claims, demands, actions, causes of action, damages, (including, without limitation, lost profits, consequential damages, interest, penalties, fines and monetary sanctions) including amounts paid to settle actions, whether before or after litigation or other proceedings or activities of any nature, or to satisfy judgments, orders or directives including, without limitation, any judgment, order or directive imposing joint and several liability on the Indemnified Parties and any costs (including the cost of diverting or altering components of the Facility in response to Claims), liability or damages:

(i) arising out of the designation of the Facility or Reconfigured Facility as a contaminated site within the meaning of any Environmental Laws;

(ii) arising out of or in any way related to the existence or operation of the Facility by Nova Scotia up to the effective date of this Agreement;

(iii) arising out of any claim based in nuisance, including any claim for a permanent or temporary injunction; or

(iv) any claim arising out of the construction or location of the Facility or Reconfigured Facility, including claims based in trespass whether such claims relate to activities occurring before or after the effective date of this Agreement (hereinafter collectively referred to as "Claims").

(b) legal fees on a solicitor and client basis, consultants fees and all other out-of-pocket expenses arising because of Claims (hereinafter referred to as "Expenses")

incurred or suffered by the Indemnified Parties, whether such Claims and/or Expenses arise under statute or not, which may at any time or from time to time be paid, incurred, claimed or asserted against any of the Indemnified Parties for, with respect to, or as a direct or indirect result of the construction, location or existence of the Facility or Reconfigured Facility or the past operation of the Facility by Nova Scotia including, **without limitation**:

A. Claims made and/or Expenses arising due to the presence on or under, or the discharge, escape, seepage, leakage, spillage, emission, exhaust, or release

from the Facility into the environment or into or upon land, the atmosphere, or any water course, body of water or wetlands, of any substance, pollutant, waste, contaminant, harmful or hazardous material, fumes, steam, or odour due to or in any way related to the Facility and, without limiting the generality of the foregoing, Nova Scotia undertakes that this Indemnity shall apply to the costs of defending and/or counter-claiming or claiming over and against third parties in such manner as the Indemnified Parties in their sole discretion may determine in respect of any action, proceeding or matter raised in connection with the Facility.

B. The breach of any Environmental Laws by Nova Scotia;

C. The trespass of the Facility or any part thereof on adjacent lands or any tort or other common law claim relating to or arising out of the past, present or future use of the Facility, or arising out of the design, construction, location or configuration of the Facility, including any claim for injunction raised in any such claim;

D. Subrogation claims made by Her Majesty the Queen in Right of Canada (Canada) pursuant to a Settlement Agreement dated July 20, 1993, between Canada and The Pictou Landing Indian Band.

The Indemnified Parties shall be held harmless as contemplated herein notwithstanding the provisions of any Ministerial Order or other directive issued or made pursuant to present or future Environmental Laws.

Without restricting the generality of the foregoing, this undertaking and indemnity shall extend to all Claims made by any person or government made on their own behalf, on the public's behalf (for example in public nuisance) or on behalf of any other party (including, without limitation, claims arising by statute or by subrogation). The undertaking and indemnification set out herein shall remain in full force and effect perpetually following the transfer of responsibility for operation of the Facility from Nova Scotia to Scott Maritimes Limited.

The foregoing indemnity is intended to provide the broadest possible indemnity to the Indemnified Parties and it is hereby mutually agreed that it is not to be interpreted *contra proferentum* or restrictively but is to be given a broad and liberal interpretation in favour of the Indemnified Parties.

DATED: November , 1995

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services (hereinafter referred to as "Nova Scotia")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of Nova Scotia (hereinafter referred to as "Scott")

MEMORANDUM OF UNDERSTANDING

Bernard F. Miller
McInnes Cooper & Robertson
Summit Place
1601 Lower Water Street
P.O. Box 730
Halifax, Nova Scotia
B3J 2V1

BFM (515698.13)

M-2704/9798

Tab 11

ACKNOWLEDGEMENT AGREEMENT dated MAY 12, 2008

To: Northern Pulp NS LP, its affiliates and Northern Pulp Nova Scotia Corporation

In connection with the proposed sale of the Pictou Pulp Mill and related assets (the "Asset Sale") by Neenah Paper Company of Canada (collectively with its affiliates, "NPCC") to its wholly-owned subsidiary, Northern Pulp Nova Scotia Corporation ("NPNS"), and the subsequent sale of the shares of NPNS (the "Share Sale", and together with the Asset Sale, the "Acquisition") to Northern Pulp NS LP (collectively with its affiliates and NPNS, the "Purchaser"), Her Majesty The Queen in the Right of the Province of Nova Scotia (the "Province") hereby acknowledges, agrees and confirms that:

(a) each of the successors and assigns of Scott Maritimes Limited ("Scott"), including Kimberly-Clark Inc. and NPCC, has had, and upon the closing of the Acquisition Purchaser will continue to have, the full benefit of and all of the rights of Scott under each of the agreements and understandings entered into between the Province and Scott in connection with the transfer of operations of the Effluent Treatment System associated with the Pictou Pulp Mill from the Province to Scott in December, 1995; and

(b) each of such agreements and understandings (including any amendments or extensions prior to the date hereof) is in good standing and, from and after the closing of the Acquisition, shall continue in full force and effect for the benefit of Purchaser notwithstanding that various circumstances anticipated by the Province and Scott at the time of execution have changed (particularly with respect to closure of the Effluent Treatment System, which has not transpired).

Without limiting the generality of the foregoing, the Province acknowledges, agrees and confirms that, from and after the closing of the Acquisition, the Memorandum of Understanding between the Province and Scott dated December 1, 1995 and the Indemnity Agreement between the Province and Scott dated December 31, 1995 shall continue to apply with respect to the ongoing operation of the Effluent Treatment System, Purchaser's use of the Lands subject to the Lease between the Province and Scott dated December 31, 1995 (extended under Lease Extension Agreement dated October 22, 2002) and Purchaser's use of Boat Harbour (pursuant to the Licence Agreement between Province and Scott dated December 31, 1995 and the letter of extension dated November 30, 2006 from the Deputy Minister of Transportation and Public Works).

The Province further acknowledges, agrees and confirms that, from and after the closing of the Acquisition, the terms identified on Schedule A hereto shall operate for the full benefit of Purchaser and its successors and assigns.

Her Majesty The Queen in the Right of the Province of Nova Scotia, as represented by the Deputy-Minister of Transportation and Infrastructure

Schedule 'A

ACKNOWLEDGED TERMS

Memorandum of Understanding. December 1. 1995

Section 10

Nova Scotia has agreed to indemnify and hold the Indemnified parties, as defined in Schedule 4 thereof, harmless for claims which may be made against them as a result the existence of or past operation of the Facility and all other claims which may be made against the Indemnified Parties following Scott leasing the Reconfigured Facility, except for claims arising directly out of Scott's operation of the Reconfigured Facility after the date of transfer (as more particularly set out herein).

Article 4.01

(c)(i) Scott shall have no liability, responsibility or obligation whatsoever arising out of, or in any way related to the operation of the Facility up to December 31, 1995 and Nova Scotia expressly agrees to assume all liabilities, responsibilities and obligations whether known or unknown relating to or in any way arising out of the use of the Facility up to December 31, 1995, and for greater certainty, Nova Scotia agrees to provide an indemnity substantially in the form annexed hereto as Schedule 5 in favour of Scott and the Indemnified Parties (as defined therein).

(c)(ii) Scott shall assume responsibility for the Operation of the Facility after December 31, 1995, and subject to the obligation to undertake the clean up program referred to in Article 4.01(f) Scott shall have no liability, responsibility or obligation whatsoever for Remediation of the Facility.

(e) Nova Scotia agrees to pay the cost of installation of the necessary equipment to establish Point C as the lawful effluent outfall and the cost of upgrading the aeration capacity of the Facility up to a maximum cost of One Million Seven Hundred and Fifty Thousand Dollars ($1,750,000.00) so that the facility has reliable, installed aeration capacity of up to 1,600 hp. It is agreed that Scott or its agents will engineer, manage and complete the conversion of the effluent outfall and upgrading of the aeration capacity of the Facility. It is further agreed that Scott shall be entitled to payment from Nova Scotia of costs incurred by it in converting the outfall and upgrading on capacity of the Facility upon presentation of invoices for work or material Nova Scotia, within (30) days of presentation of invoices. For the purposes of this subarticle, "upgrading the aeration capacity of the Facility" includes, without limitation, engineering studies, opinions on compliance, the purchase and installation of new aerators, the upgrading of electrical equipment, and the purchase of such other equipment or the performance of such other work as may be required, in Scott's discretion.

(f) Scott shall be required to undertake a clean-up program with respect to the Facility at the termination of the Lease, which clean-up program shall consist of the removal of sludge from the Settling Ponds and the ASB and restoration of the Reconfigured Facility to the state it was in at the commencement of the Lease, reasonable wear and tear excepted. For greater certainty, it is agreed that Scott shall have no obligation or responsibility to restore the Stabilization Basin, which restoration will be undertaken by Nova Scotia in its sole discretion.

(g) It is mutually agreed that Nova Scotia shall have no ongoing responsibility for the operation of the Reconfigured Facility following December 31, 1995 (except for those responsibilities that arise as landlord) but Nova Scotia shall remain responsible for Remediation of the Reconfigured Facility at the expiration of the term of the Lease and Nova Scotia shall remain in possession of and responsible for the Stabilization Basin and Nova Scotia agrees not to render the Stabilization Basin a tidal estuary and waters frequented by fish until the Stabilization Basin has been remediated by it in accordance with applicable Environmental Laws.

(h) As soon as it is practical, Nova Scotia agrees to reduce the water level in the Stabilization Basin to eliminate any alleged trespass of the waters therein beyond the ordinary high water mark of the former Boat Harbour. Such reduction shall be done in accordance with applicable Environmental Laws.

(k) Nova Scotia agrees to obtain all required permits, consents, approvals and letters of authorization for the continued operation of the Reconfigured Facility as of the date of transfer, and Nova Scotia will assign all such permits, consents, approvals and letters of authorization and obtain such consents to assignments as may be required. Nova Scotia agrees to impose operating limits on the Facility which reflect and do not exceed or apply more stringently than the standards set out in the Pulp and Paper Effluent Regulations (Canada) and further agrees to obtain all required federal government approvals, if any, to permit the continued operation of the Reconfigured Facility as contemplated in this Agreement.

(n) Nova Scotia agrees that Scott shall be entitled to use the Landfill owned by Nova Scotia adjacent to the Reconfigured Facility during the term of the Lease for ordinary maintenance of the Facility and that the Landfill has sufficient capacity for such use by Scott.

(o) Nova Scotia agrees that the Lease shall not include the Landfill (notwithstanding Scott's right of use set out above) nor shall it include any former landfill or dump sites, which sites shall remain in the possession and control of Nova Scotia.

(p) This Memorandum of Understanding and the indemnities contemplated herein shall enure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

<u>Indemnity Agreement, December 31, 1995</u>

<u>Indemnity by Nova Scotia in Favour of Indemnified Parties</u>

1.01 Notwithstanding any other provision in any Agreement between parties, Nova Scotia shall indemnify and hold Scott Maritimes Limited and Scott Paper Company and their respective officers, directors, shareholders, employees, agents, consultants, advisors and their respective heirs, successors (including successors in title), assigns and legal representatives, shareholders, and their respective officers, directors, shareholders, employees, agents, consultants and advisors (hereinafter referred to as the "Indemnified Parties") harmless from and against any and all:

(a) liabilities, losses, claims, demands, actions, causes of action, damages, (including, without limitation, lost profits, consequential damages, interest, penalties, fines and monetary sanctions) including amounts paid to settle actions, whether before or after litigation or other proceedings or activities of any nature, or to satisfy judgments, orders or directives including, without limitation, any judgment, order or directive imposing joint and several liability on the

Indemnified Parties and any costs (including the cost of diverting or altering components of the Facility in response to Claims), liability or damages:

(i) arising out of the designation of the Facility or Reconfigured Facility as a contaminated site within the meaning of any Environmental Laws;

(ii) arising out of or in any way related to the existence or operation of the Facility by Nova Scotia up to the effective date of this Agreement;

(iii) arising out of any claim based in nuisance, including any claim for a permanent or temporary injunction; or

(iv) any claim arising out of the construction or location of the Facility or Reconfigured Facility, including claims based in trespass whether such claims relate to activities occurring before or after the effective date of this Agreement (hereinafter collectively referred to as "Claims").

(b) legal fees on a solicitor and client basis, consultants fees and all other out-of-pocket expenses arising because of Claims (hereinafter referred to as "Expenses")

incurred or suffered by the Indemnified Parties, whether such Claims and/or Expenses arise under statute or not, which may at any time or from time to time be paid, incurred, claimed or asserted against any of the Indemnified Parties for, with respect to, or as a direct or indirect result of the construction, location or existence of the Facility or Reconfigured Facility or the past operation of the Facility by Nova Scotia including, without limitation:

(A) Claims made and/or Expenses arising due to the presence on or under, or the discharge, escape, seepage, leakage, spillage, emission, exhaust, or release from the Facility into the environment or into or upon land, the atmosphere, or any water course, body of water or wetlands, of any substance, pollutant, waste, contaminant, harmful or hazardous material, fumes, steam, or odour due to or in any way related to the Facility and, without limiting the generality of the foregoing, Nova Scotia undertakes that this Indemnity shall apply to the costs of defending and/or counter-claiming or claiming over and against third parties in such manner as the Indemnified Parties in their sole discretion may determine in respect of any action, proceeding or matter raised in connection with the Facility;

(B) The breach of any Environmental Laws by Nova Scotia;

(C) The trespass of the Facility or any part thereof on adjacent lands or any tort or other common law claim relating to or arising out of the past, present or future use of the Facility, or arising out of the design, construction, location or configuration of the Facility, including any claim for injunction raised in any such claim; and

(D) Subrogation claims made by Her Majesty the Queen in Right of Canada (Canada) pursuant to a Settlement Agreement dated July 20, 1993, between Canada and The Pictou Landing Indian Band.

1.02 The Indemnified Parties shall be held harmless as contemplated herein notwithstanding the provisions of any Ministerial Order or other directive issued or made pursuant to present or future Environmental Laws.

1.03 Without restricting the generality of the foregoing, this undertaking and indemnity shall extend to all Claims made by any person or government made on their own behalf, on the public's behalf (for example in public nuisance) or on behalf of any other party (including, without limitation, claims arising by statute or by subrogation). The undertaking and indemnification set out herein shall remain in full force and effect perpetually following the transfer of responsibility for operation of the Facility from Nova Scotia to Scott Maritimes Limited.

1.04 The foregoing indemnity is intended to provide the broadest possible indemnity to the Indemnified Parties and it is hereby mutually agreed that it is not to be interpreted *contra proferentum* or restrictively but is to be given a broad and liberal interpretation in favour of the Indemnified Parties and is to be construed in a manner consistent with the Memorandum of Understanding.

1.05 Nova Scotia shall not be held responsible hereunder if the fulfilment of any terms hereunder shall be delayed or prevented by civil disorders, wars, acts of enemies, acts of God, or by any other cause not within control of the party whose performance is interfered with, and which by the exercise of reasonable diligence, said party is unable to prevent or eliminate.

Tab 12

THIS INDEMNITY AGREEMENT made the 31st day of December, 1995,

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services

(hereinafter referred to as "Nova Scotia")

- and -

SCOTT MARITIMES LIMITED, a body corporate, under the laws of the Province of Nova Scotia

WHEREAS pursuant to an agreement (the "Memorandum of Understanding") Nova Scotia has agreed to indemnify the Indemnified Parties, as defined herein, against certain Claims and/or Expenses, as defined herein.

IN CONSIDERATION of the sum of One Dollar ($1.00) and other good and valuable consideration, the parties hereby agree as follows:

Indemnity by Nova Scotia in Favour of Indemnified Parties

1.01 Notwithstanding any other provision in any Agreement between the parties, Nova Scotia shall indemnify and hold Scott Maritimes Limited and Scott Paper Company and their respective officers, directors, shareholders, employees, agents, consultants, advisors and their respective heirs, successors (including successors in title), assigns and legal representatives, shareholders, and their respective officers, directors, shareholders, employees, agents, consultants and advisors (hereinafter referred to as the "Indemnified Parties") harmless from and against any and all:

(a) liabilities, losses, claims, demands, actions, causes of action, damages, (including, without limitation, lost profits, consequential damages, interest, penalties, fines and monetary sanctions) including amounts paid to settle actions, whether before or after litigation or other proceedings or activities of any nature, or to satisfy judgments, orders or directives including, without limitation, any judgment, order or directive imposing joint and several liability on the Indemnified Parties and any costs (including the cost of diverting or altering components of the Facility in response to Claims), liability or damages:

(i) arising out of the designation of the Facility or Reconfigured Facility as a contaminated site within the meaning of any Environmental Laws;

(ii) arising out of or in any way related to the existence or operation of the Facility by Nova Scotia up to the effective date of this Agreement;

(iii) arising out of any claim based in nuisance, including any claim for a permanent or temporary injunction; or

(iv) any claim arising out of the construction or location of the Facility or Reconfigured Facility, including claims based in trespass whether such claims relate to activities occurring before or after the effective date of this Agreement (hereinafter collectively referred to as "Claims").

(b) legal fees on a solicitor and client basis, consultants fees and all other out-of-pocket expenses arising because of Claims (hereinafter referred to as "Expenses")

incurred or suffered by the Indemnified Parties, whether such Claims and/or Expenses arise under statute or not, which may at any time or from time to time be paid, incurred, claimed or asserted against any of the Indemnified Parties for, with respect to, or as a direct or indirect result of the construction, location or existence of the Facility or Reconfigured Facility or the past operation of the Facility by Nova Scotia including, **without limitation:**

A. Claims made and/or Expenses arising due to the presence on or under, or the discharge, escape, seepage, leakage, spillage, emission, exhaust, or release from the Facility into the environment or into or upon land, the atmosphere, or any water course, body of water or wetlands, of any substance, pollutant, waste, contaminant, harmful or hazardous material, fumes, steam, or odour due to or in any way related to the Facility and, without limiting the generality of the foregoing, Nova Scotia undertakes that this Indemnity shall apply to the costs of defending and/or counter-claiming or claiming over and against third parties in such manner as the Indemnified Parties in their sole discretion may determine in respect of any action, proceeding or matter raised in connection with the Facility.

B. The breach of any Environmental Laws by Nova Scotia;

C. The trespass of the Facility or any part thereof on adjacent lands or any tort or other common law claim relating to or arising out of the past, present or future use of the Facility, or arising out of the design, construction, location or configuration of the Facility, including any claim for injunction raised in any such claim;

D. Subrogation claims made by Her Majesty the Queen in Right of Canada (Canada) pursuant to a Settlement Agreement dated July 20, 1993, between Canada and The Pictou Landing Indian Band.

1.02 The Indemnified Parties shall be held harmless as contemplated herein notwithstanding the provisions of any Ministerial Order or other directive issued or made pursuant to present or future Environmental Laws.

1.03 Without restricting the generality of the foregoing, this undertaking and indemnity shall extend to all Claims made by any person or government made on their own behalf, on the public's behalf (for example in public nuisance) or on behalf of any other party (including, without limitation, claims arising by statute or by subrogation). The undertaking and indemnification set out herein shall remain in full force and effect perpetually following the transfer of responsibility for operation of the Facility from Nova Scotia to Scott Maritimes Limited.

1.04 The foregoing indemnity is intended to provide the broadest possible indemnity to the Indemnified Parties and it is hereby mutually agreed that it is not to be interpreted *contra proferentum* or restrictively but is to be given a broad and liberal interpretation in favour of the Indemnified Parties and is to be construed in a manner consistent with the Memorandum of Understanding.

1.05 Nova Scotia shall not be held responsible hereunder if the fulfilment of any terms hereunder shall be delayed or prevented by civil disorders, wars, acts of enemies, acts of God, or by any other cause not within control of the party whose performance is interfered with, and which by the exercise of reasonable diligence, said party is unable to prevent or eliminate.

WITNESS WHEREOF Her Majesty the Queen in Right of the Province of Nova Scotia executed this Agreement as of the day and year first above written.

SIGNED, SEALED AND DELIVERED)
in the presence of:)

HER MAJESTY THE QUEEN in right of the Province of Nova Scotia, as represented by the Minister of Supply and Services

Per: _____

SCOTT MARITIMES LIMITED

Per: _____

Per: _____

DATED: December 31, 1995

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services

- and -

SCOTT MARITIMES LIMITED, a body corporate, under the laws of the Province of Nova Scotia

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INDEMNITY AGREEMENT

McInnes Cooper & Robertson
Summit Place
1601 Lower Water Street
P.O. Box 730
Halifax, NS B3J 2V1

BM-468/9798

BFM/dlb (570461.03)

Tab 13

THIS LEASE made the 31st day of December, 1995,

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services

(hereinafter referred to as "Landlord")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of Nova Scotia (hereinafter referred to as "Scott")

(hereinafter referred to as (the "Tenant"),

WHEREAS pursuant to an agreement (the "Memorandum of Understanding") the Landlord has agreed to lease to the Tenant certain lands more particularly described in Schedule 2 hereto (the "Lands"), together with fixtures presently standing thereon, for a term of ten (10) years.

IN CONSIDERATION of the rents hereby reserved and the covenants contained on the part of the Tenant, the Landlord grants this lease to the Tenant and the parties hereby agree as follows:

1. **Definitions and Interpretation**

(a) Definitions. The following expressions, where used in this lease mean:

(i) "Memorandum of Understanding" means the agreement dated the 1st day of December, 1995, between the Landlord and the Tenant;

(ii) "Lands" means the Lands in the County of Pictou in the Province of Nova Scotia more particularly depicted as outlined in red on the Plan annexed hereto as Schedule 2;

(iii)" Reconfigured Facility" or "Facility" means the Effluent Treatment System which consists of a pipeline for the transmission of effluent from the Mill commencing at a standpipe located on Scott's property at Abercrombie Point, Pictou County, Nova Scotia, and leading under the East River and discharging into Settling Ponds at Boat Harbour, the Settling Ponds, and ASB and discharging into Boat Harbour at Point C (which Point C shall

become the "Effluent Outfall" of the Reconfigured Facility after the upgrades contemplated herein are satisfactorily completed and the Reconfigured Facility can be operated in compliance with Environmental Laws at Point C) and all other appurtenances affixed or appended thereto, more particularly depicted on the Plan attached hereto as Schedule 2 and all lands and facilities necessary to permit the receipt and lawful disposal of effluent from the Mill, commencing at the said standpipe;

(iv) "Indemnified Parties" has the meaning ascribed to it in the Indemnity Agreement bearing even date herewith;

(v) "Environmental Laws" means all applicable laws, statutes, ordinances, rules, by-laws, guidelines, treaties, and Regulations, and all applicable directives, rules, standards, requirements, policies, orders, judgments, injunctions, or decrees which have the force of law or which are capable of having the force of law, with respect to environmental or health matters including, without limitation, the following: the *Fisheries Act* (Canada), the *Canadian Environmental Protection Act*, the *Canadian Environmental Assessment Act*, the *Transportation of Dangerous Goods Act* (Canada), the *Navigable Waters Protection Act* (Canada), the *Environmental Act* (Nova Scotia), the *Occupational Health and Safety Act* (Nova Scotia), the *Indian Act* (Canada), and any Regulations or guidelines made pursuant to the foregoing;

(vi) "Term" means the term of this lease as set out in paragraph 3;

(b) Interpretation. The captions and headings in this lease are for convenience of reference only, and do not affect the scope, intent, or interpretation of any provision. This lease is governed by the laws of the Province of Nova Scotia. This lease shall be construed in accordance with and subject to the Memorandum of Understanding and does not supersede the said Memorandum of Understanding and it is confirmed that the entry into this Lease does not result in a novation of the Memorandum of Understanding.

2. **Grant**

The Landlord leases to the Tenant the Lands together with the Existing Buildings and all fixtures and improvements forming part of the Facility thereon, for the Term.

3. **Term**

Term. To hold the Lands, the Facility, and all buildings, fixtures and improvements from time to time upon or appurtenant thereto for the term of ten (10) years commencing on the 31st day of December, 1995.

4. **Rent**

The Tenant shall pay to the Landlord at the commencement term of the rent of One Dollar ($1.00) as full rental for the term, the receipt and sufficiency of which is hereby acknowledged by the Landlord.

5. **General Covenants of Landlord and Tenant**

(a) General covenant of the Tenant. The Tenant covenants with the Landlord:

(i) to pay rent; and

(ii) to observe and perform all the covenants, and provisos of this lease on the part of the Tenant to be observed and performed.

(b) General covenant of the Landlord. The Landlord covenants with the Tenant:

(i) for quiet enjoyment;

(ii) to observe and perform all the covenants, and provisos of this lease on the part of the Landlord to be observed and performed; and

(iii) to indemnify the Indemnified Parties as set out in the Indemnity Agreement bearing even date herewith.

6. **Ownership of Facility and Fixtures**

(a) Tenant's ownership of Facility and Fixtures installed during Term. The Landlord and the Tenant agree that any buildings and all fixed improvements which the Tenant may construct upon the Lands from time to time are and are intended to remain the absolute property of the Tenant upon the expiration of this lease, and are deemed as between the Landlord and the Tenant during this lease, to be the separate property of the Tenant and not the Landlord but subject to and governed by all the provisions of this lease applicable thereto. The Landlord and the Tenant further agree that during the term of the Lease the Tenant shall be considered the Owner of the Facility for all purposes.

(b) Removal of Tenant's Fixtures. The Tenant may at or immediately before the expiration of the term of this lease, remove its fixtures, chattels and other property and the Tenant may from time to time remove such fixtures in the ordinary course of its business or in the event of any reconstruction, changes and alterations to the Lands.

7. (a) **Real Estate Taxes**

Real estate taxes. The Landlord shall be responsible for all real estate taxes which may at any time during the Term be imposed, assessed or levied in respect of the Landlord's reversionary interest in the premises. The Tenant shall be responsible for all real estate taxes and occupancy taxes which may at any time during the Term be imposed, assessed or levied in respect of the Tenant's leasehold interest in the premises or its occupation of the premises.

(b) Utility charges. The Tenant shall pay or cause to be paid when due all charges for electricity, light, heat, power, telephone and other utilities and services used in or supplied to the Lands throughout the Term of this lease.

8. **Maintenance of Facility**

The Tenant shall throughout the Term at its own expense keep in good and tenantlike repair, the Facility and all structures, improvements and fixtures at any time erected upon the Lands and subject to its right to make alterations and remove fixtures, the Tenant shall, at the end of the term, give up possession of the Facility in a state similar to its state of repair at the commencement of the lease, reasonable wear and tear excepted.

9. **Changes and Alterations in Facility**

The Tenant has the right from time to time during the Term to make changes, alterations, additions, extensions or rebuildings, structural or otherwise (collectively called "Improvements") in and to the Facility as the Tenant thinks necessary, provided, however, that the Tenant shall, if requested to do so by the Landlord, restore the premises to the condition they were in at the commencement of the Lease, reasonable wear and tear excepted.

10. **Construction Liens**

The Tenant shall not permit any lien under the *Mechanics' Lien Act* or any like statute to be filed or registered against the Lands, the Facility or any fixtures or Improvements on the Lands, by reason of work, labour, services or material supplied or claimed to have been supplied to the Tenant or anyone holding any interest in any part thereof

through or under the Tenant. If any lien is at any time filed or registered the Tenant shall procure registration of its discharge within twenty days after the lien has come to its notice or knowledge; provided that if the Tenant desires to contest in good faith the amount or validity of any lien and has no notified the Landlord, and if the Tenant has deposited with the Landlord or with the trustee, or paid into court to the credit of any lien action, the amount of lien claimed plus a reasonable amount for costs, then the Tenant may defer payment of the lien claim for a period of time sufficient to enable the Tenant to contest the claim with due diligence, provided always that neither the Lands nor the Facility or any part thereof, nor the Tenant's leasehold interest therein thereby becomes liable to forfeiture or sale.

11. **Assignment and Other Dealings by Landlord**

Right of Landlord to deal with reversion. Nothing contained in this lease prohibits or restricts the Landlord or implies any prohibition or restriction from transferring or otherwise dealing with its reversionary interest in the Lands but subject always to this lease and the rights of the Tenant hereunder. The Landlord covenants not to assign its rights under the Lease without the prior written consent of the Tenant.

12. **Indemnity**

The Landlord hereby restates its indemnity obligations as set out in Schedule 5 of the Memorandum of Understanding and the Indemnity Agreement bearing even date herewith.

13. **Notices**

Any notice, election, demand or exercise of option to which a party to this lease is entitled or required to give is deemed to have been duly given to any other party if in writing and delivered personally.

14. **Compliance with Laws Generally**

In addition to complying with the requirements of the lease, the Tenant shall ensure, in its use and occupation of the Lands and Facility and other fixtures and Improvements on the Lands, and in the conduct of its business thereon, and in the maintenance and repair thereof, and as to all other matters or things pertaining to the Lands, compliance with all laws, by-laws, statutes, orders and regulations of all governmental authorities having jurisdiction and the Landlord shall provide all reasonable assistance to the Tenant to comply therewith.

15. **Binding Effect**

This lease and the covenants and agreements herein contained extend to and enure to the benefit of and are binding upon the Landlord, the Tenant, and their respective heirs, executors, successors and assigns, according to the purport and intent of their respective covenants and agreements.

16. **Force Majeure**

Neither party shall be held responsible for any losses resulting if the fulfilment of any terms hereunder shall be delayed or prevented by civil disorders, wars, acts of enemies, acts of God, or by any other cause not within control of the party whose performance is interfered with, and which by the exercise of reasonable diligence, said party is unable to prevent or eliminate.

WITNESS the parties have properly executed this Lease as of the day and year first above written.

SIGNED, SEALED AND DELIVERED)
in the presence of:)

Don Brien

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA
as represented by the Minister
of Supply and Services

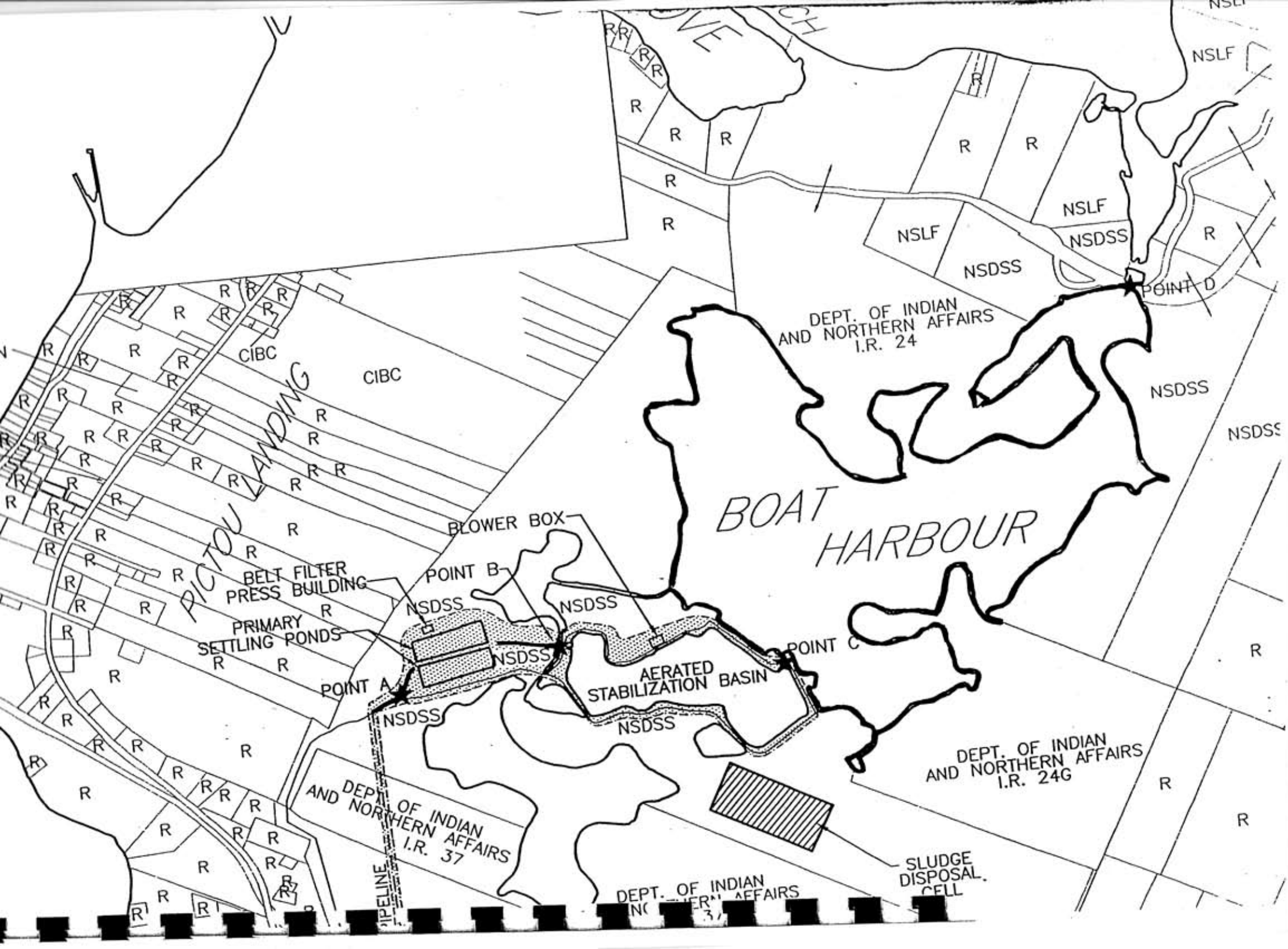
Per: Gerald J. Mallon

SCOTT MARITIMES LIMITED

Per: E. A. Byrne

Schedule 2

The Leased Premises consist of the pipeline for the transmission of effluent commencing at a Standpipe located on Scott's property at Abercrombie Point, Pictou County and leading under the East River and discharging into settling ponds at Boat Harbour together with the shaded area on the attached plan together with a right-of-way over the existing roadway to the Sludge Disposal Cell.


BOAT HARBOUR
PICTOU LANDING
CIBC
CIBC
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 24
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 37
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 24G
DEPT. OF INDIAN
BLOWER BOX
POINT A
POINT B
POINT C
POINT D
BELT FILTER PRESS BUILDING
PRIMARY SETTLING PONDS
AERATED STABILIZATION BASIN
SLUDGE DISPOSAL CELL
PIPELINE
NSDSS
NSLF
R

DATED: December 31, 1995

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services

(hereinafter referred to as "Landlord")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of Nova Scotia (hereinafter referred to as "Scott")

(hereinafter referred to as (the "Tenant"),

LEASE

McInnes Cooper & Robertson
Summit Place
1601 Lower Water Street
P.O. Box 730
Halifax, NS B3J 2V1

BFM/dlb (550800.04)

M-2704/9798

THIS LICENSE AGREEMENT made this 31st day of December, 1995.

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services;

(hereinafter referred to as "Licensor")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of the Province of Nova Scotia;

(hereinafter referred to as "Licensee")

WHEREAS the Licensor owns a tract of land covered with water, at Boat Harbour, in the County of Pictou, Province of Nova Scotia, as depicted on the Plan annexed hereto as Schedule 2;

AND WHEREAS the Licensee will operate the Boat Harbour Effluent Treatment Facility (the "Facility") on lands owned by it by lease, which are shaded on the Plan annexed hereto as Schedule 2 hereof;

AND WHEREAS the Licensor has agreed to grant the Licensee a right to use the lands of the Licensor to permit the Licensee to operate the Facility so that the effluent outfall of the Facility is Point D, as depicted on Schedule 2;

NOW THEREFORE IN CONSIDERATION of the mutual covenants contained in this License, the parties agree as follows:

1. The Licensor hereby grants to the Licensee authorization to use and enter upon the lands of the Licensor as shown outlined in red on the Plan attached hereto as Schedule 2 for the sole purpose of transmitting effluent from the Facility to Point D;

2. The License granted herein may be terminated by the Licensor by giving written notice upon any of the following events:

   (a) the Licensee ceasing to operate the Facility at the premises described in Schedule "B" hereof;

(b) the Licensee completing upgrades to the Facility which permit the effluent outfall to be changed to Point C, as depicted on Schedule "A" and the Licensee confirming in writing that the License is terminated;

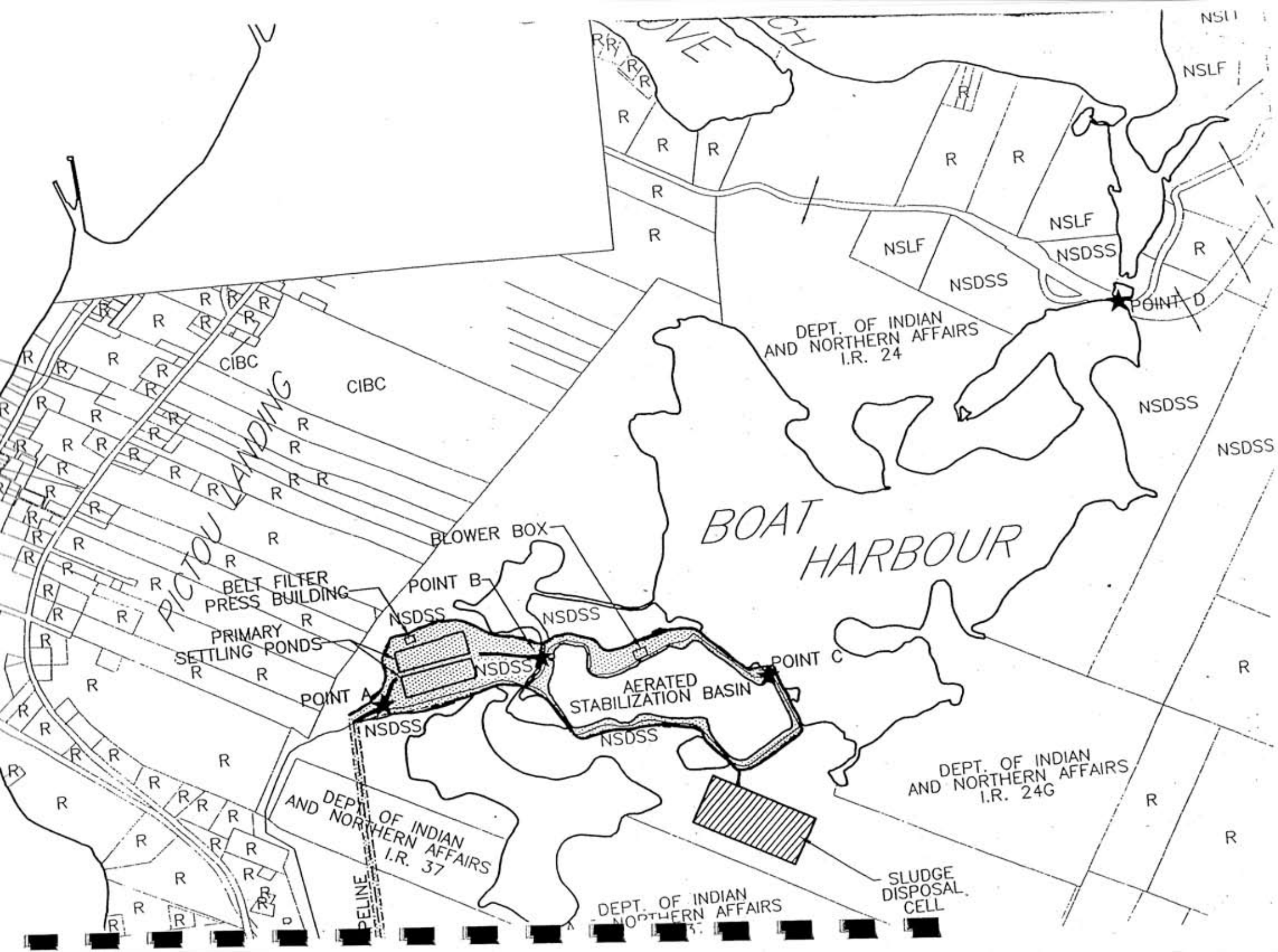
(c) the mutual agreement of the parties, evidenced in writing;

3. Unless sooner terminated in accordance with paragraph 2, this License will terminate ten (10) years from the date hereof;

SIGNED, SEALED AND DELIVERED)
in the presence of)
)
)
)
)
)
)
)
)
)
)

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA
as represented by the Minister of
Suppy and Services

Per: _____


BOAT HARBOUR
PICTOU LANDING
CIBC
CIBC
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 24
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 24G
DEPT. OF INDIAN AND NORTHERN AFFAIRS I.R. 37
DEPT. OF INDIAN AND NORTHERN AFFAIRS
PELINE
BLOWER BOX
BELT FILTER PRESS BUILDING
PRIMARY SETTLING PONDS
AERATED STABILIZATION BASIN
SLUDGE DISPOSAL CELL
POINT A
POINT B
POINT C
POINT D
NSDSS
NSLF
R

DATED: December , 1995

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Supply and Services;

(hereinafter referred to as "Licensor")

- and -

SCOTT MARITIMES LIMITED, a body corporate under the laws of the Province of Nova Scotia;

(hereinafter referred to as "Licensee")

LICENSE AGREEMENT

Bernard F. Miller
McInnes Cooper & Robertson
Summit Place
1601 Lower Water Street
P.O. Box 730
Halifax, NS B3J 2V1

BFM/dlb (571503)

BM-468/9798

Tab 15

000564

THIS LEASE EXTENSION AGREEMENT made this 22 day of October, 2002.

PICTOU COUNTY REGISTRY OF DEEDS
Document # 1955
Book 1458
Pages 5164-5166
I certify that this document was registered as shown here.
MAY 16 2003
10:42am
C. Darlene Dixon Registrar
MM DD YYYY
Time

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA, as represented by the Minister of Transportation and Public Works

(the "Landlord")

- and -

KIMBERLY-CLARK INC., a body corporate carrying on business in Nova Scotia under the name and style Kimberly Clark Nova Scotia

(the "Tenant")

WHEREAS pursuant to a lease made the 31st day of December, 1995 (the "Lease") the Landlord leased to Scott Maritimes Limited certain lands and premises known as the Boat Harbour Effluent Treatment Facility (defined therein as the Facility), for a term of ten (10) years commencing on the 31st day of December, 1995 (the "Initial Term");

AND WHEREAS the Tenant is the lawful successor to Scott Maritimes Limited;

AND WHEREAS a Notice of Lease and License made the 6th day of May, 1996 was registered at the Registry of Deeds office at Pictou, in the County of Pictou (the "Registry") on the 6th day of May, 1996 in Book 1203 at pages 483 to 487 as Document 2281 to give notice of, *inter alia*, the Lease (The Notice incorrectly identified the tenant, Kimberly-Clark Inc. as Kimberly Clark Nova Scotia Inc.);

AND WHEREAS the parties have agreed to amend the lease to extend the term for a further twenty five (25) years after the Initial Term;

AND WHEREAS the Tenant proposes to install a pipeline to form part of the Facility and the parties have agreed to provide for the grant of an easement in connection therewith.

NOW THEREFORE in consideration of the Premises and the sum of one dollar ($1.00) now paid by the Tenant to the Landlord (the receipt and sufficiency of which is hereby acknowledged), the parties hereby agree as follows:

1. **Extension of Term of Lease**

1.01 Article 3 of the Lease is hereby deleted and replaced with the following:

"Term: to hold the Lands, the Facility, and all buildings, fixtures and improvements from time to time upon or appurtenant thereto for a term of thirty five (35) years commencing on the 31st day of December, 1995."

2. Agreement to Grant Easement for Pipeline through Boat Harbour

2.01 The Landlord agrees to grant to the Tenant an easement for the remaining term of the Lease to enable the Tenant to install and operate a pipeline for the transmission of effluent from that point designated as point C on the plan attached to the Lease to a point in the vicinity of point D as designated on the said plan. The final location of the easement will be determined when the Tenant completes its detailed engineering design of the pipeline and the Landlord hereby agrees to provide a formal easement suitable for registration at the Registry when the location of the pipeline is finally determined after the detailed engineering plans are developed.

3. General Matters

3.01 **Governing law**: This Agreement shall be governed by and construed in accordance with the laws of Nova Scotia and the laws of Canada applicable therein.

3.02 **Assignment**: This Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

3.03 **Further Assurances**: The parties hereto shall do such further acts, execute and deliver such further documents and give such further assurances as may be necessary or desirable to give full effect to this Agreement and the Lease.

3.04 **Confirmation of Recitals**: The Parties hereto confirm the truth and accuracy of the recitals set out herein.

IN WITNESS WHEREOF the Parties hereto have set their hands and affixed their seals on the day and year first written above.

SIGNED SEALED AND DELIVERED in the presence of:

Witness

Witness

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NOVA SCOTIA as represented by the Minister of Transportation and Public Works

Per:

KIMBERLY-CLARK INC.

Witness

Witness

Per:

Per:

PROVINCE OF NEW BRUNSWICK

ON THIS 17 day of April, 2003, before me the subscriber personally came and appeared, BERNARD F. MILLER, a subscribing witness to the foregoing Indenture, who having been by me duly sworn, made oath and said that **KIMBERLY-CLARK INC.**, one of the parties thereto, caused the same in to be executed in its name and on its behalf by its proper officer(s) duly authorized in that behalf, his/her presence.

A Notary Public in and for
the Province of New Brunswick

BRIGITTE SIVRET NOTARY PUBLIC NEW BRUNSWICK

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

April 9, 2015

The Honourable Randy Delorey
Minister of Environment
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Dear Minister Delorey:

Re: Industrial Approval No. 2011-076657-A01
Appeal pursuant to Section 137 of the *Environment Act*

Northern Pulp Nova Scotia Corporation ("Northern Pulp") appeals Industrial Approval No. 2011-076657-A01 (the "Approval") issued by Jay Brenton of the Nova Scotia Department of Environment (the "Department") on March 9, 2015 for the operation of Northern Pulp's mill in Abercrombie Point, Nova Scotia (the "Mill").

Northern Pulp makes this appeal (the "Appeal") to you, the Minister of Environment, pursuant to section 137 of the *Environment Act*, SNS 1994-1995, c 1 (the "Act"). In the sections below, Northern Pulp states its reasons for this Appeal, outlines its specific objections to various provisions in the Approval and sets out its requested relief.

While Northern Pulp considers it necessary to proceed with this Appeal to protect the long term economic viability of the Mill, Northern Pulp remains open to working with the Department and the Province to achieve a long term solution with respect to the Mill.

SUMMARY OF APPEAL

In summary, Northern Pulp requests that certain provisions (identified below) of the Approval be removed or revised on the grounds that these provisions:

(i) are in breach of the Province's contractual obligations to Northern Pulp under various agreements (which agreements the Department refused to consider in issuing the Approval) and impose conditions that in essence seek to achieve indirectly what the Province is not permitted to do directly, namely, require Northern Pulp to cease using its current effluent treatment facility ("Effluent Treatment Facility");

(ii) impose conditions that are impossible to meet and/or are prohibitory rather than regulatory in nature;

(iii) impose conditions that are too vague or uncertain;

Northern Pulp Nova Scotia Corporation, a Paper Excellence Company
P.O. Box 549, Station Main, New Glasgow, NS B2H 5E8
260 Granton Abercrombie Branch Road, Abercrombie, NS B2H 5C6
T: 902.752.8461 | F: 902.752.9149 | info@northernpulp.com
www.northernpulp.com | www.paperexcellence.com

(iv) are unrealistic and otherwise unreasonable; and/or

(v) are inconsistent with the protection granted to Northern Pulp by the *Freedom of Information and Protection of Privacy Act* ("FOIPOP").

Northern Pulp respectfully requests that you exercise your powers under Section 137(4) of the Act to allow Northern Pulp's Appeal and remove or revise the provisions of the Approval as further outlined in this letter. Doing so would ensure that the Approval contains conditions that: (i) do not breach the Province's obligations under the various agreements between the Province and Northern Pulp and do not effectively require Northern Pulp to change the location of its current Effluent Treatment Facility; (ii) are not impossible to achieve and are regulatory rather than prohibitory in nature; (iii) are not vague or uncertain, (iv) are realistic and otherwise reasonable; and (v) are not inconsistent with the protection granted under FOIPOP.

GROUNDS OF APPEAL

I. Department's Refusal to Consider Province's Contractual Obligations - Section 8(2)(c) of the Act

As you are aware, Northern Pulp and the Province are parties to a number of agreements in respect of the operation of the Mill, including:

1) Memorandum of Understanding dated December 1, 1995 ("MOU");

2) Lease dated December 31, 1995 ("Lease");

3) License Agreement dated December 31, 1995;

4) Indemnity Agreement dated December 31, 1995 ("Indemnity Agreement");

5) Water Supply Agreement dated June 30, 1995 ("Water Supply Agreement");

6) Lease Extension Agreement dated October 22, 2002; and

7) Acknowledgement Agreement by the Province dated May 12, 2008 ("Acknowledgement Agreement").

(collectively, the "Agreements").

Northern Pulp wrote to you on December 18, 2014 in order to ensure that the Department reviewed the Approval in light of the Province's contractual obligations to Northern Pulp under the Agreements prior to issuing the final Approval. In addition, Northern Pulp requested a joint meeting with the Department of Environment and Department of Internal Services to discuss how a long term solution can be achieved in compliance with the terms of the Agreements and the Approval.

In a letter dated January 8, 2015, you responded: "While my department is aware of the existence of agreements between the Province and your company, the Province has maintained independence between the regulation of environmental issues and management of the various agreements with the mill." You encouraged Northern Pulp to meet with Internal Services to discuss the Agreements and any implications that may arise from the issuance of the Approval

by your Department, thereby refusing Northern Pulp's request to meet jointly with Northern Pulp and Internal Services.

Your express refusal to consider the Province's various contractual obligations in issuing the Approval and your refusal to meet jointly with Northern Pulp and Internal Services as requested by Northern Pulp is not in compliance with the mandatory requirement of Section 8(2)(c) of the Act which provides:

> 8 (2) The Minister, for the purposes of the administration and enforcement of this Act, and after engaging in such public review as the Minister considers appropriate, shall
>
> [...]
>
> (c) consult with and co-ordinate activities with other departments, Government agencies, municipalities, governments and other persons; [emphasis added]

Any provision in the Approval which is inconsistent with the provisions of the Agreements is necessarily the result of the Department's refusal to consider those Agreements when it issued the Approval. Northern Pulp submits that those provisions of the Approval are unreasonable due to the failure of the Department to comply with the process of consultation and co-ordination required by its own governing statute in issuing the Approval.

In the Acknowledgement Agreement, the Province acknowledged, agreed and confirmed that each of the Agreements and understandings between the Province and the Mill's prior owner Scott Maritimes Limited ("Scott") are in good standing and will continue in full force and effect for the benefit of Northern Pulp.

Northern Pulp's current owners acquired the shares of Northern Pulp and have continued to invest substantial amounts in the Mill on the understanding that the Province could and would comply with its obligations under the Agreements. It is not unreasonable to anticipate and expect that government will comply with the contracts which it has entered into. It is unreasonable for the Department to issue the Approval with a stated disregard for those contractual obligations. Northern Pulp does not waive any of its rights under any of the Agreements.

Northern Pulp submits that, taken together, the objectionable conditions included by the Department in the Approval that are in breach of the Province's obligations under the Agreements are an attempt by the Department to indirectly achieve the Province's stated goal of closing the Effluent Treatment Facility (see, e.g., Agreement in Principle between the Province and Pictou Landing First Nation dated June 16, 2014). These provisions would force Northern Pulp to apply for an approval for and build an alternative effluent treatment system that meets conditions that would be applicable to a substantially new Mill. This is a goal which cannot be achieved directly under the Agreements which the Province has entered into with the Mill's owners or under the Department's own regulatory jurisdiction. Government cannot do indirectly what it cannot do directly and it is unreasonable for the Department to seek to do so by imposing conditions as part of a regulatory approval process aimed at achieving that indirect goal.

These provisions of the Approval, in addition to being in breach of the Province's obligations under the Agreements, impose conditions which are unreasonable for a mill that was built in the 1960s to meet without requiring that a substantially new Mill be built. While Northern Pulp has

invested in upgrades at the Mill, such equipment modifications will not achieve the requirements of the Approval. The Approval therefore essentially prohibits Northern Pulp from operating the current Mill, and requires Northern Pulp to construct a substantially new Mill, in breach of the Agreements. The cumulative cost and uncertainty associated with the approval and construction of a new effluent treatment system jeopardize the long term economic viability of the Mill and is inconsistent with the Agreements.

Government cannot arbitrarily revoke Northern Pulp's contractual rights under the Agreements with the Province by way of an administrative approval process. Any re-negotiation of Northern Pulp's rights or the Province's obligations under the Agreements must necessarily be the result of written amendment to the Agreements. Northern Pulp approached the Department and the Province indicating that it was prepared to cooperatively work with the Province, as stated in Northern Pulp's December 18, 2014 letter to you:

> "We look forward to working with your department and Internal Services. We hereby request a meeting the first week of January with Internal Services and Nova Scotia Environment to discuss how a long term solution can be achieved in compliance with the terms of the above agreements and the Industrial Approval."

Absent any such cooperation between the Province and Northern Pulp, certain provisions of the Approval cannot reasonably stand given their clear breach of Northern Pulp's rights and the Province's obligations under the Agreements. Any provision in the Approval that is inconsistent with the Agreements must be removed or revised so that the Approval is consistent with the Agreements, including:

A. Definition of Effluent Treatment System – Clause 1(t)

The defined term "Effluent Treatment System" in Clause 1(t) of the Approval now includes the "former stabilization lagoon (known as Boat Harbour)". The defined term "Effluent Treatment System" is included as part of the definition of "Facility" and both terms are referred to throughout the Approval. Northern Pulp has never leased and has never been in control of Boat Harbour. The Mill discharges effluent into Boat Harbour at Point C in compliance with its obligations under applicable approvals and regulations, and has received a broad indemnification from the Province for claims and expenses related to Boat Harbour.

Under Section 4.01(g) of the MOU, the Province remained in possession of and responsible for the stabilization basin. The Lease definition of "Reconfigured Facility" or "Facility" makes it clear that the stabilization basin is not included as part of the Facility. Any terms in the Approval which impose responsibility on Northern Pulp for the stabilization basin known as Boat Harbour ("Boat Harbour") by virtue of:

- including the "former stabilization lagoon (known as Boat Harbour)" into the definition of Effluent Treatment System, including Clauses 5(h) and (i), 6 (h) and (i), 7(j) and (n), 12(au) and 16(b); or

- indirectly including the "former stabilization lagoon (known as Boat Harbour)" into the definition of the Facility, including Clauses 2(c), 3(a), 12(ac) and (am), 24(a) and 25(a),

are inconsistent with the terms of the Lease and Indemnity Agreement.

Northern Pulp therefore requests that the reference to the "former stabilization lagoon (known as Boat Harbour)" be removed from Clause 1(t) of the Approval.

B. Responsibility for Restoration of Stabilization Basin - Clause 7(n)

Clause 7(n) of the Approval requiring Northern Pulp to develop a plan for the long term environmental management and/or rehabilitation of Boat Harbour is expressly contrary to the Agreements. Under Sections 4.01(g) and 4.01(c)(ii) of the MOU, that responsibility falls upon the Province. Further, Section 4.01(f) of the MOU provides that Northern Pulp shall have no obligation or responsibility to restore the stabilization basin, which restoration will be undertaken by the Province. Northern Pulp is entitled to indemnification for any such costs under the broad provisions of the Indemnity Agreement.

Northern Pulp therefore requests that Clause 7(n) be removed from the Approval.

C. Spill Containment Plans – Clauses 14(m) and 14(n)

Clauses 14(m) and 14(n) require Northern Pulp to submit plans to the Department with respect to spill containment. However, Northern Pulp under the Lease is entitled to the use of the Effluent Treatment Facility until 2030 and presently uses that facility for spill containment, which use has been wholly adequate to date.

Requiring Northern Pulp to undertake a new spill containment system when Northern Pulp already has an adequate containment system available to it, which it is contractually entitled to use, provides no additional benefit to the environment and is in breach of the Province's obligations under the Agreements. As Northern Pulp's current system is adequate to protect the public and environment, Clauses 14(m) and 14(n) are inappropriate. Requiring Northern Pulp to undertake a new spill containment system would also be in breach of Northern Pulp's contractual rights under the Agreements. Northern Pulp requests that these Clauses be removed entirely.

D. Water Supply Agreement – Clauses 5(d) and 5(e)

Clause 5(d) of the Approval limits daily water consumption to a rate of 63,000 cubic meters per day by January 30, 2020. For comparison purposes, this represents an intensity of 72.2 m3/Adt. Clause 5(e) of the Approval also requires Northern Pulp to achieve certain water reduction milestones in the meantime. Clause 2.01 of the Water Supply Agreement says that the Province is obliged to continue to supply up to 25 million imperial gallons (or 113,652 m3) of fresh water per day to the Mill until 2021.

The intention of the parties in agreeing to the Water Supply Agreement is clearly contravened by the reductions required by Clauses 5(d) and 5(e) of the Approval. Northern Pulp remains willing to work cooperatively with the Department, as part of an overall negotiation with the Province with respect to the Agreements, to achieve water reductions that benefit the environment but are also practical and realistic. In the absence of such discussions, however, Northern Pulp requests that Clauses 5(d) and 5(e) be removed as they are clearly in breach of the Province's obligations under the Water Supply Agreement and are therefore unreasonable.

E. Surface Run-Off Diversion - Clause 6(c)

The AMEC Report[1] at p. 26 estimates that surface run-off accounts for 2.0 m3/ADt of effluent (rain water entering process sewers). See enclosed KSH Memo[2], at p. 6-8, where KSH has provided more extensive calculations that indicate a similar volume. As a very small fraction of the total flow (less than 1.5% of the total effluent flow for the highest month of the year, April), requiring Northern Pulp to divert surface run-off water into the Pictou Harbour is unreasonable.

Northern Pulp's current practice with respect to the surface run-off stream is to treat it with the Mill effluent, which system (as discussed above in Section I.C.) Northern Pulp is entitled to use until 2030. Clause 6(c) is improper as Northern Pulp's current system is adequate in protecting the public and environment and requiring Northern Pulp to undertake a new surface run-off water diversion program would be in breach of Northern Pulp's contractual rights under the Agreements.

Therefore, Northern Pulp requests that Clause 6(c) be removed.

F. Point D Monitoring – Clause 7(o)

Clause 7(o) requires monitoring at Point D for the parameters in Table 6 of Appendix A. As Northern Pulp's obligations cease at Point C under the Agreements, Northern Pulp cannot properly be responsible for monitoring at Point D, a location in the control of the Province. Northern Pulp therefore requests that Clause 7(o) be removed entirely.

G. Limits in Excess of Pulp & Paper Effluent Regulations – Clauses 6(e), 6(f), 8(d) and 8(f)

Section 4.01(k) of the MOU provides that the Province will impose operating limits on Northern Pulp that reflect and do not exceed or apply more stringently than the standards set out in the *Pulp and Paper Effluent Regulations* (Canada) ("PPER").

As the PPER does not contain limits on COD and TRS, the Approval under Clause 6(e), with respect to COD, and Clause 8(d), with respect to TRS, imposes more stringent operating limits on the Mill than are reflected in the PPER.

Further, to the extent that limits on COD have a limiting effect on BOD, the required reductions in COD under Clause 6(e) of the Approval result in more stringent conditions being imposed on the Mill, notwithstanding that Table 6 of the Approval indicates that limits for BOD are at the rate set by the PPER.

BOD_5 (Biochemical Oxygen Demand) is the amount of oxygen required to biologically oxidize the soluble components in an effluent sample incubated for a 5-day period. It is a measure of easily biodegradable organics that can be utilized as food by naturally occurring organisms. BOD_5 is an indirect measure of how the easily biodegradable organics in the effluent will consume dissolved oxygen in the receiving waters as natural microorganisms consume these

---

[1] The Department indicated to Northern Pulp that AMEC was consulted during the development of the Approval. The April, 2010 AMEC Report entitled "Boat Harbour Return to Tidal Re-Evaluation Final Report" ("AMEC Report") is the latest report that was made available to Northern Pulp.

[2] Memo from KSH Solutions Inc. ("KSH") dated March 31, 2015 entitled "Technical Assistance with Appeal of Final Industrial Approval" ("KSH Memo").

organics, thus potentially affecting flora and fauna due to reduced dissolved oxygen concentrations. COD (Chemical Oxygen Demand) is the amount of oxygen required to chemically oxidize the soluble components in an effluent sample. COD is a measure of all organics (lower molecular weight biodegradable and higher molecular weight non-biodegradable) as well as oxidizable inorganics.

COD will always be the greater of the two, as BOD_5 is a percentage of COD. It is generally accepted that COD and BOD share an empirically demonstrated relationship. Fairly regular relationships exist between COD and BOD_5 for any given industrial or municipal wastewater stream. Once the average COD:BOD_5 ratio for a particular wastewater stream is established, a relatively simple and quick 1-hour COD test can be used to predict BOD_5 with relative reliability. This is why COD tests are often done, but rarely reported. Kraft mill lignin and cellulose contain both low and high molecular weight organics. Therefore, any measures undertaken to reduce COD at the Mill will undoubtedly reduce BOD_5 as well, in breach of the MOU. See enclosed Klopping report at p. 3-4.[3]

As a result of the inconsistency of these provisions with the MOU, Northern Pulp submits that Clauses 6(e) and 8(d) are unreasonable and therefore requests that these provisions, as well as the related provisions at Clauses 6(f) and 8(f), be removed.

H. Precluding Use of Boat Harbour Effluent Treatment Facility – Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A

Under the Lease, as extended, Northern Pulp has the right to exclusive possession and occupation of the Effluent Treatment Facility until 2030. The provisions of the Approval that effectively preclude Northern Pulp from using the Effluent Treatment Facility for the Mill's operations are inconsistent with the provisions of the Lease, including Clauses 5(b) and Clause 14 of the Lease.

The effect of Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) of the Approval is to require Northern Pulp to apply for an amendment to the Approval if Northern Pulp's modeling of water use reduction projects shows that the final wastewater effluent quality will not meet the requirements of Table 6 of the Approval, without modification or addition to the Effluent Treatment System as configured as of the date of the Approval. The application for an amendment must include a plan for alternative effluent management and/or treatment designed to meet the requirements of Table 6A of the Approval.

These provisions make it clear that the Department intends to require Northern Pulp to discharge its effluent at a treatment facility at a location which has yet to be determined if it is unable to comply with the conditions imposed. By specifically not contemplating or providing a means for compliance to be achieved through modifications or additions to the current Effluent Treatment System, the Province is in breach of the Agreements with Northern Pulp that entitle Northern Pulp to use the Effluent Treatment Facility until 2030. The estimated capital cost of constructing a new effluent treatment plant is in excess of $100 million.

Northern Pulp therefore requests that any Clause in the Approval which contemplates that Northern Pulp cease using the Effluent Treatment Facility prior to 2030, including Clauses 5(h), 5(i), 5(j), 6(h), 6(i) and 6(j) and Table 6A, be removed.

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[3] Report from Paul H. Klopping dated April 8, 2015 ("Klopping Report"). Paul Klopping has been auditing the Mill since 2005.

I. Rehabilitation Plans – Clause 24

Clause 24(a) of the Approval provides that Northern Pulp must submit a detailed closure plan to the Department one year prior to the decommissioning or closure of the Facility or any part thereof. To the extent that the definition of Facility in the Approval incorporates by reference to Effluent Treatment System the "former stabilization lagoon (known as Boat Harbour)", Northern Pulp refers to Sections I.A., I.B. and I.H. above and submits that any requirement under Clause 24 for Northern Pulp to cease using its current Effluent Treatment Facility, or submit any plan or undertake any costs or rehabilitation with respect to Boat Harbour is in breach of the Lease and the Indemnity Agreement. Northern Pulp is entitled to indemnification from the Province in respect of any cessation by Northern Pulp of the Effluent Treatment Facility and any costs for any rehabilitation of Boat Harbour imposed by the Province on Northern Pulp, under the Approval or otherwise.

Northern Pulp requests that Clause 24 be revised to acknowledge that any cessation of Northern Pulp's use of the Effluent Treatment Facility and any rehabilitation of Boat Harbour are the Province's responsibility and the plans and costs thereof will be assumed by the Province.

II. Prohibitory and/or Impossible Provisions

A. Capital Investment Required to Comply with Approval is Prohibitory - Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n)

In addition to being in breach of the Agreements as discussed throughout Section I above, Northern Pulp's compliance with the Approval will require Northern Pulp to undertake significant capital expenditures estimated to be in excess of $90 million, to divert surface run-off water to the Pictou Harbour, to implement a new spill containment system, and to reduce COD. See enclosed EKONO Memo, p. 2.[4]

The estimated $90 million in capital expenditures referred to above does not include the capital expenditures to construct a new effluent treatment plant in order to comply with Clauses 5(i) and 6(i) of the Approval, estimated to be in excess of $100 million. This requirement is also in breach of Northern Pulp's rights under the Lease, as discussed in Section I. H. above

The cumulative effect of the capital cost associated with Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n) of the Approval is effectively the prohibition of Northern Pulp's operation by the Department, instead of the Department's regulation of it.

With respect to COD, Clause 6(g) requires Northern Pulp to develop a plan for additional reductions to achieve a maximum effluent COD of 11,890 kg/day at Point C. This equates to a 77% reduction from the Mill's present operation.[5] Such a provision is not regulatory in nature. It is prohibitory. That is, the Approval through Clause 6(g) has the effect of prohibiting Northern Pulp's activities, rather than regulating them. As discussed further in Section II.B. below, the

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[4] Memo from Heikki Mannisto and Eva Mannisto dated April 6, 2015 entitled "Possibility to meet COD limit of 11,890 kg/day" ("EKONO Memo").

[5] The average annual COD at Point C for the period of January 1, 2010 to December 31, 2014 is 58.8 kg/Adt. At 873 Adt/day, that equates to 51,350 kg/day at the end of the Approval if the Mill is running at current levels. 11,890 kg/day represents an intensity of 13.6 kg/Adt at Point C.

COD reduction may not even be possible and any capital investments in an attempt to achieve this requirement would be prohibitory.

With respect to surface run-off diversion under Clause 6(c), the new segregated system would require a new sewer network, retention ponds, oil and sediment traps, sample collection, alarms and a mechanism to divert this stream back to the main Mill effluent stream if contamination was detected. This new non-contact outfall will require permits from the Department as well as Environment Canada and the Department of Fisheries and Oceans. Northern Pulp has no guarantee that the Mill will receive these required approvals from these departments.

A new spill containment system under Clause 6(g) is also unreasonable in that it imposes significant cost on Northern Pulp without additional environmental or public benefit and is in breach of the Agreements.

The high capital cost of complying with any or all of Clauses 6(c), 6(g), 14(m) and 14(n) are completely disproportionate to the benefit, if any, to the public and the environment of these measures. The surface run-off diversion requirement is disproportionate given the small fraction of the flow that surface run-off represents and the fact that it is presently treated with the Mill effluent. The spill containment requirement is not only disproportionate but unnecessary because Northern Pulp already has an adequate spill containment system available to it. The Department is aware through the AMEC Report that process technologies for reducing COD to the requirement of Clause 6(g), assuming those reductions are achievable, would be prohibitory. The timelines contained in the Approval for achieving these Clauses are too short for such major construction projects to be completed. Therefore, the conditions in the Approval are impossible for Northern Pulp to meet and are prohibitory.

Through the cumulative effect of these Clauses, and the capital cost associated therewith, the Department is prohibiting the Mill from operating. Instead of regulating the existing Mill, the Department is requiring that Northern Pulp build a substantially new Mill. Provisions of regulatory approvals that prohibit rather than regulate operations are unreasonable and ultra vires. Therefore, Northern Pulp requests that Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n) be removed from the Approval.

B. COD Reduction is Prohibitory and Impossible to Meet – Clause 6(g)

As noted in Section II.A. above, the proposed COD reduction of 77% under Clause 6(g) of the Approval is prohibitory not only because of the capital investments in order to attempt to achieve this requirement but also because the proposed COD reduction is unrealistic and is essentially impossible for Northern Pulp to meet.

The AMEC Report provided an assessment of the status and operation of the existing treatment facility for the Mill as well as preliminary engineering for several effluent treatment alternatives. The assessment was conducted at the time that the regulatory discharge for the Mill was located at Point D. The AMEC Report concluded that the Mill's Aerated Stabilization Basin ("ASB") was operating well. Since the regulatory discharge point was moved to Point C on July 1st, 2010, there have been no incidences of daily or monthly BOD_5 or TSS being over the limits in the PPER. In fact, all tests have shown that the Mill is well below the regulated limits.

Even though the AMEC Report was based on outdated information and therefore could not recognize the current operational attainments of the Mill, the AMEC Report itself demonstrates that it is simply not possible for the Mill to achieve this COD reduction. As such, the

requirement that the Mill achieve the reduction required by Clause 6(g) amounts to a prohibition of the Mill's operations, rather than the regulation of it, and therefore is unreasonable.

Appendix 2 of the AMEC Report contains the preliminary engineering for the effluent treatment alternatives with mass balances (annual averages and not daily limits). The most stringent case in the AMEC Report, Case 3, completely abandons the Mill's effluent treatment facility and replaces it with a new Activated Sludge Treatment ("AST") system and includes "Significant Improvements & Water Use Reduction", as outlined in section 4.2.3 of the AMEC Report. Drawing #158229-100-6-923 is the mass balance for the New Treatment Plant – Case 3. This Case assumes a 50% reduction in liquor losses will be achieved (20,400 kg/day to 11,400 kg/day). It also assumes marginal increase in production with a design capacity of 908 Adt/day. Incineration of Waste Activated Sludge would occur in the Recovery Boiler, which at present is not permitted in Northern Pulp's Approval. The predicted effluent flow is 65,151 m3/d as an annual average; the new daily limit of 67,500 m3/d required in the Approval is even more stringent than the AMEC mass balance and does not consider seasonal variations.

The predicted COD for Case 3 is 70,900 kg/day. The typical COD removal for a new AST system would be in the neighbourhood of 50 – 60%. Even at the higher end of that removal efficiency (60%), the final COD discharge would be 28,360 kg/day (70,900 kg/day x 0.4). In summary, Case 3 demonstrates that even with significant in-Mill improvements and a brand new AST treatment system, the Mill would still exceed, by more than double, the COD daily limit of 11,890 kg/day at Point C as set out in the Approval at Clause 6(g). AMEC recognizes that other process technologies that were not included in Case 3 would be economically prohibitive to the Mill. The Klopping Report, EKONO Memo and McCubbin Report[6] all agree that the requirement contained in Clause 6(g) is unrealistic and that the associated costs would be significant.

Therefore, the requirement contained in Clause 6(g) of the Approval, as a daily limit representing a 77% reduction from the Mill's current annual average for the Mill's current operations, is impossible for Northern Pulp to meet. The Department included the requirement of Clause 6(g) in the Approval knowing that the AMEC Report says that the Mill cannot achieve that requirement even if the Mill adopted the strictures of Case 3 including installing a completely new treatment system. The requirement of Clause 6(g) is completely untenable, even according to the Report on which the Approval is based. The Department therefore must be considered to have included this provision in order to prohibit the Mill's operations.

The Approval contains conditions that treat the Mill as if it is a new mill and as such the Department has imposed regulatory standards on the Mill that are prohibitory to the existing Mill operating. Provisions of regulatory approvals that prohibit instead of regulate and that are impossible to meet are unreasonable and ultra vires. Therefore, Northern Pulp requests that Clause 6(g) be removed from the Approval.

C. Modeling Deadlines are Impossible to Meet - Clauses 5(h) and 6(h)

Clauses 5(h) and 6(h) of the Approval require Northern Pulp to submit to the Department modeling for all reduction stages along with a list of planned projects required under Clauses 5(e) and 6(e) no later than October 30, 2015.

Northern Pulp's consultants have indicated that it is impossible to complete in-Mill engineering studies and then adequately complete effluent quality modeling to predict Mill wastewater

[6] Report from Neil McCubbin dated April 6, 2015 ("McCubbin Report").

changes for submission to the Department by October 30, 2015. It is not reasonable to require such a deadline considering the impossibility of meeting that deadline as well as the fact that the modeling is for reductions that are not required until 2017.

In Northern Pulp's submission, October 30, 2016 is more reasonably attainable and appropriate. Therefore, Northern Pulp requests that Clauses 5(h) and 6(h) each be revised to change the deadline for this study from October 30, 2015 to October 30, 2016.

D. Regulatory Compliance without Modification or Addition - Clauses 5(i), 6(i) and 6(j)

Northern Pulp is also precluded through Clauses 5(i) and 6(i) from achieving the requirements of the Approval through modification or addition to the effluent treatment system as configured as of the date of the Approval, and through Clause 6(j) from reduction and prevention of liquor losses entering the effluent system. In addition to being contrary to the Agreements as discussed in Section I.H. above, requirements that a proponent achieve regulatory compliance without making improvements to the existing system are prohibitory on their face, and do not serve the public or benefit the receiving environment. Northern Pulp again requests that Clauses 5(i), 6(i) and 6(j) be removed.

III. Vague and Uncertain Provisions

A. New Treatment Facility - Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A

In addition to the objection noted in Section I.H. above, the majority of parameters and discharge limits in Table 6A in the event that Northern Pulp is required to discharge its effluent at a treatment facility at a different location have yet to be determined. Those limits are specifically contemplated as being determined based on an unknown location of a new treatment facility and on results of a receiving water study yet to be completed. That receiving water study must meet the satisfaction of the Department, yet the Approval does not indicate any criteria upon which such water study will be considered satisfactory. Northern Pulp considers the requirement to apply for and obtain approval of an as-yet-unidentified discharge location to be unreasonable.

At present, there is an absence of standards and guidelines in Clauses 5(h), 5(i), and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A. These provisions are too vague and uncertain to be considered reasonable. The conditions contain no limitation on the Department's discretion and as a result Northern Pulp has no fair notice of the conditions it must meet. Therefore, Northern Pulp requests that these provisions be removed.

B. COD Reductions - Clause 6(e)

The provisions in Clause 6(e) requiring reductions in COD do not specify or provide a means for calculating the base point for measuring such reductions. These provisions are therefore too vague to be reasonable and therefore must be removed.

IV. Unrealistic and Otherwise Unreasonable Provisions

It is clear that many provisions of the Approval are based on the AMEC Report. However, as noted in Section II.B. above, the AMEC Report is outdated and does not represent the Mill's

current operations and its operational achievements since the date of the AMEC Report. As such, certain provisions imposed by the Department in reliance of this Report are unreasonable.

The AMEC Report ranks Northern Pulp in the 95th – 100 percentile on water usage in Canada. In 2007, the year that Northern Pulp was benchmarked in this 2010 study, the Mill's regulated effluent discharge point was Point D exiting the Boat Harbour basin. In July 2010, the regulated effluent discharge point was moved back to Point C exiting the ASB. Point D is not representative of the Mill effluent flow when compared to other mills because it is downstream of the treatment plant. Effluent flow at Point D is historically 25% higher than at Point C due to surface run-off from the large Boat Harbour basin. Surface run-off was not taken into account in the AMEC Report, and therefore comparisons are not valid. Comparison of Point C data at the end of the treatment process is appropriate for benchmarking purposes. Table I shows the decrease in effluent flow from 2010 forward:

Table I: Effluent Flow Intensity (m3/Adt) – Annual Averages

Regulated Outfall Location	2007	2008	2009	2010	2011	2012	2013	2014
Point D	112	133	129					
Point C				94	89	87	86	88

As the Approval is clearly based on a lack of appreciation for the Mill's current operations, including an outdated report from AMEC which contains conclusions that are no longer correct, the Department has no basis for many provisions contained in the Approval. It is unreasonable for the Department to impose regulatory standards based on a report that relies on almost 10-year-old data and disregards the achievements of the Mill since that time.

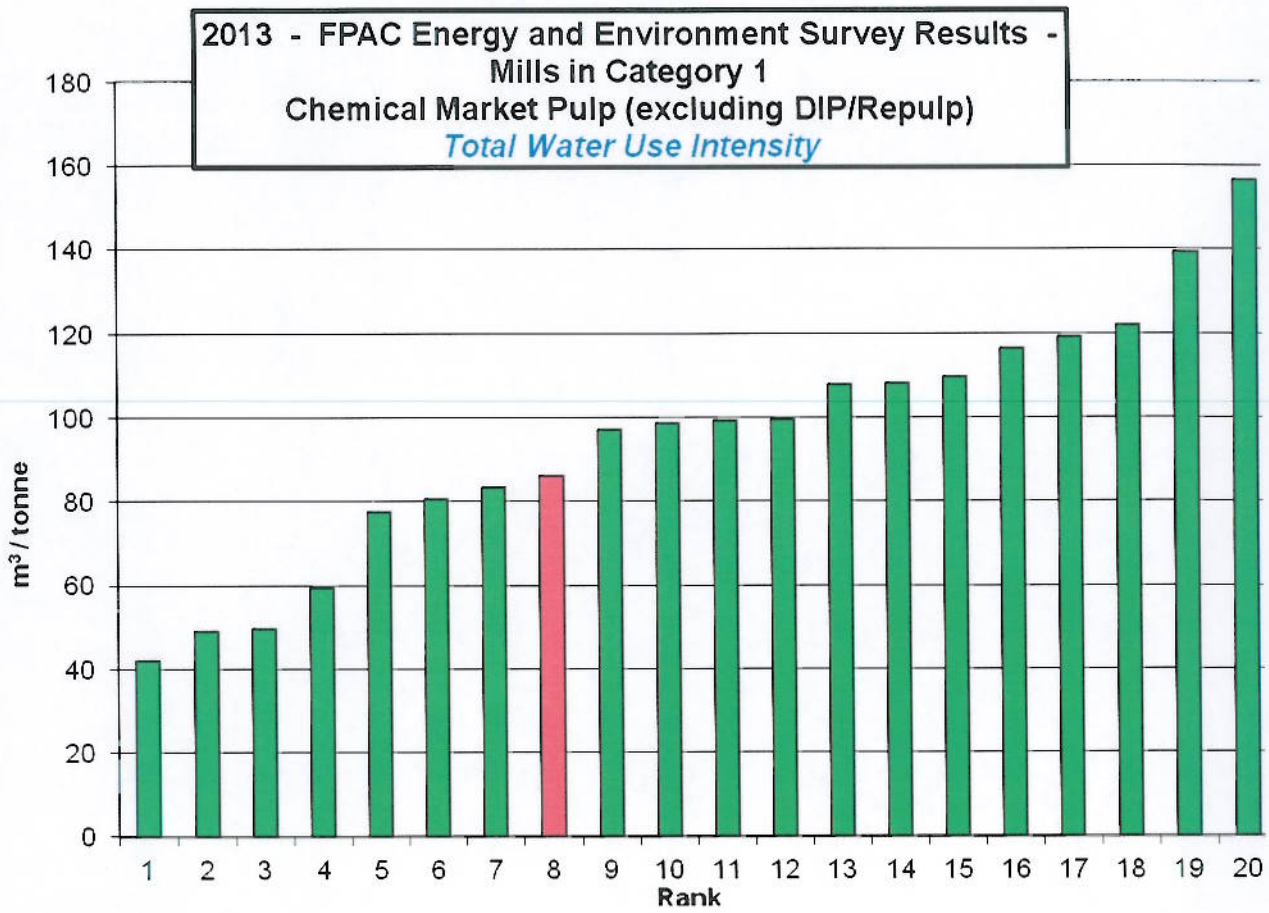
Other provisions in the Approval are unreasonable as they provide little or no additional environmental benefit but impose very significant costs on Northern Pulp and therefore are improper. As well, statements made by the Department in issuing the Approval make it clear that some provisions of the Approval are based on a misunderstanding of or lack of appreciation for the Mill's operations, which make those provisions unrealistic. Some provisions in the Approval are unreasonable as they fail to recognize industry norms or factors outside of Northern Pulp's control. Others are simply inaccurate. Those provisions must therefore be removed or revised as set out in the Sections below.

A. Water Reduction Requirement – Clauses 5(d) and 5(e)

As stated by all effluent experts (Ken Frei and Guy Martin of KSH, Paul Klopping, Neil McCubbin, and Heikki Mannisto and Eva Mannisto of EKONO), the daily limits for water intake and effluent contained in the Approval are highly unusual. Few jurisdictions place flow limits in general on intake and effluent; exceptions are generally where the mill makes up a large percentage of the waters (usually rivers) that it is drawing its water supply from or is discharging effluent into. Mills that ultimately discharge into marine environments do not typically have these restrictions: see KSH Memo, p. 4. The AMEC Report at p. 30 refers to the 2007 EKONO study which also recognizes that such limits will only be placed on mills in certain circumstances, which Northern Pulp notes are not applicable to the Mill.

The requirements related to water reductions in the Approval appear to be based on a mischaracterization of the Mill's water usage. A Departmental document accompanying the

release of the January 30, 2015 version of the Approval stated that "The Mill is a large consumer of water, especially compared to other mills." In fact, Northern Pulp's water usage is average by comparison to other Canadian mills. Enclosed is a copy of the Forest Products Association of Canada survey entitled "FPAC 2013 Energy and Environment Benchmarking Report – Pulp and Paper Sector" dated March 10th, 2015 ("FPAC Report"). The following graph is an excerpt from the FPAC Report. With 20 out of a possible 30 mills reporting, Northern Pulp ranks the 8th best in the survey for water use intensity:



Reductions of water flow of the magnitude contained in the Approval could have negative effects on the biological treatment process and ultimately the receiving water, increasing odour for residents who live in the vicinity of the effluent treatment centre.

As noted in Section I.D above, Clauses 5(d) and 5(e) should be removed from the Approval for being in breach of the Water Supply Agreement. Clauses 5(d) and 5(e) are also unreasonable as they ignore industry norms and are based on a mischaracterization of the Mill's water usage, as a result of the Department's reliance on an outdated report. Therefore, Northern Pulp repeats its requests that these Clauses be removed.

B. TRS Reduction Requirement – Clauses 8(d), 8(e) and 8(f)

The new requirement under Clause 8(d) for water-phase TRS measurements in the effluent are best described by the KSH Memo at p. 14-16. In summary, Clause 8(d) is modeled after

Ontario's new 2014 Air Pollution – Local Air Quality Regulation (which imposes certain air standards, including TRS) and the Ontario Technical Standards to Manage Air Pollution. To Northern Pulp's knowledge, Ontario is the only other province that is introducing this standard. Mills may comply with the Regulation by electing to register under the optional Technical Standard which has phased-in limits for TRS in water entering the wastewater treatment system. The Ontario Ministry of the Environment researched the relationship between TRS effluent loading and TRS in ambient air originally reported by the US EPA. Because the understanding of the relationships of TRS effluent loading and TRS in ambient air are still in their infancy and the influence of other parameters (including pH, temperature and the various types of odorous compounds present) are not well known, the Ontario government introduced this as an optional standard that mills could choose to apply for. Mills that choose to apply will, over time, provide data that will lead to improved understanding of the relationships between effluent concentrations and air quality. The optional nature of the standard gives Ontario the ability to modify the standard as is deemed necessary as information and data become available. By imposing Clause 8(d) in the Approval, the Department has applied the optional Ontario standards as a hard and fast requirement that must be abided by without regard for the outcome of the Ontario mill experiences. If the limits are deemed to be unrealistic, Ontario has allowed room for possible changes; the Department has not.

It is of particular note that Northern Pulp is regulated to fixed TRS limits, including 3-fold reductions in coming years, when the Mill does not have any baseline data. The limits in Clause 8(d) have been set by the Department before any data has been gathered and before it is known if there is even an environmental reason to impose such limits. Ontario has recognized that there is not enough known yet about the relationship between TRS effluent loading and TRS in ambient air to justify the regulation. What is an optional consideration in Ontario because the precise relationship between TRS effluent loading and TRS in ambient air has not yet been demonstrated, the Department has made a mandatory requirement of the Approval. It is unreasonable for the Department to impose a limit before knowing if there is a relationship necessitating that limit.

Northern Pulp has contacted a mill in Ontario and all of the major laboratories in Canada. It appears that no Canadian laboratories (after conferring with their satellite offices) are capable of performing the test required by Clause 8(d), NCASI Method RSC – 02.02. At this point, the closest capable lab that Northern Pulp has found is located in Simi Valley, California. This demonstrates that the Department is imposing a requirement on the Mill is entirely inconsistent with other Canadian jurisdictions.

As noted in Section I.G above, Clauses 8(d) and 8(f) should be removed from the Approval as they are in breach of the MOU. Clauses 8(d) and 8(f) should also be removed as there is no known scientific basis for the limit, which regulators elsewhere have recognized. Northern Pulp does not object to performing testing of TRS in accordance with Table 6 for the benefit of residents, as such monitoring is contemplated in Clause 8(e). However, the imposition of the regulatory requirement to achieve the TRS limits imposed in Clauses 8(e) to 8(f) is unreasonable.

Northern Pulp requests that Clauses 8(d) and 8(f) be removed entirely and that Clause 8(e) be revised to impose only a requirement that Northern Pulp test TRS in accordance with Table 6.

C. Effluent Flow Reduction Requirements – Clauses 5 and 6(a)

The reductions in Clauses 5 and 6 of the Approval are inconsistent. As water use and effluent flow are directly related in terms of the Mill's mass balance, the water use restrictions outlined in Clause 5 of the Approval effectively restrict the effluent limit contained in Clause 6(a) of the Approval to less than 67,500 m3/day or 77.3 m3/Adt. The effect of the water use restrictions in Clause 5 is to impose a greater effluent flow reduction requirement than the Department requires in Clause 6(a).

The AMEC Report (p. 25-26) indicates that consumptive water use (water taken but not returned as effluent) with the power boiler scrubber in operation is estimated at approximately 2 m3/ADt. In essence, from a mass balance perspective, Clause 5(d) is more stringent and practically translates to an effluent limit of 70.1 m3/Adt (72.2 – 2) or 61,200 m3/day. This represents a further reduction of 6,300 m3/day or an additional 9%. The McCubbin Report indicates that the net water consumption of 2 m3/Adt is very conservative and could be as high as 5 m3/Adt, which could lead to even further reduction requirements. KSH indicates that 8% of incoming water supply to the mill would be lost to evaporation. All three consultants (AMEC, Neil McCubbin and KSH) support this reduction of an additional 9-10%.

In addition to the arguments set out in Section IV.A above, the water use restrictions in Clause 5 are unreasonable because they impose conditions that are more onerous than the effluent control limits in Clause 6(a) of the Approval. Therefore, Northern Pulp requests that the water use restrictions in Clause 5 be removed.

D. COD Limits – Clauses 6(d) to 6(j)

The COD limits in Clauses 6(d) to 6(j) of the Approval are based on the outdated AMEC Report and are unreasonable.

Table II below summarizes the Mill COD data at several locations in the treatment plant.

Table II: Effluent COD Intensity (kg/Adt)

Location	2007	2008	2009	2010	2011	2012	2013	2014
Point A	154.6	124.7	103.5	123.4	99.6	92.2	82.5	87.8
Point C	**71.7**	**82.3**	**76.7**	**70.1**	**63.1**	**56.0**	**53.6**	**51.4**
Point D	74.0	78.6	71.3	65.1	62.8	56.0	55.2	50.8

The improvements in COD intensity beginning in 2011 reflected in Table II are in part the result of the Green Transformation Projects carried out by the Mill that year. Continuous improvement initiatives at the Mill have continued to provide COD reduction through to 2014.

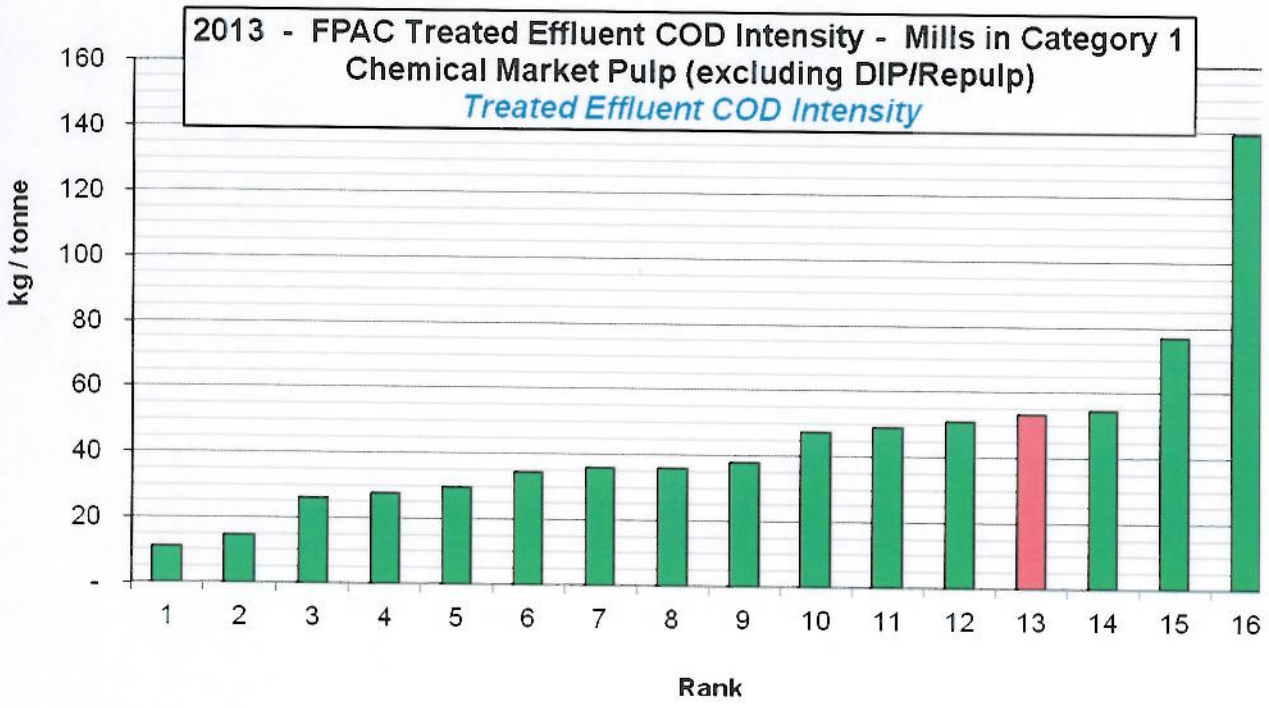
Since the AMEC Report was written, many of the proposed projects for effluent quality improvements identified in the Report have been completed, including: improvements to brown stock washing including two new washer drums and closing of the screen room with true counter-current washing, recycle of PM rejects, Stage 1 DNCG system, sludge removal plan, PB scrubber and a new emergency spill tank. A COD reduction of 30% has been achieved from the 2007 benchmark conducted in the AMEC Report.

Although not clearly stated, Northern Pulp has assumed that the COD reductions in Clause 6(e) of the Approval are based on the five year annual average COD at Point A that was reported pursuant to Clause 6(d).

Northern Pulp's average COD intensity at Point A for 2010 through 2014, as requested in Clause 6(d), is 97.1 kg/Adt. At 873 Adt/day[7], the daily discharge would be 84,800 kg/day. The 50% reduction in COD required by Clause 6(e) would mean a daily discharge of 42,400 kg/day at Point A.

There is very little published data for COD in North America, and virtually nothing from the United States. Data that is published, and all third party data presented in this Appeal, refer to "after treatment" and would be comparable to Point C in the above Table II, not point A (the inlet to treatment).

The Department has recently made statements in media interviews that Northern Pulp has four times greater COD than mills of similar size. This is clearly wrong. The following graph is an excerpt from the FPAC Report. With 16 out of a possible 30 mills in Canada reporting, this graph shows that Northern Pulp clearly does not have four times greater COD than mills of similar size, nor does it have the highest COD discharge.



The AMEC Report indicates (on p. 29) that benchmarking of effluent was done using the widely accepted EKONO study of September, 2007, which is based on 2005 data. The enclosed EKONO Memo compares COD and BOD data from Northern Pulp to the results found in the EKONO database. The EKONO benchmarking and analysis of the new COD limits concludes

[7] 310,000 Adt/year at 355 days is 873 Adt/day at the end of the Approval, assuming that the Mill is able to increase production to this limit by that time.

that the two lowest COD discharge mills are hardwood mills with oxygen delignification, modified cooking, condensate stripping, etc. and the lowest COD discharge in a Canadian bleached softwood kraft pulp mill in the database is 28-30 kg/Adt. The EKONO Memo also concludes that more than 40% of the North American bleached market kraft pulp in 2013 was produced by mills with BOD discharges higher than those at Northern Pulp's Mill. This proves once again that the Department is not working with current data and does not understand the influences of mill process equipment and wood species on COD.

It is clear that the Department was relying on outdated studies and analysis in setting the COD limits in Clause 6. This is based on outdated data and is unreasonable. Therefore, Northern Pulp requests that Clauses 6(d) to 6(j) be removed.

E. Production Limit – Clause 4(a)

Clause 4(a) of the Approval limits the maximum production rate of the Mill to 310,000 Adt/yr. Not only does this Clause prohibit the Mill's future expansion, it also offers no additional environmental benefit. The production capacity of the Mill is and should properly be limited by the existing equipment of the Mill and the other requirements of the Approval. So long as Northern Pulp is in compliance with the other requirements of the Approval, whatever the Mill's production limit happens to be when it complies with those requirements has no environmental relevance.

There is no additional environmental basis or additional public benefit for including in the Approval a provision that arbitrarily limits the production of the Mill. Northern Pulp therefore requests that Clause 4(a) be removed entirely.

F. Phenanthrene Testing – Clause 12(ag)

Clause 12(ag) requires semi-annual testing of Phenanthrene at Surface Water station SW12-3. The trend analysis requested is not warranted because the measurement was at or near the detection limit. See enclosed Dillon Consulting Memo[8]. The requirement of Clause 12(ag) therefore has no justification. It only adds cost to Northern Pulp with no corresponding additional benefit to the environment. The requirement in Clause 12(ag) is therefore unreasonable and Northern Pulp requests that it be removed.

G. Daily Limits for Water and Effluent Usage – Clauses 5(d), 5(e), 6(a) and 6(b)

The reference to water and effluent usage in the Approval in terms of daily limits is contrary to the way that effluent data is compared and benchmarked in the industry. See the AMEC Report and the enclosed EKONO Memo, FPAC Report, KSH Memo, McCubbin Report, and Klopping Report. As stated in the KSH Memo at p. 5, "Effluent flow restrictions are usually stated on an average basis, usually monthly or annually since there is no measurable risk to the environmental [sic] by one day of effluent flow above a certain amount."

The imposition of daily limits for water usage that do not consider seasonality are of particular concern to the Mill. Based on data from the last three years, the Mill's water intake has peaked at 87,000-91,000 m3/day (23-24 million gallons/day), even though the Mill's annual average water usage is 75,000 m3/day (20 million gallons/day). These peak days do not occur during the highest surface run-off months. Rather, they historically occur during the hottest days

[8] Letter from Dillon Consulting Limited dated February 11, 2015 ("Dillon Consulting Memo").

during the summer when the incoming Middle River water is at its warmest and cooling systems are most heavily loaded. Cooling towers will be an essential component of water reduction that will recycle "once-through" cooling water for re-use. Cooling towers are driven by temperature differential (water to ambient air) and relative humidity and are a very effective means of cooling. However, heat transfer during hot, humid spells can be challenging. The cooling towers offer significant water reduction on an annual basis, but daily reductions will be highly influenced by weather. It is therefore clear that the Mill will not be able to operate and comply with the daily water usage requirements of the Approval on certain days of the year. Therefore, daily limits on water usage are unreasonable as they effectively preclude the Mill from operating on a consistent basis.

There is no environmental reason to impose a daily limit in Northern Pulp's circumstances. Northern Pulp therefore requests that all water and effluent usage restrictions in the Approval, including Clauses 5(d), 5(e), 6(a) and 6(b), be revised to be based on yearly averages, not daily limits.

H. $PM_{2.5}$ Contributors – Clauses 9(a) to 9(e)

Clauses 9(a) to 9(e) of the Approval transform the voluntary objectives of the Canadian Ambient Air Quality Standards ("CAAQS") into mandatory compliance requirements without any consideration given to other local sources of $PM_{2.5}$, especially other local heavy industry, wood-burning stoves and other non-commercial sources, or the not insignificant contribution of interprovincial and international transport of $PM_{2.5}$ from other sources.

It is unreasonable to require the Mill's mandatory compliance with the limits in the CAAQS without taking into account other industrial facilities, residential sources and transportation that are also contributors to $PM_{2.5}$ in the area. See KSH Memo, p. 16-18. As the Mill's compliance with Clauses 9(a) to 9(e) is outside of the Mill's own control, such mandatory compliance requirements are unreasonable.

Northern Pulp is confident that the Mill will meet these limits as a contributor; however, imposing mandatory compliance on the Mill without taking into account other contributors is unreasonable. Northern Pulp therefore requests that Clauses 9(a) to 9(e) be revised to acknowledge that Northern Pulp is only required to demonstrate that its relative contribution to the local air quality meets the limits of the CAAQS.

I. Particulate Limit – Clause 9(h)

Clause 9(h) imposes a regulatory limit on the Recovery Boiler for particulate of 77 mg/Rm^3 @ 11% O_2. We understand, based on discussions with the Department, that this limit is based on the performance expected by the manufacturer of the new electrostatic precipitator ("ESP"). This limit does not properly take into consideration the variables that can affect actual boiler performance on a day-to-day basis, particularly in the case of a new ESP attached to an existing boiler. Contrary to North American regulatory convention, the approach taken by the Department in setting the particulate limit for the Recovery Boiler treats the installation of the new ESP as if it were a significant modification to an existing boiler and, as such, treats it as a new boiler and sets emission limits that are in line with such units: KSH Memo, p. 21-22. This is inconsistent with the approach taken in most North American jurisdictions. For example, under the U.S. Air Quality Regulations, the addition and/or replacement of pollution control equipment, such as a new ESP, is not, in itself, considered to be a modification to an existing boiler, and would not result in treating such existing boiler as if it were a new boiler for the purposes of

setting a particulate limit. As the particulate limit imposed by Clause 9(h) fails to recognize that the ESP is being connected to Northern Pulp's existing boiler system and the variables that can affect the performance of that boiler system on a day-to-day basis, Clause 9(h) is unreasonable.

The limit imposed on Quebec's existing recovery boilers of 153.5 mg/Rm^3 @ 11% O_2 represents a more reasonable and appropriate limit, as it represents state-of-the-art performance for a boiler and direct contact evaporator system of the same vintage as Northern Pulp's boiler. See KSH Memo at p. 18-22. Northern Pulp therefore requests that Clause 9(h) be revised accordingly.

J. Middle River Study – Clause 5(f)

Clause 5(f) makes Northern Pulp responsible for conducting a maximum sustainable yield study of the Middle River watershed. In the 47 years of the Mill's operation, neither the Department nor any other stakeholder has ever raised a concern about water usage impacts on the Middle River watershed. The Michelin, Granton facility also draws its fresh water supply from the Middle River and discharges its effluent back into Middle River upstream of the Mill's water supply. As well, the river is dammed to prevent salt water intrusion and the spillway dam is controlled by the Province. See KSH Memo at p. 2. No low-level warnings have ever been communicated to the Mill.

In addition, the December 15, 2015 deadline does not allow for a full year study to cover all seasons which would be normal for this type of assessment, implying that existing data must be used. The responsibility of Northern Pulp to conduct this maximum yield study of the watershed (which is usually directed towards new applicants for a water removal permit) is unreasonable, especially considering the Mill does not have access to or control of pertinent data that would be required to properly complete this study.

Northern Pulp therefore requests that Clause 5(f) be removed.

K. Waste Dangerous Goods – Clause 4(i)

Northern Pulp requests that Clause 4(i) be revised to replace the words "all wastes generated" with "all waste dangerous goods generated" in order to clarify this Clause and ensure its consistency with the preceding Clause 4(h), which deals only with waste dangerous goods.

L. TRS Reporting – Clause 7(m)(i)

The monthly reporting requirement for TRS in Clause 7(m)(i) is internally inconsistent with the reporting requirement for TRS in Table 6 of Appendix A. Clause 7(m)(i) should therefore be amended to include an exception for TRS reporting of every three months.

M. Cardlock Facility Wells – Clauses 12(a) and 12(g)

The Approval at Clause 12(a) requires Northern Pulp to maintain the Cardlock Facility Wells. The Cardlock Facility Wells are owned and operated by Parkland Fuels. Northern Pulp has permission from Parkland Fuels to sample the Wells, but the maintenance of the Wells is not under the control of Northern Pulp. Further, Clause 12(g) requires Northern Pulp to maintain records, including borehole logs, construction details and maintenance records, in respect of the Cardlock Facility Wells. This information is the property of Parkland Fuels and Parkland Fuels has no obligation to provide it to Northern Pulp.

Clauses 12(a) and 12(g) are unreasonable to the extent that these Clauses impose an obligation on Northern Pulp to maintain Wells which are not under Northern Pulp's ownership or control and require Northern Pulp to maintain with respect to those Wells records of information to which Northern Pulp is not entitled. Northern Pulp therefore requests that Clauses 12(a) and 12(g) be revised accordingly.

N. Surface Water Stations – Clause 12(ad)

Several of the Surface Water stations listed do not exist, while other new stations are not listed in Clause 12(ad). See enclosed Dillon Consulting Memo. Northern Pulp requests that this Clause be revised accordingly.

O. Stantec Report – Clause 12(au)

Clause 12(au) is inaccurate as it refers to the Stantec "Hydrogeological and Hydrological Evaluation of the Boat Harbour Treatment Facility Report" as being dated April 30, 2012. Rather, the Report is dated September 28, 2011. Northern Pulp requests that this Clause be revised accordingly.

V. Inconsistency with FOIPOP – Clause 22

The requirements in Clause 22 of the Approval that Northern Pulp provide information to the Pictou Landing First Nation ("PLFN"), including a copy of all reporting information and reports that are required to be submitted under the Approval, is inconsistent with the protection granted to Northern Pulp under FOIPOP. The public accessibility to information under the control of the Department under section 10 of the *Environment Act* is subject to the important restrictions of FOIPOP: section 10(2) of the Act.

Specifically, section 21 of FOIPOP provides that a head of a public body (such as the Minister and Administrator of the Department of Environment) must refuse to disclose information:

> (a) That would reveal
>
> (i) trade secrets of a third party, or
> (ii) commercial, financial, labour relations, scientific or technical information of a third party;
>
> (b) That is supplied, implicitly or explicitly, in confidence; and
>
> (c) The disclosure of which could reasonably be expected to
>
> (i) harm significantly the competitive position or interfere significantly with the negotiating position of the third party,
> [...]
> (iii) result in undue financial loss or gain to any person or organization, or

Much of the information required to be provided by Northern Pulp to the Department constitutes commercial, financial and technical information. That information is supplied to the Department in confidence. The disclosure of this information could reasonably be expected to harm both

Northern Pulp's competitive position as well as its negotiating position with respect to an action that has been brought by PLFN against Northern Pulp. The competitive position of Northern Pulp would be harmed because its competitors in a global market and others having interests adverse to Northern Pulp would become fully aware of the Northern Pulp's commercially sensitive information.

Requiring Northern Pulp to comply with Clause 22 of the Approval is contrary to Section 10 of the *Environment Act* and Section 21 of FOIPOP. The Department through the Approval is circumventing the due process provided for under FOIPOP and the procedural fairness afforded to Northern Pulp with respect to the release of Northern Pulp's confidential and commercially sensitive information to third parties. The Department cannot by administrative fiat overcome a legislative requirement. Clause 22 of the Approval therefore is an unreasonable and ultra vires condition imposed by the Department. Accordingly, Northern Pulp requests that Clause 22 of the Approval be removed entirely.

Northern Pulp hereby confirms that any documents submitted by Northern Pulp to the Department at any time, including but not limited to this Appeal and its enclosures, are being submitted with the expectation that the Department will observe the protections afforded to Northern Pulp by FOIPOP in respect of such documents.

CONCLUSION

In light of the above, Northern Pulp respectfully requests that you exercise your powers under Section 137(4) of the Act to allow Northern Pulp's Appeal and remove or revise the provisions of the Approval as outlined in this letter.

Yours truly,

Terri Fraser

Terri Fraser, Technical Manager
Northern Pulp Nova Scotia Corporation

Encl.[9]

1. KSH Memo, Ken Frei and Guy Martin Resumes
2. McCubbin Report, Neil McCubbin Resume
3. EKONO Memo, Heikki Mannisto and Eva Mannisto Resumes
4. Klopping Report, Paul Klopping Resume
5. Dillon Consulting Memo
6. FPAC Report

cc: Bruce Chapman, Northern Pulp (via email)
cc: Dave Davis, Northern Pulp (via email)

[9] The enclosures refer to Approval No. 2011-076657-R03 but remain valid with respect to the Appeal.

Tab 17

NOVA SCOTIA
Environment
Office of the Minister

PO Box 442, Halifax, Nova Scotia, Canada B3J 2P8 • www.novascotia.ca/nse

Our File number:

23000-30-105
10700-40

Ms. Terri Fraser, Technical Manager
Northern Pulp Nova Scotia Corporation
PO Box 549
New Glasgow NS B2H 5E8

Dear Ms. Fraser:

Re: Notice of Appeal Form Dated April 9, 2015 and additional information filed June 12, 2015 – Industrial Approval for a Pulp Mill Operated by Northern Pulp Nova Scotia Corporation Approval No. 2011-076657-A01

I am writing regarding your Notice of Appeal Form dated April 9, 2015 respecting the decision of an Administrator to issue Approval No. 2011-076657-AOl for the operation of a bleached kraft pulp mill at 260 Granton Abercrombie Road, Abercrombie Point, Nova Scotia.

After careful review of the "grounds for appeal", the information you submitted in support of your appeal, other information held by the department, and the applicable statutory provisions, I hereby render my decision pursuant to Section 137 of the *Environment Act* and order that the following be implemented pursuant to Section 137(5) of the Act:

- Term and condition 6(g) is open to interpretation and its due date approaches the expiration date of this approval, so this term and condition shall be removed effective immediately.

- Term and conditions 5(j), 6(i), and 6(j) reference a new effluent treatment facility that would be regulated by a separate approval, so these terms and conditions shall be removed effective immediately.

- Term and condition 6(e) required additional clarity pertaining to COD concentration baseline and shall now read as follows:

    - "The Approval Holder shall undertake a study to identify all sources of COD contributing to the effluent treatment system and develop a plan, together with an implementation schedule, to achieve the following reductions, from baseline COD concentrations that shall be derived, to the satisfaction of the department, from information gathered under Condition 6(d), in COD concentrations at Point A:

        i) a 10% reduction by January 30, 2017;
        ii) a total of 20% reduction by January 30, 2018;
        iii) a total of 50% reduction by January 30, 2020."

- Term and condition 8(d) is open to interpretation, which makes it difficult to ensure compliance, thus this term and condition shall be revised to ensure clarity between Northern Pulp Nova Scotia Corporation and the Department of Environment.

- Term and condition 8(f) has language more restrictive than intended and shall now read as follows:

    - "If the Approval Holder is unable to achieve the objectives established in Condition 8(d) of this Approval, the Approval Holder shall submit a plan which meets the satisfaction of the Department, by October 30th, 2016, detailing a program to meet the objectives. This plan shall include a proposed schedule for implementation of the program."

- Term and condition 12 (ag) shall be removed effective immediately. After review of the record, I conclude that ongoing testing of phenanthrene is no longer required because the measurement was at or near detection limits.

- Term and condition 12 (ad) referenced incorrect surface water monitoring locations and therefore locations SW1, SW3, SW7, and SW8 are to be removed and replaced with locations SW12-1, SW12-2, and SW12-3. This term and condition 12(ad) shall now read as follows:

    - "The Approval Holder shall ensure the following surface water stations are analyzed for parameters listed in Table 7 and 8, in Appendix A, as well as total suspended solids (TSS), biological oxygen demand (BOD), chemical oxygen demand (COD): SW4, SW5, SW6, SW9, SW11, SW12, SW12-1, SW12-2, SW12-3 and SW13. Once annually, during the low flow period, all surface water samples shall be analyzed for mercury."

- Term and condition 22(b) is unnecessary, as the communication plan defined under Condition 22(a) provides the means for the necessary sharing of information between parties, so term and condition 22(b) shall be removed effective immediately.

- Term and condition 5 pertaining to water use reduction shall be reassessed by the Department of Environment. The information contained in the record reviewed for this appeal provides multiple and varying opinions as to the technical feasibility of the targets identified. The assessment and revisions, if any, shall establish technically feasible targets that meet desired environmental outcomes. This review must also consider changes to other terms and conditions that may be impacted by changes to water usage criteria, for example, it is necessary to ensure consistency between water usage and effluent outflow.

Terms and conditions requiring further review shall be reviewed and revised as necessary by the Department of Environment and submitted to the Minister for approval prior to inclusion in the Industrial Approval.

Pursuant to Section 138 of the *Environment Act*, you have thirty (30) days to appeal my decision to the Supreme Court.

Sincerely,

Randy Delorey, MLA
Minister of Environment

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 2:35:47 PM

Project: replacement_effluent_treatment_facility_project Comments: Marine life must be protected. Water is life. For everyones sake please, please, please stop the insanity. How can we, the people of this province, convince the policymakers of the vital importance of clean waters and lands? It is insane to allow any further harm. This is an impassioned plea from a grandmother begging all people to stand up and say, NO MORE. Name:
Email: @yahoo.com Address:

Privacy-

Statement: agree x: 83 y: 18

From: @freemanlumber.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 3:06:56 PM

Project: replacement_effluent_treatment_facility_project Comments: give Northern Pulp extra time to get this effluent facility built.They need the extention to get this done,the sooner the better.This effects all of forest industry,in what is decided for there future. Name:
Email: @freemanlumber.com Address:

Privacy-Statement: agree x: 68 y: 35

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 3:23:17 PM

Project: replacement_effluent_treatment_facility_project Comments: I want clean air and clean water. Our earth in Pictou County already has had many leaks of chemicals from the pulp mill. Boat Harbour is dead. People there have suffered.I am for no pipe and no continuation in Boat Harbour. Enough is enough. Let forestry learn to be more sustainable, otherwise there will be no more forests at the rate we are going. Planting all spruce trees does not fertilize the soil. HArdwood leaves fertilize the soil. We need mixed forests. Forresters have been telling us this for years. Why does this whole province need to support pulp mills? Government need to look at the longevity of our forests.Our ocean will be a mess if we allow this Pipe in. Focus on sustainability of children,clean air , forests,clean water and protect our drinking water sheds around Pictou or find a government who will. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 46 y: 23

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 3:26:33 PM

Project: replacement_effluent_treatment_facility_project Comments: I am in favour for an extension, I do not want all those jobs in jeopardy due to a local conspiracy group. I think most ppl do want the extension but the loudest group is all youâ?Tll hear, please put this pipe in and ignore the screams of the conspiracy groups. Name: Email: @hotmail.com Address: Municipality: Privacy-Statement: agree x: 55 y: 15

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 12, 2019 7:37:49 PM

Project: replacement_effluent_treatment_facility_project Comments: this proposed so called Effluent Treatment process is so Wrong we have a Corporation who has an Indemnity Agreement allowing them to destroy our land air water with out any penalty for ever that covers their legal bills pays any fines for them by the taxpayer the misinformation of the effluents have been going into the Strait for the last 50 years the truth is ,that the current treatment at Boat Harbour lake takes the effluents at least 30 days to go from the enterance to the outflow to the Strait the Minister would know that if she did her job for the province people instead of bending to Sinar Mas owned Pulp mill Officials go see it for herself this new proposal claims that they can clean 2.5 million liters of toxic sludge per hour make pulp at the same time be cleaner than when it comes out of Boat Harbour lake where it lays along the shore at the outflow in a toxic dead zone for over a mile in each direction the Minister would see this if she did her j ob and took a tour instead of listening to reading Northern Pulp misinformation being the waters that support the fisheries of all the maritime provinces aboriginal territorial fisheries this decission should lay in the hands of the federal environment assessment My self I find this Pipe proposal to be so immoral that it should not be considered at all. Sinar Mas is the biggest Environmental Criminals in the world NO PIPE ever the most fair way to decide on this situation is to have a vote by all the communities along the gulf that would be affected in every Maritime Province Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 48 y: 20

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 7:39:26 PM

Project: replacement_effluent_treatment_facility_project Comments: I fish lobsters in LFA 25 in the Northumberland strait that much effluent being pumped into the Northumberland strait will kill millions of lobster larva. this much fresh water introduced into the Northumberland strait will have very negative affects on our fishing industry Name: Email: @hotmail.com Address:

Privacy-

Statement: agree x: 47 y: 27

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 9:42:41 PM

Project: replacement_effluent_treatment_facility_project Comments: We need to protect and save this planet and environment. Meeting regulations does NOT always mean protecting the environment. You need to shut down this place. Releasing toxins into the land and water does not protect the planet or humans. You should realize that you can use tourist dollars to enhance the planet. Name: Email: @yahoo.com Address:

Privacy-Statement: agree x: 65 y: 26

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:13:29 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe Too much risk for water quality in strait. Also too many examples of industrial screwups in past to have confidence in proposals. Ie Westray - Boat harbour - Air pollution from pulp mills Clearcutting and state of forests State of fishery caused by overfishing are prime examples Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 38 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 10:34:23 PM

Project: replacement_effluent_treatment_facility_project Comments: If this pipe goes in the straight, then we are a stupid province that dosent know shit about our environment. If it goes in, lobster, herring, crab, scallops, and any other seafood will not be able to be consumed or sold. The ice flow in the spring will break the pipes, but not before all of us stubborn citizens do. Dont be fucking stupid. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 80 y: 17

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 12, 2019 11:59:29 PM

Project: replacement_effluent_treatment_facility_project Comments: Im a fisherman from pictou and I have my whole world at stake here .I dont want this pipe out where i work.Lobster herring scallop are very important to me .they need to be protected from the pollution that will be pumped out of that old mill .I cant believe that this plan is even a consideration. There has to be a better way than this .I was at a meeting last year and the question was asked why cant they reuse the water .the mill guys said it was to costic to go threw the mill again .please stop this maddness from happening. Thanking you in advance Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 67 y: 7

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 6:30:31 AM

Project: replacement_effluent_treatment_facility_project Comments: No pipe. Stop this insanity. Close the entire operation. Itâ?Ts an environmental catastrophe. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 70 y: 20

From: @gmail.com
To: ssessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 7:34:33 AM

Project: replacement_effluent_treatment_facility_project Comments: I would like to know and see the results of water and soil tests done on the other side of the Harvey A. Veniot causeway the lake which is the west river. I have asked DOF and DOE AND Contacted MLA office Karla MacFarlane to have this tested ...noone does this testing I was told. How come?
Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 63 y: 26

From: @smu.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 7:38:09 AM

Project: replacement_effluent_treatment_facility_project Comments: Some jobs are simply too expensive. These jobs have already cost lives and Northern Pulp if it is allowed to pump poison into the Strait will cost many many more jobs, and unacceptable health an environmental impacts. Someone needs to add up the cost per job over the next 20 years. Name: Email: @smu.ca Address:

: Privacy-

Statement: agree x: 43 y: 14

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 8:49:29 AM

Project: replacement_effluent_treatment_facility_project Comments: I am concerned for the health of the PLFN, the fishing industry, tourism, watersheds for surrounding area, fish/shellfish/larvae. This neweffluent system needs to have a federal assessment! Do not sacrifice so much for a mill that has long passed its prime - Time for our leaders to do the right thing! Name: Email: @live.ca Address:

Privacy-Statement: agree x: 61 y: 17

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 9:33:51 AM

Project: replacement_effluent_treatment_facility_project Comments: Composition of untreated effluent is not something that should be remotely considered to be dumped into any waterway,lake, river, stream or ocean. In this day and age, I cannot get my head wrapped around the fact that the government is not acting on this irresponsible. known polluter, in a very aggressive manner to get them to STOP polluting and adversely affecting the environment!! The people of Nova Scotia are outraged that Northern Pulp is planning this disaster. Wake up Dept of Environment, Dept of Fisheries....our Strait needs you!! Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 63 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:16:16 AM

Project: replacement_effluent_treatment_facility_project Comments: This is a 19th century solution to a 21st century problem. If the best you can come up with is a pipe to hide your mess offshore, then you should close the damn plant.You could do better, with some rational thought and expense. If the economics dont work , then let the wonderful free market offer its solution and close. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 64 y: 24

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:38:40 AM

Project: replacement_effluent_treatment_facility_project Comments: Stop enabling this life-killing industry! Grow a set and stop this foolishness! you cant eat or breath money and Im tired of our governments supporting polluters. Enough!!! Name: Email: @hotmail.ca Address:

Privacy-Statement: agree x: 58

y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:42:09 AM

Project: replacement_effluent_treatment_facility_project Comments: This is criminal, that a government would allow this pollution to continue. I live down wind of this facility, please stop poisoning my childern Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 66 y: 36

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:45:35 AM

Project: replacement_effluent_treatment_facility_project Comments: If Northern pulp will not change to an effluent free process, they should either be regulated into submission, bought out and run by the government, or expropriated for polluting the entire Northumberland Strait and likely the Gulf of St Lawrence. To bad for Northerns profits and downtime - call their bluff on no pipe = no mill. If they want the pulpwood, they can play by the rules. Legislate them into a closed system paper process or tell Northern to go elsewhere but leave the mill But the pipe into the Strait will devalue and destroy major sustainable fisheries, will be a blight on the region, and will have health consquences for the population as well. Name: Email: @yahoo.com Address:

Privacy-Statement: agree

x: 51 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:48:06 AM

Project: replacement_effluent_treatment_facility_project Comments: Im worried about the unknown characteristics of the effluent. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 43 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:50:45 AM

Project: replacement_effluent_treatment_facility_project Comments: How can this be approved? You dont even know what is in the effluent that is being dumped Name:
Email: @gmail.com Address:
:

Privacy-Statement: agree x: 49 y: 24

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 11:26:46 AM

Project: replacement_effluent_treatment_facility_project Comments: short term monetary gain at the expense of human, fauna and flora viability on this planet cannot continue to push the discussion. jobs, corporate profits and activities continuing as normal are all red herrings. life over money must be recognized as the real issue here, both in the short term and in the long term. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 35 y: 18

From: gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 12:35:23 PM

Project: replacement_effluent_treatment_facility_project Comments: Wondering how these process is safe when we donâ?Tt even know the contents of the effluent that is supposedly harmless and wonâ?Tt affect the marine life within the Northumberland Strait Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 69 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 1:16:29 PM

Project: replacement_effluent_treatment_facility_project Comments: Totally irresponsible treatment of the marine environment by a single business that may have permanent effects on the largest export industry in Nova Scotia. Name: Email: @gmail.com Address:

: Privacy-Statement:

agree x: 60 y: 1

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 1:38:31 PM

Project: replacement_effluent_treatment_facility_project Comments: THE TOP 5 REASONS TO SUPPORT #NOPIPE 1. For your HEALTH The composition of the toxic effluent will contain dioxins, furans, metals, 1000KG of solids and other contaminates at 90,000,000 Litres PER DAY. Dioxins and Furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water. The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the millâ?Ts power boiler. The proposal is to dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mills power boiler. This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NPâ?Ts air emissions. It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area. http://ec.gc.ca/inrp-npri/donnees-data/index.cfmâ?¦ https://www.nrcm.org/â?¦/cleaning-up-â?¦/maines-dioxin-problem/â?¦ https://docs.wixstatic.com/â?¦/b61814_40a0f43682ee45d99af01fbâ?¦ 2. For the overall ECONOMY The proposed treatment system runs the risk of harming three lifelong Industries worth close to $4 Billion dollars to the Nova Scotia economy. The tourism industry is worth $2.7 Billion and prides itself on warm, clean water and world class sandy beaches. The Commercial Fishing Industry is worth over $1 Billion and prides itself on sustainable wild shellfish that is shipped all across the world. The Sport Fishing industry is worth $56 Million and the Northumberland Strait is home to the last remaining stable Atlantic Salmon stocks on mainland NS. All of this is at risk due to 32,000,000,000 Liters of waste water PER YEAR that will be 37 Celsius that will contain deleterious substances harmful to Fish species and humans. https://docs.wixstatic.com/â?¦/b61814_246fdf7e04a64e239be0fbfâ?¦ https://novascotia.ca/news/release/?id=20180222001 https://docs.wixstatic.com/â?¦/b61814_f856b6a7c7b34ffb9eba165â?¦ 3. For the ENVIRONMENT â?" Meeting Regulations DOES NOT Prevent Harm Nova Scotia and the Northumberland Strait has many great resources. However, they are at risk with the proposed Effluent treatment process. As it stands right now, there are no CCME guidelines established for Marine Environments for some of the different chemicals and compounds that make up the pulp mill effluent. Pulp and Paper Effluent Regulations PPER in Canada cover two matters total suspended solids TSS and biochemical oxygen demand BOD. Even though total discharges of TSS and BOD in pulp and paper effluent decreased by approximately 90 and 97 respectively from 1970-2008, pulp mill effluents continue to have harmful impacts on fish, fish habitat and the environment. Information gathered through environmental effects monitoring EEM at all Canadian mills points to the disturbing conclusion that although mills are meeting regulations and passing the PPER toxicity test, 70 are having harmful effects on aquatic life and habitat, and 55 are having harmful effects on the larger environment. This information led the federal department of Environment and Climate Change to undertake a modernization review of pulp and paper effluent regulations in 2017. â?oResults from EEM studies and the changing realities of the pulp and paper industry indicate a need to modernize the PPER to improve environmental protection,â? the department states. If meeting regulations is not enough to prevent harm, neither is passing toxicity tests. Only one toxicity test is required under Canadian pulp and

paper regulations. The required LC-50 test is for acute lethality. For this test, an effluent is considered acutely lethal if the treated effluent at 100 concentration kills more than 50 of the Rainbow Trout exposed to it during a 96-hour period. Long-term effects, including impacts on reproduction or growth, cumulative impacts on fish habitat and the larger environment or accumulation of substances harmful for human consumption are not regulated under the PPER. Testing for environmental effects is required for information purposes. Only two mills in Canada test for and report impacts of effluent on the usability of fish resources by humans. Effluent from pulp and paper mills is regulated at the federal level principally by the Pulp and Paper Effluent Regulations PPER, which form part of the Fisheries Act. The standards that apply to pulp effluent today were adopted in 1992 and have remained unchanged for 25 years. Highly toxic dioxins and furans are regulated under a separate Act. 70 of pulp paper mills are having harmful effects on aquatic life and habitat despite meeting current regulations . Long term impacts on reproduction and growth are not regulated under PPER. Federal regulations cover only a few of the recognized harmful substances in pulp mill effluent. For example, there are no federal regulations for AOX compounds, a component of pulp effluent in mills that bleach with chlorine or a chlorine compound. AOX compounds are recognized as extremely toxic. They are not easily broken down by bacteria and thus bioaccumulate in the environment. Yet they are not included in PPER regulations. Neither are phenols, toluene, chloroform or chemical oxygen demand COD. For 25 yrs the regulations that apply to pulp effluent have remained unchanged. Provinces may go beyond Federal standards and adopt stricter regulations for effluent from pulp mills. British Columbia, Alberta, Ontario and Quebec have adopted stricter regulations. Nova Scotia does not have regulations, but sets limits through individual industrial approvals. The EU has more protective regulations than Canada does. https://drive.google.com/â?¦/1H1HltUnh9Oem_KpPHwxmye7z5â?¦/viewâ?¦ 4. New treatment Facility is NOT BETTER Northern Pulpâ?Ts proposed new effluent treatment facility differs from the present facility in a number of ways. In the present system, untreated effluent is piped from the mill to the north settling ponds at Boat Harbour, where it remains for 12 hours for primary treatment. It then moves to an aerated stabilization basin where effluent is placed in contact with micro-organisms. The effluent remains there for 8 days for secondary treatment. After 8 days, the effluent is discharged from the aeration basin at what is known as Point C, and treatment is considered finished. At point C, samples are taken for testing to determine whether the treated effluent meets regulations. POINT C is also a DEAD ZONE!! After point C, the effluent enters the 300-acre Boat Harbour lagoon, also known as Boat Harbour Basin. Boat Harbour Basin was initially used as a stand-alone effluent treatment facility. In 1972, settling ponds and an aerated stabilization basin were constructed to meet stricter regulations for pulp effluent treatment. Additional aeration and other upgrades were added from 1992-1996, as the federal government again adopted stricter regulations. The lagoon at Boat Harbour has not been officially part of the effluent treatment system since 1972. Official or not, treated effluent remains in the lagoon for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials takes place during that time. This is referred to as â?opolishingâ? or tertiary treatment. Natural springs and surface run off further dilute the effluent. According to Northern Pulpâ?Ts figures, during the time in Boat Harbour Basin, total suspended solids TSS and biochemical oxygen below the proposed water quality standard of 1.â? The Stantec Preliminary Receiving Waters Study, August 2017, illustrates the same lack of dispersion. Treated effluent has never flowed directly into the deeper waters of the Strait. From its discharge at the shoreline, after 20-30 days in Boat Harbour Basin, tides and currents further break down, dilute and settle contaminants before they reach the deeper waters of the Strait. It is misleading to imply that effluent from the proposed new system pumped directly into the fishing grounds of the Strait within 24 hour that contains almost 1000kg of solids will have the same impact as the effluent which

presently enters the Strait at the shore edge, hugs the shore and recirculates in and out of Pictou Harbour. Further to this, the same proposal was rejected in 1994 for the same concerns!! https://thetyee.ca/â?¦/Pollution-Nova-Scotia-Pulp-Mill-Sinkâ?¦/â?¦ https://docs.wixstatic.com/â?¦/b61814_ab61cca668f1432f890d2d0â?¦ 5. Better return for your TAX DOLLARS Nova Scotians are on the hook for the Boat Harbour clean up which is expected to be close to half a billion dollars once remediated. They also paid for the design process of the proposed effluent process at a cost of $6 Million dollars and will be expected to cover the construction, installation, labour etc for the proposed pipe estimated at $100 Million dollars. Further to that $127 Million dollars of NS Tax payers dollars have been given to the mill in the last several years. Meanwhile we have doctors over worked and leaving our province. We have ER closures and very long wait times for treatment and care. Our Education system is also at its max with constant cuts. Funding for Seniors and Veterans as well as many more public programs and services would benefit from the large sums of NS tax dollars instead of it going towards Northern Pulp. https://www.halifaxexaminer.ca/â?¦/northern-pulp-scotsburn-â?¦/â?¦ https://www.halifaxexaminer.ca/â?¦/health-care-crisis-checkâ?¦/â?¦ #NOPIPE https://novascotia.ca/â?¦/Replacement_

Privacy-Statement: agree x: 70 y: 28

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 1:42:10 PM

Project: replacement_effluent_treatment_facility_project Comments: There has been too much pollution and destruction already. Better to close this pulp mill completely and train employees in more sustainable and much less harmful enterprises including hemp and bamboo production solar, wind and water energy production organic/forest/permaculture/biodiverse farming, etc. Government can support the solutions to natures current degradation, rather than waste our money on harmful practices. It would be disastrous to continue this project. Please shut them down! Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 67 y: 20

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 13, 2019 1:42:18 PM

Project: replacement_effluent_treatment_facility_project Comments: This treatment facility will be a major upgrade to an already widely accepted and used technology. The effluent will be safer and cleaner than what is already meeting and exceeding federal regulations. After reading through the application documents, it is evident that the company has explored all options and clearly explained how they arrived at the BAS system one that is used and proven in pulp mills all over the world. Name: Email: Address:

: Privacy-

Statement: agree x: 76 y: 24

From: @cogeco.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 2:11:15 PM

Project: replacement_effluent_treatment_facility_project Comments: The past damaged to this area is well recorded and we are shocked at the lack of past control by both Federal and Provincial governments and is certainly not acceptable. We must end this problem now and be more diligent in future environmental problems before they are allowed to happen. Name:
Email: @cogeco.ca Address:
:

Privacy-Statement: agree x: 57 y: 19

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 2:17:23 PM

Project: replacement_effluent_treatment_facility_project Comments: February 11, 2019 Nova Scotia Environment re: New Effluent Treatment System / re: Northern Pulp Iâ?Tve watched in amusement these past several years, as various groups have stated â?oMistruthâ?Tsâ? â?oFear Mongeringâ? to persuade residents that the Northern Pulp, Pulp Mill is the cause for every hardship health issue that they currently have. Starting with â?oAir Qualityâ? , they stated that people were â?odying in the streets in the town of Pictouâ? , that residents must wear â?oGas Masksâ? to survive. In my 54 Years living in Pictou County, never once have I witnessed people dying in the streets. And now that Northern Pulp has installed a new â?oPrecipitatorâ? , I now see the â?oPlumeâ? coming from Northern Pulp is much smaller, I suspect the system is working as it should, would suspect that this new system is meeting Nova Scotia Canadian Standards Regulations for Recovery Boiler Precipitator Emissions. Since that attempt didnâ?Tt close Northern Pulp down, now the groups are again using â?oMistruthâ?Tsâ? â?oFear Mongeringâ? to persuade the public that Northern Pulp now wants to dump â?oEffluent into the Northumberland Straitâ? , imagine!!! Suggesting that this is â?osomething newâ? and that it will ruin the water quality, beaches, property values, and Kill or damage the marine habitant. They forget to tell the public that Northern Pulpâ?Ts effluent has been discharging from Boat Harbour to the Northumberland Strait for the past 50 some years. For those past 50 years, Effluent has been mixing in with the Northumberland Strait sea water, past the various Beaches, Cottages, and the very lucrative fishing grounds, and hey, weâ?Tve been eating the fish, lobster, clams, etc., all that time. I believe these groups are doing more harm to the county province than Northern Pulp, especially when they advertise to the media those â?oMiss Truthâ?Tsâ? , which, may prevent tourists from visiting, spending their money here, or the potential new-comer, that wants to move here, but hears this groups â?overbal diarrheaâ? moves elsewhere. Nice Job Jill Matt. Northern Pulp has been purchased a couple of times in the past 15 to 20 years, they now have a new owner that wants to improve the Norther Pulp Mill, make it â?oWorld Classâ? , improve the â?oAir Effluentâ? emissions, wants to be a better business partner in the community. Itâ?Ts my understanding that the new Effluent Treatment System would be built on company property, and that once built, only treated effluent would be pumped off the property to the Northumberland Strait, thereby removing the possibility of â?oun-treated effluentâ? ever reaching salt water. Iâ?Tve seen how difficult it is when my son, son-in-law, neighbours friends have to â?oGo Westâ? for good paying jobs. Sure, most go for a couple weeks then are back home for a couple, but some of them move their families out there too, will they ever be back at some point? While their gone, theyâ?Tre no longer paying taxes here, purchasing those big items, or those everyday items. So whoâ?Ts left to pay taxes for Schools, Roads, Health Care, etc. That leaves fewer residents to pay, resulting in higher taxes!! Now is the time for someone to bring these two groups together, to discuss this matter in a civil, courteous way, and work to get along. Usually I would suggest a Premier, MLA or the like, but they all seem to be fearful for their Jobs, as this has been â?oblown out of proportionâ? . Possibly a Judge would be the answer, then both groups would have to remain quiet in the courtroom, of course when speaking to the Judge, they would have to tell the truth!! prove what they are stating is true!! To the Environment Minister, I want my support to go to Northern Pulp, for the Department of the Environment to grant the Industrial Approval, to grant an operating extension to allow time to build the New Northern Pulp Onsite Effluent Treatment System, and to get that effluent treatment system operational, provided the science behind the project

backs up the proposal, and that the system, once built is monitored operated to the Nova Scotia Canadian Pulp Mill Effluent Standards Regulations. Name: Email: @yahoo.ca Address:

message: Privacy-Statement: agree x: 47 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 2:19:22 PM

Project: replacement_effluent_treatment_facility_project Comments: February 11, 2019 Nova Scotia Environment re: New Effluent Treatment System / re: Northern Pulp Iâ?Tve watched in amusement these past several years, as various groups have stated â?oMistruthâ?Tsâ? â?oFear Mongeringâ? to persuade residents that the Northern Pulp, Pulp Mill is the cause for every hardship health issue that they currently have. Starting with â?oAir Qualityâ? , they stated that people were â?odying in the streets in the town of Pictouâ? , that residents must wear â?oGas Masksâ? to survive. In my 54 Years living in Pictou County, never once have I witnessed people dying in the streets. And now that Northern Pulp has installed a new â?oPrecipitatorâ? , I now see the â?oPlumeâ? coming from Northern Pulp is much smaller, I suspect the system is working as it should, would suspect that this new system is meeting Nova Scotia Canadian Standards Regulations for Recovery Boiler Precipitator Emissions. Since that attempt didnâ?Tt close Northern Pulp down, now the groups are again using â?oMistruthâ?Tsâ? â?oFear Mongeringâ? to persuade the public that Northern Pulp now wants to dump â?oEffluent into the Northumberland Straitâ? , imagine!!! Suggesting that this is â?osomething newâ? and that it will ruin the water quality, beaches, property values, and Kill or damage the marine habitant. They forget to tell the public that Northern Pulpâ?Ts effluent has been discharging from Boat Harbour to the Northumberland Strait for the past 50 some years. For those past 50 years, Effluent has been mixing in with the Northumberland Strait sea water, past the various Beaches, Cottages, and the very lucrative fishing grounds, and hey, weâ?Tve been eating the fish, lobster, clams, etc., all that time. I believe these groups are doing more harm to the county province than Northern Pulp, especially when they advertise to the media those â?oMiss Truthâ?Tsâ? , which, may prevent tourists from visiting, spending their money here, or the potential new-comer, that wants to move here, but hears this groups â?overbal diarrheaâ? moves elsewhere. Nice Job Jill Matt. Northern Pulp has been purchased a couple of times in the past 15 to 20 years, they now have a new owner that wants to improve the Norther Pulp Mill, make it â?oWorld Classâ? , improve the â?oAir Effluentâ? emissions, wants to be a better business partner in the community. Itâ?Ts my understanding that the new Effluent Treatment System would be built on company property, and that once built, only treated effluent would be pumped off the property to the Northumberland Strait, thereby removing the possibility of â?oun-treated effluentâ? ever reaching salt water. Iâ?Tve seen how difficult it is when my son, son-in-law, neighbours friends have to â?oGo Westâ? for good paying jobs. Sure, most go for a couple weeks then are back home for a couple, but some of them move their families out there too, will they ever be back at some point? While their gone, theyâ?Tre no longer paying taxes here, purchasing those big items, or those everyday items. So whoâ?Ts left to pay taxes for Schools, Roads, Health Care, etc. That leaves fewer residents to pay, resulting in higher taxes!! Now is the time for someone to bring these two groups together, to discuss this matter in a civil, courteous way, and work to get along. Usually I would suggest a Premier, MLA or the like, but they all seem to be fearful for their Jobs, as this has been â?oblown out of proportionâ? . Possibly a Judge would be the answer, then both groups would have to remain quiet in the courtroom, of course when speaking to the Judge, they would have to tell the truth!! prove what they are stating is true!! To the Environment Minister, I want my support to go to Northern Pulp, for the Department of the Environment to grant the Industrial Approval, to grant an operating extension to allow time to build the New Northern Pulp Onsite Effluent Treatment System, and to get that effluent treatment system operational, provided the science behind the project

backs up the proposal, and that the system, once built is monitored operated to the Nova Scotia Canadian Pulp Mill Effluent Standards Regulations. Name: Email: @hotmail.com Address:

: Privacy-

Statement: agree x: 52 y: 19

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 2:19:40 PM

Project: replacement_effluent_treatment_facility_project Comments: This is a disaster. Close it down. Pay workers a pension commensurate with their number of years on the job. Next.

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 13, 2019 2:57:43 PM

Project: - Choose - Comments: Effluent chemical chemistry will not be known until this project is operational. Stated by Northern Pulp in their delivery of a new treatment facility. Is this a joke? WHY and HOW can this project be even considered with this stance alone. WE ARE DEMANDING A FEDERAL ASSESSMENT. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 44 y: 13

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 4:02:24 PM

Project: replacement_effluent_treatment_facility_project Comments: February 12, 2019 Margaret Miller NS Minister of Environment: To Whom It May Concern: Re: Northern Pulp and its Replacement Effluent Treatment Facility Project Save Our Seas and Shores is a non-partisan coalition of fishers, First Nations and concerned citizens who have been advocating protection of the Gulf of St Lawrence for decades. We are engaged in 5 provinces because the Gulf of St Lawrence is a fragile inland sea which shares its waters, fish and coastlines with NS, NB, PEI, QC and NL. It has counter clockwise currents that only empty into the Atlantic once a year. This vulnerable body of water is home to thousands of marine species including lobster, herring, mackerel, snow crab, ground fish, Atlantic salmon, endangered right whale, blue whale, humpback whale, Leatherback turtle and harlequin duck, to name a few. It is considered one of the most precious marine ecosystems on Earth and according to DFO, has sensitive life stages of marine organisms present year around. Because of these shared waters, it can only be legitimately studied in its entirety. This is because water and fish do not recognize provincial boundaries neither does kraft bleached pulp mill effluent which is considered to be one of the most toxic industrial pollutants ever created by humans to enter our marine environment. These toxic effluents have been bio-accumulating and assaulting our oceans and marine species for over half a century. We are writing today regarding the pipe being proposed by Northern Pulp to dump 70-90 million litres of heated kraft pulp mill effluent into the Northumberland Strait. Briefly, we would like to acknowledge that Premier Stephen McNeilâ?Ts government is the first government in 52 years to announce the pending closure of Boat Harbour in 2020â?" an atrocity that has been inflicted on Pictou Landing First Nations for over half a century. We applaud this government for taking this action. The problem is, moving Boat Harbourâ?Ts toxic effluent from Boat Harbour into the Northumberland Strait is not a feasible solution in 2019. This isnâ?Tt the same gulf that was there in 1967. Itâ?Ts the same expanse of water, but it is now highly stressed. Weâ?Tre seeing plankton levels down 50 per cent from what they were four or five years ago, and now the federal government is predicting the cod fishery will be extinct in a few years. A six-year-old fish today weighs what a four-year-old fish did 10 years ago. As it stands, this Kraft pulp mill in Abercrombie, Nova Scotia has a fifty year history of environmental negligence in Pictou County and its current plan for an effluent pipe puts the delicate ecosystem of the Gulf of St. Lawrence at major risk. Discharging 70 â?" 90 million liters of bleached Kraft pulp effluent daily into the Gulf of St. Lawrence will have a significant negative impact on the fragile and sensitive spawning, nursery and migratory habitat of lobster, herring, mackerel and many other species. This in turn, will threaten tourism and fishing industries in Nova Scotia, Prince Edward Island, New Brunswick, Newfoundland and Quebec, which support a global food supply and generate billions of dollars in economic activity. Furthermore, the economic backbone of our Maritime economy and the thousands of commercial fishers in the Northumberland Strait and the five provinces bordering the Gulf of St. Lawrence, depend on these sustainable fisheries to support their families and the hundreds of coastal communities in which they live. Compounding this matter is the inherent conflict of interest the NS Dept of Environment is in, as the owner and operator of this over entitled pulp millâ?Ts waste treatment facility. In the publicâ?Ts interest and trust, how can you possibly, in good faith and transparency, oversee and determine the viability of an environment assessment of this same waste treatment facility while you are, in fact, a business partner of this mill? It is an irreconcilable conflict, in our coalitionâ?Ts humble opinion. For the record, the Gulf of St

Lawrence is already considered one of the most rapidly de-oxygenating bodies of water on earth. In short, if we as humans are to save this extremely vulnerable body of water, we need to stop dumping our industrial waste into it. PERIOD. Therefore, we implore you: You must say NO to this reckless proposal of a pipe into the Northumberland Strait and Gulf of St Lawrence. While we applaud this governmentâ?Ts impending closure of Boat Harbour, to complete this Historic action in good faith, and in terms of real and genuine reconciliation with Pictou Landing First Nations, the only viable long term solution is this - You must STOP this effluent from entering our marine environment. NOW. Respectfully submitted,

Save Our Seas and Shores Coalition Box 47 Merigomish, NS B0K1G0 http://www.saveourseasandshores.ca Name: Save Our Seas and Shores Coalition

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 4:50:42 PM

Project: replacement_effluent_treatment_facility_project Comments: I fully support the new effluent treatment plant and associated effluent pipe, as its design meets all government regulations and is critical to the economic success of Pictou county. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 63 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 4:57:39 PM

Project: replacement_effluent_treatment_facility_project Comments: February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 1 Bonny McTague ATTN: NS Environment Assessment â?oI stand firmly against Northern Pulpâ?Ts desire to pump pulp effluent into the Northumberland Strait. They are unwilling to finance a treatment which might be deemed to be safe and their new proposal most certainly will further damage our environment on an even greater scale.â? ISSUE A: TRUST The AST proposed is untried at best and would require strict adherence to management of the process and honest evaluation which this Company has never illustrated. Northern Pulp is not the environmentally friendly entity it tries to portray. We have seen this evidence of uncaring in many ways. In fact, the Public have rarely been able to trust a word they say!!! When we question or ask for clarification they donâ?Tt respond. Polite inquiries are ignored. They have even suspended their Final Public Consultation! Also, I must make mention of the Community Liaison Committee that NS Environment told them they must set up in 2011. It still operates ridiculously â?ounder coverâ? and they chose to lie that the members were selected by the Environment Dept. when in fact handpicked by NP. The push back by Northern Pulp against the Environmental Standards imposed in 2015 by the NS Government is a great example of the lack of any environmental conscience of Northern Pul p. This is proved by Bruce Chapmanâ?Ts published comments CBC regarding this issue. â?oToo expensive etc.â? This is a Company, Paper Excellence/SinarMas/Asia Pulp and Paper with a very bad record here in NS and internationally on caring for the environment. Also, a fact to know is that Asia Pulp and Paper is one of Asias largest debtors according to www.marketwatch.com As well, among Ten Top Corporate Criminals of 2018, listed by Global Exchange they are NUMBER ONE. Here in Nova Scotia they have been given millions of taxpayer dollars, an exact figure impossible to discern. The arrogant opinion that they are too big to fail pervades their bullying relationship with Government and Community. Bottom Line: It appears that proponents of Pulp Mills are willing to harm human health, species, and the environment. They choose to ignore these effects because of the economic benefits. Eventually NP may shut down when all the fiber is exhausted leaving behind a wasteland. This is a questionable goal however you spin it. This Northern Pulp Mill is rickety and old, 25 years past itsâ?T lifespan. Only one stack has an air scrubber and the high vent roof opening is also used without emission scrubbing. When their operating permit was up for renewal in 2015, they showed little regard for our environmental standards here in Nova Scotia. Pictou area and PLFN were dangerous places to be during the times toxic chemicals in the Mills air emissions were spewed out that were 80 times the allowable limit. It had to be persistent pressure by residents to force them to comply. Many people in our area suffered from Cancers as the statistics show. Breathing issues, asthma, bronchitis and COPD are off the charts. This of course ultimately is the fault of the Province but never once did the Mill owners ever speak up and acknowledge any change was needed until forced by resident pressure. The odor is still horrendous much of the time and a huge discouragement to our Tourist Industry. February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 2 We live in a beautiful historic town with fabulous scenic views. Many beautiful beaches and waterfront areas once enjoyed are in ruin. Of course, the health cases all rely on anecdotal information but recently we have learned by a published peer reviewed Scientific Study by Emma Hoffman et al, 2017 in Environmental Science Pollution Research, that cancer causing VOCs have been emitted from the Northern Pulp Mill. No upgrades to emissions are presented. Their presence has caused

massive clear-cutting of trees in our beautiful wild Nova Scotian forests which in turn has destroyed birdsâ?T nests and left no places for animals to live. We have a long list of Species at Risk here in NS. They carry out Glyphosate spraying on many hectares of woodlands every year this chemical is described by the WHO as a likely carcinogen and is banned in several countries. Their entire operation threatens the serious issue of Climate Change as trees sequester carbon. FACT: Older trees and especially hardwoods sequester far more efficiently than the young replacement trees, and future forest nutrients are lost in the remnant deadwood that we burn or pulp. Over the past 66 MILLION YEARS two major extinctions ago, the Earth has never had more CO2 put into its atmosphere per year than this year [2018]. {Zeebe et al}. We must retain Carbon Sinks, not sell them out for Toilet Paper. Northern Pulp are a heavy burden on taxpayers and excepting their wages paid out and the economy of the local NS Forest Industry their profits leave Canada lining the pockets of Billionaire owners. I realize trust is not your issue to gauge but do not be taken in by their claims. Ensure our Regulatory levels are effective, up to date and prove everything. A plan on paper or modelling is not good enough for this untrustworthy company and such a high probability of disastrous environmental consequence. I am not Scientist, I did however spend 6 years with FRBHfx Fisheries and Oceans during the 70â?Ts as a Research Technician studying the effects of Methyl Mercury, PCBs and also Endocrine and Reproductive Changes on many species of Fish. This under the direction of

I cannot accept â?oon faithâ? the claims of this Company due to the trust issue and the unknown parameters they refuse to supply. In fact, there are those in the Community who believe that the Mill has no intention of ever building this treatment. Why have they waited until now to commence and rush a process we are paying for? They had over four years to develop knowing Boat Harbour would close in 2020. We also see their poor choices of Pipe Line Route. The Caribou Route passes through two watersheds and the effluent in Caribou Harbour would be adjacent to Munroeâ?Ts Island Wildlife Reserve and Caribou Park. I do not believe they will ever receive approval for this route. I have named this â?oWilful Incompetenceâ? if true. They will simply shut down, blame the hostility of the community and sue the NS Government for 10 years lost profit. As regards the ocean survey, even I was able to go on line and in a few minutes understand the depth and type of bottom from published Navigation Charts created by BIO Hydrographers. The present route is totally unacceptable: two watersheds on land, ice scour, dredging , lack of depth and disruption to Herring Spawning outside Caribou Harbour near outfall. February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 3 ISSUE B Beyond the Trust Issue is the Fail Safety of this new AST System. There are only 9 Hours backup for any industrial activities that break down, then the whole untreated raw pulp effluent is dumped into the ocean. Even heavy rains may affect this ability to protect Caribou Harbour. And that figure represents 70-80 million liters of hot contaminated fresh water effluent daily containing pulp chips. In addition to Human health being impacted by the presence of toxic pulp chemicals in food fish, the other great worry is for the decline of the lucrative Fishery in the Northumberland Strait and for the health of all marine species including species of birds who prey on fish. ISSUE C is the known effect of Pulp Effluent on health to marine life. Death, suppressed reproduction, liver damage, abnormal growth and malformations can occur. Northern Pulp seem unable or unwilling to supply chemical components of final effluent So letâ?Ts speak about what we know about pulp and paper industrial waste. Following references are reports and studies I have read. Comp Biochem Physiol C Toxicol Pharmacol. 2018 Apr206-207:41-47. 10.1016/j.cbpc.2018.02.005. Epub 2018 Feb 27. Exposure to a Brazilian pulp mill effluent impacts the testis and liver in the zebra fish. Castro AJG1, Baptista IE1, deMoura KRS2, Padilha F1, Tonietto J1, de Souza AZP1, Soares CHL1, Silva FRMB1, Van Der Kraak G3 Decade of Research on the Environmental

Impacts of Pulp and Paper Mill Effluents in Canada: Field Studies and Mechanistic Research Journal of Toxicology and Environmental Health Part B 94:319-39 Â· September 2006 by McMaster, Parrott and Hewett Altered Reproduction in fish exposed to Pulp and Paper mill effluents by LM Hewitt - â?Z2008 - https://onlinelibrary.wiley.com/doi/full/10.1897/07-195.1 by LM Hewitt - â?Z2008 â?"Despite effluent improvements, effects on fish reproduction continue to be reported ... enhanced growth and enhanced condition that can be attributed to .... mill effluent BKME as evidenced by decreased gonad size, decreased circulating and gonadal production of reproductive steroids, altered expression of secondary sex characteristics, and decreased egg production. Fish Testes: Pulp effluent causes them to grow bigger but they are less able to support reproduction. Atlantic Salmon Federation Publication October 19, 2018 February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 4 The effect of reproduction on fish testes: Pulp effluent causes them to grow bigger but they are less able to support reproduction. Atlantic Salmon Federation Publication October 19, 2018A Nov 2, 2018 - Summary of effects of pulp mill effluents on wild fish: Summary of studies ...from pulp and paper mills affecting ï¬ sh reproduction. Studies. An overview of recent studies on the potential of pulp mill effluents to impact reproductive function in fish Oct 1998 Kelly Roland, Munkittrick, Mark E Mcmaster, L H McCarthy, Glen Van Der Kraak. Deborah MacLatchy, a Biologist who has studied the effects of pulp mills and currently serves as president of the University of Waterloo. says the two issues around pulp mills are that if there are large amounts of nitrogen and phosphorous they can cause eutrophication, which can lead to algae blooms and invertebrates changing in numbers and size. Eutrophication happens when an influx of nutrients causes excessive plant growth that in turn sucks the oxygen out of the water so that sea creatures canâ?Tt breathe. The other issue is compounds that cause what we call endocrine disruption. â?oSo, the fish are bigger because of eutrophication but also their gonads are smaller and have less reproductive ability.â? As for the small gonads, the jury remains out on exactly which chemical compounds cause this. July 26, 2018 - Truro Daily News Speaking before the P.E.I. Legislatureâ?Ts Standing Committee on Agriculture and Fisheries Biologist Melanie Giffin, who works with the P.E.I. Fishermanâ?Ts Association, said key Atlantic herring habitats in the Northumberland Strait could be threatened by the proposed Northern Pulp pipeline in Pictou Harbor*. FisheryNation.com October 20, 2018 *same effect is expected for Caribou Harbor due to close proximity-Pictou Harbour was the original route planned. Giffin said the federal Department of Fisheries and Oceans has identified key ecologically significant areas in the Southern Gulf of St. Lawrence. Theyve actually isolated three important areas in the Southern Gulf of St. Lawrence. And those three important areas all surround the Pictou Country area, she said. There are currently few spawning beds for Atlantic Herring in the Southern Gulf. Lady crab and winter skate populations, which are unique to the Northumberland Strait, are already endangered. The white hake in St. Georgeâ?Ts Bay is also endangered. Truro Daily News July 16, 2018 Michael Van den Heuval UPEI Biologist/Researcher believes pouring between 60 to 80 million liters of treated effluent a day just outside the mouth of Pictou Harbour will have an effect. â?oYes, there is that risk. He believes however it will impact a small area. The question is, are the level of the effects acceptable to society?â? Maybe within 1000 Meters but nobody really knows. NP says effects only within 100 meters. Oddly enough however Dr seems to be the only opinion that reflects a little less concern on the environmental impacts. My comments here: It is known that Eutrophication is deadly to the ocean. This will occur due to the addition of pulp chip solids 85 or less with TSS removal to the ocean to rot and consume all the oxygen. No oxygen, nothing lives and dead zones grow. The new system effluent treatment will produce far more solids than the old method which settled most of this material in Boat Harbor, 1000 kg solids minimum per day is the least load expected to be discharged The

Construction phase of this pipeline obviously will endanger marine life. February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 5
2015 Toxic Legacy project - documents gathered by Kings Journalism students to write the history of Boat Harbors treatment facility. Joan Baxterâ?Ts Book â?oThe Millâ? contains much information that has informed my opinions. It contains 900 End Notes, many are for Scientific Studies. â?oHerring Spawning Beds are within Â½ mile of the outfall, Oyster Fishery, Lobster Fishery, and Scallop Beds will all be negatively impacted. Contaminants on bottom will spread. Fish will die or migrate elsewhere. Dennis McGee NS Fleet Planning Board and Fisherman testifying to PEI Legislature Committee Feb. 8/19 created to understand deleterious effects to Fishery and demand a Federal EA of Northern Pulps New Effluent Plan. Blacklocks reports that a New Environment Canada study IDs malformed fish from pulp mill effluent. 21 May 2014 www.blacklocks.ca Fisheries and Oceans Canada. In the Maritimes, exposure to municipal wastewater or bleached kraft pulp mill effluent altered immune function in bivalvesâ? Environmental Reviews, 2008, 16NA: 19-44 by Catherine M. Couillard, Simon C. Courtenay, Robie W. Macdonald We have learned from Scientific Study in Pictou Harbor that pulp effluent has caused anemia in Blue Mussels. Detecting p-53 family proteins in haemocytic leukemia cells of Mytilus edulis from Pictou Harbor, Nova Scotia, Canada by S D St-Jean, R E Stephens, S C Courtenay, C L Reinisch Canadian Journal of Fisheries and Aquatic Sciences, 2005, 629: 2055-2066, reviewed by Aiken and Waddy, 1986a. Industrial discharges, such as bleached kraft mill effluent, potash brine, and drilling muds, have been identified as causes of reduced survival, growth, and regeneration, changes in ATPase activity, increased oxygen consumption, increased susceptibility to disease, thinning of shells, morphological abnormalities, inability to molt, and changes in behavior in Homarus americanus. A GOOGLE SEARCH OF WIKIPEDIA reveals: Wastewater discharges for a pulp and paper mill contains solids, nutrients and dissolved organic matter such as lignin. It also contains alcohols, chelating agents and inorganic materials like chlorates, also transition metal compounds and organochlorine compounds. January 14, 2018 NG News: Dr. Michelle Gray is an assistant professor at the University of New Brunswick where she teaches environment and ecosystem management. It is her opinion that â?othere is still some evidence of environmental impact.â? She explained an impact on reproduction with fish near waters impacted by pulp effluent often having smaller gonads and maturing later. Nutrient enrichment can lead to more environmental problems such as depleted oxygen levels. February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 6
Prevent Cancer Now has written to request the designation of the proposed Northern Pulp Mill renovations for a Federal Regional Environmental Assessment. Although toxic air emissions are reported to have affected local residents for decades, we are writing specifically regarding the new Effluent Treatment Project proposal to close the Boat Harbour containment facility and to discharge 70-90 million liters per day of warm effluent contaminated with toxic and persistent substances via a new pipeline directly to the rich marine environment, on the bed of the Northumberland Strait. 2018 Review on Toxicity of Paper Mill Effluent on Fish Sangeeta Dey, Manabendra Dutta Choudhury and Suchismita Das* Life Science and Bioinformatics, Assam University, Silchar, India Bulletin of Environment, Pharmacology and Life Sciences Vol 2 3 2013 17 to 23 Online ISSN 2277 *email: das_aus11@yahoo.co.in corresponding author ABSTRACT . . . . . Pulp and paper mills, controversially, are one of the largest and major contributors of pollution in aquatic environments, affecting aquatic organisms in general and fishes in particular. . . . . Many chemicals have been identified in effluents which are produced at different stages of paper making. Their toxic nature is derived from the presence of several naturally occurring and xenobiotic compounds which are formed and released during various stages of paper making. The pulp and paper mills rank high in terms of water use during paper production on the other

hand they contribute to pollution loads in rivers through effluent discharges. Waste and wastewaters are generated from both of pulp and bleaching processes. The major problems of the wastewaters are high organic content, dark brown coloration, adsorbable organic halide and toxic pollutants. Toxic dyes, bleaching agents, salts, acids and alkalis are present in effluents discharged from pulp and paper industries. Heavy metals such as cadmium, copper, zinc, and chromium are present in pulp and paper mill effluent that are ultimately released into aquatic Environment. Dichloroguicol, trichloroguicol, tetrachloroguicol and chlorinated phenols are major contaminants found in the effluent released from pulp and paper mill. Another Scientific reviewer of this subject is Walden 1976. Adoli et al. 2011 reported that mean concentrations of Cd, Cu, Cr, and Zn in mosses 1 km radius of a pulp mill were significantly higher than reference stations, suggesting atmospheric emissions from pulp mills may also contribute to local metal loadings. Atmospheric deposition of metals via the mills smoke stacks may likely continue post remediation, despite installation of a precipitator in 2015 Hoffman et al.2015 My Words This may prove that AST treated effluent testing alone cannot be trusted to determine harm. Emission can contribute. As well, burning chemical laden sludge as a treatment method will prove very harmful to air quality and Northern Pulp has offered no data to assure us otherwise. Dilution is not the solution. It must not be considered a treatment approach. In the moment perhaps, but clearly common sense tells us the same amount of pollutants are expressed, only over a longer time frame. The test of fish lethality in a bucket of effluent is unreliable. February 2019 Comment on Northern Pulp Replacement Effluent Treatment Plan Page 7 Issue D Achieving a Sustainable Future: Draft Strategy Canadian Environmental Protection Act, 1999 A Federal Sustainable Development Strategy for Canada states: marine pollution means the introduction by humans, directly or indirectly, of substances or energy into the sea that results, or is likely to result, in â?¢ a hazards to human health â?¢ b harm to living resources or marine ecosystems â?¢ c damage to amenities or â?¢ d interference with other legitimate uses of the sea. I do not believe that Northern Pulp Effluent can meet these requirements. They have displayed no monitoring credibility illustrated by undetected pipeline leaks and large air emission gaffes. In fact, the Mill displays all of the above noted dangers. Their proposal is not acceptable today or into the future. Summary: It is incredulous that proven damage by this industry world wide does not inform the Residents, Government and the Scientific Community that the harm to human health and the environment cannot be overlooked because of the social or economic benefits. There must be no effluent pipe approved for Caribou Harbour, Pictou Harbour, or any part of the Northumberland Strait. It is time we begin to remediate the damage caused in the past. To know better is to do better. The onus is on the Company to demonstrate the absence of adverse effects and Northern Pulp has failed miserably in this regard with a plan only on paper, lots of paper! Finally, it seems compliance to all laws and regulations is largely reliant on self-reporting or third parties hired by the Mill bringing us back to the serious lack of trust issue. The Precautionary Principle can rule here. If there is a lack of full scientific certainty, we must err on the side of caution. ... This participant stands firmly by this principle. Bruce Hatcher, a Cape Breton University biologist, also agrees- North Shore News Nov 29th 2018. While I acknowledge the limitations of presenting data due to Northern Pulp not supplying their treatment information up front and this has made precise assessments by residents challenging, one absolute truth remains: Boat Harbour must be closed by January 2020 and the Pulp Mill by their own incompetence will not have a place for effluent to go. PLFN citizens must never be taken advantage of again. They have suffered far too long! I believe our forest Industry will re-organize and rebound. I also support a Federal Environmental Investigation being conducted on this matter. All three Maritime Provinces are impacted by environmental damage to Northumberland Strait including First Nations Fishers. Thank you for this opportunity. Digital comment has been forwarded to NS Environment on

February 13, 2019 Name: Email: @hotmail.com Address:

Privacy-Statement:

agree x: 66 y: 16

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 6:29:17 PM

Project: replacement_effluent_treatment_facility_project Comments: They need to build a closed loop treatment plant. Time to stop poluting our environment. Name: Email: r@yahoo.com Address:

Privacy-

Statement: agree x: 59 y: 6

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 6:41:10 PM

Project: replacement_effluent_treatment_facility_project Comments: I support Northern Pulp and its new Effluent treatment facility and pipe outfall. It would have a disastrous economic impact on Pictou County, and in turn the province of Nova Scotia. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 58 y: 20

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 7:27:13 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipe it will kill and we will not be able to swim or fish Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 62 y: 35

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 8:17:13 PM

Project: replacement_effluent_treatment_facility_project Comments: My name is , I want to continue swimming in our beloved Northumland St,l swim from late May to late September dayly many times yes I love the beach and swimming as do my children and grandchildren our happiest times are spend there.My father fished lobster and now brothers, brother in laws, Uncles,and cousins.I feel sick, very sick that our lives will be in constant turmoil over this treatment facility pumping toxic waist into the Northumberland St, like many other areas it will become a dead zone.When you are raised in such a beautiful place it will break My heart to witness it distroyed! When I cant take any more My 23 aches of land on the Northumland St will be wortless, Please, Please help!#Raisedonthenorthumberlandst Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 46 y: 41

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 9:34:06 PM

Project: replacement_effluent_treatment_facility_project Comments: Iâ?Tm in full support of Northern Pulp, and feel that people truly underestimate the need for this mill in our province! I approve. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 57 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:13:23 PM

Project: replacement_effluent_treatment_facility_project Comments: NoPIPE please! I fish lobster in the strait. My family has for 100yrs. I also work in the woods and need NP for contracts. That said, I still NEED to BEG FOR NO PIPE!!! Please! Name:
Email: @hotmail.com Address:

Privacy-

Statement: agree x: 34 y: 26

From: @vianet.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:14:47 PM

Project: replacement_effluent_treatment_facility_project Comments: Life in all its forms needs protection from the deleterious effects of pollution of all kinds. Money does Not.!! Name: Email: @vianet.ca Address:

:

Privacy-Statement: agree x: 72 y: 22

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 13, 2019 10:23:38 PM

Project: replacement_effluent_treatment_facility_project Comments: Requires a FEDERAL level enviro assessment! Leaving everything in the hands of the NS govt ia like asking a fox to report every chicken he takes! Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 42 y: 26

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 12:12:31 AM

Project: replacement_effluent_treatment_facility_project Comments: 100 for np trying to clean up. Give them the time they need Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 43 y: 41

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 6:09:33 AM

Project: replacement_effluent_treatment_facility_project Comments: I can not understand how it could be acceptable to dump anything into the northumberland strait when other business/ private citizens can not dump into rivers/lakes or streams. If you disturb a small stream while working in the gravel business you will be required to pay fines and not continue the practice but in this case you can dump water at 37 degrees containing elements not normally part of this ecosystem. How can this even be considered an option in 2019! Name:
Email: @gmail.com Address:

: Privacy-

Statement: agree x: 55 y: 21

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 14, 2019 8:16:11 AM

Project: replacement_effluent_treatment_facility_project Comments: Very pleased to see that the EA has been submitted. It is quite the document my husband is reading it and has been explaining the project to me as he goes along. Very impressive project and I wish the company and employees of Nothern Pulp much success!! Our family would definitely like to remain here, without the project going through that may not happen. All the best!! Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 70 y: 19

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 8:55:56 AM

Project: - Choose - Comments: How can you even consider this when northern pulp canâ?Tt even tell what will be in there waste water ? Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 68 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 10:59:15 AM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulpâ?Ts operation does not run at a â?osteady stateâ? . Meaning chemical composition and temperature are inconsistent with the effluent as it leaves the plant. Until there is a consistent output , no system can effectively treat this effluent. This is known to the industry and NP. This means major upgrades are required at the NP plant prior to ever discharging any effluent, so you know exactly the quality of effluent you are treating and exactly what will enter the Norhumberland Strait. By their own admission in their submission, they do not know! The submission by Northern Pulp is a pro mill propaganda piece not a report grounded in independent scientific analysis. We can not afford mistakes of the past, open this up to independent oversight presented in a public forum. There are much bigger risks than the short term effects of mill jobs, many more peopleâ?Ts jobs, health and quality of life are at stake for generations. The NP mill is old ,tired and a blight on our beautiful province. REJECT THE PROPOSAL Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 54 y: 27

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:42:10 PM

Project: replacement_effluent_treatment_facility_project Comments: NP has no idea exactly what is in the effluent, so how can they say it will not affect the marine life? Name:
Email: @msn.com Address:
: Privacy-
Statement: agree x: 44 y: 30

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:43:49 PM

Project: replacement_effluent_treatment_facility_project Comments: I may be wrong, but all the so called data I see is older data. Things change, tides, marine life, environment, etc. Where is the recent data on short term and long term affects on the marine life Name:
Email: @msn.com Address:
: Privacy-
Statement: agree x: 54 y: 19

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:44:54 PM

Project: replacement_effluent_treatment_facility_project Comments: They have had leaks in the past and have tried to down play them. They did not even know they were there. How can we know for sure that if there is a leak, they will find it, fix it before any damage? Name: Email: @msn.com Address:

Privacy-Statement: agree x: 52 y: 30

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:45:57 PM

Project: replacement_effluent_treatment_facility_project Comments: they have lied, manipulated facts, and tried to hide their failures, including NOT reporting failed stack tests, how are we suppose to believe them? Name: Email: @msn.com Address:

: Privacy-Statement: agree x: 75 y: 19

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:48:25 PM

Project: replacement_effluent_treatment_facility_project Comments: they keep saying best available science which is what they said for boat harbour. When asked directly if they could say for sure there will absolutely be no ill affects on the Strait, they said they cannot say that with 100 percent certain. They are using best available science to get them out of it in the future Where is the actual science? where is the short term and Long term studies??? Name: Email: @msn.com Address:

:

Privacy-Statement: agree x: 45 y: 23

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:50:43 PM

Project: replacement_effluent_treatment_facility_project Comments: They keep saying that this is the best available treatment facility and is used across canada. They do not seem to want to look at anything else, including closed loop. Boat Harbour was the best available plan at the time and was used across Canada, look how that turned out Name: Email: @msn.com Address:

: Privacy-Statement: agree x: 55 y: 31

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 1:52:58 PM

Project: replacement_effluent_treatment_facility_project Comments: They have been complaining that they need more time. They had over 5 years as they knew they would have to come up with something else. Instead of actually coming up with ways to complete this , they concentrated more on bullying, lying, manipulating, and looking to extensions on the Boat Harbour. How can we believe anything they say??? How can we believe anything the Provincial Government says as they kept Boat Harbour going??? Name: Email: @msn.com Address:

: Privacy-Statement: agree x: 82 y: 32

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 4:00:42 PM

Project: replacement_effluent_treatment_facility_project Comments: There certainly is a significant amount of information in these documents. After hearing lots about this project, it is interesting to see the complete package. I have several comments: 1. The meeting of TSS, DO, pH and salinity within 2 meters and Colour within 5 meters as well as temperature within 100 meters seems to be an excellent result. Especially considering the size of the body of water. 2. BOD being below 20 of Federal regulations and TSS being below 15 of Federal regulations indicate good performance in my mind. 3. The use of similar systems for similar operations in Scandinavia should be seen as a positive indication. 4. Even though effluent has been entering the Strait for 50 years, there appears to be a strong fishery. All evidence points to a continued strong fishery with a new treatment plant. 5. Significant study appears to have been done for all aspects of the environment, including birds, turtles, plants, etc. Studies show no significant impact. 6. There appears to be a mitigation plan for all foreseeable events during construction and operation. 7. The choice of material for the new pipe seems appropriate. 5 cm thick pipe that is not susceptible to corrosion or decay. No thermal growth and flexible. 8. A significant spill basin to collect any effluent not meeting limits. This seems like a well prepared document that should answer all reasonable questions and concerns. Based on this, I can see no reason not to proceed. Name: Email: @ns.sympatico.ca Address: Municipality: Postal-Code:

Privacy-Statement: agree x: 72 y: 27

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 4:17:50 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp should be given extra time to build an effluent pond to deal with their waste water from the pulp mill. This plan should however include the no dumping of treated water in to the Northumberland Strait. This treated waste water should be so pure as to it being put into Pictous sewage plant would cause no further contamination than the treated waste water from the Pictou sewage treatment facility. There should be a full federal environmental assessment done to ensure nothing is going into the Northumberland Strait directly from Northern Pulps treatment ponds. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 63 y: 28

From:	@membertou.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 14, 2019 4:19:11 PM

Project: replacement_effluent_treatment_facility_project Comments: I grew up in Pictou Landing First Nation and hunted, trapped and frequented the Boat Harbour property a lot while growing up there. What I saw was horrible. I saw animals with massive lesions on them as well as missing tails that would not heal. the boat harbour fog would peel pain off houses so the community began to use vinyl siding. Many people in Pictou Landing could not go out when the fog had rolled in off of Boat Harbour because of how hard it was to breathe. When you look at the population of PLFN there is a high amount of cancer which may not be related to Boat Harbour but when you look at other communities of similar size that is not an issue like it is in PLFN. Fish kills were frequent near the release point into the Northumberland Strait not in boat harbour yet no explanation was given other than they suffocated. Fish do not suffocate in water. My family told me many stories of how they were promised that nothing would happen to our fisheries, huntin g and gathering lifestyles but the day the effluent started to pour into Boat Harbour is the day that all fish died massive fish die off occurred and so with it went our lifestyle. We now cant take anything from in or around the effluent. moving the effluent to another area without eliminating 100 of the risks to harm the fishing industry, tourist industry or the Rights of the Mikmaq to gather food for personal use, social use or ceremonial use in and around the Northumberland Strait area should be closely monitored by the federal departments of Fisheries and Oceans and the Indegenous Affairs departments. Impacting our FSC Rights should not occur because the SCC protects those Treaty Rights and if they are impacted in any way then the Federal Government should defend our Rights because they have a fiduciary right to protect the Mikmaq and the treaties we signed. Name:
Email: @membertou.ca Address:

Privacy-Statement: agree x: 73 y: 23

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 7:33:09 PM

Project: replacement_effluent_treatment_facility_project Comments: They are trying to clean it up , if you let the opinion of a few uninformed individuals affect the lives of many hard working people, you are just as ignorant as everyone thinks you are Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 52

y: 25

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 9:01:32 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel this project is well designed and thought out. The science will prove this is the best way forward. As one of the most common type of systems used in any waste treatment plants wether it be industrial or municipal. Bad blood canâ?Tt be the way forward it must be based on fact not the fiction in the news with no merit. I believe the issues in the northumberland Strait are much deeper than one single plup mill. The province of PEI with its fertilizer run off is just as bad or far worst. Please base your findings off of facts and science not the fiction being betrayed in the mainstream media

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 10:06:41 PM

Project: replacement_effluent_treatment_facility_project Comments: The Jobs at the Mill and the Forestry Sector are to important to have displaced, by any length of Shutdown of NP. The New Treatment Process is proven to be effective in other Mills Globally. There is absolutely no reason to change any assessment testing that had been agreed to earlier in this legislation to close Boat Harbor, so if the process of assessing is changing then the Date of Closure for Boat Harbor needs to be adjusted also. Good paying jobs matter. Get the New Effluent Treatment System Approved Now... Name: Email: @eastlink.ca Address:

: Privacy-Statement: agree x: 46 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 14, 2019 10:07:31 PM

Project: replacement_effluent_treatment_facility_project Comments: Please do not let NP go forward with their pipe proposal. Insane...for so many reasons. Taxpayers deserve better. The health of our community deserves better. We are dying here. There are days when I cannot breathe. Name: Email: @gmail.com Address:

e: Privacy-Statement: agree x: 77 y: 21

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 15, 2019 12:22:38 AM

Project: replacement_effluent_treatment_facility_project Comments: The content and length of this proposal are beyond my ability and presumably that of most of the public to fully review and analyze, so my comments will focus on the proposal and review process rather than the content of these documents. - With the province on the hook for an unknown amount of money related the ending the boat harbour lease, which seems to be dependant on the cost of building this new facility, there appears to be a conflict of interest / potential bias in also having the provincial government acting as the sole reviewer of the environmental assessment. The close connections between Northern Pulpâ?Ts lobbyists and the current liberal government only add to this concern. - Regardless of any pressure related to the deadline for the closure of boat harbour, the proper amount of time needs to be taken to complete reviews, and if needed, to redesign the proposal. Base on their own public engagement materials, Northern Pulp did not initiate an environmental assessment until 2 years after the Boat Harbour Act was passed. They have now submitted their last minute proposal only after already stating that they will not meet the deadline, putting increased pressure on the assessment to pass or further delay the project. Their failure to expedite the project should not allow them to bypass a thorough review. - The loss of the mill, either temporarily or permanently, would certainly have a negative effect on mill employees and the local forestry industry, but this in and of itself does not mean that the project should go forward. If this industry cannot be both environmentally and economically sustainable at the same time, it should not be one that Nova Scotia supports. If the entire forestry industry is dependant on this one mill as they have been saying, they should step up and help fund a proper treatment facility if the outcome of the assessment is that the proposal is not adequate. - I believe that a Class 2 provincial assessment and/or a federal assessment would be appropriate in this case, to ensure a complete and impartial review is conducted. And I believe this would go a long way in easing the concerns of the general public. Name: Email: Address: Municipality: Postal-Code: Phone: Fax: email_message: Privacy-Statement: agree x: 70 y: 20

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 5:46:42 AM

Project: - Choose - Comments: I feel we need a federal environment assessment into the millâ?Ts plan to place a pipe into the Northumberland Strait. The provincial government has supported the mill and its polluting ways for over 50 years. They will support this insane proposal to dump 80 plus million litres of â?o effluentâ? per day into the strait. We live right on the strait and worry about the effect this pollution will have on our environment, beaches and our fishing industry- especially the lobster larvae. The fishermen have good reason to be worried. We are totally against the proposal of the pipe going into the strait and ask for a full federal environmental assessment. Name: Email: @yahoo.com Address:

Privacy-Statement: agree x: 55 y: 30

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 6:28:44 AM

Project: replacement_effluent_treatment_facility_project Comments: no pipe into Northumberland Strait. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 56 y: 21

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 7:36:53 AM

Project: replacement_effluent_treatment_facility_project Comments: I am a land owner, farmer, and small scale Foresty worker that lives in Pictou county. I am raising a family here. I am 100 opposed to the mill and the amount of pollution it creates here. Iâ?Tm not for people losing their jobs but enough is enough. Better to be remembered as someone who took steps to make it better than to be remembered as one who put another nail in the coffin. Name:
Email: @hotmail.com Address:

Privacy-

Statement: agree x: 61 y: 14

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 7:51:35 AM

Project: replacement_effluent_treatment_facility_project Comments: No pipe

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 8:20:10 AM

Project: replacement_effluent_treatment_facility_project Comments: Northern pulp cannot be allowed to continue esp with only a level one assessment. They want to put an effluent pipe through a protected eater shed. my well water comes from it as well. Why would they be allowed to poison our water? No,northern pulp had years to get their ducks in a row and never did anything until the last hour. Time to start saying NO to northern pulp and to stop giving them handouts #nopipe Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 71 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 8:26:11 AM

Project: replacement_effluent_treatment_facility_project Comments: Excellent plan that looks good for both Forestry and Fisheries.

From: @icloud.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 9:02:13 AM

Project: replacement_effluent_treatment_facility_project Comments: No pipe No more time for Northern pulp they had enough time all ready.This shouldnt even be a discussion! Name: Email: @icloud.com Address:

Privacy-Statement: agree x: 75 y: 21

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 9:40:07 AM

Project: replacement_effluent_treatment_facility_project Comments: This is absolutely wonderful! State of the art system will provide environmental conservation as well as protect thousands of jobs at Northern Pulp and many many other indirect jobs. Too bad other forms of waste treatment systems polluting the waterways would put this much concern and money into their waste treatments. Unfortunately there are multi thousands of pollutants polluting our environment...and until the proper technology is built in the future to eliminate this completely...shutting down ONE mill and causing major chaos is not going to achieve anything, but only create more problems. Until a complete solution is derived in the future which will not happen overnight...the best we can do is uphold all waste systems to the highest level of regulations to reduce our impact on the future, which I truly believe Northern Pulp is achieving. First Nations will get their land cleaned up...and Northumberland Straight will get the absolute least and safest TREATED was te possible globally.Boat Harbour has been running their treated waste to the straight for decades...not understanding why now the fisherman are concerned??...especially now that the waste will be of a higher quality of standards Im afraid if this one company is forced to closed, regardless of the FACT that all regulations are met, all industries with any kind of environmental waste will be heavily under the scope, including thousands of boats in the straight on a regular basis also polluting the waters. Really hoping that SOMEDAY with continued efforts we can all work and play in a world with no environmental impact. Thank you

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 9:43:18 AM

Project: replacement_effluent_treatment_facility_project Comments: Project looks scientifically sound. Its a shame the survey was blocked. However, this project meets all provincial and federal regulations. Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 68 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 9:44:39 AM

Project: replacement_effluent_treatment_facility_project Comments: The environmental assessment is very in depth. It is not hard to tell the enormous amount of time and energy Northern Pulp has put into this project to get it right! I am in favor of the assessment and an extension. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 75 y: 24

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 10:11:50 AM

Project: replacement_effluent_treatment_facility_project Comments: NO PIPE!! PERIOD

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 15, 2019 10:20:13 AM

Project: replacement_effluent_treatment_facility_project Comments: very important for the economy of the province. As an employee of NP and tax payer, I believe if the science is there to support it , it should be put through. It will be a great improvement from before and should help everyone involved. I for one do not want to take my young family out of this province to find employment because of a handful of people that wont believe the science. I want my family to grow up in the pictou county area like I did with family and friends. With no mill it would be a very poor area of Nova Scotia to live. I think it is great that the mill is looking to the future for a better environment and cleaner effluent. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 64 y: 32

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 10:28:00 AM

Project: replacement_effluent_treatment_facility_project Comments: I dont feel an extension should be given, this company has had plenty of time to develop proposals for the clean up. This company has dragged it feet long enough if they were serious about the environment they would have had strategic planning to improve this situation long ago. How many more years is this plant really going to be around? No more discharge or proposed pipeline with effluent discharge. Enough is enough stop the pollution. Name: Email: @ns.sympatico.ca Address:

Privacy-

Statement: agree x: 52 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 11:59:36 AM

Project: replacement_effluent_treatment_facility_project Comments: Due to delays in surveying because of blockades and extra studies added to the environmental assessment I believe Northern Pulp should be given an extension to complete its new replacement effluent facility. Also Nova Scotia canâ?Tt afford to have NorthernPulp shut down. Would be a financial nightmare for everyone. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 85 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 12:58:54 PM

Project: replacement_effluent_treatment_facility_project Comments: Im concerned about burning the collected sludge How is this safe? Do the boiler get and stay hot enough? Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 68 y: 18

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 1:05:10 PM

Project: replacement_effluent_treatment_facility_project Comments: There has been false and/or skewed information published in regard to this project. Both levels of government need to ignore uninformed opinions and guilt over the past decisions and look at the facts only. These jobs are too important to the economy to be a political football. Give the mill more time and do the proper studies both provincial and federal. Name: Email: @gmail.com Address:

Privacy-

Statement: agree x: 48 y: 23

From:	pictou@live.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 15, 2019 1:22:14 PM

Project: replacement_effluent_treatment_facility_project Comments: What is the maximum capacity of the new system to be installed in litres per day? It has been said that it can handle a maximum of 50000 litres per day. Where will the untreated effluent in excess of the capacity go? It has been said it will bypass the system and go right out the pipe. If unit malfunctions will untreated effluent go into directly into Northumberland Strait ? We cannot take a chance on destroying a lucrative fishing industry and tourism industry .Northern Pulp has said they cant say what will be in the treated effluent but it will be better.They say there are many other mills using this system so why cant they provide answers based on those mills ?Northern Pulp still continues to emit carcinogenic substances from the stacks into the air without care or concern for the community. Also there can be no extension on Boat Harbour facility as the PLFN have suffered from the effects of this environmental disaster and racism for far too long and have been re peatedly lied to on previous closing dates. Also they will be burning the sludge from the treatment process which will add to the toxic air and carcinogens being released into the air we breath here in Pictou County Name: Email: pictou@live.ca Address:

: Privacy-Statement: agree x: 52 y: 26

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 1:48:36 PM

Project: replacement_effluent_treatment_facility_project Comments: I support northen pulps effluent treatment facility project, and an extension on boat harbour, until the project can be completed. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 73 y: 30

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 1:51:45 PM

Project: replacement_effluent_treatment_facility_project Comments: i support northern pulps effluent treatment project, and an extension on boat harbour, so the project can be finished. Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 52 y: 23

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 4:04:17 PM

Project: replacement_effluent_treatment_facility_project Comments: , P.Eng @ns.sympatico.ca February 15, 2018 Environmental Assessment Branch Nova Scotia Environment P.O. Box 442 Halifax, NS, B3J 2P8 Fax: 902 424-6925 Comments submission to Nova Scotia Environment Re: Northern Pulp Replacement Effluent Treatment Facility Project Environmental Assessment Submission To Minister Iain Rankin and others whom it may concern, I appreciate and thank you for this opportunity to make comment, and trust it will be read and considered. I am an engineer with almost 40 years experience in the pulp and paper industry in Canada. Most of that time in the kraft pulp industry, including many years in the environmental side of the business. I have traveled to many mills in Canada and the United States to conduct audits and share ideas. I have been following this issue from the beginning, and given the misinformation in the public discourse, I feel it necessary to make a few important comments for your consideration. I recently took time to read Northern Pulpâ?Ts environmental assessment submission posted on your website in its entirety, including all appendices for a total of 1735 pages. It is comforting to learn that Northern Pulp has consulted many world class experts in the subject matter in the creation of this environmental assessment. This environmental assessment is as complete and comprehensive and any I have read. It is a very large and comprehensive assessment that deserves thorough evaluation by knowledgeable and skilled individuals. I expect that you will need to go outside the department for that expertise and understanding. Please donâ?Tt be guided by the incorrect and misinformed reports appearing in the public and the media when making your decision. According to the department, the environment assessment process is designed to â?oto identify the environmental impacts associated with designated development undertakings long before the proposals are implementedâ? and its purpose is to â?opromote sustainable development by protecting and conserving the environment by identifying and assessing possible adverse effects on the environment before a new undertaking begins.â? I support this process and its goals completely. I trust that decisions will be based on facts and science, and not emotion and misleading or false information. If these decisions are allowed to be made on emotion the process will fail for all. This project has had lots of press and loud public opposition, but most do not understand the kraft pulp process or the treatment of kraft mill effluent. I urge you to put the emotion and noise aside and make you decision based on the science and track record of similar projects to the one proposed. If this process would have been followed when the existing system at Boat Harbour was constructed by the provincial government, it would have been built to the best technology of the day. This includes a properly designed outfall, which would have eliminated many of the legacy issues that plagued the existing situation from its beginning. It is important to note the provincial government used promises to provide a water supply and to treat effluent as â?obaitâ? to attract industry to the area. Three companies would ultimately be attracted by this deal. These were large multinational foreign companies Scott Paper and Michelin Tire, and a few years later CIL set up operations near the mill site. The province failed to live up to their end of the agreement by cutting corners and failing to construct a facility and treat the effluent as promised. This failed the residents of Pictou County including the Pictou Landing First Nation, as well as the industries they convinced to set up in Pictou County. In doing so they created a legacy that cannot be changed no matter how well or poorly the existing system is operated. It is also important to note that since the beginning in September 1967, the government has had many opportunities to correct the situation by constructing a proper

treatment system and outfall that could have changed the course of local history. They failed to do so because of cost, political will or whatever were the issues of the day. Effluent from this facility has been going to the strait since September 1967. For the first few years, from 1967 until 1971, there was no manmade treatment. The governmentâ?Ts concept was to rely on natureâ?Ts ability to break down organics in the natural tidal estuary known as Boat Harbour to provide whatever treatment it could. The results were unacceptable to everyone in the area. The system slowly evolved through development with various levels of success and failure until 1996, when the system was leased to the mill operator to operate. Until 1996 the provincial government had full operational control. This arrangement was functionally parallel to the current situation in municipal government, where residentsâ?T homes connect to the sewage system and the municipal governments treat and release the effluent. When the mill took control of operations, a redesign was conducted and additional aeration, instrumentation and other equipment was installed so that it could operat e reliability within the federal Pulp and Paper Effluent Regulations PPER. The Northern Pulp kraft mill is typical of many kraft pulp mills around the world. The kraft process has remained much the same as it has since the first kraft mill was built in 1947. While the equipment is bigger, more sophisticated and constructed with better materials, the chemistry remains much the same. It is the most extensively used chemical pulping process in the world. It is used in first world countries where there are extensive environmental laws and in developing countries where there are few rules. Northern Pulpâ?Ts effluent treatment process is also comparable to many kraft mills. My point is the treatment process proposed is tried, true and tested. We can be very comfortable in the process selected and the equipment supplier. Veolia is a leader in the supply of effluent treatment to mills and municipalities in Canada and around the world. Treatment system designer KSH Solutions has successfully designed effluent treatment systems for many world-class mills arou nd the world. One of the most vocal opponents to improving the current situation is the lobster fishers. They are concerned the effluent will affect the lobster fishery. They seem to have forgotten that the effluent has been going to the Northumberland Strait since September 1967. If there are any issues with the lobsters caught in the area of the current outfall the fishers have kept that a secret. In fact, some have bragged about how good they are. Since the mid 1960s then the lobster catches have almost tripled in zone 26A -- the area encompassing the current system outfall into the strait. This can be confirmed by DFO. Surely any long term effects would have presented in the ensuing 52 years of continuous fishing in zone 26A, beginning with a decline in fish stocks. The PPER require that each mill maintain an Environmental Effects Monitoring EEM program. These programs study the environmental effects of the effluent on the marine environment. This is a very robust scientific program that is administered through the Environment and Climate Change Canada. They have scientists that specialize in this field. The EEM takes an iterative approach that looks for changes and studies the effects in a deeper and deeper way. The studies and reports are very scientific and undergo peer review to ensure the science is solid and accurate. Environment Canada directs the study for each cycle, drilling down on differences from the previous cycle that are discovered. No other industry in Canada goes through such an extensive critical assessment of the effects at the end of the pipe. See appendix J for the Cycle 7 results. Other EEM reports are available for those who are interested from Environment and Climate Change Canada. I was interested to understand how the millâ?Ts treatment system compares to others we generally believe to be good systems, including those we donâ?Tt hear of in the media as we do Northern Pulp. I was interested to compare the treated effluent coming from the proposed Northern Pulp facility to that of other industries in the Atlantic region. Also, in the interest of fairness, I studied a number of industries that also discharge into the marine environment. I reviewed scientific reports regarding farming, fish processing and municipal effluent and their effects on the environment in the region. Mike van den

Heuvel, director of the Canadian Rivers Institute at UPEI, is also a Canada Research Chair in Watershed Ecological Integrity. He and his counterparts have studied the Northumberland Strait extensively and recently published a study entitled â?oNitrogen Loading Criteria For Estuaries In Prince Edward Island.â? They determined that agriculture -- particularly in PEI -- is having a major impact on nitrogen loading in the Strait, and not the mill as some will claim. The millâ?Ts outfall even as it is today has very little effect on the Northumberland Strait. Said plainly, the science contradicts what is being claimed by fishers and activists in the area. I was very disappointed to learn that fish processing plants on marine environments not connected to a municipal sewage system have amazing lax regulatory requirements to treat effluent. The only requirement is that they must have a 25 mesh screen on the pipe and the pipe must not be visible during low tides. Anything and everything they want to dispose of goes down the pipe without regulation, requirement for testing, concern about effects, or question by the regulators. Truly amazing in these highly regulated times. Why arenâ?Tt the fishers interested in this? In also learned that these plants have very high suspended solids and Biological Oxygen Demand BOD loading many times more that the mill outfall. There is also no requirement to conduct any testing. The water usage is also very high given the size of these facilities. Water is used extensively for conveying the product and during cleaning. I was surprised to learn that the chemicals used in these facilities are simila r to a kraft mill. Caustic for cleaning equipment and chlorine for sterilizing. In many ways the effluent characteristics are similar. The AOX parameter in their effluent is two to three times that of a kraft pulp mill. I was also interested to compare the millâ?Ts effluent treatment system to municipal units in Nova Scotia. I selected the towns of Pictou and New Glasgow with treats sewage for Stellarton, Trenton and Westville and some surrounding areas as well as local systems for comparison. I also examined two of the three new systems constructed as part of the Halifax Harbour Cleanup Project: The Water Street Treatment Facility and the Dartmouth Mawiomi Street Treatment System. Both were constructed as part of the much-publicized Harbour Cleanup Project which for the first time stopped raw sewage from entering Halifax harbour. I used the Freedom of Information Act to obtain their operating Approvals and sample reports of the data they are required to submit as part of their operating approvals. Effluent flow from the proposed Northern Pulp mill system is significantly larger than that of the Town of Pictou, population 3186 2016 census which is not unexpected. Surprisingly, it was only 4.7 times larger than the Town of New Glasgow. When flow is compared to the Halifax plants, I was surprised to learn that the Northern Pulp facility is 5.2 times smaller than the Water Street facility and 3.4 times smaller than the Mawiomi facility. Interestingly, the press and opponents to the system would lead you to believe that Northern Pulpâ?Ts effluent volume is larger than all of the Halifaxâ?Ts 14 treatment systems. I concluded that while the Northern Pulp facility is large, it is not unusually so for Nova Scotia, contrary to what we have been lead to believe. The proposed treatment system for Northern Pulp includes a primary treatment process followed by a secondary treatment. The primary treatment consists of a coarse screen to remove the very large pieces followed by a clarifier to remove suspended solids carried in the water. The secondary treatment -- the most important step -- is a biochemical treatment process which breaks down the constituents that remain in the effluent. The process selected is an MBBR process combined with activated sludge process. This results in a highly efficient and compact design. These processes have proven very successful in treating pulp mill effluent. Activated sludge systems have been used for many years in both industry and municipal sewage treatment plants around the world. Itâ?Ts proven and reliable technology. In fact, both the New Glasgow and Pictou municipal systems are activated sludge processes and produce good results. Only one of the three systems constructed for the Halifax Harbour Clean Up project employ secondary treatment. The two largest systems -- at Water Street and Mawiomi Street -- are primary treatment only systems. They do not use biochemical

treatment. These systems do not treat for E. coli or other harmful biological elements. Both systemsâ?T operating approvals recognize this and allow for unlimited E.Coli releases except during the summer months May 1 through to October 31 when itâ?Ts limited to 5000 CFU per 100 ml of effluent. E. coli is a bacterium commonly found in the intestines of humans and other animals, some strains of which can cause severe food poisoning. This can make people severely ill with vomiting, diarrhea and potentially kidney failure. Northern Pulpâ?Ts current system has secondary treatment in the form of an Aerated Stabilization System and does not release E.coli. The proposed system is will also not release E. coli. When comparing the other primary treated effluent parameters Biological Oxygen Demand BOD and Suspended Solids, the Northern Pulp facility is designed for half the approval limits of both Halifax systems. Regarding BOD this is 25mg/l for the mill versus 50 mg/l for the Halifax systems. When comparing suspended solids the Northern Pulpâ?Ts facility is 25 mg/l versus 40 mg/l for the Halifax systems. Another very important parameter is toxicity. Local opposition groups and the media repeatedly and incorrectly report that the existing effluent released from Boat Harbour is toxic. This is incorrect. Records submitted to both provincial and federal environment departments show the effluent has consistently passed the toxicity test. Independent tests conducted by Environment Canada have confirmed this. Records obtained through Freedom of Information requests show that both the Water Street and Mawiomi Street facilities failed toxicity tests in 2007 on a number of occasions. This is a clear violation of their operating permit. Interestingly, not a word in the press or any charges laid by provincial or federal regulators. Why is Northern Pulp treated differently? The Northern Pulp treatment system is clearly less harmful to the environment. Furthermore, all municipal systems are designed to overflow, whereby untreated sewage is allowed to bypass the treatment facility and be re leased directly into the receiving waters. Indeed, all municipal systems I obtained information on had numerous occasions of such overflow. There has been much talk about high cancer rates in Pictou County and much of the blame has been placed on the Mill. In September 2018 the Nova Scotia Health Authority released their latest study entitled Nova Scotia Incident and Survival Rates September 2018 based on province wide data collected from 2011 to 2015. This documents the incidence of cancer by type and region. It is clear that Pictou county has a slightly lower that average cancer rate than the rest of the province. There are other studies that confirm this information. Please do not be misled by inaccurate information in the public domain. In closing, I encourage you to make your determination by examining the science and the merits of this project and not on the largely inaccurate information put forward by the projectâ?Ts opponents and repeated in the press. There is ample information in the EA submission to make this judgement. There are many workers and their families from across this province that depend on the jobs that this business and related businesses provides. They deserve that your give this a fair and unbiased review. This is an important project for all of Nova Scotia and I believe it should proceed.

Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 51 y: 16

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 15, 2019 7:21:52 PM

Project: replacement_effluent_treatment_facility_project Comments: Awesome! Name:
Email: @hotmail.com Address:

Privacy-Statement: agree x: 54 y: 18

Feb 8 2019

Enviornment Assessment Branch
NS Environment
PO Box 442
Halifax NS
B3J 2P8

To Margaret Miller
NS Environment Minister.

With regards to Northern Pulps plan for pipeline

Dear Minister:

To date with lack of full scientific certainty, we have threats of serious or irreversible damage and lack of full scientific certainty the treatment plant which Northern Plup has submitted must be shut down until full assessment. In 1994 the same plan was shut down by the Tobin government to protect fish habitat from toxic effluent. The reason that pollutants that would be contrary to Fisheries Act with regard to spawning areas.

Shell fish absorb dioxins & furons a known fact. The current powerboiler is currently and repeatedly failing stack emission tests and now considering adding sludge containing toxins to mix. The route of pipeline is over Pictou, watershed and same traffic route to Northumberland Ferries Ltd. This is a entry point to PEI and this could be harmful to tourist season for the Eastside of PEI & town of Pictou

Three points :

Meeting regulations does not prevent harm

The regulations are 25 years old

70% Pulp & Paper mills are having harmful effects on aquatic life, despite meeting current regulations.

The new treatment facility is not better than current plant at Boat Harbour. This so called new plan was rejected in 1994. Why are we the tax payers paying 6 million for a rejected plan.

We have three long lived industries

Tourism, Commercial fisheries and sport fisheries all three must be worth 5 billion a year.

Citizens of Nova Scotia must have a better return of our tax dollars. We are on the hook for the clean up of Boat Harbour, which can be cleaned up, we can not say the same for Northumberland Strait. We are paying millions for the design & reconstruction of new pipe line. Why not give this money to our over worked heath care workers, Senior's and Veterans for public programs.

We are a proud house hold with one fishing fleet and a worker at Northumberland Ferries for 34 years.

We have worked hard & long hours and our way of life could be wiped out in a instant. A full stop to this project. No extension to Boat Harbour (A'se'K). No Pipe in Northumberland Strait.

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 16, 2019 6:21:30 AM

Project: replacement_effluent_treatment_facility_project Comments: Close down this mill ASAP Think about what is going into the Northumberland Strait. The ecosystem is not capable to repair this continuous damage Name: Email: @yahoo.ca Address:

Privacy-Statement: agree x: 66 y: 17

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 16, 2019 9:57:03 AM

Project: replacement_effluent_treatment_facility_project Comments: The waste proposal poses major risk to harming marine life , marine habitat, species at risk/endangered/threatened that include migratory and marine birds, fish, vegetation, reptiles etc. All listed in the submissions via Northern Pulp. The proposal goes through the Pictou town and Caribou water supply. 2 provincial parks and 2 nature preserves are within the effluent pipe footprint Meeting PPER doesnâ?Tt prevent harm to marine life or marine habitat per Environment Canada The characteristics of the proposed effluent is â?ounknownâ? to NP The proposal shows the plan to burn the toxic sludge in the power boiler. That we know is not working properly and air emissions are an issue today. The spill basin only holds 35 million litres of untreated effluent 10-12 hrs before it goes into the AST system. If a malfunction happens where does it go. They also list temporary and permanent closures for fishermen around the outflow area, creating a no anchor zone and possible compensation that has not been discussed for impacted fishers. The O2 delignification system is not laid out on how or when it will be constructed, maintain and operates like the AST system. It is listed in the appendix has a â?ofuture upgradeâ? . I will let you interpret that. The Waste proposal will be pumping effluent into the ocean after only processing it for 8 hours as opposed to the current waste system that takes about 30 days to process and reach the Strait Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 55 y: 17

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 16, 2019 10:14:42 AM

Project: replacement_effluent_treatment_facility_project Comments: With so many jobs counting on northern pulp , we need to do the right thing and give the pulp mill the time it needs .We should only be dealing with facts and not feelings or opinions . The government should do what is best for all of Nova Scotia ! Name: Email: @live.ca Address:

Privacy-Statement: agree x: 56 y: 19

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 16, 2019 3:11:08 PM

Project: replacement_effluent_treatment_facility_project Comments: The more extensive Class 2 Federal Government Assessment is required for this project proposal. This statement from the submitted Environmental Assessment Registration Document clearly signifies why: At this time, effluent chemistry characteristics including the specific substances present in treated effluent and their anticipated concentrations will not be known with certainty until the project is operational. ~Certainty regarding these facts and ALL specifics must be available at this crucial proposal stage. There is simply no way to trust the science and make the correct recommendation without having this all-important information accurately presented at this highly consequential phase. Thank you for your consideration. Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 66 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 16, 2019 5:27:56 PM

Project: replacement_effluent_treatment_facility_project Comments: At the very least, insist on a Federal Environmental Assessment of the Pictou mill proposal to shoot effluent through a new pipe into the Northumberland Strait. The best thing that could happen is for that mill to shut down completely. We do not need it! Nova Scotia does not need it! The Northumberland Strait and the fisheries do not need it! Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 60 y: 20

From: @shaw.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 16, 2019 9:52:30 PM

Project: replacement_effluent_treatment_facility_project Comments: Please do further review of this potentially damaging project to our water and life envirnoment. Once done there is no going back! Name: Email: @shaw.ca Address:

Privacy-Statement: agree x: 66 y: 29

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 8:50:25 AM

Project: replacement_effluent_treatment_facility_project Comments: Shut this plant down, stop polluting the environment. This plant sends out the wrong message to tourists and they will look at NS as supporting polluting capitalists. You will destroy the only good Atlantic Salmon runs in NS. And lobster are highly sensitive to chemicals. Dumb Dumb Dumb duh? Smarten up as they say! Name: Email: @yahoo.ca Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 68 y: 17

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 9:21:19 AM

Project: replacement_effluent_treatment_facility_project Comments: To whom it may concern, it would be a sin to place such a pipe anywhere into the Northumberland Strait with so much effluent coming out of it. This part of the province is too beautiful to harm it in this way. Weve been putting up with the stench and the disgrace of Boat Harbour long enough to know what this pipe will do. Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 74 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 10:28:02 AM

Project: replacement_effluent_treatment_facility_project Comments: I am writing to provide feedback to the Northern Pulps 1200 page proposal to conduct a new effluent treatment facility at its Abercrombie Point location in respect to whether or not your department should recommend a federal environmental assessment. Taken from NP proposal: The proposed project will consist of building a new effluent treatment facility ETF on NPNS property including a pipeline to transport treated effluent to Caribou Harbour. Ultimately, the effluent discharge will be into the Northumberland Strait, as has been the case since 1967 via the existing facility. The installation of a modern engineered diffuser provides an improvement in effluent dispersion. The improvement is such that as unlike the visual impact experienced today, it is anticipated that the effluent plume will not be visible when it reaches the waterâ?Ts surface. This opening statement shows exactly how the rest of the document will read. NP calls it a new effluent treatment facility which in itself should trigger the federal assessment. NP then states that the effluent discharge will be into the Northumberland Strait as has been the case since 1967 via the existing facility. We have seen what that has done to Boat Harbour and the surrounding area so why is it o.k. to continue to pollute the Strait in an area where it will not be visible to the majority of the public. How many people other than fishers will be in boats 4 miles off the coastline? Does this make it o.k. to pump the effluent into the Strait because no one can see it happening or because it has been happening for the last 50 years as the proposal states? Just because the new diffuser will supposedly provide an improvement in effluent dispersion doesnt mean that it is better see comments below . What about the temperature difference of the effluent? According to NP the area affected will only be 100m from the discharge site. This is based on supposition not scientific fact and will have severe consequences to the fisheries food over pulp please for years to come. Potential environmental effects are identified and predicted for both the construction and the operation and maintenance phases of the project. The residual environmental effects of each project phase are evaluated as either not significant â?oNSâ?, significant â?oSâ?, with the likelihood of occurrence identified in such cases, or positive â?oPâ?. The environmental effects of accidents, malfunctions and unplanned events as well as cumulative environmental effects of the project in combination with other past, present, or reasonably foreseeable future projects or activities are also assessed. The table that is listed on page xxiv of the proposal summarized the studies, and the effect of the project for the significance of the project related residual environmental effects of the project. I was amazed to see that all categories were predicted as NS - No Significant Residual Environmental Effects Predicted. However, in reading further into the proposal I have discovered many other areas of concern. Detailed design has not been completed for the construction of the marine outfall and pipeline. The preferred method for trenching the marine pipeline will likely be by side-cast excavation methods with re-use of bottom materials without bringing to surface. And comments such as The treated effluent is anticipated to meet complianceetc. are littered throughout the document. The whole document is written with not been completed or â?oto be determinedâ?. On numerous items the proposal states that it is not possible to know or needs more assessment due to the pipeline being defined in the fall of 2018. Again another reason for a federal assessment. Although NP has had 5 years to adjust to the new reality that Boat Harbour was closing, they have submitted a half-baked proposal, at the 11 hour with lots of what if and projections without any scientific data to back them up. This is not the fault of the population of Nova Scotia but we will have to suffer the costs both in air and water quality for NP dragging their feet and now trying to ram

their proposal through. As one writer to the Herald stated â?oIf one lobster from the Northumberland Strait is found to be tainted with chemicals, it will not be recorded as a Northumberland Strait lobster, but a Maritime lobster. The whole Maritime fishing industry is at stake. I understand that jobs are at stake here but there is more to consider than the economic benefit from one mill. There are other industries that are affected by NP destruction of the environment, notably the fisheries 1 Billion and tourism 2.7 billion. Together these two industries outstrip the benefits of NP. The health reasons of dumping 85,000 litres per day of a noxious mixture of dioxins, furans, metals and solids and other contaminates into a water source is inconceivable to me in this day and age of knowledge. Coupled with that, the mill wants to burn the sludge in the power boiler. This is the same boiler that has failed stack emissions tests Northern Pulps failed stack test happened the week of June 6 at a reading of 224, 50 over allowable levels although I understand from NP proposal that A frequent exceedance is defined as one that occurs more than 1 of the time. On page 140 under section 8.1.2.2 the proposal states that there have been no exceedances of maximum allowances. This is based on their own assessment. In the proposal NP quotes a recent paper by Hoffman et al. 2017 who evaluated ambient air levels of seven volatile organic compounds VOCs, based on ambient monitoring data reported from the National Air Pollution Surveillance Network NAPS. There are two NAPS monitoring stations near the NPNS mill that have historically monitored for VOCs. This paper focused on ambient monitoring data for the following VOCs: chloroform 1,3-butadiene vinyl chloride benzene carbon tetrachloride trichloroethylene and, perchloroethylene. The paper reported that results of the conducted temporal and spatial statistical analyses indicated that 1,3-butadiene, benzene, and carbon tetrachloride air concentrations routinely exceeded EPA air toxics-associated cancer risk thresholds, and that 1,3-butadiene and perchloroethylene levels in air were signifi cantly higher when the prevailing wind direction blew from the northeast and the NPNS mill towards the Granton NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. These outcomes have not been corroborated by regulatory agencies or other parties at this time. While this study was quick to attribute elevated ambient VOC concentrations to the NPNS mill based on a spatial and temporal evaluation only i.e., a statistical evaluation of ambient data in correlation with wind direction, without further site specific investigation, it did not attempt to rule out contributions from other potential sources of VOCs in the area e.g., transportation sources, or other industrial sources like the Michelin tire plant or the Trenton coal-fired power plant, presumably all sources of VOC emissions to some degree. So NP refuses to believe that they could be the source of air pollution but would prefer to blame it on other industries in the area. As far as the total environment foot print, meeting current PPE regulations does not mean that harm is not happening. Regulations for pulp mills were updated in 1992 and are concerned with biochemical demand and suspended solids. As it stands now, there are no CCME guidelines established for some of the different chemicals and compounds that make up the pulp mill effluent. It is not acceptable to follow 27 year old legislation so once again, a federal assessment should be considered. The new treatment facility is being touted as better than the old. I have several concerns and comments on this. It is my understanding that the current set up has the discharge going into the Northumberland Strait after a 12 hour primary treatment in the settling ponds, then moves to an aeration basin where effluent is placed in contact with micro-organisms and sits there for 8 days after which the effluent is discharged into Boat Harbour lagoon basin where it remains for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials take place during that time. In the proposed new Activated Sludge Treatment AST system on the mill site, effluent will move through a primary clarifier to an aeration basin using micro-organisms to break down pollutants, and then to a secondary clarifier. The

process will take less than 24 hours. Northern Pulp states that effluent from the new system, including an added oxygen delignification system, will be similar to treated effluent leaving the present system at point C, with some unspecified reduction in biochemical oxygen demand BOD. However, the effluent being released from the proposed new system directly into the deep waters of the Strait will not benefit from the considerable reduction in BOD, Total Suspended Solids TSS and other contaminants including heavy metals which takes place during the 20-30 days that effluent presently remains in the Boat Harbour Basin stabilization lagoon. Northern Pulp has not provided a detailed comparison between the effluent which presently reaches the edge of the Strait and the effluent they propose to release into the fishing grounds with the new system. The present effluent outfall location at the shore edge does not disperse effluent in the Strait in the same way that the proposed new outfall site would. With the proposed new system, 70million litres of treated effluent would be pumped directly and continuously into the prime fishing areas of the Strait every day. Ocean environments are increasingly stressed. The Northumberland Strait Ecosystem Overview Report, prepared for DFO in 2007, documents increasing stresses on the Strait. To state that there are other industries producing stresses does not make it alright for NP to increase this toxicity and to think otherwise is just plain insanity. In terms of toxicity, my understanding is that there is only one test required to meet federal regulations. This test measures acute toxicity -- whether 50 of rainbow trout die when exposed to effluent for 96 hours. It does not measure impacts on fish growth or reproduction or on fish habitat. No toxicity test on salt water fish is required to meet federal regulations. There are no federal regulations for a number of known harmful substances in pulp effluent, including AOX and phenols so further study is needed before this pipe is installed. We cannot wait for updated PPER legislation slated for publication in 2022. NP lists Alternatives Considered for Final Discharge Location or Method. Discharging into Pictou Harbour is not recommended due to the lack of mixing with the Strait as if mixing with a larger body of water is acceptable, Release into the Middle River upstream was not considered due to expectations that it will increase chlorides in the Middle River and potentially affect the maintenance of the equipment at the Middle River Pumping Station and inside the mill but once again it is o.k. to dump on fishing grounds. The municipal stations and private facilities do not have the capabilities to handle the volume nor is a land based option available because as proposal states: Land application of wastewater effluent has not yet been approved in Nova Scotia small wonders, Trucking or barging the sludge to a different location is not recommended. I found the barging comments interesting: A pier for barge loading would be necessary - assumed to not be at the NPNS mill location. L iquid would have to be either stored and trucked or stored and pumped to a facility to offload to an ocean going barge/tanker to be discharged outside of coastal waters in an approved area, with a large number of tankers. There would be increased industrial vessel movements in the Northumberland Strait, potentially disrupting fisheries. Project specific permits would be required as the effluent does not fall under materials permitted to dispose of offshore. NP is concerned about the increase in traffic in the Strait but not about the effluent that will be pumped there. Why would they need project specific permits if effluent does not fall under material permitted to dispose of offshore but using a pipeline to dump the effluent is allowed? A closed loop system is not economically viable according to Northern Pulp. NP also states: The main problems with the bleach plant effluent recovery are equipment corrosion and accumulation of chloride and non-process elements in the millâ?Ts water systems. Accumulation of chlorides and potassium are especially corrosive for the millâ?Ts boilers and often lead to scale build-up which would require the replacement of the boiler over time. However NP also argues that it would not be economically viable for NP however they are quick to boast of the annual volume of income at $535 million. If the chemicals used are too corrosive for the river and too corrosive to recycle in their own equipment, how can pumping

the effluent into the Northumberland Strait be a viable solution? Surely dispersing sludge over a larger area is not the answer. And what happens if NP sticks around until the end of the lease in 2030. Who is going to clean up the mess then? Who is going to compensa te the fishing and tourist industry? This are too many other stakeholders involved to let this go through without a Federal Assessment. I havent even commented on the state of the health industry in Nova Scotia that could use the money being spent on NP. NP has already received $127 million dollars in tax payerâ?Ts dollars over the years. We have paid for the design process of the proposed effluent process at a cost of $6 million dollars and will be expected to cover the cost of the construction, installation, labour etc. for the proposed pipe estimated at $100 million dollars. How can NP be allowed to pollute the environment as they have in the past and how can we as citizens believe anything that NP puts out in the media about how wonderful they are when history has shown otherwise? I would rather put my tax dollars towards the penalty of breaking the lease if need be. On top of all that, I have now read that there is a conflict of interest from the minister of the environment: As Ecojustice wrote on behalf of Friends of the Northumberland Strait, the minister has a clear financial interest in making sure the environmental assessment process is over and done with as quickly as possible. Our clients also say the ministerâ?Ts ongoing contracts with Northern Pulp give the impression that the minister is not able to make a fair decision about whether or not to approve the project. These conflicts of interest violate the publicâ?Ts right to a thorough and unbiased assessment. That is why we are calling on the minister to step away from the assessment process and make way for a federal environmental assessment.â? In summary, a federal assessment is required. I will accept the outcome of that but nothing less. Until then, NO EXTENTION, NO PIPE. In summary the concerns that need to be addressed are: The waste proposal poses major risk to harming marine life, marine habitat, species at risk/endangered/threatened that include migratory and marine birds, fish, vegetation, reptiles etc. All listed in the submissions via Northern Pulp. The proposal goes through the Pictou town and Caribou water supply. 2 provincial parks and 2 nature preserves are within the effluent pipe footprint Meeting PPER doesnâ?Tt prevent harm to marine life or marine habitat per Environment Canada The characteristics of the proposed effluent is â?ounknownâ? to NP The proposal shows the plan to burn the toxic sludge in the power boiler and air emissions are already an issue today. The spill basin only holds 35 million litres of untreated effluent 10-12 hrs before it goes into the AST system. If a malfunction happens where does it go? They also list temporary and permanent closures for fishermen around the outflow area, creating a no anchor zone and possible compensation that has not been discussed for impacted fishers. The O2 delignification system is not laid out on how or when it will be constructed. The Waste proposal will be pumping effluent into the ocean after only processing it for 8 hours as opposed to the current waste system that takes about 30 days to process and reach the Strait.
Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 63 y: 28

From:
To: CEAA.BoatHarbour.ACEE@canada.ca; ec.ministre-minister.ec@canada.ca; Environment Assessment Web Account
Subject: Northern Pulp Pipe Proposal
Date: February 17, 2019 10:28:47 AM

The Honourable Catherine McKenna

I am writing to provide feedback to the Northern Pulp's 1200 page proposal to conduct a new effluent treatment facility at its Abercrombie Point location in respect to whether or not your department should recommend a federal environmental assessment.

Taken from NP proposal:
"The proposed project will consist of building a **new** effluent treatment facility (ETF) on NPNS property including a pipeline to transport treated effluent to Caribou Harbour. Ultimately, the effluent discharge will be into the Northumberland Strait, as has been the case since 1967 via the existing facility. The installation of a modern engineered diffuser provides an improvement in effluent dispersion. The improvement is such that as unlike the visual impact experienced today, it is anticipated that the effluent plume will not be visible when it reaches the water's surface."

This opening statement shows exactly how the rest of the document will read. NP calls it a "new effluent treatment facility" which in itself should trigger the federal assessment. NP then states that the effluent discharge will be into the Northumberland Strait as has been the case since 1967 via the existing facility. We have seen what that has done to Boat Harbour and the surrounding area so why is it o.k. to continue to pollute the Strait in an area where it will not be visible to the majority of the public. How many people other than fishers will be in boats 4 miles off the coastline? Does this make it o.k. to pump the effluent into the Strait because no one can see it happening or because it has been happening for the last 50 years as the proposal states? Just because the new diffuser will supposedly provide an improvement in effluent dispersion doesn't mean that it is better (see comments below) . What about the temperature difference of the effluent? According to NP the area affected will only be 100m from the discharge site. This is based on supposition not scientific fact and will have severe consequences to the fisheries (food over pulp please) for years to come.

Potential environmental effects are identified and predicted for both the construction and the operation and maintenance phases of the project. The residual environmental effects of each project phase are evaluated as either not significant ("NS"), significant ("S"), with the likelihood of occurrence identified in such cases, or positive ("P"). The environmental effects of accidents, malfunctions and unplanned events as well as cumulative environmental effects of the project in combination with other past, present, or reasonably foreseeable future projects or activities are also assessed.

The table that is listed on page xxiv of the proposal summarized the studies, and the effect of the project for the significance of the project related residual environmental

effects of the project. I was amazed to see that all categories were predicted as NS - No Significant Residual Environmental Effects Predicted. However, in reading further into the proposal I have discovered many other areas of concern.

"Detailed design has not been completed for the construction of the marine outfall and pipeline. The preferred method for trenching the marine pipeline will likely be by side-cast excavation methods with re-use of bottom materials without bringing to surface". And comments such as "The treated effluent is anticipated to meet compliance"etc. are littered throughout the document. The whole document is written with "not been completed" or “to be determined”. On numerous items the proposal states that it is not possible to know or needs more assessment due to the pipeline being defined in the fall of 2018. Again another reason for a federal assessment.

Although NP has had 5 years to adjust to the new reality that Boat Harbour was closing, they have submitted a half-baked proposal, at the 11 hour with lots of what if and projections without any scientific data to back them up. This is not the fault of the population of Nova Scotia but we will have to suffer the costs both in air and water quality for NP dragging their feet and now trying to ram their proposal through.

As one writer to the Herald stated “If one lobster from the Northumberland Strait is found to be tainted with chemicals, it will not be recorded as a Northumberland Strait lobster, but a Maritime lobster. The whole Maritime fishing industry is at stake.

I understand that jobs are at stake here but there is more to consider than the economic benefit from one mill. There are other industries that are affected by NP destruction of the environment, notably the fisheries (1 Billion) and tourism (2.7 billion). Together these two industries outstrip the benefits of NP.

The health reasons of dumping 85,000 litres per day of a noxious mixture of dioxins, furans, metals and solids and other contaminates into a water source is inconceivable to me in this day and age of knowledge. Coupled with that, the mill wants to burn the sludge in the power boiler. This is the same boiler that has failed stack emissions tests (Northern Pulp's failed stack test happened the week of June 6 at a reading of 224, 50% over allowable levels) although I understand from NP proposal that "A frequent exceedance is defined as one that occurs more than 1% of the time".

On page 140 under section 8.1.2.2 the proposal states that there have been no exceedances of maximum allowances. This is based on their own assessment. In the proposal NP quotes a recent paper by Hoffman et al. (2017) who evaluated ambient air levels of seven volatile organic compounds (VOCs), based on ambient monitoring data reported from the National Air Pollution Surveillance Network (NAPS). There are two NAPS monitoring stations near the NPNS mill that have historically monitored for VOCs. This paper focused on ambient monitoring data for the following VOCs: chloroform; 1,3-butadiene; vinyl chloride; benzene; carbon tetrachloride; trichloroethylene; and, perchloroethylene. The paper reported that results of the conducted temporal and spatial statistical analyses indicated that 1,3-butadiene,

benzene, and carbon tetrachloride air concentrations routinely exceeded EPA air toxics-associated cancer risk thresholds, and that 1,3-butadiene and perchloroethylene levels in air were significantly higher when the prevailing wind direction blew from the northeast and the NPNS mill towards the Granton NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. These outcomes have not been corroborated by regulatory agencies or other parties at this time. While this study was quick to attribute elevated ambient VOC concentrations to the NPNS mill based on a spatial and temporal evaluation only (i.e., a statistical evaluation of ambient data in correlation with wind direction, without further site specific investigation), it did not attempt to rule out contributions from other potential sources of VOCs in the area (e.g., transportation sources, or other industrial sources like the Michelin tire plant or the Trenton coal-fired power plant, presumably all sources of VOC emissions to some degree). So NP refuses to believe that they could be the source of air pollution but would prefer to blame it on other industries in the area.

As far as the total environment foot print, meeting current PPE regulations does not mean that harm is not happening. Regulations for pulp mills were updated in 1992 and are concerned with biochemical demand and suspended solids. As it stands now, there are no CCME guidelines established for some of the different chemicals and compounds that make up the pulp mill effluent. It is not acceptable to follow 27 year old legislation so once again, a federal assessment should be considered.

The new treatment facility is being touted as better than the old. I have several concerns and comments on this. It is my understanding that the current set up has the discharge going into the Northumberland Strait after a 12 hour primary treatment in the settling ponds, then moves to an aeration basin where effluent is placed in contact with micro-organisms and sits there for 8 days after which the effluent is discharged into Boat Harbour lagoon (basin) where it remains for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials take place during that time. In the proposed new Activated Sludge Treatment (AST) system on the mill site, effluent will move through a primary clarifier to an aeration basin using micro-organisms to break down pollutants, and then to a secondary clarifier. The process will take less than 24 hours. Northern Pulp states that effluent from the new system, including an added oxygen delignification system, will be similar to treated effluent leaving the present system at point C, with some (unspecified) reduction in biochemical oxygen demand (BOD.) However, the effluent being released from the proposed new system directly into the deep waters of the Strait will not benefit from the considerable reduction in BOD, Total Suspended Solids (TSS) and other contaminants including heavy metals which takes place during the 20-30 days that effluent presently remains in the Boat Harbour Basin stabilization lagoon. Northern Pulp has not provided a detailed comparison between the effluent which presently reaches the edge of the Strait and the effluent they propose to release into the fishing grounds with the new system. The present effluent outfall location at the shore edge does not disperse effluent in the Strait in the same way that the proposed new outfall site would. With the proposed new system, 70+million litres of

treated effluent would be pumped directly and continuously into the prime fishing areas of the Strait every day.

Ocean environments are increasingly stressed. The Northumberland Strait Ecosystem Overview Report, prepared for DFO in 2007, documents increasing stresses on the Strait. To state that there are other industries producing stresses does not make it alright for NP to increase this toxicity and to think otherwise is just plain insanity.

In terms of toxicity, my understanding is that there is only one test required to meet federal regulations. This test measures acute toxicity -- whether 50% of rainbow trout die when exposed to effluent for 96 hours. It does not measure impacts on fish growth or reproduction or on fish habitat. No toxicity test on salt water fish is required to meet federal regulations. There are no federal regulations for a number of known harmful substances in pulp effluent, including AOX and phenols so further study is needed before this pipe is installed. We cannot wait for updated PPER legislation slated for publication in 2022.

NP lists Alternatives Considered for Final Discharge Location or Method. Discharging into Pictou Harbour is not recommended due to the lack of mixing with the Strait (as if mixing with a larger body of water is acceptable), Release into the Middle River upstream was not considered due to expectations that it will increase chlorides in the Middle River and potentially affect the maintenance of the equipment at the Middle River Pumping Station and inside the mill (but once again it is o.k. to dump on fishing grounds). The municipal stations and private facilities do not have the capabilities to handle the volume nor is a land based option available because as proposal states: Land application of wastewater effluent has not yet been approved in Nova Scotia (small wonders), Trucking or barging the sludge to a different location is not recommended. I found the barging comments interesting: A pier for barge loading would be necessary - assumed to not be at the NPNS mill location. Liquid would have to be either stored and trucked or stored and pumped to a facility to offload to an ocean going barge/tanker to be discharged outside of coastal waters in an approved area, with a large number of tankers. There would be increased industrial vessel movements in the Northumberland
Strait, potentially disrupting fisheries. Project specific permits would be required as the effluent does not fall under materials permitted to dispose of offshore. NP is concerned about the increase in traffic in the Strait but not about the effluent that will be pumped there. Why would they need project specific permits if effluent does not fall under material permitted to dispose of offshore but using a pipeline to dump the effluent is allowed?

A closed loop system is not economically viable according to Northern Pulp. NP also states: The main problems with the bleach plant effluent recovery are equipment corrosion and accumulation of chloride and non-process elements in the mill's water systems. Accumulation of chlorides and potassium are especially corrosive for the mill's boilers and often lead to scale build-up which would require the replacement of the boiler over time. However NP also argues that it would not be economically viable

for NP however they are quick to boast of the annual volume of income at $535 million. If the chemicals used are too corrosive for the river and too corrosive to recycle in their own equipment, how can pumping the effluent into the Northumberland Strait be a viable solution? Surely dispersing sludge over a larger area is not the answer. And what happens if NP sticks around until the end of the lease in 2030. Who is going to clean up the mess then? Who is going to compensate the fishing and tourist industry? This are too many other stakeholders involved to let this go through without a Federal Assessment.

I haven't even commented on the state of the health industry in Nova Scotia that could use the money being spent on NP. NP has already received $127 million dollars in tax payer's dollars over the years. We have paid for the design process of the proposed effluent process at a cost of $6 million dollars and will be expected to cover the cost of the construction, installation, labour etc. for the proposed pipe estimated at $100 million dollars. How can NP be allowed to pollute the environment as they have in the past and how can we as citizens believe anything that NP puts out in the media about how wonderful they are when history has shown otherwise? I would rather put my tax dollars towards the penalty of breaking the lease if need be.

On top of all that, I have now read that there is a conflict of interest from the minister of the environment: As Ecojustice wrote on behalf of Friends of the Northumberland Strait," the minister has a clear financial interest in making sure the environmental assessment process is over and done with as quickly as possible. Our clients also say the minister's ongoing contracts with Northern Pulp give the impression that the minister is not able to make a fair decision about whether or not to approve the project. These conflicts of interest violate the public's right to a thorough and unbiased assessment. That is why we are calling on the minister to step away from the assessment process and make way for a federal environmental assessment."

In summary, a federal assessment is required. I will accept the outcome of that but nothing less. Until then, NO EXTENTION, NO PIPE.

In summary the concerns that need to be addressed are:

The waste proposal poses major risk to harming marine life, marine habitat, species at risk/endangered/threatened that include migratory and marine birds, fish, vegetation, reptiles etc. All listed in the submissions via Northern Pulp.

The proposal goes through the Pictou town and Caribou water supply.

2 provincial parks and 2 nature preserves are within the effluent pipe footprint

Meeting PPER doesn't prevent harm to marine life or marine habitat per Environment Canada

The characteristics of the proposed effluent is "unknown" to NP

The proposal shows the plan to burn the toxic sludge in the power boiler and air emissions are already an issue today.

The spill basin only holds 35 million litres of untreated effluent (10-12 hrs) before it goes into the AST system. If a malfunction happens where does it go?

They also list temporary and permanent closures for fishermen around the outflow area, creating a no anchor zone and possible compensation (that has not been discussed) for impacted fishers.

The O2 delignification system is not laid out on how or when it will be constructed.

The Waste proposal will be pumping effluent into the ocean after only processing it for 8 hours as opposed to the current waste system that takes about 30 days to process and reach the Strait.

Sincerely,

From:	@smu.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 17, 2019 11:19:57 AM

Project: replacement_effluent_treatment_facility_project Comments: This project is potentially disasterous from a number of perspectives. As a landowner on Caribou Island, I am concerned for the water quality in the small harbour on the south side of the island, which has limited capacity to flush out hazardous material, which is likely to concentrate in this area where my small children swim. On the larger scale, the effluent will raise water temperature and the chemical composition of the Strait which is likely to have disasterous effects on marine life and threaten the livelihoods of the large number of individuals engaged in fisheries, which will be much worse than the loss of some mill jobs. Our province should be thinking forward and striving for innovative and sustainable solutions for our economy and environment. Supporting this disasterous mill project, which has cost the province millions, destroyed Boat Harbour, and is probably at least partly responsible for higher than average cancer rates, is not the way forward. Who knows what additional damage the proposed effluent pipe will do, and once the damage is done, it is often irremidiable. Why gamble on our childrens future? Is the province in line with Trumpian climate change deniers? Do they not recognize the severity of human impact on the environment and scientists warnings that we must do better or it will be too late? I challenge the province to do better than to save a few jobs today at the cost of our environment for generations to come. Name:
Email: @smu.ca Address:

: Privacy-Statement:

agree x: 70 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 12:01:50 PM

Project: replacement_effluent_treatment_facility_project Comments: The environment needs to be the priority for all human actions. Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 72 y: 22

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 17, 2019 12:47:59 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp have proven they cannot be trusted. The people of Pictou Landing First Nations are victims of environmental racism at the hands of their own provincial government and a foreign owned pulp and paper mill. Northern Pulp wants to dump billions of liters of treated effluent that will corrode metal pipes, into the delicate eco-sytem of the Morthumberland strait. I do not want the mill to continue operations in any way shape or form because there is not 100 percent guarantee that the effluent will not create a dead zone in the waters and it has not been dis-proven that the mill emissions are not responsible for the high rates of cancer and copd in Picou County and surrounding counties.As a measure of good faith and good corperate citazenship, our provincial government needs to force the mill to be subjected to the most stringent and in depth environmental assessment that exists in Canada, because the citizens of Pictou county know tha mill has a lot to hid e and they would not volunteerily submit to the most rigorous scientific assessment. It is passed time that this archaic mill ceased its poisoning of these lands. Not only do many families rely on the Northumberland strait for a living, we also swim and walk through the waves we sit on the beach and the watch the sunsets and sunrises. If the mill allowed to continue polluting they will be creating an environment that is not condusive for any living creature to survive. Name: Email: @gmail.com Address:

Privacy-Statement: agree

x: 74 y: 26

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 1:42:16 PM

Project: replacement_effluent_treatment_facility_project Comments: I firmly believe that we as citizens of Nova Scotia should strongly oppose the release of any thing into the waters of the Northumberland Strait or any waters around our great province. If there is even the slightest possibility of any form of discharge into these waters that may or may not cause harm to the waters and the life that lives in this water then the answer must be a no to Norther Pulps proposal. We as citizens must protect this province and any waters, land and or air that surround this province not only for ourselves but for the future generations that follow. There is far too many so called accidental discharges put into our surrounding waters, land and air and now must be the time to say no. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 61 y: 28

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 4:20:27 PM

Project: replacement_effluent_treatment_facility_project Comments: The facts indicate the facility will be an improvement over the old system. The fishing industrys claim it will be destroyed, are proven incorrect by the fact that the effluent is currently in the Strait via Boat Harbour. Treating the effluent onsite and then moving out the wastewater is an industry standard. The chemicals washed into the Strait from PEI agriculture is more of a hazard. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 78 y: 18

From: @sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 4:33:32 PM

Project: - Choose - Comments: The potential impacts on Marine species in the Northumberland Strait are well documented. Northern Pulps 1700 page Environmental Assessment also shows them. However, the plan to mitigate the risk is weak at best and meets regulations. Meeting regulations is not good enough when the Strait is at its max threshold for pressures. Be sure to submit your concerns online https://novascotia.ca/nse/ea/comments.asp SEE BELOW FOR INFO DIRECTLY FROM THEIR PROPOSAL Impact Evaluation/Effects Assessment The potential environmental effects of the project and project activities on marine fish and fish habitat are assessed in the following section. Potential Effects Marine fish could be affected by activities and components of the project during the construction phase and operation and maintenance phase. If unmitigated, these changes have the potential to change marine fish populations and fish habitat e.g., adult fish, juveniles, eggs and larvae, invertebrates and marine plants through direct mortality or indirectly through alteration or destruction of habitat. The environmental assessment of marine fish is focused on changes in marine fish populations. For the purposes of this assessment, a change in marine fish populations includes any physical injury or mortality on fish attributable to the project, and any destruction or alteration of habitat from disturbance of the marine environment. Construction Phase During construction, marine fish may experience direct mortality or functional impairment resulting in eventual mortality. The placement of in-water infrastructure would have a direct effect on sessile or slow-moving demersal fish and invertebrates as they would be unlikely to avoid construction activities within the marine PFA and could experience mortality as a result of smothering or crushing. The construction of marine-based infrastructure may affect marine fish populations through a change in available substrate and size distribution, a change in water and sediment quality, or changes to the acoustic qualities of the marine environment. The process of installing marine pipelines has a direct effect on the benthic environment. In-water activities during the construction phase may also result in a change in sediment quality. The disturbance of marine sediments may temporarily increase the concentration of TSS in the water column. Suspended solids can reduce feeding and growth rates and can alter migration of salmon in nearshore habitats Robinson and Cuthbert 1996. Reduced feeding rates, avoidance behaviour and suffocation due to effects on gill function have been observed in herring from suspended sediments Robinson and Cuthbert 1996. There may also be indirect effects on fish through alterations within localized food web structures. The severity of the effect of suspended sediments increases as a function of sediment concentration and duration of exposure Newcombe and Jensen 1996. During the construction phase, vessel noise will be concentrated within the LAA and the majority of anthropogenic sound in the marine environment generated during construction will originate through trenching, pipe laying, and backfilling. There is also the potential for underwater sound if blasting is used during the construction phase. Some marine fish species may be affected when exposed to high intensity sounds Popper 2003. The sound emitted to the marine environment during the construction phase could therefore temporarily reduce the quality of fish habitat in the marine PFA. Operation and Maintenance Phase Potential effects on marine fish and fish habitat during pipeline operation include the discharge of treated effluent from the ETF. These potential effects could result from: an increase in temperature, nutrients nitrogen and phosphorus, or TSS a change in colour, chemical and biochemical oxygen demand, dissolved oxygen DO, or pH or a reduction in salinity from the discharge of treated freshwater effluent into the Northumberland Strait. Lobster harvesters in the Pictou region have expressed

concern about the potential effects of the discharge of treated effluent on lobsters, particularly in the larval stage. Potential effects to fish during the construction phase may also be applicable during the operation and maintenance phase if project maintenance activities require the presence and operation of project vessels or equipment, and in-water activities that include seabed disturbance e.g., for pipeline retrieval Name: Email: @sympatico.ca Address

: Privacy-

Statement: agree x: 62 y: 14

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 17, 2019 11:38:14 PM

Project: replacement_effluent_treatment_facility_project Comments: Dear Sir/Madam, Thank you for the opportunity to offer input on this proposed pipe project. As a former resident of Pictou, and frequent visitor to the town, I have a strong objection to the pipe going into the Northumberland Strait at any point, let alone near the PEI ferry terminal. This company and its many previous owners have a very poor environmental track record, and for it to go through the Pictou watershed is just a very dangerous plan in my opinion. I do not think that there is any safe way to dispose of their effluent at all. Boat Harbour is an environmental disaster, and pumping the same effluent, although supposedly filtered, is just not good for our environment, our fishery, our tourism, nor our health. I ask that you please do not approve the proposed pipe if it includes going into any of our waterways. Thank you for your consideration. Yours Truly,
Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 65 y: 17

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 18, 2019 8:48:18 AM

Project: replacement_effluent_treatment_facility_project Comments: The science is solid on this project and the dept of environment and the minister should approve this project. Also an extension should be granted so the project can be done right. Name: Email: @gmail.com Address:

: Privacy-Statement:

agree x: 65 y: 28

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 18, 2019 9:14:13 AM

Project: replacement_effluent_treatment_facility_project Comments: This shouldnt happen and this plant needs to either shape up environmentally or ship out. We as a province, or at least government cater to the elite and punish the poor in the process. Name:
Email: @gmail.com Address:

: Privacy-Statement:

agree x: 62 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 18, 2019 10:33:34 AM

Project: replacement_effluent_treatment_facility_project Comments: In conducting this Environmental Assessment, you bear a serious responsibility to the people and the environment of the Northumberland Strait area, to finally ensure protection of the ocean environment and of the people, indigenous and non-indigenous, whose lives and livelihoods depend on that protection. In fact, your responsibility is to all Canadians, for we all share in the consequences of every decision of this nature. It is appalling that Northern Pulp and the Nova Scotia government have already spent years polluting the waters of Northumberland Strait and ignoring the rights and legitimate concerns of the Pictou Landing First Nation and of other local residents, particularly fish harvesters and people involved in tourism. The concerns about this new proposal are multiple, serious and urgent, as the proposal and the continued delays in promised remedial action pose huge further risks to the environment, public health, and society. They have been fully documented and detailed repeatedly by the Pictou Landing First Nation, by the Northumberland Strait Sportfishing Association and others. Please refer to their submissions, which I wholeheartedly support, and implement their recommendations. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 47 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 18, 2019 11:55:17 AM

Project: replacement_effluent_treatment_facility_project Comments: Im a Nova Scotia resident, married into a family with long term ties to Caribou Island. Im a zooplankton ecologist by training, and did most of my Ph.D work on zooplankton ecology in estuarine systems. Ive read through the Environmental Assessment, focusing on the sections where I have relevant education and work experience, and have a few comments and questions that I believe warrant some further focus. The project proposes to release the effluent at a depth of ~20 m. The Registration Document Section 8.11.2.2 states that the in situ salinities are above ~28 PSU, with temperatures varying over the annual cycle, from below 0Âº to 3ÂºC in the coldest period to average temperatures of 17-18 ÂºC during the warmest periods. The effluent is warmer 25-37 ÂºC and less saline ~4 PSU than the ambient conditions throughout the year, and will therefore have less density. As a consequence, the effluent and mixing products of effluent and seawater will rise toward the surface until the density of the mixing product equals ambient densities at that depth. Subduction of fresh water is used in other parts of the world to effect transportation of nutrients from depth toward the surface in vertically stratified systems. Vertical stratification in the Northumberland Strait seems weak based on results presented, so the vertical advection set up by the diffuser system will probably have marginal effects in terms of transport of naturally occuring nutrients. It will however very likely lead to an efficient mixing of the effluent with seawater, at higher dilution ratios than used in the calculations below in to order to bring mixing product densities in line with natural densities, the numbers used in the circulation calculations below are therefore conservative. In Appendix E1, p. 16, it is explicitly stated that their baseline water quality, taken from the Pictou Road location, is expected to be â?oworse offâ? than the actual conditions in Pictou Harbour, yet the report uses these same values in estimating dilution ratios to background values p. 24. This is misleading at best i.e. elevated baseline, implying that the calculated dilution ratios of the water quality parameters are â?obest caseâ? scenario values. I also have a question regarding how the dilution ratios were calculated. On page 25 it is stated that the ambient salinity is 28 PSU, vs an effluent salinity of 4 PSU, and that a dilution ratio of 7 is needed to reach background levels of salinity. 7 is indeed the ratio between the effluent and ambient concentrations, but this number has little relevance for when the mixing product reaches ambient concentrations. 1 m3 of effluent contains 4 kg of salts/TDS, the content of 7 m3 of seawater is 7*28 kg. The total content of sa lts in 8 m3 of mixing product is therefore 200 kg of salts/TDS, or a salinity of 25 PSU. This is ~11 lower than the seawater, to reach 5 of seawater salinity a dilution ratio of 16 is needed, to reach within 1 of seawater a dilution ratio of 85 is needed. The QA section in Appendix E2 shows the correct formula for calculations, so why are not the correct dilution ratios applied in this section in Appendix E1? In order to dilute the effluent to the design aim dilution ratio 144:1, Section 5.2.4, a daily average of 9 158 400 m3 of â?odilutantâ? e.g. seawater is needed e.g. 144x average discharge, 63 600 m3, Table 5.2.1, with 12 240 000 m3 needed daily at maximum discharge 144 x 85 000 m3. If dilution is to occur, this consitutes an average inflow to the effective dilution area of 106 m3 s-1 maximum ~141 m3 s-1. To put that in perpective, the annual average discharge rate of the St. Marys river in Nova Scotia is 45.6 m3 s-1, the St. Johns River in New Brunswick ~ 990 m3 s-1 Source Wikipedia. According to modelling studies Galbraith, P.S., ChassÃ©, J., Caverhill, C., Nicot, P., Gilbert, D., Pettigrew, B., Lefaivre, D.,Brickman, D., Devine, L., and Lafleur, C. 2017. Physical Oceanographic Conditions in the Gulf of St. Lawrence in 2016. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/044. v 91 p., the monthly averaged flows through

the Northumberland Strait NS varies over the year, with absolute monthly magnitudes spanning 300 to 7000 m3 s-1, and reversals in direction i.e. general direction westward rather than eastward in some months Galbraith et al. 2017, Fig. 67-70. Compared to the most of the other parts of the GSL, long term averaged current speeds in the vicinity of the effluent outlet are rather low. Im a biologist, not an oceanographer, but based on these numbers and background circulation information I have at least 2 concerns about the pipeline: 1. Will the effluent diffuser set up a new circulation pattern e.g. estuarine circulation that will affect the current flow through the Northumberland Strait? Especially during months of low average flow through NS the necessary inflow to the diffuser is a high proportion of monthly average flow for NS as a whole, suggesting that the diffuser may potentially have a significant effect on larger scale circulation patterns. Has there been any assessment of the effects of the diffuser on the current field outside of the immediate vicinity of the diffuser? What magnitudes of changes in the present average current field is expected in the wider Northumberland Strait? 2. What is the hydraulical residence time of water parcels once they enter the Northumberland Strait, both under existing and modified e.g. post pipeline hydrographic regimes? In other words, will the effluent be diluted by â?ofreshâ? seawater, or will the water in the Northumberland Strait slosh back and forth with the tides, leading to effluent mainly being diluted by already diluted effluent? While the numbers given in Fig. 70 in Galbraith et al. 2017 suggest a reasonable flow through the Northumberland Strait under the present hydrographic regime, the 3-month current vectors in Fig. 67 and 68 suggests sluggish water exchange. According to the documents provided, a dilution factor of ~100 is expected to be reached within 20 meters Table 6.7-1, p. 115. Into this diffusion area an average inflow of ~73 m3 s-1100 x 63 600 m3/ 86 400 s would be needed to reach the stated dilution factor, and an average outflow of ~74 m3 s-1 101 x 63 600 m3/ 86 400 s would be produced. If the diffuser pipe is 50 m long, and we add a perimeter of 20 m around it, the resulting surface projected circumference around the 100:1 diffusion area is about 226 m. I do not have access to detailed bathymetry, but assuming an average depth of 20 m for this circumference, the area through which both out and inflows would have to pass is at most 4512 m2. If one assumes that half this area is taken by the inflow, and half by the outflow, vertically averaged current speeds set up by the dilution process would be on the order of 3.2 cm s-1 at the 100:1 perimeter in the case of isotropic in/out-flow. However, due to the topography surroun ding the diffuser area, anisotropy in the directions of the in- and outflows can be expected, so this is a lower bound estimate, and real current speeds set up by the diffusors are likely to be much higher. For organisms with pelagic larvae meroplankton, such as bivalves and crustaceans, the currents and circulation patterns set up by the diffuser may lead to local changes in recruitment patterns e.g. where will larvae be transported, where is the source of dilutant water. Also fish with pelagic larvae for instance herring may be affected by changes in the current fields may affect local transport/retention and also turbulence levels, which affect encounter rates between prey and predators. In order to assess potential ecological effects knowledge of current patterns for a larger region both prior to and after disturbance are needed. Apart from listing several areas some distance away from the diffusor as areas important to meroplankton, as far as I can see no â?osupply-side ecologyâ? has been evaluated in the environmental assessment, even though recruitment ecology usually has a central position in most marine stock assessments. 3. What is downstream, i.e what is the position of the expected plume of diluted effluent? 4. What is upstream, i.e. where will the water that dilutes the effluent come from? 5. Do either down- or upstream coincide with fish spawning grounds or shellfish banks? While the levels of nutrients e.g P N added by the effluent are relatively small, the effluent has a relatively high chemical oxygen demand. The ratio of COD to BOD suggests that a fairly high proportion of the COD is non-biodegradable. 6. What type of material is it that makes up this COD? Is it dissolved, particulate or colloidal? Is it totally non-biodegradable, or just very slow to

decompose? 7. If COD matter is particulate, what is its density, and it it prone to flocculation? I.e., can we expect it to either settle to the bottom or accumulate at the surface. 8. If particulate or colloidal, is it of a size fraction that can be expected to enter the food-chain, i.e. will it potentially be taken up by filter-feeding animals such as bivalves and plankton? If taken up, is bioaccumulation likely? 9. What is the modelled overlap of the effluent plume with commercially harvested shellfish banks? I assume that being directly downstream of the diffuser may reduce commercial value of shellfish attractiveness to consumers. 10. Based on BOD, currents, modelled effluent plume and bathymetry, what are the probabilities of formation of low oxygen zones dead-zones downstream of the diffuser? While the Environmental Assessment covers a lot of ground and is very voluminous, it seems to me that the potential for effects beyond a very localized area have been largely omitted in the analysis. Overall the zone of influence of the diffusor used in the environmental assessment seems very restricted, at least when looking at ecological rather than physiological effects. To me that seems like a glaring omission in what actually constitutes a large-scale natural experiment. Looking at this from the outside, I would also encourage more inclusion of Nova Scotias excellent marine research institutions, so that they can evaluate and report back on what may either be a triumph of environmental engineering, or a tragedy of the commons. Name:
Email: @gmail.com Address:

Privacy-

Statement: agree x: 71 y: 29

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 18, 2019 4:59:52 PM

Project: replacement_effluent_treatment_facility_project Comments: Please do not allow Northern pulp to spread this toxic waste over my home Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 71 y: 37

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 8:16:15 AM

Project: replacement_effluent_treatment_facility_project Comments: This new treatment facility has the science to back up the company facts. I support the new treatment facility. Name: Email: @bellaliant.net Address:

Privacy-Statement: agree x: 52 y: 18

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 8:35:44 AM

Project: replacement_effluent_treatment_facility_project Comments: I support the science and the jobs its brings the province. For 52 years its been going into the strait and hasnt hurt the fish that I am aware of. With new technology how can it be worse? I think an extension is very reasonable. If everyone works together we can all stand to profit and maintain a health ecosystem in the strait Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 60 y: 29

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 9:05:57 AM

Project: replacement_effluent_treatment_facility_project Comments: I feel that Northern Pulp shouldnt have tyo do a Federal Assessment just because of pressures from outside. I feel that our treatment plant will meet federal regulations, so I do not see what the concerns are. Name: Email: @northernpulp.com Address:

Privacy-Statement: agree x: 51 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 9:58:51 AM

Project: replacement_effluent_treatment_facility_project Comments: This project should proceed and an extension needs to be granted to allow for the continued operation of the plant during the construction Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 56 y: 24

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s proposed effluent pipe into Caribou Harbour
Date: February 19, 2019 1:19:47 PM

My name is I have been a fisherman for almost 30 years fishing in and around the area of the proposed Northern Pulp effluent pipe. I fish lobster, rock crab, herring and scallops. This is my comment concerning the effects of the pipe on our fishery.

Caribou Harbour is one of the largest rock crab nurseries in the Eastern Gulf, containing millions of female and juvenile crab. The survival of the lobster industry in this end of the Northumberland Strait depends on the health of this rock crab nursery. Crab is the main food supply for lobster. Northern Pulp's plan to excavate a trench through the centre of this very special eco-system may spell the end of the lobster fishery in this area.

Regards

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 19, 2019 3:39:31 PM

Project: replacement_effluent_treatment_facility_project Comments: Me and nearly all my family and friends work in the forestery industry. I have read the document and I believe in the science. I dont believe that 5 years was or is enough time for a project of this size therefore an extension needs to be granted to keep novascotians working at home with family and friends. Name: Email: Address:

Privacy-Statement: agree x: 64 y: 33

From: @icloud.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 7:35:34 PM

Project: replacement_effluent_treatment_facility_project Comments: If Northern Pulp wanted to be good neighbors as they are now pleading they want to be, they would not have created the nightmare environment that surrounds them !!! Time to leave youve done enough damage. Name: Email: @icloud.com Address:

:

Privacy-Statement: agree x: 70 y: 17

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 19, 2019 8:18:17 PM

Project: replacement_effluent_treatment_facility_project Comments: i believe that a few people have scared the fisherman into thinking the new treatment plant would harm their fishery. Treated effluent has been going into the Northumberland straight since the Mill has been built. Fishers and the mill have been using the Straight for years with no problems. Now the new plant Effluent is going to be cleaner then before .That is reason to approve the Replacement Effluent Facility.This is the newest system available ,and Northern Pulp is willing to spend millions of Dollars to make it right.That is why i hope you give them the OK on this project. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 30 y: 33

From:
To: Environment Assessment Web Account
Subject: Feedback opposing the Northern Pulp Waste Proposal
Date: February 20, 2019 8:48:48 AM
Attachments: petition_comments.pdf
petition_signatures.pdf

Hello Premier McNeil and Minister Miller,

I am attaching signatures and comments from a petition that I started about 1.5 years ago when Northern Pulp made their waste proposal public. You will see 23,000 signatures from people all over NS, the Maritimes, the rest of Canada, and the World. You will see 55 pages of comments that people took the time to leave to express their concerns towards a toxic effluent pipe into the Northumberland Strait.

After reviewing all of the signatures, comments and where people reside, the message is very clear. Our reputation of warm clean ocean water and sandy beaches and our world renown seafood is at risk on THE WORLD STAGE!

We DO NOT want our reputation changing to polluted oceans and beaches and contaminated seafood. The economic fall out would be catastrophic.

Sincerely,

change.org

Recipient: Minister Environment of Nova Scotia, Minister McKenna, Jonathan Wilkinson

Letter:

Greetings,

Minister Miller, Minister Wilkinson and Minister McKenna,

Today we have dozens of rivers that dump into the Northumberland Strait not counting tributaries. The Strait is a main passage for our a lot of marine species including Waterfowl. It is a place for them to feed, rest and live. However all this is at major risk with the proposed 90 million litres of effluent to be pumped into the Strait a day. The effluent at the outflow of the pipe is going to come out at 25c in the Winter and 37c in the summer!! (The natural water temps of the Strait reaches 15C in the summer) These temps will absolutely change the diversity and make up of this sensitive and important marine ecosystem. This will increase the overall temperatures of the Strait over time due to the high volume of effluent being pumped a day.

The Effluent is going to be fresh water. The Strait is comprised of salt water and species that require a specific level of salinity. At a rate of 70-90 Million litres a day, the salinity of the Strait will change as the waste continues to accumulate over time. This will impact Wetlands, all species that use the Strait as well as the food sources within.

The makeup of the toxic chemicals that will be part of the effluent will also pose major threat to marine life. The communications officer for Northern Pulp has said a few times that the current infrastructure of the mill cannot handle the new proposed effluent makeup because it will be to corrosive to their internal setup and that pumping it into the Strait is the most economical option for the Mill. However, there are many scientific documents that show the risk and harm that will come from this.

Furthermore, the effluent would contain chlorines, dioxins, metals, among other toxic constituents and will contain 935kg of solid materials per day. All of these can bioaccumulate, having catastrophic effects on marine life. Laboratory studies using individual chlorinated organic compounds that are commonly discharged from bleached pulp mills have demonstrated effects such as deformities, as well as embryonic and larval mortalities in fish. These chronic effects will jeopardize the future of many fish species and damage the integrity of the ecosystem. It is documented that Dioxins contaminate fish and shellfish because fish act like sponges for Dioxins,

accumulating them at 25,000-50,000 times the concentrations present in their environment. It also is reported that fish species 250 miles away from the source have been impacted.

The other obvious threat to the Strait is the colour of the water will change. The effluent due to its makeup will change the colour at the water at the outflow of the pipe which is positioned a few kms offshore and directly into the Strait. At millions of litres a day, this will impact a very large area and ultimately change the natural state of the ecosystem.

The Strait already has several large dead zones due to nutrient overloading from many sources. It cannot handle any additional pressures. Boat Harbour, once a very healthy estuary and wetlands is an official environmental disaster due to the mills current waste process. The NS Government is mandating that it be stopped by 2020 and cleaned up. However, the option Northern Pulp came up with is to dump it into the Northumberland Strait! We need Federal involvement and a full Environmental Assessment completed to ensure that the proper scientific testing is done and risks highlighted.

These are only a few points of a concern from a very long list that this pipe will cause. Our wetlands and surrounding marine habitat are not the only things at risk here. Atlantic Salmon, Trout, Herring, Gasperaux, Smelt, Eels, Whales, Atlantic dolphins, Tuna, Mackerel, Striped Bass, etc etc etc all will be impacted by high water temps, toxic chemicals, changes in salinty and water clarity.

You can help by submitting feedback on the Environmnetal process by sending your concerns to ea@novascotia.ca

Comments

Name	Location	Date	Comment
	Dartmouth, Canada	2018-04-13	I believe this is absolutely not being Good Stewards of the environment.....this should never have been the only option....for that matter an option at all!!
	Canada	2018-04-13	Nothing good can come of this. We need to start caring for our oceans and coastlines.
	Trenton, Canada	2018-04-13	I am 100 1 % for this the plant. They make enough money to billed the best effluent pond on their property and not pipe ont in the harbor or strait they are cheep
	Burlington, Canada	2018-04-13	#nopipe
	porters lake, Canada	2018-04-13	We need to protect our current fishing population that we have or we won't have it for future Generations
	Aspen, Canada	2018-04-13	Concern for freshwater & saltwater fisheries, aquaculture & ecosystem.
	Chester Basin, Canada	2018-04-13	This is a disgrace money hungry corperations cutting corners to line there pockets.
	Bickerton West, Nova Scotia, Canada	2018-04-13	#nopipe
	Toronto, Ontario, Canada	2018-04-13	This mill is destroying habitat with clear cutting, spraying toxins from the air, poisonious air pollution and dumping of toxins in Pictou Harbour. Shut it down.
	New Glasgow, Canada	2018-04-13	NoPIPEDon't Destroy our Fisheries!
	Pictou, Canada	2018-04-13	The dead zone that exists in the strait now that was created from boat harbour outflow is very large and no fish live in that area . We need the Feds to investigate that under section 35 of fishery act. That would be a start . Many criminal charges could be laid already but nothing seems to be happening
	Fall River, Canada	2018-04-13	This is not an environmentally responsible or sustainable way to manage and operate any business. There is a complete disregard and disrespect for our marine environment and everything living within the ecosystem, which concerns me greatly.
	Westminster, Colorado, US	2018-04-13	This is a disgrace. No concern for the future.
	New Glasgow, Canada	2018-04-13	I'm signing this petition because I am fully against the pipe being put into the straight. It will hurt the fisherman, plant workers, buyers, helpers, tourism in the county and destroy sports fishing.

Name	Location	Date	Comment
			Salmon are already at a minimum in our rivers. Let's not ruin it even more.
	Timberlea, Canada	2018-04-13	I been saying this for years we need help��
	New Glasgow, Canada	2018-04-13	Saving our waters for future generations is number one
	New Glasgow, Canada	2018-04-13	It is not the 1960's any longer. We KNOW that marine environments need to be protected for their sustainability, their marine life and marine plants. Professor Oliver (oceanographer) from Dalhousie Univ. recently reported the oceans are warming faster than ever. There is no guarantee what will happen to the Northumberland Strait if 70,000 million litres DAILY of 37C hot, FRESH water effluent is piped into it on a continuous basis year after year. Not another Boat Harbour! #nopipe!
	Halifax, Canada	2018-04-13	There’s a better way to create jobs than killing the Strait. If the Govt doesn’t ruin legal cannabis before it gets off the ground it would be nice to see a pulp mill turned into something more positive.
	Victoria, Canada	2018-04-13	If Northern Pulp cannot safely dispose of the effluent they should not be allowed to produce it. There is no justification whatsoever for putting the interests of Northern Pulp or the Nova Scotia government before the safety, health and reproduction security of all species indigenous to the Northumberland Strait and its tributaries.
	Seaview, Pictou County, Canada	2018-04-13	I signed this petition because the people of Pictou County have been abused for far too long by this mill and government(s) who have allowed excessive toxic emissions and effluent to destroy our land, water and air. Enough is enough, don't let this continue and ruin our fisheries and beaches.
	Stellarton, Canada	2018-04-13	It is a bad Idea to pump that effluent into the strait where there is so much fishing and tourism involved
	Shelburne, Canada	2018-04-13	No pipe - and kick this company out. They are polluting our air - water and destroying entire forests to get their pulp.
	Hunter River, Canada	2018-04-13	I am completely disgusted they would even consider pumping effluent into the strait in this day and age. All the work peop.e do to recycle, stop using poisons, unleaded gas, electric cars etc There are plants that can be built to clean the water instead of disrupting our ecosystem. Has anyone considered what this will do to the beaches? The north shore of Nova Scotia and the south shore are the warmest waters north of the Carolinas with beautiful world class beaches..... will you still want to swim there or let your babies play in that sand?
	Wabush, Canada	2018-04-13	The Northumberland Strait is a rare and precious aquatic environment! Why would we as Canadians allow a foreign owned Forestry company to pump effluient into this pristine environment? Tell them to fix their environmental issues and stop polluting our waters!!

Name	Location	Date	Comment
	Q. Cove, Canada	2018-04-13	Why do we risk our earth with oil at all when there are so many other cleaner solutions at hand....Wind, tidal, solar, geothermal, hemp...take your pick, jobs for many and ahhhh, gotta love the smell of all that fresh air
	Stourbridge, England, UK	2018-04-13	Why are they allowed to keep poisoning people. Do no politicians care.
	Lower Sackville, Canada	2018-04-13	If you cannot pump a sewer into a lake why would government allow this to be done?
	Luxembourg, Luxembourg	2018-04-13	Certains " humains " ne sont pas en dessus de tous! C'es notre devoir de respectez et protegez les animaux et les oceans. Eux, aussi on le droit d'avoirs une vie saine sur ce planéte! Vous, le savez? Prenez, votre responsabiltée ârrêtez et aidez, s.v.p. Civilisez? Bien triste, de signez des pétitions. Merci.
	Antigonish, Canada	2018-04-13	
	Sherbrooke, Canada	2018-04-13	Such a terrible idea.
	Sydney, Canada	2018-04-14	I’m signing because humans suck.
	NEW GLASGOW, Canada	2018-04-14	what will we tell the Grand children when they ask Grampa why wont anyone eat the fish or lobsters from here , Grandma why cant we swim in the beach , Grampa we cant sunbath on our beaches because the sand & water stinks Grandma how come I have a hard time to breath & my eyes burn when I am close to the water
	Margaree Forks, Canada	2018-04-14	We meed to protect our resourses. The environment is stressed as is, and we must push for better regulations and environmental laws to reduce the polution and stress on our land and waters
	Westville, Canada	2018-04-14	I'm signing because I don't want the pipe #nopipe
	Antigonish, Canada	2018-04-14	The natural environment is our most important resource.
	Porters Lake, Canada	2018-04-14	I’m signing because I like to eat clean and fresh fish not ones full of chemicals.
	Leeuwarden, Netherlands	2018-04-14	please sign&share
	Amherst, Canada	2018-04-14	We don't know the ramifications of this and I don't want to have to deal with the negative consequences.
	Halifax, Canada	2018-04-14	Don't know consequences.
	Ottawa, Canada	2018-04-14	
	LYON, France	2018-04-14	PROTEGEZ LES SAUMONS DU NORD- THUMBERLAND / CANADA

Name	Location	Date	Comment
	Dartmouth, Canada	2018-04-14	dumping waste water is not a very environmental idea mr. "environmental" ""minister "" use your head.
	Zdroisko, Poland	2018-04-14	Getekend
	Scotsburn, Canada	2018-04-14	We have to protect our waters
	Dartmouth, NS, Canada	2018-04-14	I think this is the right thing to do!
	Oxford, Canada	2018-04-14	Northern pulp must he stopped. They can do whatever they please
	Westville, Canada	2018-04-14	Concern about all aquatic species in the Strait
	Japan	2018-04-14	賛同
	Pictou county, Canada	2018-04-14	It is insanity to allow pulp mill effluent into spawning, nursing and migratory waters. Protect the environment. Don't destroy it.
	Wolfville, Canada	2018-04-14	Projects like this can't be allowed to ruin our water ways and fisheries!
	Prince, Canada	2018-04-14	It's a scary world when idea's like this are seriously being considered
	Sydney, Canada	2018-04-14	On it's own, this is a bad idea. Given who's proposing it and backing up the "no harm to the environment" claims, and their lying track-record, we'd be masochistic not to fight it.
	Dartmouth, Canada	2018-04-14	This pipe will ruin the environment in the Northumberland Strait. It must be stopped
	Wolfville, Canada	2018-04-14	Tired of this companies disregard of the environment
	timberlea, Canada	2018-04-14	I find it hard to believe that in 2018 I have to sign something like this to force the government to protect our fisheries and ultimately our very own health. Have we learned nothing?
	Belle River, Canada	2018-04-14	Don't want that hot poison water being dumped in the ocean..
	Powell River, Canada	2018-04-14	I grew up with clean clear water, our oceans face terrible challenges already, we need to stop using our planet as a dumping ground for unneeded profit seeking industries.
	Coventry, US	2018-04-14	The environment is globally under attack from special interest groups. Nova Scotia especially needs a break because it still maintains, in many regions, that ability to maintain fragile species. The Northumberland Strait is one of these ecosystems that needs this special consideration.
	Merigomish, Canada	2018-04-14	Do not destroy our beauty and fishery!
	Moncton, Canada	2018-04-14	STAP EET!!

Name	Location	Date	Comment
	Celebration, Florida, US	2018-04-14	I own a summer home at Melmerby Beach.
	Mount Uniacke, Canada	2018-04-14	I love my Grandkids.
	France	2018-04-14	I sign
	Hamilton, Canada	2018-04-15	We need to save our fresh Trout and Salmon.
	Montague, Canada	2018-04-15	They must have effluent treatment in place before releasing it into the strait
	Pictou, NS, Canada	2018-04-15	There is no reason good enough to put this area of the ocean at risk. The track record of this mill is historically terrible and has had enough help from the taxpayers of Nova Scotia.
	Mount Stewart, Canada	2018-04-15	I care about what is done to our environment.
	Mount Stewart, Canada	2018-04-15	We need to stand up and take notice of what is being done to our environment!
	North Sydney, Canada	2018-04-15	Our provincial govt has shown time and time again that they can't handle projects at this size appropriately. They allowed Northern Pulp, who is only tested 4 times a year, to exceed emissions for about 4 years because they were 'working towards compliance'. Northern Pulp used that time to set production records instead of reducing their emissions. When the original 'world class treatment facility' was built, they noticed how horribly bad it was after two days after it killed all of the fish and became the worst case of environmental racism in the province. That was 51 years ago and still won't close for another 2 years. If that pipe goes in, I'm sure the same logic will be in place that if we notice that it is a mistake, even after 2 days, we will likely see that pipe continue for 50 years. And if the company has something go on that they need to fix that makes things worse while they 'work towards compliance', I'm sure they'll take that opportunity to break production records over showing any concern
	Pictou, Canada	2018-04-15	I live on this Strait. Our waters need to be protected for our fisheries, our tourism, and our people. In 2018 it is unthinkable to pollute the water (and our air), like a third world country.
	Dartmouth, Canada	2018-04-15	Waste heat dumping will affect the marine ecosystem. Use a cooling tower.
	Petitcodiac, Canada	2018-04-15	our environment is more important than paper
	Fort McMurray, Canada	2018-04-15	
	TOURCOING, France	2018-04-15	La pêche n a rien d un sport ce n est qu une autre façon de nommer la maltraitance animale signé et ptg svp

Name	Location	Date	Comment
	Moncton, New Brunswick, Canada	2018-04-15	Our Province needs us to protect it and it's ecosystems. There is another way to do what they want to accomplish. Take the time and figure that out without destroying ecosystems and habitat.
	Edmonton, Alberta, Canada	2018-04-16	We have to start paying more attention to our land and water instead of the money.
	Dartmouth, Canada	2018-04-16	I enjoy the outdoors and love my province and community!
	Berwick, Canada	2018-04-16	Signed
	Pictou, Canada	2018-04-16	We need to protect our waters. NO PIPE!!!!
	Westville, Nova Scotia, Canada	2018-04-16	This is a crime against humanity! And we will pay!!
	Halifax, Canada	2018-04-16	Really good cause!
	Saint Peters, Canada	2018-04-16	absolute LUNACY to pump all that CRAP into the Strait.
	Nova Scotia, Canada	2018-04-16	I don't want the same damage done to the east coast that has been done west.
	Kissimmee, Florida, US	2018-04-17	I support marine life!
	Canada	2018-04-17	1000 + signatures!! Thanks for great feedback and continue to share.Here is a great article on Bleach Kraft Effluent and Marine Life. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_forma
	Chester, Canada	2018-04-17	
	Little Narrows, Nova Scotia, Canada	2018-04-17	Our fishing industry, & tourism brings far more $ into this province then Northern Pulp. Environmental issues need to be appropriately addressed. It's time to clean up toxic pollution in this province.
	Dartmouth, Canada	2018-04-17	Why on earth would anyone allow this to happen.
	Chéticamp, Canada	2018-04-17	This should be illegal in Canada because it will poison our offshore waters with effluent from a mill that has not followed environmental laws for decades. Shame on our government.
	Canada	2018-04-18	I am signing this because the proposal to pump 90 million litres of effluent a day into the Northumberland Strait is unacceptable.
	Orangedale, Canada	2018-04-18	I'm signing because this is something that can be changed.
	Salt Springs, NS, Canada	2018-04-18	An effluent pipe would be a crime and a travesty! Very adverse effects for fishermen, home and cottage owners along the shore and beach goers.

Name	Location	Date	Comment
	Halifax , NS, Canada	2018-04-18	Ingnore our environment at our peril!
	Grand Etang, NS, Canada	2018-04-18	Did they hire Scott Pruitt to consult on this, or what? Over-the-top insanity!
	Antigonish, Canada	2018-04-18	Let's keep our waters and fishing industry safe!
	Houston, Texas, US	2018-04-18	#nopipe period. End of story.
	New Glasgow, Canada	2018-04-18	The resource in our waters should be protected from dumping waste of any nature
	Stratford P.E.I., Canada	2018-04-18	Do not even think of this happening we are not Montreal.
	Mabou, Nova Scotia, Canada	2018-04-18	Many fishermen in Atlantic Canada depend on the fisheries for their livelihood. The damage to the ecosystem by this greed is will kill to many already endangered species.
	Mabou, Canada	2018-04-18	As an oysterman in Mabou Harbor, featuring world renowned oysters. The Northern Pipe effluent release is something I will vigorously protest.
	Charlottetown, Canada	2018-04-18	Brought up in a fishing family
	Tatamagouche, Canada	2018-04-18	The combined value of these fisheries is in the Millions of dollars which supports about 7100 fisher persons in the Gulf . Compare this with only about 300 employed by the Pulp Mill .
	vero beach, Florida, US	2018-04-19	Because of the unthinkable,poorly imagined ,and horridly demeaning slap in the face of species that 'dont speak english'...human beings were made,to demonstrate high intelligence; what happened ? Its akin to saying "We dont care about Life!" . The fish,that i kill, to provide sustanence,are dispatched with prayers and blessings...this is wholesale ,Godless greed, for "the Love of money, is at the root of all evil...." Must stop !
	Three Fathom Harbour, Canada	2018-04-19	Northern Pulp must stop polluting, whether that be in Boat Harbour / Pictou Landing, or in the Strait! Enough. #NoPipe
	Donkin, Canada	2018-04-19	I believe that our environment and diversity of fish and wild life is more important than the profits of corporations.
	Wallace, Canada	2018-04-19	I care about protecting our natural environment for future generations!
	Herring Cove, Canada	2018-04-19	What a disgusting thing to do to this beautiful area and the natural environment. Toxic, deplorable.
	Upper Tantallon, Canada	2018-04-19	Stop polluting the waters

Name	Location	Date	Comment
	Edmonton, Alberta, Canada	2018-04-20	I've seen and smelled the damage Northern Pulp is responsible for, and am aware of the health impacts in Pictou Lansing. Stop this now!
	Schomberg, Canada	2018-04-23	The livelihood of fishermen and their or I should out fishing ground are worth more than that plant will ever be , the plant has already destroyed tourism in the area , were they should be swamped with people whating to visit and enjoy thief waterfront
	Antigonish, Canada	2018-04-23	We need to protect our land and water. This is unacceptable.
	Halifax, Canada	2018-04-24	I've seen the destruction to the environment in the bays and inlets this where this company spued their poison. A pipe further into the strait would destroy beaches, our fish,oysters etc and is Unacceptable . They hold jobs as ransom! Never liked their presence or their stink
	Roanoke, Virginia, US	2018-04-25	We MUST save species for future generations!
	Halifax, Canada	2018-04-26	I care
	NEW GLASGOW, Canada	2018-04-26	Northern Pulp has gone too long disrespecting our forests , waters ,&people
	SAntigonish, N.S., Canada	2018-04-26	L
	Berwick, Canada	2018-04-26	I know its a huge subject and this place provides a lot of jobs but we have to start taking a serious look at our environmental impacts rather than just saying yes to money and comfort. NOPIPE
	Kings Head, Canada	2018-04-27	I too am very concerned about the safety and doing everything we can to protect our waters . We have too much at stake to not take this seriously .
	Warsaw, Poland	2018-04-27	I care about my home.
	Halifax, Canada	2018-04-27	Nova Scotia forests should not be a toilet paper farm for China or anywhere. Our water is not a toxic dump. Northern Pulp your day is over.
	Fall River, Canada	2018-04-27	Too much is at risk and the evidence of risk is overwhelming after 51 years. Dead zones and the lack of accountability or real enforcement in Nova Scotia for industries that don't put human life and the environment first.
	trenton, Canada	2018-04-27	I want clean air, water and land free of mill pollution!
	Pictou, Canada	2018-04-27	Because we need to protect our marine environment, the fishery and tourism industries that this effluent pipe will destroy.
	Saint John, Canada	2018-04-27	I am deeply disturbed that such a disasterous option would even be considered!

Name	Location	Date	Comment
	Antigonish, Canada	2018-04-27	We shouldn't be going backwards in how we treat the environment. We have one earth, we shouldn't be taking shortcuts because they cost less. There is always a better way. It's 2018, haven't we learned by now?
	New Glasgow, Canada	2018-04-27	Northern Pulp is an environmental disaster and the worst part is that the government of NS keeps handing them millions and millions of the taxpayers money to keep going. It's absolutely shameful.
	Miramichi, Canada	2018-04-27	We know better. We can do better.
	Sackville, Canada	2018-04-27	Water is life.
	New Glasgow, Canada	2018-04-27	I am very concerned! It just doesn't make sense to dump millions of litres of toxic waste into our ocean. Our ocean will become an environmental disaster! Also my family's livelihood is at stake if the the oceans fish stocks are destroyed. Why are there different rules for different government departments? If I were to do any type of work near a river I would have to install a barrier around the river to protect it! Why not protect our oceans!
	Halifax, Nova Scotia, Nova Scotia, Canada	2018-04-28	This whole idea of pumping pulp mill waste water full of chemicals into a delicate ecosystem that many in the area cherish and rely upon for their livelihoods is absolute insanity. I WANT THIS ENTIRE MILL OPERATION SHUT DOWN IMMEDIATELY!!!!
	Halifax, Canada	2018-04-28	No job is worth ruining our environment!
	Halifax, Canada	2018-04-28	It is fucking ridiculous how all technology changes yet the oil/car industry stays the same. Oil is destroying our planet. Green energy is the only way. Save the planet. And might I add, go vegan!
	Hunter River, Canada	2018-04-28	I 'm opposed to the Northern Pulp's Effluent Pipe being placed in the Northumberland Strait. The water of the gulf, the strait and the the Atlantic are not a limitless dumping ground for corporations. Marine ecosystems and and the species they support are already stressed and threatened.
	Mount Uniacke, Nova Scotia, Canada	2018-04-28	Dumping toxic waste in the Northumberland Strait will create an environmental disaster that will affect fisheries and tourism. Time to realize our environment is precious and make protecting it a priority.
	Halifax, Canada	2018-04-28	To allow the effluent from a NS pulp & paper mill to flow untreated into the Strait is to disregard the forms of life living in this body of water and to say that once again, the economic bottom line of one industry supercedes any other consideration. This is short-sighted thinking. My family has had a summer property for decades on the south shore of PEI, and we have already seen an increase in the water temperature, and a concomitant alteration to the diversity of species, as a result of climate change. The temperatures of the effluent will further affect this. But of course the toxicity of the effluent is another concern. Fish & seafood stocks will be affected, as well as the livelihoods of fishers. I also wonder if the water will be safe to swim in... some days frothy bubbles wash up on shore as

Name	Location	Date	Comment
			a result of who knows what effluent already in the water. Will my nephew's children, 35 years from now, have to swim in a pool rather than the ocean...?
	Halifax, Canada	2018-04-28	This is sociopathic behaviour given our present day understanding of the consequences of these actions.
	Truro, Canada	2018-04-28	I do not trust this government to take adequate precautions to protect our water.
	Mulgrave, Nova Scotia, Canada	2018-04-28	I'm signing because I believe in keeping all our waterways clean which means free of ALL pollutants - pulp mill waste, plastics, pesticide runoff - in short, anything that does not belong in water. I want to eat clean, unadulterated fish and sea plants.
	Kingston, Canada	2018-04-28	Don't let the waters be poisoned for the mill's convenience.
	Pictou, Canada	2018-04-28	It is unacceptable to poison the water, the people,the fish and all other species that live in or depend upon the Northumberland Strait !
	Abbotsford, Canada	2018-04-28	The pipe is The Mills attempt at an inexpensive (cheap) solution to treat their effluent. No pipe/ better waste management on the mill site.
	Halifax, Canada	2018-04-28	it's the responsible thing to do
	Westville, Nova Scotia, Canada	2018-04-28	We all deserve clean air and water. I love my beaches. I don’t believe our government is acting in our best interest; I believe they are acting on money in there pockets!
	Truro, Canada	2018-04-29	I want a clean future for our kids
	Truro, Canada	2018-04-29	We need to stop destroying our planet.
	Nova Scotia, Canada	2018-04-29	A healthy Strait serves all species in this region!
	Sydney, Nova Scotia, Canada	2018-04-29	CBRM must treat all sewage waste (and pay the price to do so) but the big company can dump chemicals which will mix with other toxic chemicals, creating new ones, into the gulf? You're going to kill a lot of fish & people to save money for one industry? Please wake up!
	Guysborough, Canada	2018-04-29	This is wrong on so many levels.
	Canada	2018-04-29	ask them to dump in their own backyard!!!! how many jobs and lives-both human and animal will this KILL.
	N Falls, Canada	2018-04-29	Please stop this from happening!!!
	Truro, Canada	2018-04-29	Let’s hope the petition has some impact.
	Halton Hills, Canada	2018-04-29	Save the North Cumberland Sraight JUST SAY NO

Name	Location	Date	Comment
	Pictou, Canada	2018-04-29	This proposal needs to be rejected if the Provincial government can not do it because their hands are held captive by Northern Pulp then send it to Federal Government. If proper science is looked at and not decision based science than it will be rejected. There is to much at risk and to much harm will be done if this is allowed to proceed.
	pictou, Canada	2018-04-30	I want my kid to grow up and be able to enjoy the beaches, go on fishing trips and boating adventures just like i did and i want him to be able to be safe doing so
	Pictou, Canada	2018-04-30	Pumping industrial discharge into waterways stopped being acceptable back when bell bottoms and disco. That this idea is being considered is a terrible joke.
	Pictou, Canada	2018-04-30	Pumping industrial discharge into waterways stopped being acceptable back when bell bottoms and disco were still in style. This is a terrible joke.
	Trenton Nova Scotia, Canada	2018-04-30	Don't destroy another area with this poisonous waste water coming from the NP Kraft Pulp Mill.We have Boat Harbour to get cleaned up.Isn't that enough toxins to clean up in our little Pictou Co.area???
	Halifax, NS, Nova Scotia, Canada	2018-04-30	I’m signing because I live in Pictou and raised there and see the distraction this plant has caused over the years.
	Hove, England, UK	2018-04-30	This pipe will kill life in the ocean, the livilhood of thousands and our precious environment. Please stop this from happening!
	Dartmouth, Canada	2018-04-30	So tired of the narrative that we have to make this easy for the pulp mill or they will pull out of the county. It is wrong to dump into the waterways. It is wrong to pollute our air. It is wrong to clearcut our forrests. We need to face the fact that this is profit driven and that the company has no loyalty to our county. As soon as theyre done their pillage, they will move on to other unsuspecting places to use them up.
	St. John's, Canada	2018-04-30	I'm signing because paper is not worth the lives of people, the irreversible damage to the environment or the damage to peoples livelihood.
	Wakefield, Massachusetts, US	2018-04-30	It's time to stop the polluting of our precious oceans and waterways by greedy and shortsighted businesses.
	Halifax, NS, Nova Scotia, Canada	2018-04-30	Destruction was the word I meant to type. This has gone on far too long No pipe ever should be filling our straight with toxic waste. Period
	Fortrose, Scotland, UK	2018-04-30	Save the wildlife. Keep wild places wild. No pipeline here.
	Westville, Canada	2018-05-01	To save our community
	New Glasgow, Canada	2018-05-01	If the government isn’t going to do something about this then we have to! What a joke our minister of environment is! We should vote

Name	Location	Date	Comment
			someone in who actually cares about us and our health .They are finally admitting how toxic boat harbour is. But the government is going to let them put it in our ocean? So how can they justify pumping these toxins into our ocean? The rest of the world is trying to reduce emissions and here in Nova Scotia we're living in the Stone Age just going to pump everything into our atmosphere and pristine waters.This pipe is going to ruin our lobster fishery and I don't think the fishermen will stand for it. Nor will I . I talked to an engineer who has done projects at other pulp mills and he said there's definitely other options, they just don't want to spend the money! Don't for one second let them make you believe this is our only option. There's many options, one being block the access to the mill so they can't operate!
	Pictou, Canada	2018-05-01	No pipe in the strait.
	Stellarton, Nova Scotia, Canada	2018-05-01	There are more environmentally friendly ways to dispose of this effluent. I may be very uneducated regarding this topic, but the mill has already destroyed boat harbour, now they want to destroy the ocean and all that lives in it. I say NO. Spend the money to do it right without destroying our waters.
	Pictou County, Canada	2018-05-01	Keep it clean - no pulp waste in our water!
	Amherst, Canada	2018-05-01	One of the the greatest passions I have is fly fishing for trout and salmon. First is the passion and understanding of the fish itself. Without a doubt salmon are facing difficult times due to industry, whether it's fish farmers destroying there breeding and feeding grounds and the cesspools of disease they create or pollution from industry. They do not need to face another road block while swimming to breeding grounds. Keep the pipe out of the strait.
	Pictou, Canada	2018-05-01	I love our environment, our oceans, our air !! Our tress!!
	Inverness, Canada	2018-05-01	
	Pugwash NS, Canada	2018-05-01	This is outrageous. What is our Environment Minister and local politicians doing about this?
	New Glasgow, Nova Scotia, Canada	2018-05-01	Disgusting that the government continues to allow and financially support this pit of poison. No pipe!
	Lower Sackville, Canada	2018-05-01	There's too much at stake ! NO PIPE !
	Berwick, Canada	2018-05-01	Intentional pollution is disgusting. To stand aside and not protest is to enable this!
	Vancouver, Canada	2018-05-01	Keep effluent out of our food chain and waters
	Canada	2018-05-01	NO PIPE

Name	Location	Date	Comment
	Halifax, Canada	2018-05-01	I care about the environment more than I care about employment for the unemployable masses of uneducated workers. Down with the mill!
	Pictou, Canada	2018-05-02	A pipe in the Strait will be an environmental disaster.
	Jolicure, Canada	2018-05-02	I want to help secure a clean future for the Northumberland Stright
	Lockeport, Canada	2018-05-02	Absolutely NOT!
	Truro, Canada	2018-05-02	Fuck the mill!
	Nepean, Ontario, Canada	2018-05-02	These are NOT renewable resources. Put our money into something that is sustainable and healthy for the environment.
	Gatineau, Canada	2018-05-02	Stop destroying our planet... Enough destruction!!!
	RR3 Pictou, Canada	2018-05-02	I'm signing because this pipe will decimate the lobster fishing on the east coast as well as the north Atlantic right wales, salmon, sea turtles, and turn Canada's Ocean playground into Canada's ocean deadzone
	Woodbridge, Canada	2018-05-02	Enough already. Why aren't we responsible by now with our water and eco-systems. The technology is available.
	Mississauga, Ontario, Canada	2018-05-02	will we ever learn how mankind's impact affects all things
	Rimbey, Canada	2018-05-02	This is one more example of liberal hypocrisy. They take the environmental high road when it comes to pipelines to transport our petroleum products and they impose carbon taxes to try to save the planet from climate change which has been occurring since the beginning of time and then Liberal Environment Minister under Chretien admitted that the science concerning climate change was phony. This is proof that these people can care less about the environment. The strongest opponents to the Trans Mountain Pipeline expansion, when they are in the BC capital, poop directly in the Pacific Ocean as Victoria does not treat it's sewage. These same goons just raised their carbon tax, yet many oppose a sewage treatment plant. And Montreal has dumped raw sewage in the St. Lawrence when opposing the Energy East pipeline. And Nova Scotia who was predominantly Liberal red in the 2015 supporting Trudeau who promised the carbon tax now has a proposed disposal pipeline to the Northumberland Strait to dump toxic effluent. Our w
	Walkerton, Canada	2018-05-02	THE NERVE OF THESE COMPANIES. DON'T THEY KNOW THE WATER IS NOT THEIRS TO POLLUTE, AND WHERE IS THE GOVERNMENT IN THIS VERY BAD IDEA.
	Hamilton, Canada	2018-05-02	Please, this is vitally important.
	Antigonish, Canada	2018-05-02	I think it is important for the Minister of Environment to do more studies to consider the long term effects a pipe like this could have on the marine life in the Strait and to consider how that may affect

Name	Location	Date	Comment
			the people and industry who depend on a stable and healthy marine life. Don't hurt one industry to protect another industry.
	Little Current, Canada	2018-05-02	It is 2018 and we shouldn't be dumping anything into the ocean, plastic and especially effluent. Build a water treatment plant for heaven's sake.
	Woodstock, Canada	2018-05-02	No more oil spills. Save our water life from crazy money grabbers!Enough !
	Gander, Canada	2018-05-02	I'm tired of govt stealing tax$$$ and not using the money to help humans sustain life in and off land
	Sudbury, Canada	2018-05-02	How do you spell INSANITY ?.?
	Halifax, Canada	2018-05-02	I love the younger people and we really need to start to care a little about what we are actually doing with the many other choices there are that could be utilized
	Lake Country, Canada	2018-05-02	THIS century includes innovation and technology to better deal with effluent from pulp mills. Take the time to find a better way to deal with it than dump it into the strait. Invest in our future, not our past.
	Lindsay, Canada	2018-05-02	If we don't protect our natural environment there will be no future for our children.
	Assiniboia, Canada	2018-05-02	We have to quit polluting our waters and killing our marine life! There has to be a better solution!
	Brampton, Canada	2018-05-02	We are killing the oceans
	Hamilton, Canada	2018-05-02	I have seen far to much from weak minded politicians that take a quick route to solve a problem. Our waters and oceans are the life blood. Poluting our water is criminal
	Hamilton, Canada	2018-05-02	It’s hard to believe that it is even on the table to pour untreated effluent into a natural water body.
	Edmonton, Canada	2018-05-02	This continuing destruction of Maritime land, clean water & food, is utterly disgusting of government. It has been over decades since pollution wrecked the land & water, more so the citizens are carrying heavy cancer issues. Most of my family & friends have died. Please stop polluting, it needs to end.
	Victoria, Canada	2018-05-02	Because this is the right thing to do
	Edmonton, Canada	2018-05-02	Business owners need to take responsibility for non-polluting options to dispose of their waste, and the government needs to ensure that this is done to ensure healthy ecosystems now and in the future.
	Toronto, Canada	2018-05-02	Other solutions that don't affect the Marine environment should be considered.
	London, Canada	2018-05-02	Thermal pollution is a real threat to fishing ecosystems.

Name	Location	Date	Comment
	Blenheim, Canada	2018-05-02	Once again, we see a company trying to overrule the needs of the environment for it's own profit. Instead, use your employees to help solve the problem and thus keep the company alive (as well as the environment of the Strait). Otherwise. shut the company down until it solves its problem (I'd feel bad for its employees if shutting down was the only solution).
	Banff, Canada	2018-05-02	We have to take a stand to protect out waters and its inhabitants!
	Burnaby, Canada	2018-05-02	
	Winnipeg, Canada	2018-05-02	We need to protect our wildlife on land and in the oceans. Pouring its effluence without it being treated is gross negligence in my book. Gone are the days of simply dumping into Our land or oceans. We now know that there are dire consequences to wildlife when we do. It goes without saying, you can't poison your food and expect to live.
	Vernon, Canada	2018-05-02	Canada is not the only country that needs to smarten up, this disgrace is going on around the whole world and is going to cost us all BIG time if it's not stopped.
	Howell, New Jersey, US	2018-05-02	The water ways of NS need to be free of pollutants that negatively effect the environment
	Regina, Canada	2018-05-02	When exactly are the persons that we elect into government going to figure out that we cannot simply dump our CRAP! into our marine systems and expect it to not have serious, negative consequences!? What year/century are we living in; 1918?
	Gilford, Ont., Canada	2018-05-02	This waterway will become unhealthy for the trout and Atlantic salmon as well as humans with temperature change and the toxic chemicals. Avoid another tragedy please!
	New Glasgow, Canada	2018-05-02	We need to protect our wildlife
	Calgary, Canada	2018-05-02	One more of man's great decisions to destroy more of the environment.
	Beaverton, Oregon, US	2018-05-02	The waters of Northumberland Strair don’t stay there but work their way around the whole earth. To allow this pollution here, and similarly in many other places, is to toxify the waters of the whole planet, to the detriment of all life.
	Dartmouth, Canada	2018-05-02	Could we have a government concerned with making the right long term decision?
	Montreal, Canada	2018-05-02	For our waters and our wildlife!
	North Bay, Canada	2018-05-02	Leave our water system alone! No pipes!
	Sorrento, Canada	2018-05-02	It's the right thing to do!

Name	Location	Date	Comment
	Fredericton, Canada	2018-05-02	We've done enough damage to our environment. It's time to design and implement better solutions.
	erin, Canada	2018-05-02	Hard to believe this is happening in 2018 in Canada ! We continue to use our precious water as a toilet !!!
	Atlanta, Georgia, US	2018-05-02	We have to stop polluting our environment!!!
	Powll River BC, Canada	2018-05-03	Clean up humanity, our waste ..pay the price for a good life on a clean planet .As long as we reproduce as we do our actions will destroy us. We soon reach critical mass of selfdestruction .A few bugs ,beasts,rhinos extinct will be nothing compared to what's looming beyond permafrost meltdown. Who knows really how much methane will be released soon.Even the rich won't have anywhere to escape to.
	Pictou County, Canada	2018-05-03	My husband is a commercial fisherman and this directly impacts our livelihood
	Glen Huron, Canada	2018-05-03	The hidden effluent, exposed by environmentalist groups, conscientious media outlets and sustainable activists has shed a well deserved light on the atrocities committed by these farming operations - increased monitoring and regulation of this must be encouraged and adopted.
	Calgary, Canada	2018-05-03	Our nation should be focusing on renewable, sustainable forms of fuel - wind and solar! These practices of using oil for fuel are outdated and are doing nothing to benefit our environment
	Ottawa, Canada	2018-05-03	Dumping contaminated waste into the ocean is ridiculous and should never be allowed!
	Beaufort, South Carolina, US	2018-05-03	WHAT IS IT ABOUT HUMAN NATURE THAT WE HAVE THE CAPABILITIES TO DESTROY OURSELVES AND ALL LIVING CREATURES AND STILL DO NOTHING TO STOP IF FROM HAPPENING?
	Pictou, Canada	2018-05-03	I don't trust thus company. I believe they will ruin the Northumberland Strait if allowed to pump effluent into it.
	Ottawa, Canada	2018-05-04	This is a travesty!!
	Victor Harbor, Australia	2018-05-04	I oppose all dumping of pollution, more so when the effects are so profound. This shit has to stop!
	Houston, Texas, US	2018-05-04	#nopipe period. End of story.
	Halifax, Nova Scotia, Canada	2018-05-06	In 2018, It only makes sense
	Victoria, Canada	2018-05-06	Pollution by dilution is not a solution
	Salisbury, Maryland, US	2018-05-06	What a truly bad idea!

Name	Location	Date	Comment
	Port George, Canada	2018-05-06	As with our dirty Canadian oil refineries, it's time industry paid for their messes; treaty the stuff!
	Dartmouth, Canada	2018-05-07	I’m sure the chemical engineers would like to get this right and neutralize the effluent and get it to the right tempersture before releasing it to the environment. Don’t destroy 4 indistries and the health of Nova Scotians for the sake of this one industry that we don’t even profit from.
	Coquitlam, Canada	2018-05-07	It's not cheaper to dump this effluent directly into the ocean. The effects from this effluent will cost a billion times more to clean up than the few jobs it will create by dumping... If the effluent can't be disposed of in a positive way to benefit something then the whole project needs to be stopped.
	Halifax, Canada	2018-05-07	I'm concerned about our marine life.
	Charlottetown, Canada	2018-05-08	I come from a fishing family - we need to protect the Northumberland Strait ! NO PIPE
	Elizabethville, Pennsylvania, US	2018-05-08	I grew up crossing that straight. There is a very delicate balance that is important to maintain. Please look at other options.
	charlottetown, Prince Edward Island, Canada	2018-05-08	Far too risky.
	Canada	2018-05-08	Our resources are far too valuable to be destroyed.
	Whitby, Canada	2018-05-08	We've created enough ecological mess. Everyone, and every community, large or small, must deal with their own crap.
	Red Deer, Canada	2018-05-08	Complete your signature Red Deer, Canada I’m signing because... (optional) Display my name and comment on this petition
	Belfast, Canada	2018-05-08	No more pipelines or other pollution .
	Brossard, P.Q., Canada	2018-05-08	Such a rich place for wildlife
	Ottawa. ON, Canada	2018-05-08	Surely the Government has considered the environmental impact
	Ottawa, Canada	2018-05-08	Using the ocean as a dumping ground has to stop.
	Victoria, Canada	2018-05-08	This effluent needs to be properly treated before being released into the environment to reduce negative impact.
	Nanaimo, Canada	2018-05-08	Stop the pipe Dave the sea life
	Ottawa, Canada	2018-05-08	We must prevent the destruction of our waterways. The Great Lakes and St Lawrence Seaway are part of the largest freshwater system in the world. We should preserve it.

Name	Location	Date	Comment
	Ottawa, Canada	2018-05-08	Designing a pipe to dump waste water from a pulp into a productive and remarkably beautiful stretch of Canada’s coastline waters is wrong in so many ways.
	Owen Sound, Canada	2018-05-08	There is no long term future for oil. It is a finite product which will disappear. I do not see any Government programs for long term energy production that does not involve oil. The Federal Government is failing it's promises and ignoring the Canadian people's wishes. The economy does not make a country, the community and the people make a country.
	Moberly Lake, BC, Canada	2018-05-08	Oceans should no longer be used as a sewage pond for human waste.
	Kingston, Canada	2018-05-08	The Gulf of St. Lawrence is not your toilet.
	Chatham-Kent, Canada	2018-05-08	Don’t mess with the oceans. No pipelines in Northumberland.
	Venice, California, US	2018-05-08	We need Marine animals natural waters marine life etc. Think upanother way to deal with to deal with toxic waste. No pipeline.
	London, Canada	2018-05-08	As a former resident of New Brunswick, I understand the delicacy of that ecosystem and would be appalled to see it damaged.
	Edmonton, Canada	2018-05-08	What is the matter with you people?! Haven't you heard of a sewage treatment plant?! Where is all the money that the Feds promised for infrastructure???
	Saint Catharines, Canada	2018-05-08	There is a better solution to the problem.
	Toronto, Canada	2018-05-08	You bet I'm signing this. How can you possibly think that dumping all that crap in the water will not harm or destroy what is there? Canadians love our fresh clean water ways. Don't mess with it.
	Halifax, Nova Scotia, Canada	2018-05-08	Please be reasonable and say no to the environmentally UN-friendly idea of dumping effluent into the Northumberland Strait!
	elora, Canada	2018-05-08	Surely we are smarter than this! Come on engineers! This is our childrens’ future too!
	Dunnville, Canada	2018-05-08	All pipelines fail in time. Stop this senseless destruction. Petro is no longer needed as we now have so many cleaner alternatives.
	Cornwall. ON, Canada	2018-05-08	There are enough problems facing our oceans. We should not be adding to them.
	London, Canada	2018-05-08	It’s essential that we expand our efforts to protect our environment. We have reached a point of no return.
	Ardrossan, Alberta, Canada	2018-05-08	Our water is being destroyed when it needs to be saved

Name	Location	Date	Comment
	Kelowna, British Columbia, Canada	2018-05-08	throwing away effluent is throwing away money. It can be recycled, the water cleaned and released. There is no need to treat the ocean as a toilet.
	Toronto, Canada	2018-05-08	Effluent piped directly into the Strait? What are you thinking?
	Chilliwack, British Columbia, Canada	2018-05-08	In 20 years the world will be off its dependence on oil and onto clean energy, let’s start this change now.
	Victoria BC, Canada	2018-05-08	This is 2018. How can you!!?
	Bethany, Canada	2018-05-08	There has to be a better way to handle this without compromising our oceans.
	Leamington, Canada	2018-05-08	I agree that the risk to the habitat and marine life is too great for the location of this pipeline.
	Bridgewater, Canada	2018-05-08	The long term environmental risks to this proposed plan heavily out way any short term economical benefits.
	Toronto, Canada	2018-05-08	This is dosgraceful
	Victoria, Canada	2018-05-08	The environment is more important than this mill's desire to save money. What a stupendously idiotic idea.
	Penhold, Canada	2018-05-08	Wow leave the oceans alone stop wrecking the planet
	Victoria, Canada	2018-05-08	a fish sent me
	Lincoln, Canada	2018-05-08	Surely, the company involved could consult with experts to come up with a less environmentally damaging disposal of their effluent. It is their moral responsibility to do so, but too often economic expediency is the winner.
	Winnipeg, Canada	2018-05-08	because I care about our oceans and all that live in it. people are the worst enemy to nature.
	Westport, Canada	2018-05-08	This must not happen.
	Aylesford, Canada	2018-05-08	is that the best we can do in 2018!!!? Raw sewage poured into the ocean...."out of sight out of mind" mentally has got to stop!
	Brighton, Canada	2018-05-08	Respect for Nature - Respect for LIFE
	Ariss, Canada	2018-05-08	Treat the effluent so it is non toxic and has a neutral effect on the environment prior to dumping. It is the cost of doing business. The ocean is not a garbage dump.
	Stratford, Canada	2018-05-08	You don't pump toxic chemicals into Straits.
	Pender Island, Canada	2018-05-08	We need to protect our environment, for its own sake, and for future generations.

Name	Location	Date	Comment
N A	Mount Stewart, Canada	2018-05-08	What year is this that we are still considering a long pipe the solution?
	Nanaimo, Canada	2018-05-08	Once again, politicians are faced with making the RIGHT decision and flying in the face of their «friends» and moneybags. There is NO LIMIT to the greed of WorldCorp Kapitalists whose agenda is PROFIT and the environmental and social costs be damned. Just one more example of the massive destruction perpetrated in the name of «progress» where that «progress» is the advancement of the 1% world slavery agenda.
	Azilda, Canada	2018-05-08	Sewage should be treated in lagoons before disposed of in oceans.
	Toronto, Canada	2018-05-08	Its the right thing to fight for safe waters For Canada's Fish!!
	Brampton, Canada	2018-05-08	This would be a disaster for the environment.
	Invermere, Canada	2018-05-08	I thought us Canadians had such educated views now, but to pipe garbage into the ocean is so backward and selfish!
	Gabriola, Canada	2018-05-08	To put all the marine life at risk by proposed pumping of 90 million litres of effluent would be an rresponsible act especially when the oceans are already threatened and when this is where they get energized and feed before entering the rivers. Do not go ahead with this plan.
	Millarville, Canada	2018-05-08	This is as bad as Victoria B.C. stop this
	Leduc County, Canada	2018-05-08	We need clean solutions to continue living together on this planet with the life that gives us all life.
	London, Canada	2018-05-08	We are killing the oceans.
	bc, Canada	2018-05-08	enough is enough.
	Cheltenham, Canada	2018-05-08	I love the maritimes and have visited many time as a tourist over my lifetime. Please help keep this region diverse and pristine!
	West Vancouver, Canada	2018-05-08	Please consider how important this area is to the planet. Do not rush into development simply for economic reasons. There are vast economic benefits that exist based on the feeding grounds of the fish. Do not pollute this sensitive area!
	Chelsea, QC, Canada	2018-05-08	If our politicians continue to place profit above planet they should be made to pay. First at the ballot box and then in the courts.
	Mt. Albert, Canada	2018-05-08	We need to stop polluting our rivers and oceans if we want to survive.
	Abbotsford, Canada	2018-05-08	I am signing because there must be another way for this mill to operatebecause I am from the West Coast and Canada does not need further fishing destruction.
	Peterborough, Canada	2018-05-08	Life should be a priority over money and the environment sustains us all. Especially the oceans.

Name	Location	Date	Comment
	Sidney, Canada	2018-05-08	All of life on our planet depends on the health of our oceans.
	stoney creek, Canada	2018-05-08	WE NEED TO WAKE UP.
	Vancouver, B.C., Canada	2018-05-08	We only have one world. We must protect it.
	Truro, Canada	2018-05-08	I do not trust the people that tell me the pipe will not have a negative environmental impact. I KNOW IT WILL! David Boyle
	Oakville, Canada	2018-05-08	For an education in environment management, check out the non-fiction book "Collapse" by Jared Diamond.
	Mission, Canada	2018-05-08	We need to protect our oceans and all fish life. To often we proceed with business ventures that end up costing our environment.
	Sarnia, Ontario, Canada	2018-05-08	Seriously? You can’t treat this water first?? Greedy a$$&@les
	Freelton, Canada	2018-05-08	Warming and rising oceans along with poluted waters are a worldwide threat.
	Toronto, Ontario, Canada	2018-05-08	Defend clean water - for all of us
	Debert, Canada	2018-05-08	Precautionary principled...K.
	ETOBICOKE, Ontario, Canada	2018-05-08	Our biodiversity needs to be protected.
	Courtenay, Canada	2018-05-08	I care
	Toronto, Canada	2018-05-08	It is very disturbing that industry can still be allowed to dump effluent into waterways that will damage the ecosystem.
	Maple Ridge, Canada	2018-05-08	The environment needs to come first. Ahead of money.
	Gibsons, Canada	2018-05-08	Stop the insanity of polluting our earth and expecting the environment to absorb our greed!!
	Medicine Hat, Canada	2018-05-08	Is there no end to perverted corporate greed and political appeasement? For God's sake, think of everyone, not just the tiny minority!
	Stouffville, Canada	2018-05-08	This is my ocean location & I wish to continue to enjoy its beauty & protect our marine life for now & generations to come.
	Delta, Canada	2018-05-08	
	Saskatoon, SK, Canada	2018-05-08	This is the only EARTH we have.Keep it clean for people & ALL species!

Name	Location	Date	Comment
	Chilliwack, Canada	2018-05-08	People running these companies need to find solutions to these issues before engaging an a process.
	Kemptville, Canada	2018-05-08	There must be another way. They must find a better solution.
	Quadra Island, Canada	2018-05-08	The environment, the foundation of our [and all other species'] well being and very survival, is dying by "a thousand cuts". We must become far more careful about what we do to it. NO more dumping into fresh or marine waters as if they were a large toilet! Perhaps waters could take "another hit" before, but now they are under multiple assaults and can no longer.
	Whitehorse, Canada	2018-05-08	We need to do better!
	Lakefield, Ontario, Canada	2018-05-08	I can’t believe this is considered a viable option in this day and age. For gawds sake, think about what you’re doing. Thank you.
	Fredericton New Brunswick, Canada	2018-05-08	I am worried about the abuse of our planet and want to preserve it for future generations.
	Revelstoke, Canada	2018-05-08	Why are we still allowing companies to dump waste into our oceans???
	Ottawa, Canada	2018-05-08	Polluting the environment should not be allowed for economic reasons ever!!!
	Toronto, Ontario, Canada	2018-05-08	It’s not acceptable to treat our oceans as a garbage dump!
	Ottawa, Canada	2018-05-08	If the effluent is too corrosive to the infrastructure of the mill, how can it possibly be acceptable to dump it into the environment? Dear Minister, I urge you to protect the marine environment by preventing the effluent dump. The marine emviroemnt is iinvaluable and irreplaceable..
	Trenton, Canada	2018-05-08	Also, a great deal of the coastline of the Northumberland Strait is designated as a Maritime Protected Area by the Government of Canada, and that the proposed area for effluent discharge is also the location of several federal marine refuges.
	Canada	2018-05-08	Polluting valuable Marine ecosystems is unconscionable! Find a better solution to the pulp waste problem!
	Boutiliers point, Canada	2018-05-08	My major concern are the effluent chemicals; proper waste management can reduce the chemical output!
	Toronto, Ontario, Canada	2018-05-08	One more nail in our collective coffin...
	Oakville, Canada	2018-05-08	Isn,t this waste treated first??
	Barrie, Ontario, Canada	2018-05-08	There has to be another option, we cannot poison the waters around us.

Name	Location	Date	Comment
	Montréal, Canada	2018-05-08	We need the ocean to be save for all marine life.
	Delta, Canada	2018-05-08	For the safety of marine life
	Shelburne, Canada	2018-05-08	enough is enough STOP destroying our home planet. People who allow this are Ecological terrorists and are committing crimes against humanity.
	Strathroy, Canada	2018-05-08	we only have one planet, don't destroy it or anything that lives here
	Saskatoon, Canada	2018-05-08	There is a better way.
	Edmonton, Alberta, Canada	2018-05-08	WTF Nova Scotia, how could you not possibly know how disastrous this will be?
	Toronto, Canada	2018-05-08	As consumers, we need to demand less bleaching - tissue, toilet paper, paper towels, all involve bleach. Read this FAQ, and decide for yourself:<a href="https://sites.google.com/dillon.ca/northernpulpetf/frequently-asked-ques rel="nofollow">https://sites.google.com/dillon.ca/northernpulpetf/frequently-as
	kamloops, British Columbia, Canada	2018-05-08	the government are stupid assholes who don't care about anything but themselves and their lobbiests...go to hell
	Smithville, Canada	2018-05-08	OH PLEASE save the future of the Northumberland Strait
	Salt Spring Island, Canada	2018-05-08	I am finding increasingly difficult to understand any reasoning that would have a person put in charge of protecting the environment maaking a damaging decision like this. What the hell is going on????
	Toronto, Canada	2018-05-08	Any kind of effluent should NEVEr be dumped into our oceans or lakes. No exceptions.
	Penetanguishene, Canada	2018-05-08	Are we insane or just crazy?? Don't put marine life & water at risk! We're supposed to REDUCE our dependency on fossil fuels; not increase it!
	London, Canada	2018-05-08	Has the Pulp & Paper industry learned nothing over the last 100 years about the effects of their pollution in the air and water around them? The oceans and connected waterways are NOT dumping grounds for effluent they, the industry, produce, and do not want to be responsible for dealing with in a environmentally sensitive fashion. If that cannot be done, perhaps they should not be in business! Absolutely NO to the effluent pipe pumping toxic chemicals etc. into the Northumberland Strait !
	Dorval, Qc, Quebec, Canada	2018-05-08	We must stop polluting the world we live in.
	Ottawa, Ontario, Canada	2018-05-08	Our water systems and marine life are way more important than more oil coroporation profits. Thid insanity has to stop.
	Dunstaffnage, PEI, Canada	2018-05-08	Seriously, there has to be a better way.

Name	Location	Date	Comment
	Chilliwack, Canada	2018-05-08	Why do we keep trying to destroy our beautiful planet and all the wonderful creatures in it!!! Shameful!!
	Grande Prairie, Canada	2018-05-08	This has nothing to do with oil!
	Grande Prairie, Canada	2018-05-08	This has nothing to do with oil!
	Rothesay, Canada	2018-05-08	Stop polluting our waters!
	Toronto, Ontario, Canada	2018-05-08	Much concerned, and very alarming.....
	Ottawa, Canada	2018-05-08	Please support an ecologically wise and responsible solution.
	Winnipeg, Canada	2018-05-08	Process your waste into something neutral or useful. Don't just dump it out of sight/out of mind, because someone will ultimately have to pay for your convenience.
	Saint Marys, Canada	2018-05-08	This is unacceptable! It is time that we made protecting our waterways a priority.
	Vancouver, Canada	2018-05-08	We need to protect our eco system.
	Saanichton, Canada	2018-05-08	We need to protect both east and west sides of Canada. Stand up for each other.
	Toronto, Ontario, Canada	2018-05-08	NO PIPELINE EVER!! Get off oil dependency and begin investing in non toxic energy!
	Vancouver, Canada	2018-05-08	We don't need any more pipelines, why can't the Liberal government stand strong for the environment?
	Trochu, Canada	2018-05-08	To bad they love shit but hate oil...
	Bowmanville, Canada	2018-05-08	There has to be another way that doesn’t forever change our water ways.
	Vancouver, Canada	2018-05-08	The truth of this petition is common sense.
	Malahat, Canada	2018-05-08	What are you thinking? Stop it!
	Surrey, Canada	2018-05-08	the environment isn't worth the chance. if there ever a spill, it never gets all cleaned up.
	Montréal, Canada	2018-05-08	You have a very worthy cause. My petition also has great merit. Would you present my petition concerning the risk that airline passengers will face and the countless deaths of birds and animals in two protected forest from an ill-placed odorous compost plant that is in violation of the regulations of Montreal-Trudeau airport. My petition is located at https://chn.ge/2HJXHvg Good luck with your petition. Anne

Name	Location	Date	Comment
	Galiano Island, Canada	2018-05-08	Toxins must be liscensed and regulated.
	Brampton, Ontario, Canada	2018-05-08	There are new energy sources out there, namely Oro Blanc why is this not being developed?
	Belleville, Canada	2018-05-08	There is no excuse for industry dumping their effluent into the environment. This is the 21st century.
	Edmonton, Canada	2018-05-08	I love to eat wild fish and think that our oceans and its' creatures are already struggling enough as it is.
	Terrace, Canada	2018-05-08	Time to stop these idiots from treating the ocean like one big garbage dump.
	Napanee, Ontario, Canada	2018-05-08	I cannot believe in this day and age, with the concern for our environment as heightened as it is, and with the knowledge we now have, that THIS is even A REMOTE consideration by the MINISTER OF THE ENVIRONMENT, no less!!!!!!! It's absolutely shameful and it impacts not just Nova Scotians, but the whole world!!! Our marine ecosystems MUST be protected at all costs - they are the source of life one this planet!! I sincerely hope, Minister, that you will see the dangers inherent in allowing piped effluent into marine ecosystems, and Stand Up as a Protector of the Environment as your title implies.
ux	Montreal, Quebec, Canada	2018-05-08	The mill has to come forward with a better solution.
	Halifax, Canada	2018-05-08	DO I REALLY NEED TO EXPLAIN WHY ITS A DANGEROUS GAME TO DUMP EFFLUENT INTO THE NORTH UMBERLAND STRAIT
	Ladysmith, B.C., British Columbia, Canada	2018-05-08	We have trouble out here on the West Coast re fishing too, so wishing you good luck!!!
	Victoria, B.C., Canada	2018-05-08	Sewage Treatment Plants can be built to be self sustaining.
	Port Alberni, Canada	2018-05-08	Our marine life is struggling as it is with plastics in the oceans, fishing gear and pollution. If we lose our oceans, we lose ourselves. We must be smarter and care more. "The most dangerous breed - humans."
	Copenhagen, Denmark	2018-05-08	Canada needs to wake up and halt all new investments in oil and gas, as a minimum effort in the global fight for our climate.
	Stettler, Canada	2018-05-08	It's time the federal government took as much interest in fixing raw sewage dumping as they do in putting endless roadblocks in building new pipelines in Canada?
	Duncan, Canada	2018-05-08	Canadians need to work together to rid ourselves of the negative forces at work trying to exploit resources regardless of the impact on nature and humanity

Name	Location	Date	Comment
	Vancouver, Canada	2018-05-08	I absolutely cannot believe at this day and age, with all we know about how badly we are destroying our marine environments, that we are still engaging in this kind of practice!
	Surrey, Canada	2018-05-08	We Can not get away from fossil fuel use fast enough. Love nature.
	Ladysmith, Canada	2018-05-08	we need to end our dependence on fossil fuel. we need to protect our oceans and everything that lives there.
	Brampton, Canada	2018-05-08	Taking care of our environment and our wildlife helps to take care of us. When are we going to understand this, its almost too late!
	Victoria, Canada	2018-05-08	The danger to the local environment is too great.
	salt spring island, Canada	2018-05-08	It is the right thing to do...ethics. Ever read any history of on the pillaging of saline and birdlife thats happened over the last 200 or so years? Humans have destroyed and driven life to extinction so will human pollution.
	victoria, Canada	2018-05-08	Protect the fish please!
	Westport, Canada	2018-05-08	Sounds like a bad idea to me.
	Cobourg, Canada	2018-05-08	If we don't protect our food sources, then all the oil in the world will be useless. Food needs priority.
	Toronto, Canada	2018-05-08	Once the water is polluted and the fish are dead, it's too late...
	Canada	2018-05-08	Just to be clear, this is an effluent pipe (waste liquids) from a pulp mill, not a fossil fuel pipeline. :-)
	Mississauga, Ontario, Canada	2018-05-08	No pipe!!!!!!
	Winnipeg, Canada	2018-05-08	Take care off the environmental system. Help the plant , give our children a future.
	Canada	2018-05-08	Just to be clear, this is an effluent pipe (waste liquids) from a pulp mill, not a fossil fuel pipeline. :-) (I totally agree, we need to protect our oceans from every form of humanity's trash and industrial waste. City's such as New York dumping their garbage offshore; Montreal pumping its sewage into the St Lawrence ... are disgusting !!)
	Hagensborg, Canada	2018-05-08	I'm all for jobs and mills create work and good products. There's got to be a way to deal with this that doesn't destroy our food and our health.
	Kelowna, B.C., Canada	2018-05-08	we all need to ban together and keep our oceans clean and safe for all living creatures.
	Halifax, Canada	2018-05-08	we have enough water problems now without creating new ones. we cant even fish Atlantic salmon because there are so few and now a mill wants to destroy the rest and many other fish we depend on for various reasons. Ones this affluent gets into the ocean it

Name	Location	Date	Comment
			will remain there for ever as it has no where else to go. Are we really debating whether or not this is ok, so, a company who cares nothing about the Maritime's or its people can make more money by destroying our natural resources which are connected to our food sources
	Fort Worth, Texas, US	2018-05-08	This region is important to our global health.
	ottawa, Canada	2018-05-08	There has to be an environmentally sound way of treating the effluent and if it is not economically feasible, the mill ownership is not looking hard enough!
	Ottawa, Canada	2018-05-08	Without the environment and clean water to drink and replenishable resources we have nothing , all these companies care about is money , they don't care about the devistation left behind for further generations
	Cranbrook, British Columbia, Canada	2018-05-08	Our oceans are failing. We are losing species at an alarming rate. Until we look at the cumulative effects of what is happening globally, we must stop dumping toxins into our waterways and on the land. We are jeopardizing all that sustains us and future generations by our careless regard for the earth and all the creatures that live on it.
	Brampton, Canada	2018-05-08	Because its about time th Bearing Straight gets its fair share of the pollution!
	Toronto, Canada	2018-05-08	Please pursue other options for pulp waste!
	St-Zénon, Canada	2018-05-08	C’est Vital de sauver les espèces animal de l’extinction !
	manitoba, Canada	2018-05-08	I want environmental respect in my life and the lives of my children!!! And for Canada!!!! We need to lead this!! Look at what Mother Nature has accomplished in Chernobyl ���
	Maple Ridge, Canada	2018-05-08	Are you kidding, it’s 2018.
	Maple Ridge, Canada	2018-05-08	This is NOT the place to be dumping toxic and harmful waste. Our Canadian Marine Life are already under terrible stress with other environmental factors impacting their survival. Please come up with another solution that will not have such dire consequences on such an important food source.
	Vancouver BC, Canada	2018-05-08	Doesn't anyone ever listen! Stop destroying our environment to save on costs.
	Newcastle, Canada	2018-05-08	Our natural resources must be protected!
	Hearst Ontario, Ontario, Canada	2018-05-08	I believe we need to clean up mother earth for all inhabitants with our Injury to the ecosystem.
	Mayne Island, Canada	2018-05-08	I'm signing because I think it's a TERRIBLE idea to dump tons of toxic effluent into the Northumberland Strait, with the consequent destructive impact on sea-life and marine eco-systems. It's

Name	Location	Date	Comment
			criminally stupid to believe this is an appropriate solution for dealing with the waste. Wake Up!
	Sangudo, Canada	2018-05-08	No! This is not good for anything but the mill. The oceans are already polluted with toxic chemicals, plastics and other wastes. Our marine life is already suffering, horribly. Already, in certain areas it's not safe to eat many kinds of seafoods. Adding more effluent is NOT a good idea. People are seriously being affected by environmental pollutants with all kinds of diseases from Autism to Cancer to MCS and many others that are not yet recognized as bring a result of toxic overload. Please say NO to this!
	Chambly, Canada	2018-05-08	This is just a completely terrible plan. It is inconceivable how any sane person or group of people (a company) could seriously consider such a proposal in the first place!
	London, Canada	2018-05-08	There are lots of issues of concern. World waters are already getting too warm impacting sea life and weather patterns globally. Adding pollutant is just crazy!
	Welland, Canada	2018-05-08	We absolutely must act to protect marine environments; this is NOT the way to do that!
	Surrey, Canada	2018-05-08	We are trying to do the same thing here in BC..Pacific wild salmon, orcas, and humpbacks. Oil pipelines..and spills will devastate our coast.
	Victoria, Canada	2018-05-08	quality over short term monetary gain!
s	Port Sydney, Canada	2018-05-08	There are more than enough pollutants poisoning our seas and oceans. We absolutely do not need to exacerbate an already critical and expanding problem. Stop poisoning our marine life.
	North Vancouver, British Columbia, Canada	2018-05-08	Keep the pollution in the Legislature. We are having running battles in BC over aquaculture, much as NS, and of course, the KM pipeline. It appears more and more that the effluent is the affluent.
	Vancouver, Canada	2018-05-08	Fish when gone are gone forever,no discharge into there home and habitatThank you.
	Victoria, Canada	2018-05-08	If we do not protect our ecosystem, at the moment, our prospect of living in 50 years is zero ...
	Oakville, Canada	2018-05-08	What’s happening today is just wrong. Oceans need protection. They are not a dump for our waste
	Hamilton, Canada	2018-05-08	I’m signing because i want to protect the fish
	Red Deer, Canada	2018-05-08	We have to STOP dumping crap in our waters.
	Calgary, Canada	2018-05-08	I am concerned about that much waste dumping into the Northumberland Strait and the effects to our oceans and sea life, not to mention the effects to our economy as a result of collapsed fisheries.

Name	Location	Date	Comment
	Ottawa, Canada	2018-05-08	It is essential we protect our ecosystems and food supply. Nature has created a delicate balance. Even a one or two degree change affects water species. ...ask anyone who owns a fishtank. Protect our environment.
	Maple Ridge, Canada	2018-05-08	We only have one world and everything on it is in fine balance...it's worth protecting!
	Kelowna, B. C., Canada	2018-05-08	Again, I can't believe what I am reading: to deliberately dump pulp mill effluent into pristine waters where the ice is melting alread so that polar bears have no chance for survival as no food can be caught. Does this take a moment of consideration to say? STOP THIS IMMEDIATELY . There is no end to what damage we are doing to our waters. They can store the effluent - pay for it - and find ways to detoxify it. Are the people we elect into government not thinking but bowing to big business? This cannot continue . We already have nuclear waste being pumped into the waters non-stop . There is no hope for humans and other life if not stopped.
	Caledon, Canada	2018-05-08	The oceans are getting more and more polluted we need to protect it bfore its all destroyed
	Vancouver, Canada	2018-05-08	Without food - we die. Food resources before energy money.
	Ottawa, Canada	2018-05-08	This home to thousands of species. Would anyone of us agree t toxins being pumped into our homes because it is seen as the only viable alternative?
	Burlington, Canada	2018-05-08	Stop screwing with our planet!!!
	Brantford, Canada	2018-05-08	This pipe should not even be a consideration for very obvious reasons. It is pathetic that we must have a petition to protect an integral part of our eco system.
	Montreal, Canada	2018-05-08	We need to more towards environmentally CLEAN waste practices. The ocean is not a toilet bowl !
	Grafton, Canada	2018-05-08	This is not possible that in today's world with all the technology we have that we have governments that are even thinking of dumping effluents in our marine ecosystems. Not possible and not on my watch.
	Saskatoon SK, Canada	2018-05-08	It is completely shocking to me that any company would propose such a damaging effluent pipe. If the toxic effluent is too corrosive for their machinery, it is certainly too toxic for the sea waters. I am totally opposed to it.
	Collingwood, Canada	2018-05-08	Please do not destroy any more of our natural environment with money being the main reason.
	Montague, Canada	2018-05-08	if they think the pipe is such a great idea to pump effluent waste into our precious strait.....why not put the pipe into a retaining pond on the CEO's property? it's safe, isn't it? and would be great for his or her's backyard!

Name	Location	Date	Comment
	Richmond Hill, Canada	2018-05-08	It's an ecological disaster
	Victoria, Canada	2018-05-08	Short term profits to a company is a concept from the dark ages. The effluent must be cleaned of toxic materials as is the law and policy in other jurisdictions in this country
	Calgary, Canada	2018-05-08	I am a fisherman who likes trout & salmon, and even pikes. PLEASE Don't destroy the strait for Greed!
	Edmonton, Alberta, Canada	2018-05-08	We need water, everyone needs water and we need to stop destroying our precious water and everything in our waters. Please no pipe.
	VERNON, British Columbia, Canada	2018-05-08	Time is NOW to start looking after our enviorment.
	Burlington, Canada	2018-05-08	we must protect our environment before profits and ignorance
	Sainte Marie De Kent, Canada	2018-05-08	Save the world before it's too late. Maybe it already is. But don't make life harder for the remain of humanity and our children,
	St. John's, Canada	2018-05-08	I care for our earth, it’s ridiculous how is as humans treat it
	Winnipeg, Canada	2018-05-08	We need to start treating all our water with care and respect. Dilution is NOT the solution!
	St Margaret's Bay, Canada	2018-05-08	To be clear, we are not promoting the closing of the mill; the smart thing instead would be to pursue other options to deal with the Pulp waste versus polluting this valuable Marine ecosystem. Once this effluent changes the Strait, it is likely changed for dozens if not hundreds of years, and will be difficult if not impossible to clean up. Do the right thing for Nova Scotia and our ocean waters!
	Toronto, Ontario, Canada	2018-05-08	No pipelines! We can and have lived without it!!
	Montreal, Canada	2018-05-08	It is unacceptable to endanger local fish populations and compromise the environment, not to mention tourist industry for the entire region, for the sake of one company’s profit.
	CONSTANCE LAKE, Canada	2018-05-08	Have to stop all pollution cause we won't have a future when we are destroying the environment.
	Edmonton, Canada	2018-05-08	1 earth humans as it's keepers, and all we managed to do is cash in on the oil and it's not paid off oil spills killed off parts of one fertile sea beds , all it took is is 1 major oil spill, i ask you why... is it worth it once the oil is all tapped out add, over population, go green technology, that will save this world pain and suffering.
	Victoria, British Columbia, Canada	2018-05-08	NO pipes
	Gabriola, Canada	2018-05-08	If marine life survives- we humans survive

Name	Location	Date	Comment
	Calgary, Alberta, Canada	2018-05-08	Dumping effluent in the ocean is not good for any one or any thing on this planet. Please stop this.
	calgary, Canada	2018-05-08	protect our water and ocean
	Halifax, Canada	2018-05-08	This is an outrage. There must be a better way to dispose of the waste.
	Vankleek Hill, Canada	2018-05-08	This is wrong..there has to be a better solution...we cannot continue to pollute and destroy Mother Earth and her Creatures. Please stop
	Pickering, Canada	2018-05-08	An operation which requires this kind of an easement to survive should not go ahead. The environment is not something simply "nice to have".
	Coaldale, Canada	2018-05-08	People have to stop polluting our planet and start healing it. Be it land, sea, or air
	Courtenay, Canada	2018-05-08	The earth shakes & unless the “pipe” (assuming it’s metal) expands with an earth quack, there’s too much potential for damage.
	Hamilton, Canada	2018-05-08	REMEMBER BP OIL!!! NEVER FORGET!
	Kingston, Canada	2018-05-08	Protect the species; find another way to deal with effluent (there are lots of other ways).
	Saint John's, Canada	2018-05-08	gross.
	St. Albert, Canada	2018-05-08	If they can't treat their waste then they should not be able to operate. GO GREEN EXCUSE ME !!!!!!!!!!!!
	Dundas ON, Canada	2018-05-09	To protect the trout and salmon.
	Winlaw, Canada	2018-05-09	What they are planning is not acceptable.
	Halton Hills, Canada	2018-05-09	Canada has the means to do the right thing.
	Goderich, Canada	2018-05-09	My husband, Leon, and I oppose unnecessary pollution of any kind that puts the health of our planet at further risk.
	Nobleton, Ontario, Canada	2018-05-09	We have got to start making better decisions before it is too late?
	Campbell River, Canada	2018-05-09	Because it's messed up!!!
	Abbotsford, British Columbia, Canada	2018-05-09	The oceans are not dump sites
	Halifax, NS, Canada	2018-05-09	

Name	Location	Date	Comment
	Rigaud, Canada	2018-05-09	I was so happy when I heard Pictou was getting sewage treatment, now this set-back. Why?
	Union Bay, Canada	2018-05-09	I"m signing because I believe our environment needs protecting and we have to find alternate ways of dealing with toxic waste from the pulp mill.
	Saint Thomas, Canada	2018-05-09	Short term gain for privately owned mills to dump effluent the cheapest way = screwing over everyone and everything else. Is that really the legacy policy makers want?
	Quesnel, Canada	2018-05-09	Ok by now , in this century ,you should be able to figure it out this can only be bad for the environment enough already
	Nanaimo, Canada	2018-05-09	Our children have inherited a disaster, the state of Mother Earth is treacherous.
	London, Canada	2018-05-09	It is extremely stupid for an elected official to allow a for-profit corporation to dump its toxic waste into a sensitive environment in this way. The mill is responsible for ensuring that the toxic by-products of its manufacturing process do not pollute the environment and the government of Nova Scotia should be intelligent enough to recognize this.
	Vancouver, Canada	2018-05-09	Water is life. Why are you destroying life?
	Dartmouth, Canada	2018-05-09	Please stop this effluent pipe from being put there. Our fish and turtles deserve our protection!
	Edmonton, Canada	2018-05-09	This is absolutely ridiculous!! I definitely oppose the Northern Pulp's Effluent Pipe to Dump this in the Northumberland Strait. There must be other ways to deal with effluent!!
	Winnipeg, Canada	2018-05-09	I'm signing because all sewage should be treated before it is discharged anywhere in Canada.
	Chemainus, Canada	2018-05-09	This precious habitat and it’s wildlife will be irreversibly destroyed by dispensing tons of toxic effluent into it. STOP IT!
	Port Moody, Canada	2018-05-09	We have to fight for our earth everyday. It is so tiring to see that people do not know if they don't protect the water they will have nothing.
	Sidney, Canada	2018-05-09	Step up and defend the strait from toxic pollution.
	Salt Spring Island BC, Canada	2018-05-09	It is just totally insane what unconscious Corporations will try and do, without regulation and control they won’t stop their drive for profit.
	Leduc, Canada	2018-05-09	This just seems like a silly thing to allow
	Georgetown, Canada	2018-05-09	This is ascenine pumping toxic chemicals STRAIGHT INTO a body of water WITHOUT TREATING THE WATER first. Why do companies only think about their bottom line? What about the future Earth? Do they even care? It doesn’t sound like they do.

Name	Location	Date	Comment
	Brantford, Canada	2018-05-09	Too much crap going into the water now!
	Hamilton, Canada	2018-05-09	We must save this main passage for the sake of our Trout and Atlantic Salmon.
	Foxhole, England, UK	2018-05-09	This is not the way forward.
	Vaughan, Canada	2018-05-09	I don’t want my country to become more polluted.
	Halifax, Canada	2018-05-09	Poisoning our precious water is ridiculous and unnecessary!!
	Montreal, Quebec, Canada	2018-05-09	Petrolium extraction is dirty, on all aspects.
	Québec, Quebec, Canada	2018-05-09	Il faut protéger les cours d'eau, une ressource inestimable.
	Peterborough, Canada	2018-05-09	Pipelines are passe. Invest in renewables!
	Kentville, Canada	2018-05-09	The Mill was a con, and it continues to be a crime against the planet. It must be shut down, not extended.
	Ottawa, Canada	2018-05-09	Let’s move forward with our energy choices, not backward!
	Ottawa, Canada	2018-05-09	Please do not allow the effluent to be pumped into the strait. Sea Trout and Atlantic Salmon will soon be an endangered species.
	Halifax, Canada	2018-05-09	The Ocean, the Atlantic Salmon are part of our culture and History in Atlantic Canada we should cherish them not crush them.Nova Scotia Canada Ocean playground , let’s keep it that way
	Victoria, Canada	2018-05-09	Save our planet &#xFFFD;, and stop harming it.
	Montréal, Canada	2018-05-09	We have to transition away from oil. There is simply no safe way to continue using it.
	Fort Erie, Canada	2018-05-09	They have the technology to clean without destruction to the environment. I heard of a technology years ago, created or experimented with, by a large company in Southern Ontario who did sheet metal and ironwork. It was a type of incinerator where everything that went into it the waste product produced was nontoxic and mostly water. From what I was told by a person who worked for them, the tests were successful. It was hushed up because it was not a money maker. True or false? is there someone who could find out?
	Brampton, Canada	2018-05-09	Our marine life deserve better.
	Glen Haven, Canada	2018-05-09	#nopipe
	pictou, Canada	2018-05-09	I am signing this because I am deeply concerned that there has not been enough research done in order to allow this to take place.

Name	Location	Date	Comment
			We have seen what the effluent has done to Boat Harbour and I fear it will be the same for the Strait as the treatment process they are planning will not remove such toxins as Cadmium and Mercury. I have seen soil tests from the exit point of Boat Harbour that were privately done and Cadmium levels are well above the allowable limit and in case you do not know Cadmium is known for its damaging effects on DNA. Unless you want to be know for taking part in a national disaster I would strongly suggest you look at this issue very closely and give a directive for a Class 2 Assessment. You are calling for one on the Clean up, so thinking there should be one for what caused it in the first place.
	HALIBURTON, Canada	2018-05-09	Zero carbon emissions are needed to save the people of this planet. Wasting money on pipelines is ludicrous.
	Maple Ridge, Canada	2018-05-09	This is ridiculous. We know how damaging this kind of dumping is. Stop now!
	Canada	2018-05-09	It will kill our water and all the fish
	Kelowna, Canada	2018-05-09	Fish first - please! Forget the profits for sake of ou environment please!
	Surrey, Canada	2018-05-09	I value our natural wildlife of trout and salmon. These are keystone species being put at risk.
	NEW GLASGOW, Canada	2018-05-09	there is no reason for this pipe to to ever exist except for greed
	NEW GLASGOW, Canada	2018-05-09	the N.S. Gov .has to pay for the new effluent system & they want the cheapest & easiest way to get rid of the effluents ,where as they signed to own the effluents,also, that is why they have been trying to fast track the asessment & approval
	Ashcroft, Canada	2018-05-09	I worry about the effects on the rivers in the area
	Oakville, Canada	2018-05-09	The mill owners made a profit from producing the effluent and it is their responsibility to clean it up and only put clean water back into the sea. Why should the general public and Nature suffer because of a Corporations greed and having no community feelings.
	Oakville, Canada	2018-05-09	The mill owners made a profit from producing the effluent and it is their responsibility to clean it up and only put clean water back into the sea. Why should the general public and Nature suffer because of a Corporations greed and having no community feelings.
	Surrey, Canada	2018-05-09	Make them create a pond for the effluent and process it!
	Belleville, Canada	2018-05-09	Because I do care
	Fredericton, Canada	2018-05-09	We need to keep the wild we still have!
	Pictou, Canada	2018-05-09	We need to stand up and protect our environment and fishing industries!!!

Name	Location	Date	Comment
	Houston, Texas, US	2018-05-09	I’m a fan of a pristine NE Passage.
	Hamilton, Canada	2018-05-09	Enough of pipelines!! how many more areas need to be ruined?
	Moncton, Canada	2018-05-09	This has to be the dumbest idea since the Tar Ponds.
	Desable, Canada	2018-05-09	No, find another way. Polluting is never an option.
	Fort Erie, Canada	2018-05-10	Negative things keep happening to this planet, where do you think it is going to lead us. Before it is too late do the right thing.
	Calgary, Canada	2018-05-10	I'm signing because the environment in this area is under siege. It is critical that the regulations not be tampered with or allowances made for anyone.
	Canada	2018-05-10	I know the Mill is a major employer here in Pictou county, all the spin off jobs through out the province and beyond. But to discharge the "treated" effluent into the Northumberland Strait.....That's just insane!
	Westville, Canada	2018-05-10	I completely oppose the plan to pump pulp mill effluent into our Strait. There has been zero scientific studies and decisions are being made from an economic and engineering standpoint only. This is wrong!
	St. John's, Canada	2018-05-10	Our beautiful ocean is NOT WORTH the risks. Not worth the money to be made. Not worth it.
	Strathmore, Canada	2018-05-10	If the mill can’t afford to dispose of their byproduct then they shouldn’t exist
	High River, Canada	2018-05-10	stop this pollution & thoughtless cruelty/ destruction now.. has to be a better way.
	Bow Island, Canada	2018-05-10	This is unacceptable - we should be trying to protect what’s left of our already damaged habitat, not destroy it. Technology exists so that industry can exist in an environmentally responsible way, it just requires the will to use it.
	fort st. john, Canada	2018-05-10	I am amazed that that in times wnen many fisheries have been decimated, leaving many w/o work & a source of food reduced radidically as well as a time when we Canada is trying to save our natural environment that a govt would allow a private company to emit that much effluent that would ruin the Strait waters. NORTHUMBERLAND Strait & all that it provides, is for the inalienable right of the citizens of the provinces around it; not to provide a cheaper dump for a private company to the detriment of the Strait. Very small minded. Please reconsider such an option & serve those who voted for your govt.; protect the Strait.
	Kitchener, Ontario, Canada	2018-05-10	Find a better way to deal with this !

Name	Location	Date	Comment
	Dryden, Canada	2018-05-10	We send astronauts to outer space and yet we are still dumping human waste garbage into rivers and oceans. Only clean water should enter our rivers and oceans!
	kitchener, Canada	2018-05-10	This pipeline is a ridiculous idea. Haven't we learned ANYTHING about environmental protection?
	Shelburne, Nova Scotia, Canada	2018-05-10	There will be nothing left if we keep destroying the bit of healthy environment that is left.
	Nelson, Canada	2018-05-10	Im signing because, I believe our water ways all over the planet are fundamental to human life. Our priority as we consider more expansion of human society needs to first consider if the actions taken are going to maintain the health and diversity of our waterways and the ecosystems they support. Water is the fundamental element necissary for the human body. If we continue to disregard the necessity to keep our water safe in this limited resource of earth, we will not be living in a very healthy environment 30-40-50 years down the road. We need only observe the detrimental impact we have already had on our global environment to know how bad it could get, if continue in the same light, with disregard for the very substances that sustain life. This idea should be seen as a crime, if it was implemented, a crime against humanity! Our fundamental life source is in danger and to even consider continuing to contaminate it is ludicrous!!!
	Lethbridge, Canada	2018-05-10	I am appalled that we still do this in Canada . Why are you not pre planning for the extra effluent long before you need to dispose of it. I work in research our rivers and streams are becoming very polluted naturally without mans thoughtlessness.
	Halifax, Canada	2018-05-10	I care
	Delta, Canada	2018-05-10	We need to protect wild salmon and marine ecosystems far more than we do investment and dependence on harmful fossil fuels.
	Nelson, Canada	2018-05-10	All good is wild & free!
	Elgin, Canada	2018-05-10	Help protect our fish.
	Toronto, Canada	2018-05-10	Northern Pulp must be stopped from using our ocean as a sewer. Their poisons must be prevented from entering our ecosystem.
	Summerside, Canada	2018-05-10	Perhaps in this day and age, if you can't deal with your waste in a proper manner, you shouldn't be in business...
	Sydney, Canada	2018-05-10	It’s time to stop this polluting of our environment.
	Stellarton, Canada	2018-05-10	I’m signing because it is the only right thing to do! Thanks to Matt Dort for being such an inspiring influence!
	New Glasgow, Canada	2018-05-11	Isn’t it time this stopped, rather than starting over someplace so special to so many, full of whales , tuna , and gannets feeding on Herring all of September... and rich Lobster spawning grounds!!

Name	Location	Date	Comment
	Londonderry, Canada	2018-05-11	Salmon, trout, lobster and recreation are all threatened by this NP’s pipe.#nopipe
	Midhurst, Canada	2018-05-11	Dumping 90 million litres of effluent daily into the Strait will cause harm to marine ecosystem. Find another solution!
	Vancouver, Canada	2018-05-11	Nobody should dump ANYTHING in the ocean!! Its a source of food for millons. Who in their right mind would even think of polluting the oceans??? So much for civilized.....Nature does not dump anything. There is no waste in nature. Something always cleans up and we better get on that or we will kill our environment. We are well on our way.
	Toronto, Canada	2018-05-11	Companies should not be allowed to continue to download costs onto taxpayers and the environment. They take the profit and we take the cost. How is this a fair deal for us?
	Halifax, Canada	2018-05-11	I care about the health if Canada's environment. I want it preserved for my children.
	New Glasgow, Canada	2018-05-11	This planned effluent pipe into our beautiful strait in unconscionable.
	North Myrtle Beach, South Carolina, US	2018-05-11	This ocean is a habitat for our eco system which includes us humans . We should be proud to keep our waters clean and un-polluted! Let’s do this!!!
	Vancouver, Canada	2018-05-11	Beautiful warm waters need full protection from pollution.
	Westville, Canada	2018-05-11	I think its long past time the government protected our ocean, not pander to corporations. Stop the poisoning of your citizens, and the destruction of natural habitats we depend on
	Vancouver, Canada	2018-05-11	Crude bitumen... probably not the best mineral to pipe through an environmentally sensitive area. For the life of me, I can't understand, why, governments, at every level, don't think refined stuff would be a huge improvement, and a much safer, albeit not a terrific, option. That crude filth we don't want near our shores... Get real. Remember Exxon? Sheesh! What does it take? Any disaster for BC's coastline is going to impact so many. If you want oil to come here, send it in the right form, not goop that can't be utilized until refined anyway. Wakey, wakey!
	Trenton, Canada	2018-05-11	Why risk our environment? It is insane that the government would want to allow this to happen. #NoPipe
	Knutsford, Canada	2018-05-11	You are commenting on the wrong petition Lynne Fox. This is about dumping pulpwood sludge into the Atlantic not about the oil pipeline to the Pacific. Wakey Wakey Lynne.
	Toronto, Canada	2018-05-11	I disagree with this bullshit
	Vancouver, Canada	2018-05-11	Oops! My upset - given the coverage on this pipeline it's little wonder there's a mix-up. However, my sentiment for any pipeline

Name	Location	Date	Comment
			is still the same - measures, proper structures need to be implemented. No question about it. Thanks for the point out! L
	Ottawa, Canada	2018-05-11	there is no more important cause for our future than that of our oceans - if we want a decent future for our kids we need to insure it by taking care of the planet now before it's too late - it's the only decent thing to do and it's the best inheritance we could give
	Kelowna, British Columbia, Canada	2018-05-11	How Stupid can People Be!?!?! It is High Time that Governments Do their Jobs and Deal Appropriately with All Pollutants...Wake Up People...
	Montague, Canada	2018-05-11	Save our Future!
	New Glasgow, Canada	2018-05-11	I know it is important. #NOPIPE
	River Denys, Canada	2018-05-11	Nature is more Important than a Papier mill
	Charlottetown, Prince Edward Island, Canada	2018-05-12	I am very concerned about our eco systems.
	Hammonds plains, Canada	2018-05-12	This will be an environmental disaster.
	Australia	2018-05-12	Icare about our fish
	Orillia, ON, Canada	2018-05-12	Alternative ways and means are available in this day and age of extinguishing species and climate change, surely--these companies must show the will.
	Barrie, Canada	2018-05-12	Are the people who live in these areas so stupid that they are still allowing this to happen? Why don't they stand up and demand an alternative?
	New Glasgow, Canada	2018-05-12	We are. The government is against us and multimillion dollar company is against us. Not as easy as you think.
	Burnaby, British Columbia, Canada	2018-05-13	We either close out nearly all outfishing for ever and save our people's lives, or we live very few more years and all painfully
	Ssrsfield, On., Canada	2018-05-13	Unbelievable! With today's scientific knowhow, industry is still trying to use the old «let's just dump our garbage into the sea» method of years past. Incredible! If that mill cannot find a better way of solving their waste problem, they should not be allowed to operate until they do find a clean solution to that problem.
	Attleborough, England, UK	2018-05-13	All effluent can be recycled. It just costs more. If we won't pay for an ethical product, the product must not be manufactured.
	Waterford, Canada	2018-05-13	We cannot afford any environmental disasters The priority is the planet

Name	Location	Date	Comment
N A	Pictou, NS, Canada	2018-05-13	This would be nothing short of another environmental devastation to our beautiful county. #NO PIPE
	Mississauga, Canada	2018-05-13	You must pursue other options to deal with the Pulp waste versus polluting this valuable Marine ecosystem.The Strait is a main passage for our Sea Trout and Atlantic Salmon as well as a place to feed and get energized prior to entering the rivers. However all this is at major risk with the proposed 90 million litres of effluent to be pumped into the Strait a day.
	Airdrie, Canada	2018-05-13	Seriously!! This is something that happened 100 years ago but we know better now. And let's face it, the taxpayer will pay for the clean up after the damage is done.
	North Vancouver, Canada	2018-05-13	Too much environmental damage is being done by industry in Canada.
	Cochrane, Canada	2018-05-13	Everything is being destroyed because of greed.
	Vancouver, Canada	2018-05-13	Because we have corporate shills pretending to be Minister's who represent the Citizens of Canada. With all the big icebergs drifting south, lets see if one can hit and create another oil disaster. After all they have no accountability.
	Calgary, Canada	2018-05-14	Someone has to have the will to stop this
	Nashville, Tennessee, US	2018-05-14	My mom's from Cape Breton, NS. This is too important a place, ecologically, to befoul with paper mill effluent. As someone in the printing business for the past 47 years, I understand the importance of the mill. But, the costs associated with the paper-making process should be borne by the mill and the purchasers of the paper, not the environment. The fish, and the ocean itself, should not be harmed by a shifting or disguising of real costs.
	Lincoln, Canada	2018-05-14	The government is horrible with respect to tax payers and there health and well being. They are ignorant!
	Oakville, Canada	2018-05-14	Enough is enough. We need to stop polluting the earth for the convenience of corporations.
	Washington, North Carolina, US	2018-05-14	enough destroying the inviroment ,there are other ways to get ride of there waste but will cost them a few bucks
	Kingston, Canada	2018-05-14	We can't afford to lose any more rivers!!!
	Cape Breton, Canada	2018-05-14	We need to save our rivers. no more polluting the rivers.
	Halifax, Canada	2018-05-14	Should not be
	Chilliwack, Canada	2018-05-14	this is ridiculous in todays modern world dumping raw sewage into the ocean as Victoria Vancouver Island has been doing for the 100 yrs...bullshit.
	Dieppe, Canada	2018-05-15	Enough is enough. Polluting these water must be stopped.

Name	Location	Date	Comment
	Vancouver, Canada	2018-05-15	I have personally witnessed the on going effect of the effluent , color, smell and foam along our beaches of the Northumberland Strait. In the last 10 years I have also seen its effects on Pictou Island shoreline and shellfish who’s shells are a very copper brown stain.
	Mahone Bay, Canada	2018-05-15	What kind of 'environment minister' pushes pipelines, BP offshore drilling and filth entering the Northumberland Strait? Why, it must be a yet another hypocritical Liberal 'environment' minister!
	trenton, Canada	2018-05-15	I want future generations to be able to enjoy the ocean. I for one was unable to enjoy the ocean growing up. Boat Harbour is in my back yard and the only way I can view what was once a spectacular place is by hearing stories. I want those stories to be real again for generations to come. Why ruin our beautiful home by polluting our waters?
	kingston on, Canada	2018-05-16	I care
	Summerside, Canada	2018-05-16	I care about our waterways and the Northumberland Straight
	Corner Brook, Canada	2018-05-17	Ridicules
	Westville, Canada	2018-05-17	Enough is enough, NP pollutes our air and water as well reck havic on our woodlands, talking no responsibility for their actions. Our fishing grounds must be protected.
	Port Dufferin, Nova Scotia, Canada	2018-05-17	this is wrong on so many levels ...think we had a lot of fish and marine life die and wash up on shore already . imagine if they are allowed to do this ,the devastation it will cause to marine life, eco systems and even us from eating things caught in that area contaminated by chemicals .
	Québec, Canada	2018-05-18	We must stop the planetary ecocide !
	Tatamagouche, Canada	2018-05-18	It's long past time to stop allowing a large foreign corporation pollute our environment, raze our forests, and get away with millions of dollars while harming our fisheries and tourism industries.
	Dunrobin, Canada	2018-05-18	I grew up there and shall return
	New Glasgow, Canada	2018-05-18	Keep sending your letters to the Federal and Provincial government agencies , maybe we will get a respond from a real person instead of a computer ...The Federal government should be involved in this ...there should be no way that this mill be allowed to dump their pollution into a prime fishing area like the Northumberland Strait thus affecting all three maritime provinces....
	Barneys River Station, Canada	2018-05-18	Who is allowing..?Find out who owns you, learn, understand and be conscientious about the reasons of this all and than understand the results.You live in a corporate country and you are not the

Name	Location	Date	Comment
			shareholder but their asset.Schools never tell you the truth... you must do that for yourself
	Trenton Nova Scotia, Canada	2018-05-19	I live in the Pictou Landing community and there are days the air is so toxic it is so hard to breath and I get so sick.If the wind is blowing from the east we get Boat Harbour fumes,If the wind blows from the west we get the NP fumes.Can't live this way any longer.#no pipe ever!!!
	North Vancouver, British Columbia, Canada	2018-05-19	Save the Atlantic salmon, get rid of the aquaculture fishery, and ditch the crooked politicians. See DFO Minister Leblanc's Arctic surf clam licensing to family friends and Liberal supporters. And we think the American are bad...we are becoming Americans.
	Sterling, Virginia, US	2018-05-20	I don't know whose brilliant idea it was to propose pumping 90 million litres of effluent daily, but that's insane. Trout is delicious, and before they're eaten they deserve to live healthily.
	Penticton, Canada	2018-05-22	This is disgusting and certainly not necessary in today's world. Clean up you act, and anyone else that is dumping sewage into the waterways. How do you think the Nile, Ganges, et al. became so polluted? Haven't you learned anything?
	Nanaimo, Canada	2018-05-22	Our natural habitat matters more than anything else. Keep Canada Pristine!!!
	Pitt Meadows, Canada	2018-05-22	time to clean up our planet and leave future generations with a better system than we have , no need to allow this mess
	Sturgis, Michigan, US	2018-05-22	The effects of this will be far reaching. Quality and safety of commercial fishing will affect everybody.
	Penticton, Canada	2018-05-24	Who says schools never tell you the truth? Some people just refuse to acknowledge the truth because it doesn't suit them.
	Kimberley, Canada	2018-05-24	The cost savings now will never justify the environmental impact.
	Hamilton, Canada	2018-05-25	Our enviroment has been damaged possibly beyond year. We do have to try. This is one of those steps. I like how you are going about it , saying lets look at alternates for this situation. Very commendable. We need our fish for many many many reasons. Do some research as to why but please vote. Thank you Kevin Mulholland. Hamilton Ontario Canada. L8K 1H9
	Edmonton, Canada	2018-05-25	It effects my home town pictou nova Scotia and I'm completely against what they're trying to do
	Lower Sackville, Canada	2018-05-25	Boat harbour and the stack emissions were awful since day one, but now pumping the effluent directly into the strait untreated? Shame on you, it's unacceptable.
	Montréal, Canada	2018-05-25	Having experienced that beautiful region (Melburby beach!), there is no way this idiotic project should be allowed
	Corbyville, Canada	2018-05-26	Apparently the mill ownership can be traced backed through a series of companies and at the end it appears the owner is in

Name	Location	Date	Comment
			Indonesia, so why would they care what happens to the strait. In this day of high tech engineering there has to be a better way of dealing with the waste if the parent company is forced to spend the money.
	New Glasgow, Canada	2018-05-27	We are in dire straits here! Our very health depends on clean waters to insure viable and untainted fish and other marine life. It is obscene to put big and dirty business ahead of the health and well being of the citizens who live here. They will creep away when they can no longer wrench any more out of our environment, but we will still be here, left with little to hang on to for a healthy life. It has happened before. Why let it happen again and again? Enough is enough
	New York, New York, US	2018-05-30	No pipe
	Newmarket, Canada	2018-05-30	I was raised in rural Nova Scotia and remember the prestine waters and fishing ... and that’s how it should be Our beautiful Province that is unique in its own way.... please don’t let this pipe happen
	Lords Cove, Canada	2018-05-30	Enough is enough! Our planet is in peril- it's time to start fixing it, not making it worse....
	Halifax,ns, Canada	2018-05-30	It will harm fishery, tourism , and our beautiful beaches
	Dartmouth, NS, Canada	2018-05-30	We need to be smarter about our decisions
	Kawartha Lakes, Canada	2018-05-30	I am strongly opposed to this pipe being in the Northumberland Strait.
	Halifax, Nova Scotia, Nova Scotia, Canada	2018-05-30	Our current provincial government is not acting for the environment and hence is creating an environmental deficit for our children and grand-children.
	Smiths Falls, Canada	2018-05-31	Haven't we learned anything yet about what fouling our oceans means to our species, too? Waste disposal is a cost of business that should not be foisted on the environment.
	Saugeen Shores, Ontario, Canada	2018-05-31	Is the water cleaned/filtered before flowing out into the Northumberland Strait? If not, do they fine them for polluting on such a preposterously high scale as this? Keep it clean!
	Fall River, Canada	2018-06-01	The mill is 26 past its life expectancy. No matter what anyone tells you about upgrades, people who go inside the mill are prone to relating feelings of terror about the risk of the conditions inside the mill. I have been to Boat Harbour, and I can speak to the terror of the outfall from the mill. Recent revelations about the estimated costs to clean up Boat Harbour, are grave supports for the risks the Mill's planned effluent pipe will impose on the Northumberland Strait. The illnesses, the air quality and offensive stench. The mill's impacts on our forests in the province. Enough is enough.
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	Moncton, Canada	2018-06-01	No pipe in the strait
	Denver, Colorado, US	2018-06-01	Because The Northumberland Strait is more vital than pulp effluent. NS is not a paper mill trash bin. Save the Marine life. Thank you.
	Canada	2018-06-01	The water will be treated with toxins, dioxins, chlorine, pulp fibres, and fresh water. The Strait is salt water and the marine species rely on a certain degree of salinity
	Fredericton, Canada	2018-06-02	the Oceans are not our private dumping grounds.
	Toronto, Canada	2018-06-03	I want to express my deepest desire to keep the health and well-being of northern fish stocks alive and well for future generations.
	Ajax, Canada	2018-06-05	Northern pulp must treat the effluent water they produce, prior to releasing it into the Northumbrrland Strait. They must take responsibility for the garbage they create.
	Nanaimo, Canada	2018-06-08	I can't figure out how to contact the individual who started this petition, but I have information about a new technology that is far superior and cleaner than what is being proposed in the Northumberland Strait. This information was forwarded to the mill in question, but no response as of yet. If the person who started this petition would like more information about what we proposed, they can contact me at natasha.juba@hotmail.com, and I can put you in touch with the people involved in the technology. Good luck, I hope that your concerns are listened to!
	Montréal, Canada	2018-06-08	I agree with the petition...
	Toronto, Canada	2018-06-13	The salmon and trout are already facing insurmountable problems. Perhaps this is the government's plan to finish them off? So much for campaign promises.

Name	Location	Date	Comment
	Stellarton, Canada	2018-06-14	Because our oceans should not be ruined for others greed and we should be taking better care of OUR oceans and planet
	Victoria, Canada	2018-06-14	Atlantic salmon represent a resource which took thousands if not millions of years to develop. The resource is in a critical state; on life support. Any industrial project which threatens in any way shape or form the future viability of Atlantic salmon is not economically viable, period.
	Atlanta, Georgia, US	2018-06-19	We must always protect our natural resources.
	Halifax, Canada	2018-06-21	My family has lived in New Glasgow, Pictou County for generations, enjoying all the coastal beaches had to offer. I attended as a child, and worked as a young adult at Big Cove, YMCA camp, where we ran canoe trips along the shoreline of the northumberland strait, following east towards Cape Breton, or west towards the ferry to PEI. I have known personally and come to enjoy the pristine coastal waters, a boon for local tourism, and seen bountiful marine life such as seals and porpoises, schools of young fish taking refuge from the tumultous atlantic waters. I studied Biology at Dalhousie University, and have good evidence to know the harm this would cause to the local economy, and ecology. We cannot allow such reckless disregard for health and human safety, as well as our collective natural resources. Sincerely,
	Vancouver, Canada	2018-06-22	I am a property owner on Pictou Island, NS. I grew up in New Glasgow. I come back every summer. I have seen the change in the quality of the water and our shoreline on the Northumberland Strait.This needs to stop before it is completely destroyed. The short term gain for NP and its few employees is not reason enough for the long term destruction of our strait and all that that encompasses.
	Antigonish, Canada	2018-06-22	Anything worth doing ..is worth doing RIGHT!!. Do the RIGHT THING!
	Canada	2018-06-22	We will contact you
	West Vancouver, Canada	2018-06-29	This decision will require courage, compassion and integrity from Nova Scotia's political leadership. While these traits often exist in candidates for public office, they seem to erode once elected. I hope, as many have recommended, that the politicians vote to protect the marine environment and they support industries that rely on pristine coastal waters to provide employment and promote tourism.
	Micmac, Canada	2018-07-02	#waterissacred, #waterislife, #nopipe
	Conway, Massachusetts, US	2018-07-04	Dumping effluent into pristine waters is a “Third World” thing. We’re better educated than that. We know better. Do the right thing, STOP such dumping. Spend the money on up-to-date waste water cleaning and recycle it.

Name	Location	Date	Comment
	Halifax, Canada	2018-07-05	It’s an ecological disaster and the local people are strongly against it. Don’t force it on them.
	Charlottetown, Canada	2018-07-06	Maritime activities accounted for 15.2% of Nova Scotia's GDP in 2015, and between 10-25% of the GDP of the other Maritime provinces. Deliberately harming the viability of the Maritime ecosystems in this way is grossly irresponsible. This project must be stopped.(Fisheries and Oceans Canada, Maritime Sectors Gross Domestic Product Contribution to Provincial and Territorial Economies 2015, <a href="http://www.dfo-mpo.gc.ca/stats/maritime/tab/mar-tab2-eng.htm" rel="nofollow">http://www.dfo-mpo.gc.ca/stats/maritime/tab/mar-tab2-eng.htm
	Dauphin, Canada	2018-07-06	It will destroy this fragile ecosystem
	bedford, Canada	2018-07-06	The future of the Northumberland Strait is being put at risk. This greedy pulp mill could have invested in alternative soultions to clean up their operation, but instead they reap profits year after year and continue to threaten the environment, mutiple industries and the health of those living in and around the maritimes. Shame on this pulp mill and anyone who supports the idea of dumping into the water.
	trenton, Canada	2018-07-06	so many reasons
	Oakville, Canada	2018-07-06	I'm signing because the ocean is an important part of our global ecosystem, and the wastewater dumped into it would be extremely harmful.
	Montreal, Canada	2018-07-07	Our livelihood is more important than the economy
	New Liskeard, Canada	2018-07-07	WTF, only the stupid could expect to do something as potentially destructive as this. Smarten up, change your system and recycle/reuse this water.
	Oshawa, Canada	2018-07-07	Fossil fuels are NOT the way of the future. Protect what we have, politicians won’t fight for the environment-the people must.
	NANAIMO, BC, Canada	2018-07-07	It is time.
	Regina, Saskatchewan, Canada	2018-07-07	We can no longer use our oceans and our skies as dumping grounds for our garbage and waste. Everything must be net zero.
	Ann Arbor, Michigan, US	2018-07-07	Oil is out, renewable is in.
	Summerside, Canada	2018-07-08	I work in the fishing industry. As does some of my family. I don't want our lively hoods to suffer, because of a corporation in another province. I also want to continue to enjoy local sea food without worrying about what it's doing to my and my family's health.
	Richmond, Canada	2018-07-08	I can’t even believe they would even consider this🙁

Name	Location	Date	Comment
	Hugo, Oklahoma, US	2018-07-08	Our oceans and waterways provide home to all kinds of life.
	Dartmouth, Canada	2018-07-08	Not the best idea. Hiding the $hit.
	Ottawa, Canada	2018-07-09	I care about nature, our oceans and the overall health of Earth
	Pictou, Canada	2018-07-09	I am signing because it is not acceptable to dump millions of litres of effluent into our fishing ground. The proposed pipe will come out right in front of our home. Unbelievable that the government would consider supporting this! No pipe!
	West Kelowna, Canada	2018-07-09	It's the right thing to do.
	Canada	2018-07-09	I believe this is wrong.
	Perth Andover, Canada	2018-07-09	no no and no :(do not put our water at risk :(
	Miscouche, Canada	2018-07-11	This does so much harm to our oceans it has to be stopped!
	Milton, Canada	2018-07-11	I want this to be available to many more generations
	Toronto, Canada	2018-07-20	Without clean water there is no life
	New glasgow, Canada	2018-07-20	I am signing because it is ludicrous to potentially destroy the local fishing industry for the sake of another industry's responsibility. We can live without pulp processing, but can't live without a vital food source.
	dartmouth, Canada	2018-07-20	Im doing this to have a better future for my kids.Would be good to leave something for our grand kids
	Westville, Canada	2018-07-21	We need to protect our natural assets
	Lansdowne, Canada	2018-07-21	No company has the right to imperil the environment!
	Brookfield, Canada	2018-07-23	We need to keep businesses honest & keep them open to the better way not the easier/cheaper way. We also need to unify the effort to live in harmony with nature.
	antigonish, Canada	2018-07-24	I'm worried about the impact on my job as a lobster and tuna fisherman
	Jamaica Plain, Canada	2018-07-24	Ruining the rest of what we have left of our strait would be horrible
	Dartmouth, Canada	2018-07-24	No Pipe

Name	Location	Date	Comment
	New Glasgow, Canada	2018-07-25	No pipe !!!!
	Dartmouth, Nova Scotia, Canada	2018-07-26	Just not a bright idea
	Barneys River Station, Canada	2018-07-28	Why would anyone think a petition or asking "Government" to help with created situation by big international corporations will bring remedy?Noam Chomsky stated that their own peoples are the biggest enemies of corporatized not civil authorities => Governance.Check your civil status how you being is perceived and treated as an asset/thing, CDM As long as you keep silent and don't want to understand the issue forget your fight, you are lost already be design...https://www.youtube.com/watch?v=-cT-E-zXLlI&feature=youtu.be
	Barneys River Station, Canada	2018-07-28	you should worry, the damages will be real and you be blamed on top of it.Carbon-tax is lurking, 'cause you are the problem. Most take the Tax and do not think further.., start thinking big about things you have not known.. petitions are not designed to work, petite=small
	Barneys River Station, Canada	2018-07-28	nice ideas but pls realize why a corporation exists, who developed this fiction and whyyou have to go back a few centuries--> google "Unam Sanctam" and what it realty meant, the desired outcome...still surprised?
	Barneys River Station, Canada	2018-07-28	but a corporation has, can and will, and your government being a corporation itself has applied wool over your eyes trying to keep away your waking up...just check who is issuing licences now, how "access NS" is being organized and who owns this fiction and who it can be sold to....think and ask questions
	Barneys River Station, Canada	2018-07-28	why would this Corporation be benefited with the Indemnity provision, backed up and payed by whom? btw "Government is doing things absolutely right being a Corporation itself and has to listen to its owners, no owner you are not but their asset, their thing/resource to be used up and not bestowed with rights,CDM = capitis dimintutio maxmia, learn about this to live
	Barneys River Station, Canada	2018-07-28	I know is hard to swallow but most citizen of this world have no clou why things are as the are and real problems not solvedPictou County has been plagued with this pulp mill (air, water pollution,low wood prizes, clear-cut, spraying herbicides etc), "Government" funds by the millions poured in over the last half century for no real progress, wake up and small this rotten scheme actually and as what it does to us...
	Barneys River Station, Canada	2018-07-28	good luck, if you concerned study what happened in 1974 with the Canada Bank Act and its outcome...The yet unborn of your growing kids are already loaded up.did you know about this http://www.comer.org/ ???
	Barneys River Station, Canada	2018-07-28	how? by not grasping the reality?

Name	Location	Date	Comment
	Barneys River Station, Canada	2018-07-28	correct, what do you propose?
	Barneys River Station, Canada	2018-07-28	expect more from foreign Corporation and a no civil fiction of "government"?Did school prepare you for what, who rules? think notwe all have rights but they don’t come down like dew in a hot summer nightwe don’t even have a fundamental framework for and by the peoples, what do we expect...
	Westville, Nova Scotia, Canada	2018-08-04	I’m signing because this is absolutely disgusting.
	Pictou, Canada	2018-08-14	the effluent would contain chlorines, dioxins, metals, among other toxic constituents and will contain 935kg of solid materials per day.
	Halifax, Canada	2018-08-14	As a commercial lobster fishermen in the Gulf, I know this pollution puts our entire lobster industry at risk. One contaminated lobster could sink our entire reputation and market abroad.
	st peters, Canada	2018-08-15	Because I care
	Pictou, Canada	2018-08-15	Imagine what that kind of financial boost to new small business could do for our economy! Instead of sending it over seas!
	Port Hope, Canada	2018-08-15	How can these companies live with themselves!!! The pollution in itself is horrible let alone everything being fished out!!!!!
	Truro, Canada	2018-08-17	Nova Scotia and PEI coastlines have been damaged enough over the years...let the fishing return..quit messing with the ecosystem
	Murray River PE, Canada	2018-08-17	Signing to help prevent a company that doesn't care about polluting the waters of Northumberland strait and harming incomes from fishermen, property values and tourism.
	US	2018-08-20	Enough is enough
	Indianapolis, Indiana, US	2018-08-20	Truly sickening...I am ashamed of man. "The greatness of a nation and its moral progress can be judged by the way its animals are treated."-Mahatma Ghandi "We should respect animals because it makes better human beings of us all.
	London, Canada	2018-08-28	I agree with the goal.
	Stratford, Canada	2018-08-28	We feel strongly that we must do whatever is necessary to protect the finite environment. David Ing
	Ottawa, Canada	2018-08-29	No Pipes...We're past that.
	Kensington, Canada	2018-08-29	I believe we must take better care of our planet.
	Port Moody, Canada	2018-08-29	We have to quit messing with the ecosystem!

Name	Location	Date	Comment
	St Ann, Canada	2018-08-29	I hope it's not too late !
	Wellington, Canada	2018-08-29	Because it’s time we tarted to care for this world and stop caring for our wallets
	SouthGranvile, Canada	2018-08-29	Protect our fisheries.
	Charlottetown, Canada	2018-08-29	I value our waters and marine life and beaches.
	London, England, UK	2018-08-29	Make all the culprits clean their own effluent
	Saint Catherines, Canada	2018-08-29	It is crucial that we protect our water, marine life and industry. This pollution should be criminal.
	Canada	2018-08-29	
	charlottetown, Prince Edward Island, Canada	2018-08-29	I care about my island and it's water quality! I enjoy swimming in this area, as well as thousands of others!
	Miramichi, Canada	2018-08-29	What they want to do is unacceptable.
	Montague, Canada	2018-08-29	This should not happen.
	red deer, Canada	2018-08-29	I care about the environment
	Charlottetown, Canada	2018-08-29	I'm signing because I'm neither insane nor stupid. You have to be one or the other to think this is a good idea.
	Stratford, Ontario, Canada	2018-08-29	I care a lot about the Northumberland Strait
	Crapaud, Canada	2018-08-29	I live right here....in a center of a Straight. I cannot allow this to happen....this will kill tourism and many businesses around!
	Charlottetown, Canada	2018-08-29	This is indeed a major risk to the environmental health of the Northumberland Strait.
	Canada	2018-08-30	Aquatic life and healthy waters in our region is important and deserves protection, to preserve this nature. And btw I enjoy responsible fishing.
	Stanhope, Canada	2018-08-30	In what world could this be a good idea?
	Canada	2018-08-30	I believe by standing together in unity via this petition and those like it; we can make a difference.
	Stratford, Canada	2018-08-30	No pulp in the Gulf!
	Belle River, Canada	2018-08-30	I live in Wood Islands and swim in the strait. Never let this happen to our strait and fish and beaches

Name	Location	Date	Comment
	Conquerall Bank, Canada	2018-08-31	It's important
	Port Colborne, Canada	2018-08-31	This is wrong! We're killing ourselves when we kill our planet!
	Charlottetown, Canada	2018-08-31	Our government needs to stop this and start protecting our environment.
	Miscouche, Canada	2018-08-31	I want the earth to be as healthy as possible
	Charlottetown, Canada	2018-08-31	Because it's 2018.
	Rice Point, Canada	2018-09-01	This is completely insane and stupid.
	Montague, Canada	2018-09-03	Reasons I don't want to see waste going into are waters are, is it killing sea life n beside that I swim in that water
	Trenton, Canada	2018-09-06	
	nova scotia, Canada	2018-09-23	I'm a fisherman and fishing is renewable
	Winnipeg, Canada	2018-10-02	Keep My Country (Canada) free from degradation .
	Munster, Indiana, US	2018-10-04	So many of our waters have already been ruined by mining, development, drilling, pollution, and other man-made harm.Enough is enough!Our waters are supposed to be a place of peace and quiet for us, and the fish and wildlife which live in them and/or rely on them!The animals are running out of places to live and be safe. Our fish and wildlife are under threat from so many angles. They desperately need to be protected, mainly from humans.Life is hard enough for people, let alone the animals.Can't we please offer them some much needed help?!PLEASE protect our waters for all future generations before they are permanently ruined. Some damage cannot be undone!
	Charilttrown, Canada	2018-10-09	
	Canada	2018-10-16	I am in support of saving our wildlife, fisheries and waterways. It's time that we starting being responsible for our actions and take care of what we have.
	pictou, Canada	2018-10-25	I worked there for ten years and even though the effluent in the bay of fundy is a really bad idea, you guys don't even know half off it.Good luck
	Trenton, Canada	2018-10-25	Pleas no pipe!
	London, Canada	2018-10-27	STOP THIS DISASTER NOW !!
	TERRE COTTA, Canada	2018-10-31	I have just recently reviewed the UN report on Climate Change and just tonight listened to the WWF report on declining animal /

Name	Location	Date	Comment
			marine species world wide. When will the humane race wake up and realize that proposals such as this effluent dumping into the Northumberland Strait is just another piece of the puzzle aimed at the destruction and death of our planet as we know it today. One day in the not too distant future we will wake up and say "What have we done?" When you hear this , it will be too late. Prepare your children and your grand children to live on a planet the likes of which we have never seen before!
	Montague, Canada	2018-11-04	My family’s cottage is in pictou county and many of my friends livelihood depends on the strait. No pipe in the strait.
	Davis, California, US	2018-11-04	Effing environmental criminals. Put them in jail.
	Creston BC, Canada	2018-11-06	Stop it now. Show moral integrity. Make human health and Earth's protection your greatest priority.
	Sinclair's island., Canada	2018-11-08	The idea of polluting the water is insane
	Winnipeg, Canada	2018-11-14	You cannot profit over the destruction of public resources, God-given resources and not take responsibility for the damage you do, the mess you make.
	Cloverdale, NS, Nova Scotia, Canada	2018-11-20	Stop the pollution of our waters and hopefully get rid of the company period!!!!
	Surrey, Canada	2018-11-21	Close it down no delays
	Kentville, Canada	2018-11-21	The Northumberland Strait supports fishing, shellfish and lobsters.
	Stroud, UK	2018-11-21	This is ecocide. Look up Mission Life Force to become an Earth Protector!
	Hammonds Plains, Canada	2018-11-21	I’m concerned about the environmental impact, as well as the impact to Tourism in NS, PEI and NB. There are popular beach areas in the strait and I know I don’t want my kids swimming in effluent .
	Halifax, Nova Scotia, Canada	2018-12-04	Boat Harbour was approved because of lies. It has been terrible for 50 years. It must be ended as promised.
	Halifax, Canada	2018-12-05	
	Paris, France	2018-12-07	We are many people out there that are not aware and concious of these things happening and some that don't even give a damn because of their conditions and education levels, this is a wonderful way to share the and educate people so we can save our planet of this catastrophe..
	Toronto, Ontario, Canada	2018-12-11	I have swam in these waters every summer of my life. This would have devastating effects on the environment, on fisheries, tourism and the way of life for those who live in the region. I get that is scary

Name	Location	Date	Comment
			to loose an industry like pulp and paper in the province but what is scarier is loosing biodiversity.
	Pictou, Canada	2018-12-11	I'm signing because I care about the future of our fishery, our strait, and our community. #nopipe
	Canada	2018-12-11	Fuck northern pulp
	Clark's Harbour, Canada	2018-12-12	Be stupid not to sign this
	London, Canada	2018-12-12	Im connected to mother earth....
	Ottawa, Canada	2018-12-12	I believe strongly in the fact that we muct move away from Fossil Fuels.
	Canmore, Canada	2018-12-13	This just makes no sense at all.
	Cow Bay, Canada	2018-12-17	They destroyed NB's natural forest, don't want to see ours go the same way. Glyphosate (Roundup) is a dangerous poison not only us but all living things it comes in contact with. Stop it now.
	Courtenay, Canada	2019-02-02	i am very concerned about the widlife and people. i do not live there now, but i lived near there for around 3 years. linda ferns, DVM
	Charlottetown, Prince Edward Island, Canada	2019-02-03	There is no life without clean water.
	New Glasgow, Canada	2019-02-03	
	Antigonish, Canada	2019-02-05	My family will be directly impacted by the pipe if it goes through #nopipe
	Canada	2019-02-05	I love our waters
	westville, Pictou county, Canada	2019-02-05	I'm signing not only because my family makes part of our living off of the Northumberland strait, but also because I notice the way northern pulp impacts the health of everyone in this county, the pulp mill needs to go, and this pipe will not only absolutely destroy our waters, but will also allow northern pulp to continue to pollute our environment and damage my health, along with everyone around me. #nopipe
	New Glasgow, Canada	2019-02-05	It's the right thing to do! Protect our waters!
	New Waterford, Canada	2019-02-06	Tired of all the pollution this mill has caused
	Pictou, Canada	2019-02-06	#nopipe
	Stellarton, Canada	2019-02-06	I am concerned for and about the health of the people and the environment in the area of which I live .Northern Pulp have already

Name	Location	Date	Comment
			had too many chances to correct their wrongs and have ignored all of it !!
	Bathurst, Canada	2019-02-06	I care !
	pictou, Canada	2019-02-08	
	Eastern passage, Canada	2019-02-11	I care about our future.. our childrens future... I care about the animals. We need to think ahead. Leave the oil in the ground
	Moncton, Canada	2019-02-11	
	Hawi, Hawaii, US	2019-02-11	Protecting our water and the ecosystems within those waters should be the most important thing. We are in a climate crisis and this will only speed that up, we are on the verge of extinction as we continue to desemate this earth and all those inhabiting it.
	Harrowsmith, Canada	2019-02-12	All water sources lead in some way to the ocean, which is in need of dire help due to our society. Let's stop adding to the problem and instead start coming up with solutions! :)
	Saint John, Canada	2019-02-12	I support the cause !
	Pomaria, South Carolina, US	2019-02-13	For the families
	Truro, Canada	2019-02-13	I believe we have done enough damage. It's really time to care for our planet.
	Pigeon, Michigan, US	2019-02-13	I support this cause..
	Lucasville, Nova Scotia, Canada	2019-02-17	This is all about money and jobs. I am against destroying our waters ways for the sake of saving a factory where CEO’s are earnings millions on the backs of our environment. The pulp mill shouldn’t be there in the first place
	Mount Herbert, Canada	2019-02-17	Save the Strait from further damage, remember that PEI pesticides have already poured a tremendous amount of poison into the Strait.
	Belfast, Canada	2019-02-18	the strait is critical
	Charlottetown, Canada	2019-02-18	Water and marine life are important.
	Montague, Canada	2019-02-18	I love the waters of Northumberland Strait and this makes no sense.

change.org

Recipient: Minister Environment of Nova Scotia, Minister McKenna, Jonathan Wilkinson

Letter:

Greetings,

Minister Miller, Minister Wilkinson and Minister McKenna,

Today we have dozens of rivers that dump into the Northumberland Strait not counting tributaries. The Strait is a main passage for our a lot of marine species including Waterfowl. It is a place for them to feed, rest and live. However all this is at major risk with the proposed 90 million litres of effluent to be pumped into the Strait a day. The effluent at the outflow of the pipe is going to come out at 25c in the Winter and 37c in the summer!! (The natural water temps of the Strait reaches 15C in the summer) These temps will absolutely change the diversity and make up of this sensitive and important marine ecosystem. This will increase the overall temperatures of the Strait over time due to the high volume of effluent being pumped a day.

The Effluent is going to be fresh water. The Strait is comprised of salt water and species that require a specific level of salinity. At a rate of 70-90 Million litres a day, the salinity of the Strait will change as the waste continues to accumulate over time. This will impact Wetlands, all species that use the Strait as well as the food sources within.

The makeup of the toxic chemicals that will be part of the effluent will also pose major threat to marine life. The communications officer for Northern Pulp has said a few times that the current infrastructure of the mill cannot handle the new proposed effluent makeup because it will be to corrosive to their internal setup and that pumping it into the Strait is the most economical option for the Mill. However, there are many scientific documents that show the risk and harm that will come from this.

Furthermore, the effluent would contain chlorines, dioxins, metals, among other toxic constituents and will contain 935kg of solid materials per day. All of these can bioaccumulate, having catastrophic effects on marine life. Laboratory studies using individual chlorinated organic compounds that are commonly discharged from bleached pulp mills have demonstrated effects such as deformities, as well as embryonic and larval mortalities in fish. These chronic effects will jeopardize the future of many fish species and damage the integrity of the ecosystem. It is documented that Dioxins contaminate fish and shellfish because fish act like sponges for Dioxins,

accumulating them at 25,000-50,000 times the concentrations present in their environment. It also is reported that fish species 250 miles away from the source have been impacted.

The other obvious threat to the Strait is the colour of the water will change. The effluent due to its makeup will change the colour at the water at the outflow of the pipe which is positioned a few kms offshore and directly into the Strait. At millions of litres a day, this will impact a very large area and ultimately change the natural state of the ecosystem.

The Strait already has several large dead zones due to nutrient overloading from many sources. It cannot handle any additional pressures. Boat Harbour, once a very healthy estuary and wetlands is an official environmental disaster due to the mills current waste process. The NS Government is mandating that it be stopped by 2020 and cleaned up. However, the option Northern Pulp came up with is to dump it into the Northumberland Strait! We need Federal involvement and a full Environmental Assessment completed to ensure that the proper scientific testing is done and risks highlighted.

These are only a few points of a concern from a very long list that this pipe will cause. Our wetlands and surrounding marine habitat are not the only things at risk here. Atlantic Salmon, Trout, Herring, Gasperaux, Smelt, Eels, Whales, Atlantic dolphins, Tuna, Mackerel, Striped Bass, etc etc etc all will be impacted by high water temps, toxic chemicals, changes in salinty and water clarity.

You can help by submitting feedback on the Environmnetal process by sending your concerns to ea@novascotia.ca

Signatures

Name	Location	Date
	Canada	2018-04-13
	Halifax, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Amherst, Canada	2018-04-13
	Moncton, Canada	2018-04-13
	Bridgewater, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Canada	2018-04-13
	Saint John, Canada	2018-04-13
	New glasgow, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Canada	2018-04-13
	Burlington, Canada	2018-04-13
	Trenton, Canada	2018-04-13
	Fort McMurray, Canada	2018-04-13
	porters lake, Canada	2018-04-13
	lunenburg, Canada	2018-04-13

Name	Location	Date
	Glace Bay, Canada	2018-04-13
	Stillwater NS, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Hebbville, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Chester Basin, Canada	2018-04-13
	Elmsdale, Canada	2018-04-13
	Antigonish, Canada	2018-04-13
	Bickerton West, Canada	2018-04-13
	Kentville, Canada	2018-04-13
	North Grant, Canada	2018-04-13
	Toronto, Canada	2018-04-13
	Sydney, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Lyons brook, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Amherst, Canada	2018-04-13
	Dartmouth, N.S., Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Madrid, Spain	2018-04-13
	Sherbrooke, Canada	2018-04-13

Name	Location	Date
	Aspen, Canada	2018-04-13
	Wittenbach, Switzerland	2018-04-13
	Charlottetown, Canada	2018-04-13
	Glace Bay, Canada	2018-04-13
	Fall River, Canada	2018-04-13
	Germany	2018-04-13
	Hamburg, Germany	2018-04-13
	Pubnico, Canada	2018-04-13
	Sherbrooke NS, Canada	2018-04-13
	Essen, Germany	2018-04-13
	Poortvliet, Nebraska, US	2018-04-13
	Terrebonne, California, US	2018-04-13
	Sydney, Canada	2018-04-13
	Westminster, Colorado, US	2018-04-13
	Berlin, Germany	2018-04-13
	Hoogezand, Netherlands	2018-04-13
	US	2018-04-13
	Sconser, Scotland, UK	2018-04-13
	Aschaffenburg, Germany	2018-04-13
	Kirkland, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Switzerland	2018-04-13

Name	Location	Date
	Grand-Métis, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Charlottetown, Canada	2018-04-13
	Mahone Bay, Canada	2018-04-13
	Antigonish, Canada	2018-04-13
	Truro, Canada	2018-04-13
	Muttenz, Switzerland	2018-04-13
	Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Toronto, Canada	2018-04-13
	Germany	2018-04-13
	Copenhagen, Denmark	2018-04-13
	New Glasgow, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Timberlea, Canada	2018-04-13
	Scotsburn, Canada	2018-04-13
	Kirchdorf an der Krems, Austria	2018-04-13
	Antigonish, Canada	2018-04-13
	Madrid, Spain	2018-04-13
	Summerside, Canada	2018-04-13
	Bedford Station, Canada	2018-04-13
	Sydney, Canada	2018-04-13

Name	Location	Date
	Dartmouth, Canada	2018-04-13
	Heerlen, Netherlands	2018-04-13
	Antigonish, Canada	2018-04-13
	Paris, France	2018-04-13
	Truro, Canada	2018-04-13
	Summerside, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Barcelona, Spain	2018-04-13
	Halifax, Canada	2018-04-13
	Lower Sackville, Canada	2018-04-13
	Stellarton, Canada	2018-04-13
	Wolfratshausen, Germany	2018-04-13
	Sylvester, Canada	2018-04-13
	Cardigan, Canada	2018-04-13
	Burlington, Canada	2018-04-13
	Las Vegas, Nevada, US	2018-04-13
	New Glasgow, Canada	2018-04-13
	Eskasoni, Canada	2018-04-13
	Eskasoni, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Sampsonville, Canada	2018-04-13
	Schoondijke, Netherlands	2018-04-13

Name	Location	Date
	Wellington, Canada	2018-04-13
	Eskasoni, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Vaison-la-Romaine, France	2018-04-13
	Victoria, Canada	2018-04-13
	Seaview, Pictou County, Canada	2018-04-13
	Truro, Canada	2018-04-13
	Ghent, Belgium	2018-04-13
	Bredestraat, Belgium	2018-04-13
	Truro, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Canso, Canada	2018-04-13
	North Sydney, Canada	2018-04-13
	Moncton, Canada	2018-04-13
	Charlottetown, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Stellarton, Canada	2018-04-13
	Eskasoni, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Eskasoni, Canada	2018-04-13

Name	Location	Date
	Bedford, Canada	2018-04-13
	Westville, Canada	2018-04-13
	Lanaken, Belgium	2018-04-13
	Germany	2018-04-13
	Halifax, Canada	2018-04-13
	Hawkinsville, Georgia, US	2018-04-13
	Westville, Canada	2018-04-13
	Murray River, Canada	2018-04-13
	Lower Sackville, Canada	2018-04-13
	Saint-Joseph-de-Kent, Canada	2018-04-13
	Oak Point, Canada	2018-04-13
	Hunter River, Canada	2018-04-13
	Church Point, Canada	2018-04-13
	Mayen, Germany	2018-04-13
	Toulouse, France	2018-04-13
	Halifax, Canada	2018-04-13
	Canada	2018-04-13
	Wabush, Canada	2018-04-13
	Brussels, Belgium	2018-04-13
	Hazelbrook, Canada	2018-04-13
	Q. Cove, Canada	2018-04-13
	alma, Canada	2018-04-13

Name	Location	Date
	East Preston, Canada	2018-04-13
	Stourbridge, England, UK	2018-04-13
	Dartmouth, Canada	2018-04-13
	Toronto, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Guntersdorf, Austria	2018-04-13
	Westville, Canada	2018-04-13
	Lower Sackville, Canada	2018-04-13
	Lawrencetown, Canada	2018-04-13
	Charlottetown, Canada	2018-04-13
	sydney, Canada	2018-04-13
	Prince Edward Island, Canada	2018-04-13
	Pictou, Canada	2018-04-13
	Nürnberg, Germany	2018-04-13
	Murray harbour, Canada	2018-04-13
	Antigonish, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Montague, Canada	2018-04-13
	Charlottetown, Canada	2018-04-13
	Wijk Bij Duurstede, Netherlands	2018-04-13

Name	Location	Date
	Westcock, Canada	2018-04-13
	Antigonish, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Sherbrooke, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Dartmouth, Canada	2018-04-13
	Bedford, Canada	2018-04-13
	Blind River, Canada	2018-04-13
	Montague, Canada	2018-04-13
	New Glasgow, Canada	2018-04-13
	Antigonish, Canada	2018-04-13
	Bedford, Canada	2018-04-13
	Cincinnati, Ohio, US	2018-04-13
	Charlottetown, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Charlottetown, Canada	2018-04-13
	Montague, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Truro, Canada	2018-04-13
	Murray Harbour, Canada	2018-04-13
	Browns Plains, Australia	2018-04-13
	Dartmouth, Canada	2018-04-13

Name	Location	Date
	Dartmouth, Canada	2018-04-13
	Berwick, Canada	2018-04-13
	canoas, Illinois, US	2018-04-13
	Oxford nova scotia, Canada	2018-04-13
	Halifax, Canada	2018-04-13
	Pictou County, Canada	2018-04-13
	Stittsville, Canada	2018-04-14
	North Sydney, Canada	2018-04-14
	Montague, Canada	2018-04-14
	Charlottetown, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	Sydney, Canada	2018-04-14
	Indian Harbour Lake, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Saint Peter's, Canada	2018-04-14
	Oxford, Canada	2018-04-14
	Summerside, Canada	2018-04-14
	stellarton, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	New Glasgow, Canada	2018-04-14
	Montague, Canada	2018-04-14

Name	Location	Date
	NEW GLASGOW, Canada	2018-04-14
	Charlottetown, Canada	2018-04-14
	Walled Lake, Michigan, US	2018-04-14
	Halifax, Canada	2018-04-14
	Stellarton, Canada	2018-04-14
	Eskasoni, Canada	2018-04-14
	Reno, Pennsylvania, US	2018-04-14
	River John, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Tatamagouche, Canada	2018-04-14
	Canada	2018-04-14
	St Albert, Canada	2018-04-14
	Tokyo, Japan	2018-04-14
	Sherbrooke, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Winnipeg, Canada	2018-04-14
	Burlington, Canada	2018-04-14
	halifax, Canada	2018-04-14
	Truro, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	Scotsburn, Canada	2018-04-14
	Silver Spring, Maryland, US	2018-04-14

Name	Location	Date
	Montague, Canada	2018-04-14
	Canada	2018-04-14
	villarotta- luzzara, Italy	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	New Glasgow, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Westville, Canada	2018-04-14
	Margaree Forks, Canada	2018-04-14
	Baddeck, Canada	2018-04-14
	Mount Stewart, Canada	2018-04-14
	Westville, Canada	2018-04-14
	Charlottetown, Canada	2018-04-14
	Antigonish, Canada	2018-04-14
	Stellarton, Canada	2018-04-14
	ABBOTSFORD, Canada	2018-04-14
	Portland, Oregon, US	2018-04-14
	Truro, Canada	2018-04-14
	Rr#1 Trenton NS, Canada	2018-04-14
	Hanover, Germany	2018-04-14
	trenton, Canada	2018-04-14

Name	Location	Date
	Montague, Canada	2018-04-14
	Cardigan, Canada	2018-04-14
	Greenwood, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	BrightsGrove, Canada	2018-04-14
	Höör, Oklahoma, US	2018-04-14
	Port Hawkesbury, Canada	2018-04-14
	Matawan, New Jersey, US	2018-04-14
	Katy, Texas, US	2018-04-14
	New Glasgow, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Canada	2018-04-14
	Porters Lake, Canada	2018-04-14
	port hawkesbury, Canada	2018-04-14
	Pierrelatte, France	2018-04-14
	Halifax, Canada	2018-04-14
	Japan	2018-04-14
	Leeuwarden, Netherlands	2018-04-14
	Hoogezand, Netherlands	2018-04-14
	Amherst, Canada	2018-04-14

Name	Location	Date
	Denare Beach, Canada	2018-04-14
	Amsterdam, Netherlands	2018-04-14
	Inverness, Canada	2018-04-14
	Leicester, England, UK	2018-04-14
	New Glasgow, Canada	2018-04-14
	Ottawa, Canada	2018-04-14
	Germany	2018-04-14
	Tacoma, Washington, US	2018-04-14
	Vancouver, Canada	2018-04-14
	Canada	2018-04-14
	hemford, Canada	2018-04-14
	Worcester, UK	2018-04-14
	Shobdon, England, UK	2018-04-14
	Wahlsburg, Germany	2018-04-14
	Paris, France	2018-04-14
	Hessle, England, UK	2018-04-14
	Berg, Austria	2018-04-14
	LYON, France	2018-04-14
	Dartmouth, Canada	2018-04-14
	Germany	2018-04-14
	Zdroisko, Poland	2018-04-14
	, Scotland, UK	2018-04-14

Name	Location	Date
	cluj, Romania	2018-04-14
	Kentville, Canada	2018-04-14
	Georgetown, Malaysia	2018-04-14
	Pictou, Canada	2018-04-14
	R'veer, Netherlands	2018-04-14
	Schöneberg, Germany	2018-04-14
	Dartmouth, Canada	2018-04-14
	Bremen, Germany	2018-04-14
	Balzan, Malta	2018-04-14
	Upice, US	2018-04-14
	Nelson, England, UK	2018-04-14
	Brookside, Canada	2018-04-14
	Ichtershausen, Germany	2018-04-14
	Bedford, Canada	2018-04-14
	Charlottetown, Canada	2018-04-14
	Mount Stewart, Canada	2018-04-14
	Erlensee, Germany	2018-04-14
	Bagnolet, France	2018-04-14
	Popovo, Bulgaria	2018-04-14
	56220, Germany	2018-04-14
	Saint John, Canada	2018-04-14
	Antigonish, Canada	2018-04-14

Name	Location	Date
	Düsseldorf, Germany	2018-04-14
	longes, Florida, US	2018-04-14
	Germany	2018-04-14
	Montréal, Canada	2018-04-14
	NS, Canada	2018-04-14
	san german puerto rico, New York, US	2018-04-14
	RR1 Merigomish, Canada	2018-04-14
	Kennebunkport, Maine, US	2018-04-14
	Fredericton, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	sabine.stiker@web.de, Germany	2018-04-14
	Vienna, Austria	2018-04-14
	Antigonish, Canada	2018-04-14
	Scotsburn, Canada	2018-04-14
	Guysborough, Canada	2018-04-14
	Ipswich, UK	2018-04-14
	Gent, Belgium	2018-04-14
	Mumbai, India	2018-04-14
	Germany	2018-04-14
	gignac, France	2018-04-14
	country harbour, Canada	2018-04-14
	Halifax, Canada	2018-04-14

Name	Location	Date
	Sydney, Australia	2018-04-14
	Dartmouth, NS, Canada	2018-04-14
	UK	2018-04-14
	Nova scotia, Canada	2018-04-14
	Ottawa, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Seafoam NS, Canada	2018-04-14
	Waverley, Canada	2018-04-14
	Canada	2018-04-14
	Merigomish, Canada	2018-04-14
	Amherst, Canada	2018-04-14
	Hantsport, Canada	2018-04-14
	Oxford, Canada	2018-04-14
	Hamoir, Belgium	2018-04-14
	Westville, Canada	2018-04-14
	Bytom, Poland	2018-04-14
	Tokyo, Japan	2018-04-14
	St. Peter's, Canada	2018-04-14
	Old Town, Maine, US	2018-04-14
	Kittery, Maine, US	2018-04-14
	Japan	2018-04-14
	Somerville, Massachusetts, US	2018-04-14

Name	Location	Date
	Merigomish, Canada	2018-04-14
	Nova Scotia, Canada	2018-04-14
	Eppenbrunn, Germany	2018-04-14
	Enfield, NS, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	Afton Station, Canada	2018-04-14
	Wolfville, Canada	2018-04-14
	Szatymaz, Hungary	2018-04-14
	Pictou, Canada	2018-04-14
	Ottawa, Canada	2018-04-14
	Oshawa, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Prince, Canada	2018-04-14
	Oulens-Echallens, Switzerland	2018-04-14
	Bellaire, Texas, US	2018-04-14
	Hasselt, Texas, US	2018-04-14
	Zülpich, Germany	2018-04-14
	Moncont, Canada	2018-04-14
	Frankfurt Am Main, Germany	2018-04-14
	Miami, Florida, US	2018-04-14
	Halifax, Canada	2018-04-14

Name	Location	Date
	Belfast, Canada	2018-04-14
	Houston, Texas, US	2018-04-14
	Montague, Canada	2018-04-14
	River John, Canada	2018-04-14
	Calgary, Canada	2018-04-14
	Digby, Canada	2018-04-14
	Charlottetown, Canada	2018-04-14
	Inverness, Canada	2018-04-14
	Amherst, Canada	2018-04-14
	St. Peter's, Canada	2018-04-14
	Sydney, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Brooklyn, New York, US	2018-04-14
	Pictou, Canada	2018-04-14
	大阪, Japan	2018-04-14
	Chester, Canada	2018-04-14
	Fort mcmurray, Canada	2018-04-14
	Devon, England, UK	2018-04-14
	Staffordsville, Kentucky, US	2018-04-14
	Merigomish, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Edmonton, Canada	2018-04-14

Name	Location	Date
	Pictou, Canada	2018-04-14
	Toronto, Canada	2018-04-14
	Japan	2018-04-14
	Montague, Canada	2018-04-14
	Fairview, Canada	2018-04-14
	Mississauga, Canada	2018-04-14
	Hilpoltstein, Germany	2018-04-14
	Afa, France	2018-04-14
	Calgary, Canada	2018-04-14
	UK	2018-04-14
	Bangkok, Thailand	2018-04-14
	Murray river p.e.i, Canada	2018-04-14
	Katy, Texas, US	2018-04-14
	UK	2018-04-14
	Guilford, Vermont, US	2018-04-14
	Calgary, Canada	2018-04-14
	Calgary, Canada	2018-04-14
	Montague, Canada	2018-04-14
	London, Canada	2018-04-14
	Sarnia, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Lower Sackville, Canada	2018-04-14

Name	Location	Date
	Canada	2018-04-14
	Calamba,Laguna, Philippines	2018-04-14
	Canada	2018-04-14
	Sannois, France	2018-04-14
	Port Hastings, Canada	2018-04-14
	Pictou, Canada	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	France	2018-04-14
	US	2018-04-14
	Canada	2018-04-14
	Wolfville, Canada	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	timberlea, Canada	2018-04-14
	Canada	2018-04-14
	Montague, Canada	2018-04-14
	Luskville, Canada	2018-04-14
	Munich, Germany	2018-04-14
	Rusagonis, Canada	2018-04-14
	Lyon, France	2018-04-14
	Calgary, Canada	2018-04-14

Name	Location	Date
	Puerto Lumbreras, Spain	2018-04-14
	Singapore, Singapore	2018-04-14
	merksem, Belgium	2018-04-14
	Lynn, Massachusetts, US	2018-04-14
	Katy, Texas, US	2018-04-14
	Moncton, Canada	2018-04-14
	Washington, Utah, US	2018-04-14
	Atwood, Illinois, US	2018-04-14
	Germany	2018-04-14
	port hawkesbury, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Westville, Canada	2018-04-14
	Kingston, Canada	2018-04-14
	Amsterdam, Netherlands	2018-04-14
	France	2018-04-14
	Des Moines, Iowa, US	2018-04-14
	Mermaid PEI, Canada	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14

Name	Location	Date
	Canada	2018-04-14
	Canada	2018-04-14
	Calgary, Canada	2018-04-14
	Hennebont, France	2018-04-14
	US	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	Vienna, Austria	2018-04-14
	San Antonio, Texas, US	2018-04-14
	livorno, Italy	2018-04-14
	Sidney, Ohio, US	2018-04-14
	Toronto, Canada	2018-04-14
	Belle River, Canada	2018-04-14
	Beaver bank, Canada	2018-04-14
	Pei, Canada	2018-04-14
	Saskatoon, Canada	2018-04-14
	Ljubljana, Slovenia	2018-04-14
	Powell River, Canada	2018-04-14
	torino, Italy	2018-04-14
	saint-aignan, France	2018-04-14
	Sherwood Park, Canada	2018-04-14
	Pictou, Canada	2018-04-14

Name	Location	Date
	Lake Cowichan, Canada	2018-04-14
	Spain	2018-04-14
	Riedbach, Germany	2018-04-14
	Toronto, Canada	2018-04-14
	Glace bay, Canada	2018-04-14
	Coventry, US	2018-04-14
	Canoe Cove PEI, Canada	2018-04-14
	Bridgetown, Canada	2018-04-14
	los angeles, California, US	2018-04-14
	istanbul, Turkey	2018-04-14
	Kirchbach, Austria	2018-04-14
	Borden, Canada	2018-04-14
	rekem, Belgium	2018-04-14
	Shasta Lake, California, US	2018-04-14
	Saint-nicolas-de-port, France	2018-04-14
	Abercraf, Wales; Cymru, UK	2018-04-14
	Cambridge, Canada	2018-04-14
	Murray Harbour, Canada	2018-04-14
	US	2018-04-14
	France	2018-04-14
	US	2018-04-14
	Scotsburn, Canada	2018-04-14

Name	Location	Date
	US	2018-04-14
	Debert, Canada	2018-04-14
	Birchwood, England, UK	2018-04-14
	Canada	2018-04-14
	Vienna, Austria	2018-04-14
	debert, Canada	2018-04-14
	France	2018-04-14
	Powell River, Canada	2018-04-14
	Eschweiler, Germany	2018-04-14
	Pictou, Canada	2018-04-14
	Espoo, Finland	2018-04-14
	ch-town, Canada	2018-04-14
	New glasgow, Canada	2018-04-14
	Oslo, Norway	2018-04-14
	Germany	2018-04-14
	Saint Anns, Canada	2018-04-14
	Moncton, Canada	2018-04-14
	Halifax, Canada	2018-04-14
	Merigomish, Canada	2018-04-14
	Vernon, Canada	2018-04-14
	Toronto, Canada	2018-04-14
	New Glasgow, Canada	2018-04-14

Name	Location	Date
	Halifax, Canada	2018-04-14
	Inverness, Canada	2018-04-14
	Gent, Belgium	2018-04-14
	IRELAND, Ireland	2018-04-14
	Halifax, Canada	2018-04-14
	Grevenbroich, Germany	2018-04-14
	paris, France	2018-04-14
	Nidderau, Germany	2018-04-14
	st-cruiz, Costa Rica	2018-04-14
	Saratoga, California, US	2018-04-14
	Moonstone, Canada	2018-04-14
	Derendingen, Switzerland	2018-04-14
	Florida, Florida, US	2018-04-14
	Berwick, Canada	2018-04-14
	Polten, Austria	2018-04-14
	Sankt Pölten, Austria	2018-04-14
	Hammonds Plains, Canada	2018-04-14
	Celebration, Florida, US	2018-04-14
	Halifax, Canada	2018-04-14
	Bogota, Colombia	2018-04-14
	Tatamagouche, Canada	2018-04-14
	Cardigan, Canada	2018-04-14

Name	Location	Date
	pictou, Canada	2018-04-14
	Houthalen, Belgium	2018-04-14
	Pictou, Canada	2018-04-14
	Austin, Texas, US	2018-04-14
	Sudbury, Canada	2018-04-14
	Digby, Canada	2018-04-14
	Puerto Vallarta, Mexico	2018-04-14
	Antigonish, Canada	2018-04-14
	S.O., New Jersey, US	2018-04-14
	Dartmouth, Canada	2018-04-14
	Cambridge, UK	2018-04-14
	US	2018-04-14
	UK	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	UK	2018-04-14
	Canada	2018-04-14
	UK	2018-04-14
	Canada	2018-04-14
	Canada	2018-04-14
	Nørrebro, Denmark	2018-04-14
	Bridgewater, Canada	2018-04-14

Name	Location	Date
	stephenville, Texas, US	2018-04-14
	Portsmouth, New Hampshire, US	2018-04-14
	5310 leuze, Belgium	2018-04-14
	Chilpancingo Guerrero, Mexico	2018-04-14
	Zagreb, Croatia	2018-04-14
	Sao Paulo, Brazil	2018-04-14
	Montague, Canada	2018-04-14
	Etobicoke, Canada	2018-04-14
	Sydney, Canada	2018-04-14
	Hagerhill, Kentucky, US	2018-04-14
	Charlottetown, Canada	2018-04-14
	Burns Lake, Canada	2018-04-14
	San Miguel, Argentina	2018-04-14
	Mönchengladbach, Germany	2018-04-14
	Fürth, Germany	2018-04-14
	Mount Uniacke, Canada	2018-04-14
	Dartmouth, Canada	2018-04-14
	Konstanz, Germany	2018-04-14
	Manchester, Åland Islands	2018-04-14
	Marple Bridge, England, UK	2018-04-14
	Calcutta, India	2018-04-14
	France	2018-04-14

Name	Location	Date
	New Glasgow, Canada	2018-04-15
	Welland, Canada	2018-04-15
	New Glasgow, Canada	2018-04-15
	Fulshear, Texas, US	2018-04-15
	Charlottetown, Canada	2018-04-15
	Eskasoni, Canada	2018-04-15
	Oakville, Canada	2018-04-15
	Toronto, Canada	2018-04-15
	Steinbach, Canada	2018-04-15
	Toronto, Canada	2018-04-15
	Sydney, Canada	2018-04-15
	Eldon, Canada	2018-04-15
	Madoc, Canada	2018-04-15
	New Glasgow, Canada	2018-04-15
	Dartmouth, Canada	2018-04-15
	bridgetown , w.a, Australia	2018-04-15
	Dartmouth, Canada	2018-04-15
	Linden, California, US	2018-04-15
	Bangkok, Thailand	2018-04-15
	Gifu, Japan	2018-04-15
	Hamilton, Canada	2018-04-15
	Tolar, Texas, US	2018-04-15

Name	Location	Date
	Koné, New Caledonia	2018-04-15
	Ottawa, Canada	2018-04-15
	Pownal, Canada	2018-04-15
	Fort McMurray, Canada	2018-04-15
	Willowbrook, Illinois, US	2018-04-15
	Port Coquitlam, Canada	2018-04-15
	Canada	2018-04-15
	Katy, Texas, US	2018-04-15
	US	2018-04-15
	Toowoomba, Australia	2018-04-15
	Buenos Aires, Argentina	2018-04-15
	France	2018-04-15
	UK	2018-04-15
	Hindås, Sweden	2018-04-15
	Geneve, Switzerland	2018-04-15
	Powell River, Canada	2018-04-15
	Málaga, Spain	2018-04-15
	hong kong, Hong Kong	2018-04-15
	Halifax, Canada	2018-04-15
	Spain	2018-04-15
	Plaisir, France	2018-04-15
	Danbury, England, UK	2018-04-15

Name	Location	Date
	Montague, Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Finland	2018-04-15
	Winterport, Maine, US	2018-04-15
	Lanaken, Belgium	2018-04-15
	Pictou, NS, Canada	2018-04-15
	Pont de Chéruy, France	2018-04-15
	Marly-la-Ville, France	2018-04-15
	Dartmouth, Canada	2018-04-15
	Hannover, Germany	2018-04-15
	Roma, US	2018-04-15
	Санкт-Петербург, Russia	2018-04-15
	West Branch, Canada	2018-04-15
	Scituate, Massachusetts, US	2018-04-15
	Antigonish,N.S., Canada	2018-04-15
	Australia	2018-04-15
	Berlin, Delaware, US	2018-04-15
	Mount Stewart, Canada	2018-04-15
	North Sydney, Canada	2018-04-15
	MELUN, France	2018-04-15

Name	Location	Date
	Scotsburn, Canada	2018-04-15
	Eberbach / seltz, France	2018-04-15
	Oakville, Canada	2018-04-15
	Toronto, Canada	2018-04-15
	Vernon, Canada	2018-04-15
	Pictou, Canada	2018-04-15
	Hebburn, England, UK	2018-04-15
	Groesbeek, Netherlands	2018-04-15
	Port Hawkesbury, Canada	2018-04-15
	Dartmouth, Canada	2018-04-15
	Kippens, Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
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	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15

Name	Location	Date
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	New Glasgow, Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Setagaya-ku, Japan	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15

Name	Location	Date
	Chester, Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
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	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Bromley, UK	2018-04-15
	UK	2018-04-15

Name	Location	Date
	UK	2018-04-15
	Canada	2018-04-15
	Margaree forks, Canada	2018-04-15
	Dartmouth, Canada	2018-04-15
	Inverness, Canada	2018-04-15
	Sherbrooke, Canada	2018-04-15
	antigonish, Canada	2018-04-15
	Charlottetown, Canada	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	London, UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	Centreville, Canada	2018-04-15
	UK	2018-04-15

Name	Location	Date
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Aalborg, Denmark	2018-04-15
	Sacramento, California, US	2018-04-15
	Belton, Texas, US	2018-04-15
	Dunkirk, Maryland, US	2018-04-15
	Georgetown, Canada	2018-04-15
	Shubenacadie, Canada	2018-04-15
	Victoria, Canada	2018-04-15
	Mechelen, Belgium	2018-04-15
	Pictou county, Canada	2018-04-15
	Full, Switzerland	2018-04-15
	Pictou, Canada	2018-04-15
	Roma, Italy	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15

Name	Location	Date
	UK	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	US	2018-04-15
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	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	UK	2018-04-15

Name	Location	Date
	UK	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	MEUDON LA FORET, France	2018-04-15
	Rolle, Switzerland	2018-04-15
	signes, France	2018-04-15
	Lausanne, Switzerland	2018-04-15
	25436, Delaware, US	2018-04-15
	Montague PEI, Canada	2018-04-15
	bordeaux, France	2018-04-15
	Fort McMurray, Canada	2018-04-15
	Jambes, Belgium	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	Saskatoon, Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15

Name	Location	Date
	UK	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	Canada	2018-04-15
	Canada	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	US	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	UK	2018-04-15
	jambes, Belgium	2018-04-15
	UK	2018-04-15
	Esch, Texas, US	2018-04-15
	TOURCOING, France	2018-04-15
	cabestany, Florida, US	2018-04-15
	Singapore, Singapore	2018-04-15
	Halifax, Canada	2018-04-15

Name	Location	Date
	Nancy, France	2018-04-15
	France	2018-04-15
	Lower Sackville, Canada	2018-04-15
	Pictou, Canada	2018-04-15
	Spain	2018-04-15
	st pete, Florida, US	2018-04-15
	Collombey, Switzerland	2018-04-15
	Montague, Canada	2018-04-15
	Johnstons River, Canada	2018-04-15
	Moncton, Canada	2018-04-15
	Charlottetown, Canada	2018-04-16
	Montague, Canada	2018-04-16
	Toronto, Canada	2018-04-16
	Villiers-en-Désoeuvre, France	2018-04-16
	Toronto, Canada	2018-04-16
	New Glasgow, Nova Scotia, Canada	2018-04-16
	Charlottetown, Canada	2018-04-16
	Myrtle Beach, South Carolina, US	2018-04-16
	US	2018-04-16
	UK	2018-04-16
	US	2018-04-16
	Canada	2018-04-16

Name	Location	Date
	US	2018-04-16
	Canada	2018-04-16
	Canada	2018-04-16
	US	2018-04-16
	Edmonton, Alberta, Canada	2018-04-16
	Trenton, Canada	2018-04-16
	Pahrump, Nevada, US	2018-04-16
	Adelaide, Australia	2018-04-16
	Dartmouth, Canada	2018-04-16
	Cologne, Germany, Germany	2018-04-16
	Germany	2018-04-16
	Kosice, Slovakia	2018-04-16
	Australia, Alabama, US	2018-04-16
	bridgetown, Canada	2018-04-16
	Germany	2018-04-16
	Sakado-shi, Japan	2018-04-16
	555 22, Australia	2018-04-16
	Takatsuki, Japan	2018-04-16
	Milan, Italy	2018-04-16
	神奈川県, Japan	2018-04-16
	Sackville, Canada	2018-04-16
	Moncton, Canada	2018-04-16

Name	Location	Date
	Japan	2018-04-16
	Wellington, Florida, US	2018-04-16
	dartmouth, Canada	2018-04-16
	South Bend, Indiana, US	2018-04-16
	Napanee, Canada	2018-04-16
	Villeurbanne, France	2018-04-16
	Truro, Canada	2018-04-16
	TORRES, UK	2018-04-16
	Okotoks, Canada	2018-04-16
	Miramichi, Canada	2018-04-16
	rr1 trenton, Canada	2018-04-16
	Stellarton, Canada	2018-04-16
	Halifax, Canada	2018-04-16
	Dartmouth, Canada	2018-04-16
	Sp, Brazil	2018-04-16
	Sherbrooke, Canada	2018-04-16
	Canada	2018-04-16
	Charlottetown, Canada	2018-04-16
	bruxelles, Belgium	2018-04-16
	Tokyo, Japan	2018-04-16
	Dartmouth, Canada	2018-04-16
	Sackville, Canada	2018-04-16

Name	Location	Date
	Vancouver, Canada	2018-04-16
	aulac, Canada	2018-04-16
	Schneeberg, Germany	2018-04-16
	Lower Sackville, Canada	2018-04-16
	bruxelles, Belgium	2018-04-16
	Brussels, Belgium	2018-04-16
	Peterborough, Canada	2018-04-16
	Zaragoza, Spain	2018-04-16
	Berwick, Canada	2018-04-16
	Sugarcamp, Canada	2018-04-16
	Sackville, Canada	2018-04-16
	Burnt church new brunswick, Canada	2018-04-16
	Pictou, Canada	2018-04-16
	Montréal, Canada	2018-04-16
	Westville, Canada	2018-04-16
	Upper cape, Canada	2018-04-16
	São Paulo, Brazil	2018-04-16
	Moncton, Canada	2018-04-16
	Halifax, Canada	2018-04-16
	Saint Peters, Canada	2018-04-16
	Hamilton, Canada	2018-04-16
	Nova scotia, Canada	2018-04-16

Name	Location	Date
	Canada	2018-04-16
	ESTEIO, Puerto Rico, US	2018-04-16
	Rio Grande, Brazil	2018-04-16
	Porto Alegre, RS, República Federativa do Brasil, Brazil	2018-04-16
	Paris, France	2018-04-16
	Paris, France	2018-04-16
	Sackville NB., Canada	2018-04-16
	Port Hawkesbury, Canada	2018-04-16
	Dartmouth, Canada	2018-04-16
	Cambridge, Canada	2018-04-16
	Pictou, Canada	2018-04-16
	New Glasgow, Canada	2018-04-16
	Nova Scotia, Canada	2018-04-16
	Lower Sackville, Canada	2018-04-16
	Porto Alegre, Brazil	2018-04-16
	Purchase, New York, US	2018-04-16
	Germany	2018-04-16
	Cape Town, South Africa	2018-04-16
	Edinburgh, Scotland, UK	2018-04-16
	Charlottetown, Canada	2018-04-16
	Gardena, California, US	2018-04-16

Name	Location	Date
	New Glasgow, Canada	2018-04-16
	Fredericton, Canada	2018-04-16
	Rotterdam, Netherlands	2018-04-16
	Hampton, New Hampshire, US	2018-04-16
	Dartmouth, Canada	2018-04-16
	US	2018-04-16
	Canada	2018-04-16
	Canada	2018-04-16
	Canada	2018-04-16
	UK	2018-04-16
	Canada	2018-04-16
	UK	2018-04-16
	UK	2018-04-16
	US	2018-04-16
	US	2018-04-16
	Canada	2018-04-16
	US	2018-04-16
	Pictou, Canada	2018-04-16
	Ridderkerk, Netherlands	2018-04-16
	Charlottetown, Canada	2018-04-16
	Cardiff By The Sea, California, US	2018-04-16
chanel mitton	Amherst, Canada	2018-04-16

Name	Location	Date
	Scotsburn, Canada	2018-04-16
	Elgin, Canada	2018-04-16
	Amesbury, Massachusetts, US	2018-04-16
	Springhill, Canada	2018-04-16
	Dieppe, Canada	2018-04-16
	Pictou, Canada	2018-04-16
	ARACAJU SE, Brazil	2018-04-16
	Porto, Portugal	2018-04-16
	Norfolk, Virginia, US	2018-04-16
	New Glasgow, Canada	2018-04-17
	福岡県, Japan	2018-04-17
	Rio De Janeiro, Brazil	2018-04-17
	Elmsdale, Canada	2018-04-17
	Los Angeles, California, US	2018-04-17
	Sydney, Canada	2018-04-17
	Stretford, England, UK	2018-04-17
	Bowen Island, Canada	2018-04-17
	New Waterford, Canada	2018-04-17
	Americana, Brazil	2018-04-17
	Edinburgh, Scotland, UK	2018-04-17
	Moncton, Canada	2018-04-17
	Oakland, California, US	2018-04-17

Name	Location	Date
	antigonish, Canada	2018-04-17
	Amparo, Brazil	2018-04-17
	Westville, Canada	2018-04-17
	Dartmouth, Canada	2018-04-17
	Dartmouth, Canada	2018-04-17
	san sebastian, Spain	2018-04-17
	Paris, France	2018-04-17
	Essex Junction, Vermont, US	2018-04-17
	Espoo Finland, Finland	2018-04-17
	liège, Belgium	2018-04-17
	Rochester, Michigan, US	2018-04-17
	Kissimmee, Florida, US	2018-04-17
	Asso, Italy	2018-04-17
	Port Hawkesbury, Canada	2018-04-17
	Brooklyn, New York, US	2018-04-17
	Inverness Nova Scotia, Canada	2018-04-17
	Conception Bay South, Canada	2018-04-17
	Chester, Canada	2018-04-17
	Inverness, Canada	2018-04-17
	Sao Paulo, Brazil	2018-04-17
	Navas Del Rey, Spain	2018-04-17
	Little Narrows, Canada	2018-04-17

Name	Location	Date
	london, Canada	2018-04-17
	Dartmouth, Canada	2018-04-17
	Dartmouth, Canada	2018-04-17
	Chéticamp, Canada	2018-04-17
	Spain	2018-04-17
	Vancouver, Canada	2018-04-17
	New Glasgow, Canada	2018-04-17
	Southwest Margaree, Canada	2018-04-17
	Fairfield, Iowa, US	2018-04-17
	Rigolet, Canada	2018-04-18
	Canada	2018-04-18
	Italy	2018-04-18
	Orangedale, Canada	2018-04-18
	Halifax, Canada	2018-04-18
	Whycocomagh, Canada	2018-04-18
	Cheticamp, Canada	2018-04-18
	Naples, Florida, US	2018-04-18
	Dartmouth, Canada	2018-04-18
	Dartmouth, Canada	2018-04-18
	Dartmouth, Canada	2018-04-18
	Dartmouth, Canada	2018-04-18

Name	Location	Date
	Margaree Harbour, Nova Scotia, New York, US	2018-04-18
	Tokyo, Japan	2018-04-18
	Hobart, Australia	2018-04-18
	Fontenay-aux-roses, France	2018-04-18
	Ketch Harbour, Canada	2018-04-18
	Charlottetown, Canada	2018-04-18
	Pictou.N.S, Canada	2018-04-18
	Salt Springs, NS, Canada	2018-04-18
	Whycocomagh, Canada	2018-04-18
	Whycocomagh, Canada	2018-04-18
	Margaree, Canada	2018-04-18
	Halifax , NS, Canada	2018-04-18
	Saint Vincent, France	2018-04-18
	Colombes, France	2018-04-18
	Halifax, Canada	2018-04-18
	Grand Etang, NS, Canada	2018-04-18
	Margaree, Canada	2018-04-18
	Mount Pisgah, Canada	2018-04-18
	Antigonish, Canada	2018-04-18
	Toronto, Canada	2018-04-18
	Wellington, Canada	2018-04-18

Name	Location	Date
	Halifax, Canada	2018-04-18
	East Margaree, Canada	2018-04-18
	Stratford P.E.I., Canada	2018-04-18
	Riverview, Canada	2018-04-18
	Hampton, Canada	2018-04-18
	Mabou, Canada	2018-04-18
	Mabou, Canada	2018-04-18
	Montague pei, Canada	2018-04-18
	Halifax, Canada	2018-04-18
	Halifax, Canada	2018-04-18
	Charlottetown, Canada	2018-04-18
	Mount Stewart, Canada	2018-04-18
	Baddeck, Canada	2018-04-18
	Sao Paulo, Brazil	2018-04-18
	Dartmouth, Canada	2018-04-18
	Halifax, Canada	2018-04-18
	Tatamagouche, Canada	2018-04-18
	Inverness, Canada	2018-04-18
	Pictou, Canada	2018-04-18
	Inverness, Canada	2018-04-18
	Antigonish, Canada	2018-04-18
	Woburn, Massachusetts, US	2018-04-19

Name	Location	Date
	Amherst NS, Canada	2018-04-19
	Canada	2018-04-19
	edmonton, Canada	2018-04-19
	Pictou, Canada	2018-04-19
	Vernon Bridge, Canada	2018-04-19
	South Winsloe, Canada	2018-04-19
	Charlottetown, PE, Canada	2018-04-19
	New Glasgow, Canada	2018-04-19
	Antiginish, Canada	2018-04-19
	Reading, Massachusetts, US	2018-04-19
	Ottawa, Canada	2018-04-19
	New Glasgow, Canada	2018-04-19
	New Glasgow, Canada	2018-04-19
	Tatamagouche, Canada	2018-04-19
	Germany	2018-04-19
	vero beach, Florida, US	2018-04-19
	Plant City, Florida, US	2018-04-19
	Three Fathom Harbour, Canada	2018-04-19
	Halifax, Canada	2018-04-19
	Donkin, Canada	2018-04-19
	Sackville, Canada	2018-04-19
	Charlottetown, Canada	2018-04-19

Name	Location	Date
	New Glasgow, Canada	2018-04-19
	Don Mills, Canada	2018-04-19
	Wallace, Canada	2018-04-19
	Moncton, Canada	2018-04-19
	Mabou, Canada	2018-04-19
	Herring Cove, Canada	2018-04-19
	Upper Tantallon, Canada	2018-04-19
	Yarmouth, Canada	2018-04-19
	Halifax, Canada	2018-04-19
	Inverness, Canada	2018-04-19
	US	2018-04-19
	US	2018-04-19
	Canada	2018-04-19
	London, England, UK	2018-04-19
	Canada	2018-04-19
	US	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	UK	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19

Name	Location	Date
	Canada	2018-04-19
	UK	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	US	2018-04-19
	Canada	2018-04-19
	US	2018-04-19
	Canada	2018-04-19
	US	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	Canada	2018-04-19
	US	2018-04-19
	LaHave, Canada	2018-04-20
	Seabright, Canada	2018-04-20
	Edmonton, Canada	2018-04-20
	Edmonton, Canada	2018-04-20
	Limerick, Ireland	2018-04-20
	Ireland	2018-04-20
	Dublin, Ireland	2018-04-20
	Wulften Am Harz, Germany	2018-04-20

Name	Location	Date
	Avondale, Arizona, US	2018-04-20
	Cheticamp, Canada	2018-04-20
	Mississauga, Canada	2018-04-20
	Port Hood, Canada	2018-04-20
	FONTENAY-TRESIGNY, France	2018-04-20
	Canada	2018-04-20
	Canada	2018-04-20
	West Babylon, New York, US	2018-04-20
	US	2018-04-20
	UK	2018-04-20
	US	2018-04-20
	UK	2018-04-20
	Canada	2018-04-20
	UK	2018-04-20
	US	2018-04-20
	UK	2018-04-20
	Epinay sur Orge, France	2018-04-20
	Vannes, France	2018-04-20
	Victoria, Canada	2018-04-20
	Woods Harbour, Canada	2018-04-20
	Antigonish ,Nova Scotia, Canada	2018-04-21
	Dingwall, Canada	2018-04-21

Name	Location	Date
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	UK	2018-04-21
	US	2018-04-21
	UK	2018-04-21
	Canada	2018-04-21
	Canada	2018-04-21
	Canada	2018-04-21
	Truro, Canada	2018-04-21
	Marietta, Ohio, US	2018-04-21
	Weßling, Germany	2018-04-21
	Antwerpen, Belgium	2018-04-21

Name	Location	Date
	Hastings, Australia	2018-04-21
	San Diego, California, US	2018-04-22
	Geldrop, Netherlands	2018-04-22
	Gloucester, England, UK	2018-04-22
	Charlottetown, Canada	2018-04-22
	Baddeck, Canada	2018-04-22
	Germany	2018-04-23
	Schomberg, Canada	2018-04-23
	Halifax, Canada	2018-04-23
	Wolfville, Canada	2018-04-23
	Antigonish, Canada	2018-04-23
	Antigonish, Canada	2018-04-23
	West Dover, Canada	2018-04-23
	Canada	2018-04-23
	Dartmouth, Canada	2018-04-23
	Halifax, Canada	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	US	2018-04-23
	UK	2018-04-23
	Dartmouth, Canada	2018-04-23

Name	Location	Date
	UK	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	US	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	US	2018-04-23
	Gaspereaux Lake, Canada	2018-04-23
	Canada	2018-04-23
	US	2018-04-23
	Canada	2018-04-23
	US	2018-04-23
	US	2018-04-23
	Canada	2018-04-23
	UK	2018-04-23
	US	2018-04-23
	Canada	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	UK	2018-04-23
	Canning, Canada	2018-04-23
	Pictou, Canada	2018-04-23

Name	Location	Date
	Halifax, Canada	2018-04-23
	halifax, Canada	2018-04-23
	Halifax, Canada	2018-04-24
	Halifax, Canada	2018-04-24
	Halifax, Canada	2018-04-24
	Katy, Texas, US	2018-04-24
	Halifax, Canada	2018-04-24
	Halifax, Canada	2018-04-24
	Halifax, Canada	2018-04-24
	Truro, Canada	2018-04-24
	Halifax, Canada	2018-04-25
	Montreal, Canada	2018-04-25
	Antigonish, Canada	2018-04-25
	Miramichi NB, Canada	2018-04-25
	Canada	2018-04-25
	US	2018-04-25
	Antigonish, Canada	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	Fowlerville, Michigan, US	2018-04-25
	Canada	2018-04-25

Name	Location	Date
	US	2018-04-25
	Salt Lake City, Utah, US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	Antigonish, Canada	2018-04-25
	Antigonish, Canada	2018-04-25
	Fowlerville, Michigan, US	2018-04-25
	F, Canada	2018-04-25
	Canada	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	US	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	US	2018-04-25

Name	Location	Date
	UK	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	US	2018-04-25
	Canada	2018-04-25
	US	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	Canada	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	US	2018-04-25

Name	Location	Date
	UK	2018-04-25
	US	2018-04-25
	Canada	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	UK	2018-04-25
	Canada	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	Canada	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	Canada	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	Roanoke, Virginia, US	2018-04-25
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25

Name	Location	Date
	UK	2018-04-25
	US	2018-04-25
	UK	2018-04-25
	Toronto, Canada	2018-04-25
	Antigonish, Canada	2018-04-25
	Halifax, Canada	2018-04-26
	Newburyport, Massachusetts, US	2018-04-26
	madrid, Spain	2018-04-26
	Mill Village, Canada	2018-04-26
	Dartmouth, Canada	2018-04-26
	Dartmouth, Canada	2018-04-26
	Canada	2018-04-26
	Canada	2018-04-26
	Canada	2018-04-26
	Liberia, Canada	2018-04-26
	Canada	2018-04-26
	Canada	2018-04-26
	New Glasgow, Canada	2018-04-26
	Riverview, Canada	2018-04-26
	Fredericton, Canada	2018-04-26
	Ann Arbor, Michigan, US	2018-04-26
	Pictou, Canada	2018-04-26

Name	Location	Date
	Canada	2018-04-26
	Canada	2018-04-26
	Halifax, Canada	2018-04-26
	SAntigonish, N.S., Canada	2018-04-26
	Pictou, Canada	2018-04-26
	Louisdale, Canada	2018-04-26
	Canada	2018-04-26
	Berwick, Canada	2018-04-26
	Whitton, Middx, England, UK	2018-04-26
	pictou, Canada	2018-04-26
	Canada	2018-04-26
	Dartmouth, Canada	2018-04-26
	Canada	2018-04-26
	Canada	2018-04-27
	Antigonish, Canada	2018-04-27
	Westville, Canada	2018-04-27
	pictou nova scotia, Canada	2018-04-27
	Cambridge, Canada	2018-04-27
	Canada	2018-04-27
	Canada	2018-04-27
	Canada	2018-04-27
	Canada	2018-04-27

Name	Location	Date
	Kings Head, Canada	2018-04-27
	Merigomish, Canada	2018-04-27
	Warsaw, Poland	2018-04-27
	Pictou, Canada	2018-04-27
	Halifax, Canada	2018-04-27
	Fall River, Canada	2018-04-27
	Canada	2018-04-27
	Truro, Canada	2018-04-27
	trenton, Canada	2018-04-27
	Pictou, Canada	2018-04-27
	Canada	2018-04-27
	Windsor, Canada	2018-04-27
	Trenton, Canada	2018-04-27
	Russia	2018-04-27
	Pictou, Canada	2018-04-27
	Leduc, Canada	2018-04-27
	Toronto, Canada	2018-04-27
	Canada	2018-04-27
	New Glasgow, Canada	2018-04-27
	Canada	2018-04-27
	Baku, Azerbaijan	2018-04-27
	Saint John, Canada	2018-04-27

Name	Location	Date
	Saint John, Canada	2018-04-27
	New Glasgow, Canada	2018-04-27
	Antigonish, Canada	2018-04-27
	Miramichi, Canada	2018-04-27
	Sackville, Canada	2018-04-27
	Russia	2018-04-27
	Frenchfort, pe, Canada	2018-04-27
	Saint John, Canada	2018-04-27
	Pictou County, Canada	2018-04-27
	New Glasgow, Canada	2018-04-27
	Syracuse, New York, US	2018-04-27
	Saint Louis, NB, Canada	2018-04-27
	Stewiacke, Canada	2018-04-27
	Halifax, Nova Scotia, Canada	2018-04-28
	Canada	2018-04-28
	Canada	2018-04-28
	Antigonish, Canada	2018-04-28
	Toronto, Canada	2018-04-28
	Truro, Canada	2018-04-28
	Canada	2018-04-28
	Truro, Canada	2018-04-28
	Chaplin Island Road, Canada	2018-04-28

Name	Location	Date
	Port Hawkesbury, Canada	2018-04-28
	Stellarton, Canada	2018-04-28
	Scotsburn, Canada	2018-04-28
	Rutland, Vermont, US	2018-04-28
	St.peters ns., Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Halifax, California, US	2018-04-28
	Halifax, Canada	2018-04-28
	Canada	2018-04-28
	Pictou Co, Canada	2018-04-28
	Hunter River, Canada	2018-04-28
	Mount Uniacke, Canada	2018-04-28
	Summerside, Canada	2018-04-28
	Riverside, California, US	2018-04-28
	Toronto, Canada	2018-04-28
	Truro, Canada	2018-04-28
	Charlottetown, Canada	2018-04-28
	Mount Stewart, Canada	2018-04-28
	Charlottetown, Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Toronto, Canada	2018-04-28

Name	Location	Date
	Baddeck, Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Beechville, Canada	2018-04-28
	Antigonish, Canada	2018-04-28
	Stratford, Canada	2018-04-28
	Canada	2018-04-28
	Macedonia (FYROM)	2018-04-28
	MacDougall Settlement, Canada	2018-04-28
	Denver, Colorado, US	2018-04-28
	Halifax, Canada	2018-04-28
	Truro, Canada	2018-04-28
	US	2018-04-28
	Abymes, Guadeloupe	2018-04-28
	Delta, Canada	2018-04-28
	Summerside, Canada	2018-04-28
	Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Mulgrave, Canada	2018-04-28
	Charlottetown, Canada	2018-04-28
	Kingston, Canada	2018-04-28
	Antigonish, Canada	2018-04-28
	Pictou, Canada	2018-04-28

Name	Location	Date
	Nappan, Canada	2018-04-28
	Murray River, Canada	2018-04-28
	Sussex, Wisconsin, US	2018-04-28
	truro, Canada	2018-04-28
	Abbotsford, Canada	2018-04-28
	Halifax, Canada	2018-04-28
	Almonte, Canada	2018-04-28
	Bass River, Canada	2018-04-28
	Falmouth, Canada	2018-04-29
	Cape Breton, Canada	2018-04-29
	Truro, Canada	2018-04-29
	Dartmouth, Canada	2018-04-29
	Hopewell n.s., Canada	2018-04-29
	Canada	2018-04-29
	Medicine Hat, Canada	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	US	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	US	2018-04-29
	Truro, Canada	2018-04-29

Name	Location	Date
	Country HBR, Canada	2018-04-29
	Canada	2018-04-29
	Thame, England, UK	2018-04-29
	Oman	2018-04-29
	Nova Scotia, Canada	2018-04-29
	Canada	2018-04-29
	Sydney, Canada	2018-04-29
	Montague, Canada	2018-04-29
	Trenton. Ns, Canada	2018-04-29
	Salt Springs, Canada	2018-04-29
	Guysborough, Canada	2018-04-29
	Dartmouth, Canada	2018-04-29
	Antigonish, Canada	2018-04-29
	Canada	2018-04-29
	Gilmour, Canada	2018-04-29
	Sydney, Canada	2018-04-29
	Guysborough, Canada	2018-04-29
	N Falls, Canada	2018-04-29
	Boularderie East, Canada	2018-04-29
	Canada	2018-04-29
	Dartmouth, Canada	2018-04-29
	Merigomish, Canada	2018-04-29

Name	Location	Date
	Halifax, Canada	2018-04-29
	New glasgow, Canada	2018-04-29
	Halifax, Canada	2018-04-29
	Conception Bay South, Canada	2018-04-29
	Hillcrest, Canada	2018-04-29
	Scotsburn, Canada	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	UK	2018-04-29
	US	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	Canada	2018-04-29
	UK	2018-04-29
	UK	2018-04-29
	US	2018-04-29
	US	2018-04-29
	India	2018-04-29
	Sydney, NS, Canada	2018-04-29
	Bedford, Canada	2018-04-29
	Rose Bay, Canada	2018-04-29

Name	Location	Date
	Truro, Canada	2018-04-29
	Trenton, Canada	2018-04-29
	Halton Hills, Canada	2018-04-29
	Minnedosa, Canada	2018-04-29
	Long Creek, Canada	2018-04-29
	Summerside, Canada	2018-04-29
	Canada	2018-04-29
	Boutilier's Point, Canada	2018-04-29
	Flat River, Canada	2018-04-29
	Canada	2018-04-29
	US	2018-04-29
	US	2018-04-29
	US	2018-04-29
	UK	2018-04-29
	Summerside, Canada	2018-04-29
	US	2018-04-29
	UK	2018-04-29
	Pictou, Canada	2018-04-29
	Pictou, Canada	2018-04-29
	Pictou, Canada	2018-04-30
	pictou, Canada	2018-04-30
	Rice Point, Canada	2018-04-30

Name	Location	Date
	Canada	2018-04-30
	Bridgetown NS, Canada	2018-04-30
	Pictou, Canada	2018-04-30
	Halifax, Canada	2018-04-30
	Pictou, Canada	2018-04-30
	Halifax, Canada	2018-04-30
	Canada	2018-04-30
	Pictou, Canada	2018-04-30
	Pictou, Canada	2018-04-30
	Pictou, Canada	2018-04-30
	Durham, Canada	2018-04-30
	Trenton Nova Scotia, Canada	2018-04-30
	Canada	2018-04-30
	Canada	2018-04-30
	Westville, Canada	2018-04-30
	Halifax, NS, Canada	2018-04-30
	Calgary, Canada	2018-04-30
	Evanston, Canada	2018-04-30
	Canada	2018-04-30
	US	2018-04-30
	Scotch Hill, Canada	2018-04-30
	Kenzieville, Canada	2018-04-30

Name	Location	Date
	Montréal, Canada	2018-04-30
	Roanoke, Virginia, US	2018-04-30
	London, UK	2018-04-30
	Fortrose, Scotland, UK	2018-04-30
	Edinburgh, UK	2018-04-30
	Hove, England, UK	2018-04-30
	Dartmouth, Canada	2018-04-30
	Halifax, Canada	2018-04-30
	Dartmouth, Canada	2018-04-30
	Zoetermeer, Netherlands	2018-04-30
	Canada	2018-04-30
	Antigonish, Canada	2018-04-30
	Amesbury, England, UK	2018-04-30
	St. John's, Canada	2018-04-30
	Yarmouth, Canada	2018-04-30
	Halifax, Canada	2018-04-30
	Canada	2018-04-30
	US	2018-04-30
	Canada	2018-04-30
	US	2018-04-30
	UK	2018-04-30
	UK	2018-04-30

Name	Location	Date
	Wakefield, Massachusetts, US	2018-04-30
	US	2018-04-30
	US	2018-04-30
	Canada	2018-04-30
	Canada	2018-04-30
	Canada	2018-04-30
	UK	2018-04-30
	UK	2018-04-30
	Canada	2018-04-30
	Canada	2018-04-30
	UK	2018-04-30
	antioch, California, US	2018-04-30
	Fortrose, Scotland, UK	2018-04-30
	Canada	2018-04-30
	US	2018-04-30
	pictou, Canada	2018-05-01
	Pictou, Canada	2018-05-01
	Westville, Canada	2018-05-01
	Scotsburn, Canada	2018-05-01
	Frasers Mills, Canada	2018-05-01
	Westville, Canada	2018-05-01
	Pictou, Canada	2018-05-01

Name	Location	Date
	Westville, Canada	2018-05-01
	New Glasgow, Canada	2018-05-01
	New Glasgow, Canada	2018-05-01
	Whycocomagh, Canada	2018-05-01
	Canada	2018-05-01
	Truro, Canada	2018-05-01
	Pictou, Canada	2018-05-01
	Stellarton, Canada	2018-05-01
	Neptune, New Jersey, US	2018-05-01
	US	2018-05-01
	US	2018-05-01
	US	2018-05-01
	Scotsburn, Canada	2018-05-01
	US	2018-05-01
	Canada	2018-05-01
	Horsham, England, UK	2018-05-01
	Koh Samui, Thailand	2018-05-01
	Halifax, Canada	2018-05-01
	Caribou Island, Canada	2018-05-01
	Westville, Canada	2018-05-01
	Halifax, Canada	2018-05-01
	Canada	2018-05-01

Name	Location	Date
	Canada	2018-05-01
	Canada	2018-05-01
	Australia	2018-05-01
	Canada	2018-05-01
	pictou, Canada	2018-05-01
	US	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	BRISTOL, England, UK	2018-05-01
	Hove, England, UK	2018-05-01
	Mount Helena, Australia	2018-05-01
	Pictou County, Canada	2018-05-01
	Murray River, Canada	2018-05-01
	joggins, Canada	2018-05-01
	Amherst, Canada	2018-05-01
	Halifax, Canada	2018-05-01
	Browns MIlls, New Jersey, US	2018-05-01
	Dartmouth, Canada	2018-05-01
	Mexico, Mexico	2018-05-01
	moncton, Canada	2018-05-01
	Malagash, Canada	2018-05-01
	US	2018-05-01

Name	Location	Date
	UK	2018-05-01
	Inverness, Canada	2018-05-01
	Pugwash NS, Canada	2018-05-01
	US	2018-05-01
	halifax, Canada	2018-05-01
	Millgrove, Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	US	2018-05-01
	Canada	2018-05-01
	Dartmouth, Canada	2018-05-01
	UK	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01
	Canada	2018-05-01

Name	Location	Date
	UK	2018-05-01
	Canada	2018-05-01
	Kanata, Ontario, Canada	2018-05-01
	Bridgewater, Canada	2018-05-01
	Berwick, Canada	2018-05-01
	US	2018-05-01
	Ottawa, Canada	2018-05-01
	Amherst, Canada	2018-05-01
	Fortrose, Scotland, UK	2018-05-01
	Aylesford, Canada	2018-05-01
	Canada	2018-05-01
	Berwick, Canada	2018-05-01
	Lower Sackville, Canada	2018-05-01
	New Glasgow, Canada	2018-05-01
	Berwick, Canada	2018-05-01
	Amherst, Canada	2018-05-01
	Canada	2018-05-01
	UK	2018-05-01
	Canada	2018-05-01
	collingwood, Canada	2018-05-01
	Trenton, Canada	2018-05-01
	US	2018-05-01

Name	Location	Date
	UK	2018-05-01
	Halifax, Canada	2018-05-01
	Edmonton , Alberta, Canada	2018-05-01
	Chilliwack, Canada	2018-05-01
	Sherwood Park, Canada	2018-05-01
	Kitchener, Canada	2018-05-01
	Shelburne, Canada	2018-05-01
	shelburne, Canada	2018-05-01
	Halifax, N.S., California, US	2018-05-01
	Canada	2018-05-01
	Thorburn, Canada	2018-05-01
	Canada	2018-05-01
	Los Angeles, California, US	2018-05-01
	US	2018-05-01
	Chipman Brook, Canada	2018-05-01
	Winnipeg, Canada	2018-05-01
	US	2018-05-01
	US	2018-05-01
	Canada	2018-05-01
	US	2018-05-01
	US	2018-05-01
	US	2018-05-01

Name	Location	Date
	Halifax, Canada	2018-05-01
	Tatamagouche, Canada	2018-05-01
	Halifax, Canada	2018-05-01
	Halifax, Canada	2018-05-01
	Malagash, Canada	2018-05-01
	Jolicure, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Pictou, Canada	2018-05-02
	victoria, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Canada	2018-05-02
	Lockeport, Canada	2018-05-02
	US	2018-05-02
	Spruce Grove, Canada	2018-05-02
	Hong Kong, Hong Kong	2018-05-02
	saltspring island, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Canada	2018-05-02
	Truro, Canada	2018-05-02
	Sri Lanka	2018-05-02
	UK	2018-05-02
	Truro, Canada	2018-05-02
	Scotburn, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Lawrencetown, Canada	2018-05-02
	toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Burlington, Canada	2018-05-02
	MONTREAL, Canada	2018-05-02
	vancouver, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	Halifax, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Toronto, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	Peterborough, Canada	2018-05-02
	Sudbury, Canada	2018-05-02
	Scarborough, Canada	2018-05-02
	Quispamsis, Canada	2018-05-02
	Kingston, Canada	2018-05-02
	arnprior, Canada	2018-05-02
	Fergus, Canada	2018-05-02
	US	2018-05-02
	Montreal, Canada	2018-05-02
	Wallenstein, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Bowmanville, Canada	2018-05-02
	St Marys, Canada	2018-05-02
	Almonte, Canada	2018-05-02
	Toronto, Canada	2018-05-02

Name	Location	Date
	Toronto, Canada	2018-05-02
	Québec, Canada	2018-05-02
	wakefield, Canada	2018-05-02
	Hillsburgh, Canada	2018-05-02
	Freelton, Canada	2018-05-02
	Nepean, Canada	2018-05-02
	Gatineau, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Mississauga, Canada	2018-05-02
	Tofield, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Etobicoke, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Mississauga, Canada	2018-05-02
	Baden, Canada	2018-05-02
	Belle River, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	South Woodslee, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Corner brook, Canada	2018-05-02

Name	Location	Date
	Edmonton, Canada	2018-05-02
	Brampton, Canada	2018-05-02
	Port Elgin, Canada	2018-05-02
	Norris Point, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Barrie, Canada	2018-05-02
	Port Colborne, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Thunder Bay, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Burlington, Canada	2018-05-02
	RR3 Pictou, Canada	2018-05-02
	St Catharines, Canada	2018-05-02
	Hammonds Plains, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Essex, Canada	2018-05-02
	Guelph, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Chester, Canada	2018-05-02
	Stratford, Canada	2018-05-02

Name	Location	Date
	Tweed, Canada	2018-05-02
	Woodbridge, Canada	2018-05-02
	US	2018-05-02
	Barrie, Canada	2018-05-02
	Mill Bay, Canada	2018-05-02
	US	2018-05-02
	Kingston, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Sutton, Canada	2018-05-02
	Saint-Lambert, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Port Williams, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Sudbury, Canada	2018-05-02
	Wellington, Canada	2018-05-02
	Howick, Canada	2018-05-02
	Fonthill, Canada	2018-05-02
	US	2018-05-02
	Schomberg, Canada	2018-05-02
	To, Canada	2018-05-02

Name	Location	Date
	Portage la Prairie, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Canada	2018-05-02
	Abbotsford, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Durham, UK	2018-05-02
	Montreal, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Regina, Canada	2018-05-02
	UK	2018-05-02
	Canada	2018-05-02
	Merville, Canada	2018-05-02
	Bradford, Canada	2018-05-02
	Canada	2018-05-02
	Wakefield, Canada	2018-05-02
	Fredericton, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Rimbey, Canada	2018-05-02
	Guelph, Canada	2018-05-02
	Montréal, Canada	2018-05-02

Name	Location	Date
	Belle River, Canada	2018-05-02
	Quinte West, Canada	2018-05-02
	Surrey, Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	N-D-du-Mont-Carmel, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Windsor, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	montreal, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Cookstown, Canada	2018-05-02
	Kincardine, Canada	2018-05-02
	Shanty Bay, Canada	2018-05-02
	US	2018-05-02
	Innisfil, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02

Name	Location	Date
	Mattawa, Canada	2018-05-02
	US	2018-05-02
	Cranbrook, Canada	2018-05-02
	Whitby, Canada	2018-05-02
	Orton, Canada	2018-05-02
	Brampton, Canada	2018-05-02
	US	2018-05-02
	Port Carling, Canada	2018-05-02
	Tatamagouche, Nova Scotia, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	UK	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Guelph, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	innisfil, on, Canada	2018-05-02
	Oak Bay NB, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	McGill University, Montreal, Canada	2018-05-02

Name	Location	Date
	Oakville, Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Wood Islands, PE, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Oro Station, Canada	2018-05-02
	vaughan, Canada	2018-05-02
	Whitby, Canada	2018-05-02
	Lethbridge, Canada	2018-05-02
	UK	2018-05-02
	Prevost, Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	peterborough, Canada	2018-05-02
	Gatineau, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	UK	2018-05-02
	Canada	2018-05-02

Name	Location	Date
	Canada	2018-05-02
	Saint Andrews, Canada	2018-05-02
	Mount Forest, Canada	2018-05-02
	West Kelowna, Canada	2018-05-02
	Mississauga, Canada	2018-05-02
	Thornhill, ON, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Plum coulee, Canada	2018-05-02
	London, Canada	2018-05-02
	Gatineau, Canada	2018-05-02
	Burlington, Canada	2018-05-02
	Saint Catharines, Canada	2018-05-02
	Canada	2018-05-02
	D'Escousse, Canada	2018-05-02
	Saskatoon, Canada	2018-05-02
	Bromont, Canada	2018-05-02
	Regina, Canada	2018-05-02
	Napanee, Canada	2018-05-02
	Tobermory, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Vancouver, Canada	2018-05-02
	Newmarket, Canada	2018-05-02
	Regina, Canada	2018-05-02
	Lasqueti Island, Canada	2018-05-02
	Unionville, ON, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Dover, New Hampshire, US	2018-05-02
	London, Canada	2018-05-02
	Québec City, Canada	2018-05-02
	Caledon, Canada	2018-05-02
	Brazil	2018-05-02
	South Slocan, B. C., Canada	2018-05-02
	Burnaby, Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Winnipeg, Canada	2018-05-02
	UK	2018-05-02
	Toronto, Canada	2018-05-02
	Etobicole, Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02

Name	Location	Date
	Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Canada	2018-05-02
	Waterloo, Canada	2018-05-02
	US	2018-05-02
	New Hamburg, Canada	2018-05-02
	Canada	2018-05-02
	windsor, Canada	2018-05-02
	North York, ON, Canada	2018-05-02
	Canada	2018-05-02
	Walkerton, Canada	2018-05-02

Name	Location	Date
	Burlington, Canada	2018-05-02
	RR3 Salt Springs, NS, Canada	2018-05-02
	US	2018-05-02
	Hamilton, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Oakville, Canada	2018-05-02
	Bloomfield, Canada	2018-05-02
	Maple Ridge, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Chilliwack, Canada	2018-05-02
	peterborough on, Canada	2018-05-02
	Québec, Canada	2018-05-02
	Pickering, Canada	2018-05-02
	Mission, Canada	2018-05-02
	Gibsons, Canada	2018-05-02
	Kitchener, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Cobourg, Canada	2018-05-02
	Grande Prairie, Canada	2018-05-02

Name	Location	Date
	UK	2018-05-02
	Oliver, Canada	2018-05-02
	Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Canada	2018-05-02
	Minesing, Canada	2018-05-02
	Kitchener, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Canada	2018-05-02
	Cochrane, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	UK	2018-05-02
	Canada	2018-05-02
	Conestogo, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Chatham-Kent, Canada	2018-05-02
	Antigonish, Canada	2018-05-02
	Windsor, Canada	2018-05-02
	Ottawa, Canada	2018-05-02

Name	Location	Date
	York, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Bonnington, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	US	2018-05-02
	Stratford, Canada	2018-05-02
	Wiarton, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	US	2018-05-02
	Cumberland, Canada	2018-05-02
	London. Ont., Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	Winnipeg, Canada	2018-05-02
	London, Canada	2018-05-02
	Little Current, Canada	2018-05-02

Name	Location	Date
	Halifax, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Waterloo, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Sudbury, Canada	2018-05-02
	North Vancouver, Canada	2018-05-02
	Montreal, Quebec, Canada	2018-05-02
	Pictou, Canada	2018-05-02
	Chelsea, Canada	2018-05-02
	Newmarket, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Fort Saskatchewan, Canada	2018-05-02
	US	2018-05-02
	Mill Bay, Canada	2018-05-02
	Woodstock, Canada	2018-05-02
	Cambridge, Canada	2018-05-02
	Kelowna, Canada	2018-05-02
	Barrie, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Toronto, Canada	2018-05-02

Name	Location	Date
	Stratford, Canada	2018-05-02
	Outremont, Canada	2018-05-02
	bradford, Canada	2018-05-02
	Thunder Bay, Canada	2018-05-02
	burlington, Canada	2018-05-02
	Newmarket, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Gander, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Prince George, Canada	2018-05-02
	Canada	2018-05-02
	Burlington, Canada	2018-05-02
	Kaslo, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Comox, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Puvwash, Canada	2018-05-02
	Kings Co, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Cap-Chat, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Lincoln, Canada	2018-05-02
	Sudbury, Canada	2018-05-02
	Guelph, Canada	2018-05-02
	Canada	2018-05-02
	Lamont, Canada	2018-05-02
	Pickering, Canada	2018-05-02
	Penticton, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	montreal, Canada	2018-05-02
	North Vancouver, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Hagensborg, Canada	2018-05-02
	gatineau, Canada	2018-05-02
	Osoyoos, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Powell River, Canada	2018-05-02

Name	Location	Date
	Toronto, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Grand Bay-Westfield, Canada	2018-05-02
	Sunnyvale, Canada	2018-05-02
	Deep River, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Sherbrooke, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Whitehorse, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Lake Country, Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	Markham, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Mississauga, Canada	2018-05-02
	Kelowna, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Burlington, Canada	2018-05-02

Name	Location	Date
	US	2018-05-02
	US	2018-05-02
	North Vancouver, Canada	2018-05-02
	Halton Hills, Canada	2018-05-02
	Richmond Hill, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Orillia, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Lanark, Canada	2018-05-02
	Woodbridge, Canada	2018-05-02
	Fernie, Canada	2018-05-02
	Lindsay, Canada	2018-05-02
	US	2018-05-02
	Saint-Constant, Canada	2018-05-02
	Windsor, Canada	2018-05-02
	Assiniboia, Canada	2018-05-02
	north vancouver, Canada	2018-05-02
	Whaletown, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Parksville, Canada	2018-05-02
	Toronto, Canada	2018-05-02

Name	Location	Date
	Niagara-on-the-Lake, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	surrey, Canada	2018-05-02
	Antigonish, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Brampton, Canada	2018-05-02
	North Vancouver, Canada	2018-05-02
	Oshawa, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Edmonton, Canada	2018-05-02
	Wolfville, Canada	2018-05-02
	Richmond, Canada	2018-05-02
	Burnaby, Canada	2018-05-02
	Ottawa, Canada	2018-05-02

Name	Location	Date
	Fergus, Canada	2018-05-02
	Langley, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Nobleton, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Stratford, Canada	2018-05-02
	Windsor, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	blind bay, Canada	2018-05-02
	Kamloops, Canada	2018-05-02
	Arreton, England, UK	2018-05-02
	US	2018-05-02
	Belleville, Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Mississauga, Canada	2018-05-02
	Calgary, Canada	2018-05-02

Name	Location	Date
	Canada	2018-05-02
	Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	US	2018-05-02
	montreal, Canada	2018-05-02
	Kelowna, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Westville, Canada	2018-05-02
	Coldstream, Canada	2018-05-02
	Mill bay, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Fossambault, Canada	2018-05-02
	St. Hubert QC, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Edmonton, Canada	2018-05-02

Name	Location	Date
	Sooke, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Kawartha Lakes, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Waterloo, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Kingston, Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Welland, Canada	2018-05-02
	La Porte, Texas, US	2018-05-02
	US	2018-05-02
	Good Corner, Canada	2018-05-02
	Qualicum Beach, BC, Canada	2018-05-02
	Thessalon, Canada	2018-05-02
	Saltspring Island, Canada	2018-05-02
	Kitchener, Canada	2018-05-02
	Newmarket, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	New Maryland, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Hope, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Ontario, Canada	2018-05-02
	US	2018-05-02
	Regina, Canada	2018-05-02
	Plymouth, UK	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	Vancouver, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Abbotsford, Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Guelph, Canada	2018-05-02

Name	Location	Date
	Victoria, Canada	2018-05-02
	Redruth, England, UK	2018-05-02
	Lillooet, Canada	2018-05-02
	Moose Jaw, Canada	2018-05-02
	Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Burnaby, Canada	2018-05-02
	Canada	2018-05-02
	UK	2018-05-02
	Edmonton, Canada	2018-05-02
	Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Ammon, NB, Canada	2018-05-02
	Caledon, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	Calgary, Canada	2018-05-02
	Delta, Canada	2018-05-02

Name	Location	Date
	Whitehorse, Canada	2018-05-02
	Port Coquitlam, Canada	2018-05-02
	Vernon, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Nepean, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	West Kelowna, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Saskatoon, Canada	2018-05-02
	Lions Bay, Canada	2018-05-02
	Barrie, Canada	2018-05-02
	US	2018-05-02
	Grand Forks, Canada	2018-05-02
	Port Renfrew, Canada	2018-05-02
	Richmond, Canada	2018-05-02
	Sydney, Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Calgary, Canada	2018-05-02

Name	Location	Date
	Garson, Canada	2018-05-02
	London, Canada	2018-05-02
	Waterloo, Canada	2018-05-02
	Coquitlam, Canada	2018-05-02
	Nanaimo District, Canada	2018-05-02
	Verdun, Canada	2018-05-02
	victoria, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Canada	2018-05-02
	Red Deer County, Canada	2018-05-02
	Whitby, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Regina, Canada	2018-05-02
	Cochrane, Canada	2018-05-02
	Waterloo, Canada	2018-05-02
	Kitchener, Canada	2018-05-02
	Calgary, Canada	2018-05-02
	Surrey, Canada	2018-05-02
	US	2018-05-02
	Surrey, Canada	2018-05-02
	Halifax, Canada	2018-05-02
	Richmond, Canada	2018-05-02

Name	Location	Date
	Welland, Canada	2018-05-02
	moose Jaw, Sask, Canada	2018-05-02
	Elliot Lake, Canada	2018-05-02
	Westlock, Canada	2018-05-02
	Chilliwack, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Pickering, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Charlottetown, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	UK	2018-05-02
	Toronto, Canada	2018-05-02
	Saskatoon, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Renfrew, Canada	2018-05-02
	US	2018-05-02
	Vancouver, Canada	2018-05-02
	US	2018-05-02
	Calgary, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Vancouver, Canada	2018-05-02

Name	Location	Date
	London, Canada	2018-05-02
	TORONTO, Canada	2018-05-02
	Roberts Creek, Canada	2018-05-02
	Brentwood Bay, Canada	2018-05-02
	US	2018-05-02
	Plymouth, England, UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	Nakusp, Canada	2018-05-02

Name	Location	Date
	US	2018-05-02
	UK	2018-05-02
	Canada	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	Banff, Canada	2018-05-02
	Markham, Canada	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	parksville, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Courtenay, Canada	2018-05-02
	Surrey, Canada	2018-05-02
	Summerland BC, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Penticton, Canada	2018-05-02
	Burnaby, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Richmond Hill, Canada	2018-05-02
	US	2018-05-02
	Winnipeg, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Nanaimo, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Glen Haven, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	New Tecumseth, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Chilliwack, Canada	2018-05-02
	Surrey, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Duncan, Canada	2018-05-02
	Vernon, Canada	2018-05-02
	Duncan, BC, Canada	2018-05-02
	Coquitlam, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Vernon, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Surrey, Canada	2018-05-02
	Gatineau, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Bowen Island, Canada	2018-05-02
	Saanichton, Canada	2018-05-02
	Coquitlam, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Orangeville, Canada	2018-05-02
	Cache Creek, Canada	2018-05-02
	Howell, New Jersey, US	2018-05-02
	Laval, Canada	2018-05-02

Name	Location	Date
	Hubbards, Canada	2018-05-02
	Cambridge, Canada	2018-05-02
	Whitby, Canada	2018-05-02
	Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	victoria, Canada	2018-05-02
	Regina, Canada	2018-05-02
	North Vancouver, Canada	2018-05-02
	Prince George, Canada	2018-05-02
	North Saanich, Canada	2018-05-02
	UK	2018-05-02
	Shelburne Ontario, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	White Rock, Canada	2018-05-02
	US	2018-05-02
	Victoria, Canada	2018-05-02
	US	2018-05-02
	Maple Ridge, Canada	2018-05-02

Name	Location	Date
	Toronto, Canada	2018-05-02
	Westmount, Canada	2018-05-02
	US	2018-05-02
	US	2018-05-02
	Morinville, Canada	2018-05-02
	Canada	2018-05-02
	Black Creek, Canada	2018-05-02
	Beeton, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Laval, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Léry, Canada	2018-05-02
	Banff, Canada	2018-05-02
	Berwick, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Desboro, Canada	2018-05-02
	Delta, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Eastend, Canada	2018-05-02
	Gimli, Canada	2018-05-02

Name	Location	Date
	Acton, Canada	2018-05-02
	Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Bowser, Canada	2018-05-02
	US	2018-05-02
	Thunder Bay, Canada	2018-05-02
	Vaughan, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	Kingsville, Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	Grimsby, Canada	2018-05-02
	Selkirk, Canada	2018-05-02
	US	2018-05-02
	Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	UK	2018-05-02

Name	Location	Date
	UK	2018-05-02
	Phoenix, Arizona, US	2018-05-02
	UK	2018-05-02
	Toronto, Canada	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	Port McNeill, Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	UK	2018-05-02
	UK	2018-05-02
	Canada	2018-05-02
	Abbotsford, Canada	2018-05-02
	Gilford, Ont., Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Brampton, Canada	2018-05-02
	US	2018-05-02
	Penticton, Canada	2018-05-02
	Whistler, Canada	2018-05-02
	Québec, Canada	2018-05-02
	Denman Island, Canada	2018-05-02
	Aurora, Canada	2018-05-02

Name	Location	Date
	Northumberland County, Canada	2018-05-02
	Arnstein, Canada	2018-05-02
	Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Prévost, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Canada	2018-05-02
	Delta, Canada	2018-05-02
	Niagara Falls, Canada	2018-05-02
	New Glasgow, Canada	2018-05-02
	Uxbridge, Canada	2018-05-02
	Caerphilly, Wales; Cymru, UK	2018-05-02
	Calgary, Canada	2018-05-02
	Beaverton, Oregon, US	2018-05-02
	Nobleton, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Cumbernauld, Scotland, UK	2018-05-02
	medford, Oregon, US	2018-05-02
	New Westminster, Canada	2018-05-02
	Whitby, Canada	2018-05-02
	US	2018-05-02

Name	Location	Date
	Penetanguishene, Canada	2018-05-02
	London, Canada	2018-05-02
	Hamilton ON, Canada	2018-05-02
	Dartmouth, Canada	2018-05-02
	Duncan, Canada	2018-05-02
	Roberts Creek, Canada	2018-05-02
	Bradenton, Florida, US	2018-05-02
	Montreal, Canada	2018-05-02
	Guelph, Canada	2018-05-02
	US	2018-05-02
	Toronto, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Thunder Bay, Canada	2018-05-02
	ajax, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Sherwood Park, Canada	2018-05-02
	Val-des-monts, Canada	2018-05-02
	Kentville, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Vancouver, Canada	2018-05-02

Name	Location	Date
	Coquitlam, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Toronto, Canada	2018-05-02
	US	2018-05-02
	Vancouver, Canada	2018-05-02
	New Westminster, Canada	2018-05-02
	Nanaimo, BC, Canada	2018-05-02
	Warrington, UK	2018-05-02
	Dorval, Canada	2018-05-02
	Greece	2018-05-02
	Thetis Island, Canada	2018-05-02
	Granville, Australia	2018-05-02
	Collingwood, Canada	2018-05-02
	Brackendale, Canada	2018-05-02
	Coquitlam, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Gabriola, Canada	2018-05-02
	Straffordville, Canada	2018-05-02
	Montréal, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Parksville, Canada	2018-05-02
	North Bay, Canada	2018-05-02

Name	Location	Date
	New Glasgow, Canada	2018-05-02
	US	2018-05-02
	Fredericton, Canada	2018-05-02
	Lafond, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Saint Albert, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	New Westminster, Canada	2018-05-02
	US	2018-05-02
	Vancouver, Canada	2018-05-02
	Vancouver, Canada	2018-05-02
	Sorrento, Canada	2018-05-02
	Ottawa, Canada	2018-05-02
	Edmonton, Canada	2018-05-02
	Kingston, Canada	2018-05-02
	Casselman, Canada	2018-05-02
	Regina, Canada	2018-05-02
	Canada	2018-05-02
	US	2018-05-02
	coquitlam, bc, Canada	2018-05-02
	US	2018-05-02
	Edmonton, Canada	2018-05-02

Name	Location	Date
	UK	2018-05-02
	Victoria, Canada	2018-05-02
	Mission BC, Canada	2018-05-02
	North Vancouver, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	US	2018-05-02
	Angus, Canada	2018-05-02
	UK	2018-05-02
	US	2018-05-02
	Mississauga On, Canada	2018-05-02
	UK	2018-05-02
	Salmon Arm, Canada	2018-05-02
	Richmond, BC, Canada	2018-05-02
	Richmond, Canada	2018-05-02
	US	2018-05-02
	Moncton, Canada	2018-05-02
	Lethbridge, Canada	2018-05-02
	Montreal, Canada	2018-05-02
	Fredericton, Canada	2018-05-02
	Edmonton, AB, Canada	2018-05-02
	Langley, B.C., Canada	2018-05-02
	ottawa, Canada	2018-05-02

Name	Location	Date
	Edmonton, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	Oakville, Canada	2018-05-02
	erin, Canada	2018-05-02
	UK	2018-05-02
	Victoria, Canada	2018-05-02
	Atlanta, Georgia, US	2018-05-02
	Nelson, Canada	2018-05-02
	Winnipeg, Canada	2018-05-02
	Prince George, Canada	2018-05-02
	ColdstreamB.C., Canada	2018-05-02
	Langley, Canada	2018-05-02
	Hamilton, Canada	2018-05-02
	Victoria, Canada	2018-05-02
	Mars ton, Canada	2018-05-02
	US	2018-05-03
	Napanee, Canada	2018-05-03
	Canada	2018-05-03
	Mahone Bay, Canada	2018-05-03
	US	2018-05-03
	Toronto, Canada	2018-05-03
	kamloops, Canada	2018-05-03

Name	Location	Date
	Coquitlam, Canada	2018-05-03
	Dartmouth, Canada	2018-05-03
	Ottawa ON, Canada	2018-05-03
	Calgary, Canada	2018-05-03
	Canada	2018-05-03
	Woodville, Canada	2018-05-03
	port coquitlam, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Guelph, Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Toronto ON, Canada	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	West Lorne, Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03

Name	Location	Date
	Canada	2018-05-03
	US	2018-05-03
	UK	2018-05-03
	Bowen Island, Canada	2018-05-03
	Surrey, Canada	2018-05-03
	London, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Victoria BC, Canada	2018-05-03
	St. John's, Canada	2018-05-03
	Brampton, Canada	2018-05-03
	Tofino, Canada	2018-05-03
	Espanola, Canada	2018-05-03
	London, Canada	2018-05-03
	Saanich, Canada	2018-05-03
	greenfield park, Canada	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	Honolulu, Hawaii, US	2018-05-03
	Port Alberni, Canada	2018-05-03
	Townsville, Australia	2018-05-03
	US	2018-05-03
	Bracebridge, Canada	2018-05-03

Name	Location	Date
	Surrey, Canada	2018-05-03
	Edmonton, Canada	2018-05-03
	Ottawa, Canada	2018-05-03
	Dalmeny, Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	winnipeg, Canada	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	Tatamagouche, Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Langley Township, Canada	2018-05-03
	Salmon Arm, Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Gibsons, Canada	2018-05-03
	US	2018-05-03

Name	Location	Date
	US	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	Sechelt, Canada	2018-05-03
	Powll River BC, Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	Hornby Island, B.C., Canada	2018-05-03
	Verdun, Canada	2018-05-03
	Victoria, Canada	2018-05-03
	White Rock, Canada	2018-05-03
	Gabriola Island, Canada	2018-05-03
	US	2018-05-03
	Abbotsford, Canada	2018-05-03
	US	2018-05-03
	Vancouver, Canada	2018-05-03
	Old Barns, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Westmeadows, Australia	2018-05-03
	Toronto, Canada	2018-05-03

Name	Location	Date
	UK	2018-05-03
	Burnaby BC, Canada	2018-05-03
	Winnipeg, Canada	2018-05-03
	US	2018-05-03
	Victoria, Canada	2018-05-03
	Vancouver, Canada	2018-05-03
	Vancouver, Canada	2018-05-03
	Philadelphia, Pennsylvania, US	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Lewisberry, Pennsylvania, US	2018-05-03
	Vancouver, Canada	2018-05-03
	Calgary, Canada	2018-05-03
	Edmonton, Canada	2018-05-03
	UK	2018-05-03
	UK	2018-05-03

Name	Location	Date
	Canada	2018-05-03
	Dundas, On, Canada	2018-05-03
	Truro, Canada	2018-05-03
	North York, Canada	2018-05-03
	US	2018-05-03
	Australia	2018-05-03
	UK	2018-05-03
	US	2018-05-03
	Val-des-Monts, Canada	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	UK	2018-05-03
	US	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03

Name	Location	Date
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Haliburton, Canada	2018-05-03
	Winnipeg, Canada	2018-05-03
	London, Canada	2018-05-03
	Canada	2018-05-03
	Merville, Canada	2018-05-03
	US	2018-05-03
	Calgary, Canada	2018-05-03
	Canada	2018-05-03
	New Glasgow, Canada	2018-05-03
	Springville, Canada	2018-05-03
	US	2018-05-03
	Windsor, Canada	2018-05-03
	Canada	2018-05-03
	Bedford, Canada	2018-05-03
	US	2018-05-03
	Oliver, Canada	2018-05-03
	US	2018-05-03
	Toronto, Canada	2018-05-03
	US	2018-05-03

Name	Location	Date
	US	2018-05-03
	gibbons, Canada	2018-05-03
	Halifax, Canada	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03

Name	Location	Date
	US	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Edmonton, Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
	Canada	2018-05-03
	Turkey	2018-05-03
	Nelson, Canada	2018-05-03
	Keremeos, Canada	2018-05-03
	Ottawa, Canada	2018-05-03
	Ottawa, Canada	2018-05-03
	San Clemente, California, US	2018-05-03
	US	2018-05-03
	Montréal, Canada	2018-05-03
	Katy, Texas, US	2018-05-03
	Ottawa, Canada	2018-05-03
	US	2018-05-03

Name	Location	Date
	Calgary, Canada	2018-05-03
	Glen Huron, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Harrow, Canada	2018-05-03
	Gabriola, Canada	2018-05-03
	US	2018-05-03
	Vernon, Canada	2018-05-03
	Houston, Texas, US	2018-05-03
	Canada	2018-05-03
	Houston, Texas, US	2018-05-03
	Sarnia, Canada	2018-05-03
	US	2018-05-03
	Ottawa, Canada	2018-05-03
	Sudbury, Canada	2018-05-03
	Orangeville, Canada	2018-05-03
	US	2018-05-03
	Sault Sainte Marie, Canada	2018-05-03
	West Vancouver, Canada	2018-05-03
	Canada	2018-05-03
	Abbotsford, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Vancouver, Canada	2018-05-03

Name	Location	Date
	North Vancouver, Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	Canada	2018-05-03
	US	2018-05-03
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	UK	2018-05-03
	US	2018-05-03
	US	2018-05-03
	Vancouver, Canada	2018-05-03
	Lake Country, Canada	2018-05-03
	Peoria, Arizona, US	2018-05-03
	Calgary, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	US	2018-05-03
	Coquitlam, Canada	2018-05-03
	Canada	2018-05-03

Name	Location	Date
	Delta, Canada	2018-05-03
	Canada	2018-05-03
	River john, Canada	2018-05-03
	Vancouver, Canada	2018-05-03
	Toronto, Canada	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03
	UK	2018-05-03
	UK	2018-05-03
	US	2018-05-03
	Eskasoni, Canada	2018-05-03
	US	2018-05-03
	Beaufort, South Carolina, US	2018-05-03
	Calgary, Canada	2018-05-03
	Canada	2018-05-03
	Ottawa, Canada	2018-05-03
	Markham, Canada	2018-05-03
	Beaufort, South Carolina, US	2018-05-03
	Pictou, Canada	2018-05-03
	Tatamagouche, Canada	2018-05-03
	Canada	2018-05-03

Name	Location	Date
	Selkirk, Canada	2018-05-03
	Dartmouth, Canada	2018-05-03
	Pictou, Canada	2018-05-03
	Cobble Hill BC, Canada	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03
	Calgary, Canada	2018-05-03
	New Glasgow, Canada	2018-05-03
	Pictou, Canada	2018-05-03
	Kitchener, Canada	2018-05-03
	VICTORIA, Canada	2018-05-03
	Richmond Hill, Canada	2018-05-03
	Lloydminster, Canada	2018-05-03
	New Glasgow, Canada	2018-05-03
	New Glasgow, Canada	2018-05-03
	Westville, Canada	2018-05-03
	Canada	2018-05-03
	Dresden, Canada	2018-05-03
	UK	2018-05-03
	US	2018-05-03
	UK	2018-05-03
	Canada	2018-05-03

Name	Location	Date
	Canada	2018-05-03
	Canada	2018-05-03
	Kingston, Canada	2018-05-03
	Westville, Canada	2018-05-03
	Montréal, Canada	2018-05-04
	Placentia, Canada	2018-05-04
	Derwent, Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Hawkestone, Canada	2018-05-04
	Vancouver, Canada	2018-05-04
	Canada	2018-05-04
	Port Moody, Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	Rose Park, Australia	2018-05-04
	Dollard-Des Ormeaux, Canada	2018-05-04
	Easley, South Carolina, US	2018-05-04
	US	2018-05-04
	Trenton, Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04

Name	Location	Date
	US	2018-05-04
	US	2018-05-04
	Ottawa, Canada	2018-05-04
	Calgary, Canada	2018-05-04
	US	2018-05-04
	Fort Saint John, Canada	2018-05-04
	Victor Harbor, Australia	2018-05-04
	Toronto, Canada	2018-05-04
	Toronto, Canada	2018-05-04
	Montreal, Canada	2018-05-04
	Surrey, Canada	2018-05-04
	Canada	2018-05-04
	Galiano Island, Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Adelaide, Australia	2018-05-04
	Edmonton, Canada	2018-05-04
	US	2018-05-04

Name	Location	Date
	Burnaby, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Prince George, Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Lachine, Quebec, Canada	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Vancouver, Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Black Creek, Canada	2018-05-04
	Birmingham, England, UK	2018-05-04
	UK	2018-05-04

Name	Location	Date
	UK	2018-05-04
	Harrow, Canada	2018-05-04
	UK	2018-05-04
	South Africa	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Czech Republic	2018-05-04
	Dartmouth, Canada	2018-05-04
	Baddeck, Canada	2018-05-04
	Canada	2018-05-04
	UK	2018-05-04
	Wishaw, UK	2018-05-04
	Hamilton, Canada	2018-05-04
	Canada	2018-05-04
	Dartmouth, Canada	2018-05-04
	Souris, Canada	2018-05-04
	Yarmouth County, Canada	2018-05-04

Name	Location	Date
	Halifax, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	UK	2018-05-04
	Merlin, Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Ottawa, Canada	2018-05-04
	Canada	2018-05-04
	Oxford, Canada	2018-05-04
	US	2018-05-04
	Red Deer, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Montreal, Canada	2018-05-04

Name	Location	Date
	US	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Romania	2018-05-04
	Canada	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	Halifax, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Sutton-in-Ashfield, England, UK	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04

Name	Location	Date
	Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
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	US	2018-05-04
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	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04
	Las Vegas, Nevada, US	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	Summerside, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04

Name	Location	Date
	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
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	US	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	Mount Pearl, Canada	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Canada	2018-05-04

Name	Location	Date
	Pictou, Canada	2018-05-04
	US	2018-05-04
	Dartmouth, Canada	2018-05-04
	Canada	2018-05-04
	Orillia, Canada	2018-05-04
	Pickering, Canada	2018-05-04
	Debert,Nova Scotia, Canada	2018-05-04
	Canada	2018-05-04
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	UK	2018-05-04
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	Canada	2018-05-04
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	UK	2018-05-04
	UK	2018-05-04
	grande prairie, Canada	2018-05-04
	US	2018-05-04
	Halifax, Canada	2018-05-04

Name	Location	Date
	Canada	2018-05-04
	Canada	2018-05-04
	Toronto, Canada	2018-05-04
	Rexton, Canada	2018-05-04
	London, Canada	2018-05-04
	Corbyville, Canada	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
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	Canada	2018-05-04
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	US	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Markham, Canada	2018-05-04
	mt uniacke, Canada	2018-05-04
	Thunder Bay, Canada	2018-05-04
	US	2018-05-04
	Kentville, Canada	2018-05-04
	US	2018-05-04

Name	Location	Date
	UK	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	Pontllanfraith, Wales; Cymru, UK	2018-05-04
	UK	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	Abercrombie, Canada	2018-05-04
	Montréal, Canada	2018-05-04
	Edmonton, Canada	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	UK	2018-05-04
	Sooke, Canada	2018-05-04
	UK	2018-05-04
	Liverpool, England, UK	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Tahlequah, Oklahoma, US	2018-05-04
	UK	2018-05-04

Name	Location	Date
	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Port Moody, Canada	2018-05-04
	UK	2018-05-04
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	UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Brechin, Canada	2018-05-04
	Campbell River, Canada	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Vancouver, Canada	2018-05-04
	Nova Scotia, Canada	2018-05-04
	Canada	2018-05-04
	montreal, Canada	2018-05-04
	Canada	2018-05-04

Name	Location	Date
	US	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	US	2018-05-04
	US	2018-05-04
	UK	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	Halifax, Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	UK	2018-05-04
	Sidney, Canada	2018-05-04
	UK	2018-05-04
	Edmonton, Canada	2018-05-04
	UK	2018-05-04
	Canada	2018-05-04
	Kitchener, Canada	2018-05-04
	Victoria, Canada	2018-05-04
	Canada	2018-05-04
	Nelson, Canada	2018-05-04
	US	2018-05-04

Name	Location	Date
	UK	2018-05-04
	US	2018-05-04
	Ewshot, England, UK	2018-05-04
	US	2018-05-04
	US	2018-05-04
	Edmonton, Canada	2018-05-04
	Cross Roads Country Harbour, Canada	2018-05-04
	US	2018-05-04
	Canada	2018-05-04
	Qualicum Beach, Canada	2018-05-04
	Canada	2018-05-05
	US	2018-05-05
	Canada	2018-05-05
	Saskatoon, Canada	2018-05-05
	New Glasgow, Canada	2018-05-05
	Canada	2018-05-05
	Westmount, Canada	2018-05-05
	US	2018-05-05
	Canada	2018-05-05
	US	2018-05-05
	US	2018-05-05
	US	2018-05-05

Name	Location	Date
	US	2018-05-05
	Mallorytown, Canada	2018-05-05
	US	2018-05-05
	Grande Prairie, Canada	2018-05-05
	Vancouver, Canada	2018-05-05
	UK	2018-05-05
	India	2018-05-05
	Moncton, Canada	2018-05-05
	Canada	2018-05-05
	UK	2018-05-05
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Name	Location	Date
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	Canada	2018-05-05
	Sudbury, Canada	2018-05-05
	Canada	2018-05-05
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	US	2018-05-05
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Name	Location	Date
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	Canada	2018-05-05
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	Canada	2018-05-05
	Toronto, Canada	2018-05-05
	Canada	2018-05-05

Name	Location	Date
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	Canada	2018-05-05
	Mulmur, Canada	2018-05-05

Name	Location	Date
	Canada	2018-05-05
	Canada	2018-05-05
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	Canada	2018-05-05
	Canada	2018-05-05
	Corner Brook, Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05

Name	Location	Date
	Canada	2018-05-05
	Canada	2018-05-05
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Name	Location	Date
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	US	2018-05-05
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	Canada	2018-05-05
	Canada	2018-05-05
	UK	2018-05-05
	US	2018-05-05

Name	Location	Date
	UK	2018-05-05
	UK	2018-05-05
	UK	2018-05-05
	UK	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
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	Delta, Canada	2018-05-05
	UK	2018-05-05
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	Canada	2018-05-05
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	US	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	US	2018-05-05

Name	Location	Date
	US	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Vancouver, Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-05
	Belle River, Canada	2018-05-05
	Belle river pei, Canada	2018-05-05
	India	2018-05-05
	Canada	2018-05-05
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	Canada	2018-05-05
	Canada	2018-05-05

Name	Location	Date
	Digby, Canada	2018-05-05
	Canada	2018-05-05
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Hamilton, Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
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	Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06

Name	Location	Date
	Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
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	Canada	2018-05-06
	US	2018-05-06
	UK	2018-05-06
	Australia	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Lytham Saint Annes, England, UK	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	Markham, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06

Name	Location	Date
	US	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Costa Rica	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Halifax, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
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	Canada	2018-05-06
	Canada	2018-05-06

Name	Location	Date
	Canada	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Summerside, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Victoria, Canada	2018-05-06

Name	Location	Date
	Luton, England, UK	2018-05-06
	Saint-hyacinthe, Canada	2018-05-06
	Canada	2018-05-06
	Salisbury, Maryland, US	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	UK	2018-05-06
	US	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	US	2018-05-06
	US	2018-05-06
	US	2018-05-06
	Leduc, Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Toronto, Canada	2018-05-06

Name	Location	Date
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Pickering, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Halifax, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	UK	2018-05-06
	Canada	2018-05-06
	US	2018-05-06
	Apo, Armed Forces Africa, Canada, Europe, Middle East, US	2018-05-06
	US	2018-05-06
	Canada	2018-05-06
	Port George, Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06
	Canada	2018-05-06

Name	Location	Date
	Westville, Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
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	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Dartmouth, Canada	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07

Name	Location	Date
	Canada	2018-05-07
	Canada	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	UK	2018-05-07
	US	2018-05-07
	US	2018-05-07
	UK	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Czech Republic	2018-05-07
	Kitchener, Canada	2018-05-07
	UK	2018-05-07
	UK	2018-05-07
	UK	2018-05-07
	UK	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07

Name	Location	Date
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
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	UK	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Halifax, Canada	2018-05-07
	Herring Cove, Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	toronto, Canada	2018-05-07

Name	Location	Date
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
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	US	2018-05-07
	oro station, Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
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	US	2018-05-07
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	US	2018-05-07
	US	2018-05-07

Name	Location	Date
	US	2018-05-07
	US	2018-05-07
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	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
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	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
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	US	2018-05-07
	US	2018-05-07

Name	Location	Date
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	Canada	2018-05-07
	UK	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Coquitlam, Canada	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07

Name	Location	Date
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
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	US	2018-05-07
	Canada	2018-05-07
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	Canada	2018-05-07
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	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07

Name	Location	Date
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	UK	2018-05-07
	US	2018-05-07
	Halifax, Canada	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-07
	St. John's, Canada	2018-05-07
	Halifax, Canada	2018-05-07
	US	2018-05-07
	Canada	2018-05-07
	US	2018-05-07
	UK	2018-05-07
	Colombia	2018-05-07
	US	2018-05-07
	US	2018-05-07
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Cardiff, Wales; Cymru, UK	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08

Name	Location	Date
	York, Canada	2018-05-08
	Central District, Canada	2018-05-08
	US	2018-05-08
	Charlottetown, Canada	2018-05-08
	Morell, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Elizabethville, Pennsylvania, US	2018-05-08
	charlottetown, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Belfast, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Cayman Islands	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Charlottetown, Canada	2018-05-08

Name	Location	Date
	Charlottetown, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Halton Hills, Canada	2018-05-08
	Shefford, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Hammonds Plains, Canada	2018-05-08
	West Lorne, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	Picton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Powell River, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Gatineau, Canada	2018-05-08
	Kitimat, Canada	2018-05-08
	Wiarton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Falmouth, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Pocologan, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Kirkland, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Saint-Norbert-d'Arthabaska, Canada	2018-05-08
	Kirkland, Canada	2018-05-08
	Berwick, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kitchener, Ontario, Canada	2018-05-08
	Swansea, Toronto, Canada	2018-05-08
	Chatham, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Whitby, Canada	2018-05-08

Name	Location	Date
	Hamilton, Canada	2018-05-08
	Fergus, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	Stoney Creek, Canada	2018-05-08
	Saint-Laurent, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Saint-jean-sur-richelieu, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Sarnia, Canada	2018-05-08
	huntsvilleRdHuntsville, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Sainte-Claire, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	waterloo, Canada	2018-05-08
	ON, Canada	2018-05-08
	Repentigny, Canada	2018-05-08
	Scarborough, Canada	2018-05-08

Name	Location	Date
	Ajax, Canada	2018-05-08
	Stirling, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	toronto, Canada	2018-05-08
	Marlbank, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Aurora, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Oliver, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Grand Manan, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Georgina, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Pierrefonds, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Thorold, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Innisfil, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	Val-David, Canada	2018-05-08
	Annapolis royal, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	streetsville, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Central District, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Squamish, Canada	2018-05-08
	Athens ON, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Montreal-West, Canada	2018-05-08
	Bridgewater, Canada	2018-05-08

Name	Location	Date
	Burlington, Canada	2018-05-08
	Saint John, Canada	2018-05-08
	Red Deer, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Grimsby, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Belfast, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Blenheim, ON, Canada	2018-05-08
	Lake Charlotte, Canada	2018-05-08
	Westmount, Canada	2018-05-08
	Milton, Canada	2018-05-08
	ottawa, Canada	2018-05-08
	Thunder Bay, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	Clarksburg, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, ON, Canada	2018-05-08
	Ompah, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Milton, Canada	2018-05-08
	Belleville, Ontario, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Mont-Saint-Hilaire, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Cobble Hill, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	St. John's, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Uxbridge, Canada	2018-05-08
	Port Hope, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Nackawic, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Courtice ON, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Laval, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	London, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Simcoe, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Brossard, P.Q., Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Gatineau, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Ottawa. ON, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	markham, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	The Blue Mountains, Canada	2018-05-08

Name	Location	Date
	Mississauga, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Woodbridge, Canada	2018-05-08
	Lake Saint Peter, Canada	2018-05-08
	De Winton, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Markham, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Milton, Canada	2018-05-08
	London, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Kitchener ON, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Baie d'urfe, Canada	2018-05-08
	Petitcodiac, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Thornhill, Ontario, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	dunsford, Canada	2018-05-08
	Shawinigan, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Okotoks, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Blenheim ON, Canada	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Montréal, Canada	2018-05-08
	Hinchinbrooke, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Laval, Canada	2018-05-08
	Dorval, Canada	2018-05-08
	Welland, Canada	2018-05-08
	Dollard-des-Ormeaux, QC, Canada	2018-05-08
	Palmerston, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Mallorytown, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	London, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Prescott, Canada	2018-05-08
	Thunder Bay, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Owen Sound, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Inverness, Canada	2018-05-08
	London, Canada	2018-05-08

Name	Location	Date
	Gatineau, Canada	2018-05-08
	Calmar, Canada	2018-05-08
	Moberly Lake, BC, Canada	2018-05-08
	Kirkland, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	Hudson, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	North Bay, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	L'Orignal, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	Glace Bay, Canada	2018-05-08
	London, Canada	2018-05-08

Name	Location	Date
	Newmarket, Canada	2018-05-08
	Upper Sackville, Canada	2018-05-08
	Belleville, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Milton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Great Village, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Chatham-Kent, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	MontcTremblant, Canada	2018-05-08
	Orleans, Canada	2018-05-08
	London, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Sackville, Canada	2018-05-08
	London, Canada	2018-05-08
	minising on, Canada	2018-05-08
	Cranbrook, Canada	2018-05-08
	Maple, Canada	2018-05-08

Name	Location	Date
	Winnipeg, Canada	2018-05-08
	London, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	St Thomas, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Saint-Charles-Garnier, Canada	2018-05-08
	Red Deer, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	St-Anaclet, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Ingersoll, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Brampton, Canada	2018-05-08
	Antigonish, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Brighton, Canada	2018-05-08
	Pincourt, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	Hillgrove, NB, Canada	2018-05-08
	Norwood, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	ADSTOCK, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Golden Lake, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	North Bay, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Port Moody, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Wahnapitae, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Sherwood Park, Canada	2018-05-08
	Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	Owen Sound, Canada	2018-05-08
	Canada	2018-05-08
	Regina, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	kitchener, Canada	2018-05-08
	UK	2018-05-08
	Milton, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Alma, Canada	2018-05-08

Name	Location	Date
	Collingwood, Canada	2018-05-08
	THORNHILL, ONTARIO, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Grand Valley, Canada	2018-05-08
	Rimouski, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	North York, Canada	2018-05-08
	Rockwood, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Martensville, Canada	2018-05-08

Name	Location	Date
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Ingersoll, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	King City, Canada	2018-05-08
	UK	2018-05-08
	Vaughan, Canada	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	HALIFAX, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Winnipeg, MB, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Bracebridge, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Saanichton, Canada	2018-05-08

Name	Location	Date
	Burlington, Canada	2018-05-08
	penticton, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Bolton-Ouest, Canada	2018-05-08
	Moose Jaw, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	UK	2018-05-08
	Hamilton, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	Rosemont, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Brockville, Canada	2018-05-08
	Riverview, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Yellowknife, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Tupper Lake, Canada	2018-05-08
	Aurora, Canada	2018-05-08
	CAlgary, Canada	2018-05-08
	Lumby, Canada	2018-05-08
	East Selkirk, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Burlington, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Okotoks, Canada	2018-05-08
	Bridgewater, Canada	2018-05-08
	London, Canada	2018-05-08
	Brockville, Canada	2018-05-08
	Saint Catharines, Canada	2018-05-08
	Portland, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Etobicoke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Port Coquitlam, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	montreal, Canada	2018-05-08
	Canada	2018-05-08
	Hamilton, Canada	2018-05-08

Name	Location	Date
	Winnipeg, Canada	2018-05-08
	Wentworth, Canada	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	US	2018-05-08
	woodstock ont, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	North Bay, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Owen Sound, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Grand Forks, Canada	2018-05-08
	US	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	toronto, Canada	2018-05-08
	Midland, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Langton, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Canada	2018-05-08
	La Prairie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	India	2018-05-08
	US	2018-05-08
	Québec City, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Orangeville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Whitefish, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	Surrey, B.C., Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	North Bay, Canada	2018-05-08
	US	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Regina, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	elora, Canada	2018-05-08
	US	2018-05-08
	Gabriola, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Timmins, Canada	2018-05-08
	Leduc, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	kamloops, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Québec, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vernon, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Val-des-monts, Canada	2018-05-08
	Sainte-Louise, Canada	2018-05-08
	Midland, Canada	2018-05-08
	Halifax, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salisbury, North Carolina, US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Moncton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Thorndale, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Brechin, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Niagara Falls, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Red Deer, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Waterloo, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	Bowmanville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Peterbrorough, Canada	2018-05-08
	US	2018-05-08
	Lethbridge, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	West Kelowna, Canada	2018-05-08
	Kanata, Ontario, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Perth, Ontario, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Little Current, Canada	2018-05-08
	Salmon Arm, Canada	2018-05-08
	US	2018-05-08
	Saanichon, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Brossard, Canada	2018-05-08
	toronto, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Lakeside, PEI, Canada	2018-05-08
	Salaberry-de-Valleyfield, Canada	2018-05-08
	Lachine, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Dunnville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Picton, ON, Canada	2018-05-08
	Cornwall. ON, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Sault Ste. Marie, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Ottawa, Ontario, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Bathurst, Canada	2018-05-08
	US	2018-05-08
	Sault Ste. Marie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Ontario, Canada	2018-05-08
	Toronto, Ontario, Canada	2018-05-08
	Dundas, Canada	2018-05-08
	US	2018-05-08
	Red Deer, Canada	2018-05-08
	US	2018-05-08
	Peterborough, Canada	2018-05-08
	Chatham-Kent, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Bolton-Ouest, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kamloops, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Altona, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Westport, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Fernie, Canada	2018-05-08
	Codrington, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Strathmore, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Acton, Canada	2018-05-08
	Regina, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Laval, Canada	2018-05-08
	US	2018-05-08
	Thorold, Canada	2018-05-08
	US	2018-05-08
	Nanoose Bay, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	regina, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Drayton Valley, Canada	2018-05-08
	US	2018-05-08
	New Glasgow, Canada	2018-05-08
	US	2018-05-08
	Arden, Canada	2018-05-08
	Richmond, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Sudbury, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	HAMILTON, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Brampton, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Gatineau, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Moncton, Canada	2018-05-08
	Almonte, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Waterford, Ontario, Canada	2018-05-08
	Gatineau Qc., Canada	2018-05-08
	Willow Beach, Canada	2018-05-08
	Apsley, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Stratford, Canada	2018-05-08
	Hammonds Plains, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Swan Hills, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Torbay, Canada	2018-05-08
	Smiths Falls, Canada	2018-05-08
	brantford, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Barrie, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Grimsby, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Sooke, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saint-Leolin, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Thamesville, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Long Sault, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Gatineau, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	duncan, Canada	2018-05-08
	London, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Pointe Claire, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Newmarket, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Shawnigan Lake, Canada	2018-05-08
	US	2018-05-08
	Squamish, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Barrie, Canada	2018-05-08
	Tamworth, Canada	2018-05-08
	georgetown, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Ottawa, ontario, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	White City, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Melita, Canada	2018-05-08
	Baltimore, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Canada	2018-05-08
	Bainsville, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Mississauga, Canada	2018-05-08
	Caledonia, Canada	2018-05-08
	Granum, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Innisfil, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	oak ridges, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Delta, Canada	2018-05-08
	London, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	US	2018-05-08
	Brampton, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	gibsons bc, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Saint-Gabriel-de-Valcartier, Canada	2018-05-08
	RIDGEWAY, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Manitouwadge, Canada	2018-05-08
	US	2018-05-08
	Dartmouth, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Rigaud, Qc, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Calgary, AB, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Sarnia, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Branchton, Ontario, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Whitby, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Georgetown, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	BEDFORD, Canada	2018-05-08
	Uxbridge, Canada	2018-05-08
	London, Canada	2018-05-08
	toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Saint-Lazare, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Grand Falls, Canada	2018-05-08
	Cloyne, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	halifax, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Barrie, Canada	2018-05-08
	Ardrossan, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Dorval, Canada	2018-05-08
	Flesherton, Canada	2018-05-08
	Yellowknife, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Chamcook, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Waterloo, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	victoria, Canada	2018-05-08
	Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Perth, ON, Canada	2018-05-08
	US	2018-05-08
	Kelowna, Canada	2018-05-08

Name	Location	Date
	Burnaby, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Medicine Hat, Canada	2018-05-08
	Westmount, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	Brechin, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Stellarton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Oakville, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Nobleton, Ontario, Canada	2018-05-08
	Chelsea, Canada	2018-05-08
	US	2018-05-08
	Abbotsford, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Etobicoke, Canada	2018-05-08
	Red Deer, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Milton, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Pierrefonds, Canada	2018-05-08
	Côte Saint-Luc, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Canada	2018-05-08
	Mattawa, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Sutil rd, Canada	2018-05-08
	Thornhill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Limoges, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Milton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	North Bay, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Sidney, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	US	2018-05-08
	Westmount, Canada	2018-05-08
	Port Howe Nova Scotia, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Breslau, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	White Rock, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Blind River, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Gabriola, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Belleville, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Chilliwack, Canada	2018-05-08
	St-Jean-sur-Richelieu, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Tobermory, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	North Bay, Canada	2018-05-08
	US	2018-05-08
	Lacombe, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Rothesay, Canada	2018-05-08
	Hartington, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Alexandria, Canada	2018-05-08
	Norwood, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Scarborough, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Orangeville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kitimat, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Shawnigan Lake, Canada	2018-05-08
	North York, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Markham, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Blainville, Québec, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Québec, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Wentworth-Nord, Quebec, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Elora, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	toronto, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Regina, Canada	2018-05-08
	steinbach, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Victoria BC, Canada	2018-05-08

Name	Location	Date
	Scarborough, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Port Coquitlam, Canada	2018-05-08
	Prince George, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Southampton, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Shanty Bay, Canada	2018-05-08
	US	2018-05-08
	Val-des-Monts, Canada	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Bethany, Canada	2018-05-08
	montreal, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Whitney, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08

Name	Location	Date
	Bramton, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Langbank, Canada	2018-05-08
	Ridgeway, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Sechelt, Canada	2018-05-08
	US	2018-05-08
	Woodstock, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Gatineau, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salmon Arm, Canada	2018-05-08
	Leamington, Canada	2018-05-08
	Blyth, Canada	2018-05-08

Name	Location	Date
	Whitby, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Tatamagouche, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Westmount, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Sechelt, Canada	2018-05-08
	Dalhousie, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Québec, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	Edmonton, Alberta, Canada	2018-05-08
	Etobicoke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	Bluevale, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Wingham, Canada	2018-05-08
	London, Canada	2018-05-08
	Madison, Wisconsin, US	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Grimsby, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Longueuil, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Gatineau, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Leamington, Canada	2018-05-08
	hornby island, Canada	2018-05-08
	US	2018-05-08
	Invermere, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	grand bend on, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Musquodoboit Harbour, Canada	2018-05-08
	Bridgewater, Canada	2018-05-08
	US	2018-05-08
	Pointe-Claire, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Woodland beach Township of Tiny, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Richmond Hill, Canada	2018-05-08

Name	Location	Date
	Hubley, Canada	2018-05-08
	US	2018-05-08
	North Bay, Canada	2018-05-08
	US	2018-05-08
	Maple Ridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Québec, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	US	2018-05-08
	La Pocatiere, Canada	2018-05-08
	Belleville, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Brossard, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Okotoks, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Olds, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Penhold, Canada	2018-05-08

Name	Location	Date
	niagara on the lake, Canada	2018-05-08
	Dorval, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Peachland, Canada	2018-05-08
	Kimberley, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Markham, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kelowna, Canada	2018-05-08
	manotick, Canada	2018-05-08
	Georges River, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Burlington, Canada	2018-05-08
	London, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Port Sydney, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Lincoln, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Brandon, Canada	2018-05-08
	US	2018-05-08
	Waverley, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ste. Anne, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	OTTAWA, Canada	2018-05-08
	US	2018-05-08
	Whitby, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Westport, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Powell River, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Aylesford, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	ancaster, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	Brighton, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Ariss, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	US	2018-05-08
	Stratford, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	London, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Hammonds Plains, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Strathroy, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Sundre, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Niagara Falls, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Westmount, Canada	2018-05-08
	Pender Island, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	lac du cerf quebec j0w 1s0, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Mount Stewart, Canada	2018-05-08
	US	2018-05-08
	Perth, Canada	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Rose Bay, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Lyn, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	ottawa, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Terence Bay, Canada	2018-05-08
	Hudson, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Gabriola, Canada	2018-05-08
	Canmore, Canada	2018-05-08
	US	2018-05-08
	Montreal-West, Canada	2018-05-08
	US	2018-05-08
	Cowansville, Canada	2018-05-08
	Thunder Bay, Canada	2018-05-08
	US	2018-05-08
	Saint Thomas, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Moose Jaw, Canada	2018-05-08

Name	Location	Date
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Lytton, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Westholme, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Markham, Canada	2018-05-08
	Strathroy Ontario, Canada	2018-05-08
	Quebec, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Langley, Canada	2018-05-08
	Pointe-Claire, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Kitchener, Ontario, Canada	2018-05-08

Name	Location	Date
	Côte Saint-Luc, Canada	2018-05-08
	US	2018-05-08
	Cobourg, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Huntsville, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	US	2018-05-08
	Kawartha Lakes, Canada	2018-05-08
	US	2018-05-08
	Hannon, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Fort Erie, Canada	2018-05-08

Name	Location	Date
	Winnipeg, Canada	2018-05-08
	Calabogie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Penticton, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Langley, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Lefebvre, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mission, Canada	2018-05-08
	Port Alberni, Canada	2018-05-08
	Saint-Denis-de-Brompton, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Saint Marys, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Kingston, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Oro Station, Canada	2018-05-08
	US	2018-05-08
	Cambridge, Canada	2018-05-08
	Penticton, Canada	2018-05-08
	US	2018-05-08
	Gatineau, Canada	2018-05-08
	Laval, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Dundas, Canada	2018-05-08
	US	2018-05-08
	vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08

Name	Location	Date
	Montreal, Canada	2018-05-08
	Lindsay, Canada	2018-05-08
	New Minas, Canada	2018-05-08
	US	2018-05-08
	waterloo, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Fredericton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Gabriola, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Edson, Canada	2018-05-08
	Petrolia, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Cold Lake, Canada	2018-05-08
	US	2018-05-08
	Salt Spring, Canada	2018-05-08
	Brooks, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Fergus, Canada	2018-05-08
	Vavenby, Canada	2018-05-08
	Bridgetown, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Timmins, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Fort McMurray, AB, Canada	2018-05-08
	Pickering, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Cochrane, Alberta, Canada	2018-05-08

Name	Location	Date
	Burnaby, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Upper Rawdon, Canada	2018-05-08
	Langley, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Millarville, Alberta, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Stony Plain, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Courtenay, Canada	2018-05-08
	New Glasgow, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Aylsham, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Moncton, Canada	2018-05-08
	Smiths Falls, Canada	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	Toronto, Ontario, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Leduc County, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Nelson B. C., Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Longueuil, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Hamilton, Canada	2018-05-08

Name	Location	Date
	Summerstown, Canada	2018-05-08
	US	2018-05-08
	Penhold, Canada	2018-05-08
	US	2018-05-08
	Kelowna, BC, Canada	2018-05-08
	Lincoln, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Devon, Canada	2018-05-08
	bc, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Prince George, Canada	2018-05-08
	US	2018-05-08
	Cheltenham, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Laval, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Châteauguay, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Kuujjuaq, Canada	2018-05-08
	Chelsea, QC, Canada	2018-05-08
	London, Canada	2018-05-08
	Burnaby BC, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Stettler, Canada	2018-05-08
	Red Deer, Canada	2018-05-08
	Vancouver, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Côte Saint-Luc, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Queen Creek, Arizona, US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Bentley, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Peterborough, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Apple Hill, Ontario, Canada	2018-05-08

Name	Location	Date
	Paris, Canada	2018-05-08
	Revelstoke, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	rr1 westville, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Saltspring Island, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	North Saanich, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	150 Mile House, Canada	2018-05-08
	Mt. Albert, Canada	2018-05-08
	Laval, Canada	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Brockville, Canada	2018-05-08
	Richmond, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Terence Bay, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Kemptville, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Abbotsford, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Rodney, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Parksville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Owen Sound, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	Marbleton, Quebec, Canada	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Alberta, Canada	2018-05-08
	US	2018-05-08
	Selkirk, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Pointe-Claire, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	toronot, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Regina, Canada	2018-05-08

Name	Location	Date
	Sooke, Canada	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08
	Sidney, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Dawson, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	stoney creek, Canada	2018-05-08
	Mission, Canada	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	Vancouver, B.C., Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Elora, Canada	2018-05-08
	OSHAWA, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Windsor Ontario, Canada	2018-05-08
	Manotick, Canada	2018-05-08
	Verdun, Canada	2018-05-08
	Herbert, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	US	2018-05-08
	Belleville, Canada	2018-05-08
	US	2018-05-08
	Truro, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Pointe-Claire, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Stony Plain, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Alert Bay, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	UK	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	hornby isle, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Erin, Canada	2018-05-08
	Stratford, ON, Canada	2018-05-08
	Sherwood Park, Canada	2018-05-08
	US	2018-05-08
	Ladysmith, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	conestoga, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Canmore, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Sundre, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	Terrace, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Mission, Canada	2018-05-08
	Canada	2018-05-08
	Saint-Basile-le-Grand, Canada	2018-05-08
	Sarnia, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Prince Edward, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	ham, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Freelton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	L'Isle-Verte, Québec, Canada	2018-05-08
	Tatamagouche, N.S., Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Herring Neck, Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Debert, Canada	2018-05-08
	Port Carling, Canada	2018-05-08
	US	2018-05-08
	chalk river, Canada	2018-05-08
	Fanny Bay, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Rockwood, Canada	2018-05-08
	US	2018-05-08
	ETOBICOKE, Canada	2018-05-08
	Whitehorse, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	McDonalds Corners, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	Carvel, Canada	2018-05-08
	Markham, Canada	2018-05-08
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Collingwood, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	UK	2018-05-08
	Wasaga Beach, Canada	2018-05-08
	Baie-D'Urfe, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Whitby, Canada	2018-05-08
	Cochrane, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Sechelt, Canada	2018-05-08
	Pickering, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Grand Marais, Canada	2018-05-08
	Canmore, Canada	2018-05-08
	Sudbury, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Dauphin, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Windsor, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	victoria, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Campbell River, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Dartmouth, Canada	2018-05-08
	Saint Lazare, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Valemount, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Netherlands	2018-05-08

Name	Location	Date
	Red Deer, Canada	2018-05-08
	US	2018-05-08
	Laterrière, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Thornhill, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Sudbury, Canada	2018-05-08
	US	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Vancouver, BC, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Bobcaygeon, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Smarden, England, UK	2018-05-08
	Saskatoon, Canada	2018-05-08
	Meteghan River, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Gatineau, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Swift Current, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Kettleby, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Whitby, Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Medicine Hat, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Stouffville, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Medicine Hat, Canada	2018-05-08
	Delta, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Quebec, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Mabou, Canada	2018-05-08
	London, Canada	2018-05-08

Name	Location	Date
	Saskatoon, SK, Canada	2018-05-08
	Nelson, Canada	2018-05-08
	US	2018-05-08
	Chilliwack, Canada	2018-05-08
	US	2018-05-08
	Port Alberni, Canada	2018-05-08
	US	2018-05-08
	Surrey, B C, Canada	2018-05-08
	Merville, Canada	2018-05-08
	Elk Point, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Thunder Bay, Canada	2018-05-08
	Winnipeg, MB, Canada	2018-05-08
	Mission, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	toronto, Canada	2018-05-08
	Amherst, Massachusetts, US	2018-05-08
	Kemptville, Canada	2018-05-08

Name	Location	Date
	Uxbridge, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	London, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Quadra Island, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Whitehorse, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	williams lake, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	West Kelowna, Canada	2018-05-08
	US	2018-05-08
	Magog, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Magog, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	US	2018-05-08
	Strathmore, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Owen Sound, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Blind River, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Gabriola, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Cobourg, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Lakefield, Canada	2018-05-08

Name	Location	Date
	Regina, Canada	2018-05-08
	St. John's, Canada	2018-05-08
	Spruce Grove, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Fergus, Ontario, Canada	2018-05-08
	US	2018-05-08
	Knowlton, Canada	2018-05-08
	Fredericton New Brunswick, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	edmonton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Port Moody, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Vaughan, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Summerland, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Revelstoke, Canada	2018-05-08
	Roberts Creek BC, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Grindrod, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Mayne Island, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Red Deer, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Smiths Falls, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	UK	2018-05-08
	Ottawa, Canada	2018-05-08
	Wawanesa, Canada	2018-05-08
	US	2018-05-08
	Saint-Lambert, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Courtenay, Canada	2018-05-08
	Holland Landing, Canada	2018-05-08
	Richmond Hill, Ontario, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Smithers, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Canada	2018-05-08
	Chester, Canada	2018-05-08
	US	2018-05-08
	Hamilton, Canada	2018-05-08
	Woodstock, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Church Point, Canada	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Powell River, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Winlaw, Canada	2018-05-08

Name	Location	Date
	Salmon Arm, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	Regina, Sask, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	UK	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Matlock, Canada	2018-05-08
	London, Canada	2018-05-08
	Nr. Vancover, Canada	2018-05-08
	US	2018-05-08
	Baldonnel, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Lillooet, B.C., Canada	2018-05-08
	Canning, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Sylvan Lake, Canada	2018-05-08

Name	Location	Date
	Kelowna, Canada	2018-05-08
	US	2018-05-08
	Janetville, Canada	2018-05-08
	Sackville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Madoc, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Stratford, Canada	2018-05-08
	US	2018-05-08
	Quathiaski Cove, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Montreal, Canada	2018-05-08
	BC, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	New Hazelton, Canada	2018-05-08
	US	2018-05-08
	Sudbury, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Elmira, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Parksville, Canada	2018-05-08
	Gabriola, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Mission, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	US	2018-05-08
	Orleans, Canada	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Delta, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	Brockville, Canada	2018-05-08
	Canada	2018-05-08
	Victoria, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	north van, Canada	2018-05-08
	ladysmith bc, Canada	2018-05-08
	US	2018-05-08
	edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Vanderhoof, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	Etobicoke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Millarville, Canada	2018-05-08
	Tecumseh, Canada	2018-05-08
	North Vancouver BC, Canada	2018-05-08
	Toronto, Ontario, Canada	2018-05-08
	Trenton, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Saskatoon, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Magog, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Shawnigan Lake, Canada	2018-05-08
	Aurora, Canada	2018-05-08
	Seaforth, Canada	2018-05-08
	US	2018-05-08
	Aupaluk, Canada	2018-05-08
	Gatineau (Québec), Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Rossland, Canada	2018-05-08
	Oakville, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Swan Hills, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Three Hills, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	burlington, Canada	2018-05-08
	Thetis Island, Canada	2018-05-08
	Boutiliers point, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Vernon, Canada	2018-05-08
	London, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Saltspring Island, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Medicine Hat, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Port Perry, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Whitchurch-Stouffville, Canada	2018-05-08

Name	Location	Date
	West Vancouver, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Langley, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Medicine hat, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Powell River, Canada	2018-05-08
	US	2018-05-08
	oakville, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Hatley, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	North Augusta, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	London, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Hudson Heights, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	Cantley, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Saint Thomas, Canada	2018-05-08
	Sidney, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	US	2018-05-08
	Penticton, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	US	2018-05-08
	Horsefly, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Marmora, Canada	2018-05-08
	US	2018-05-08
	Calgary Ab, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	melancthon, Canada	2018-05-08
	Sidney, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Blackstock, Canada	2018-05-08
	Surrey, BC, Canada	2018-05-08
	River Denys, Canada	2018-05-08
	Sarnia, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	Rosebud, Canada	2018-05-08
	Saint-Jean-Sur-Richelieu, Canada	2018-05-08
	North Saanich, BC, Canada	2018-05-08
	Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	NVan, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Picton, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	Hazelton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Capreol, Canada	2018-05-08
	Knutsford, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Kirkfield, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Windsor ON, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Sarasota, Florida, US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Richmond, Canada	2018-05-08
	North Saanich, BC, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Nanticoke, Canada	2018-05-08
	Moose Jaw, Canada	2018-05-08
	Halfmoon Bay, Canada	2018-05-08
	Port Dover, Canada	2018-05-08
	US	2018-05-08
	Dawson Creek, Canada	2018-05-08
	Carleton Place, Canada	2018-05-08
	US	2018-05-08
	Parksville, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Magog, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Salt Spring Island, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	St. Albert, A, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Delta, Canada	2018-05-08
	Cantley, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Dartmouth, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Crofton, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Wheatley, Canada	2018-05-08

Name	Location	Date
	Brock, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Palm Desert, California, US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vernon, Canada	2018-05-08
	Sault Ste Marie, Canada	2018-05-08
	US	2018-05-08
	Kelowna, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Saanichton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Surrey, BC, Canada, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Acton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	Trail, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Terra Cotta, Canada	2018-05-08
	Salmon Arm, Canada	2018-05-08
	US	2018-05-08
	Kettleby, Canada	2018-05-08
	Squamish, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Saanichton, Canada	2018-05-08
	RobertsCreek BC, Canada	2018-05-08
	Shelburne, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Laval, Canada	2018-05-08
	US	2018-05-08
	Lindsay, Canada	2018-05-08

Name	Location	Date
	Toronto Ontario, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Ladysmith, Canada	2018-05-08
	Fredericton N.B., Canada	2018-05-08
	US	2018-05-08
	North York, Canada	2018-05-08
	Salt Spring Island, B.C., Canada	2018-05-08
	Markham, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Vernon, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	Red Deer, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Memramcook, Canada	2018-05-08

Name	Location	Date
	Hawkestone, Ontario, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Hinton, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	Pickering, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Regina, Canada	2018-05-08
	Kinmount, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Penetanguishene, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Delta, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Montréal, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Richmond, Canada	2018-05-08
	Clarence-Rockland, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	Penticton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Powell River, Canada	2018-05-08
	Rosthern, Canada	2018-05-08
	Sidney, Canada	2018-05-08
	Whistler, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Welland, Canada	2018-05-08
	Strathroy, Canada	2018-05-08
	Langley, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Collingwood, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Laval, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Highland Grove, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Winnipeg, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	London, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Morden, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	port severn, Canada	2018-05-08
	Saint-Laurent, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Markham, Canada	2018-05-08
	Saint-Colomban, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Meaford, Canada	2018-05-08
	US	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Pictou, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Summerland, Canada	2018-05-08
	bellevillle, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Pointe-Claire, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	UK	2018-05-08
	Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Alfred, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Yarker, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Middle Sackville, Canada	2018-05-08
	scotsburn nova scotia, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Invermere, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	QUEBEC CITY, Canada	2018-05-08
	US	2018-05-08
	Powell River, Canada	2018-05-08
	US	2018-05-08
	Woodbridge, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Regina, Canada	2018-05-08
	US	2018-05-08
	kamloops, Canada	2018-05-08

Name	Location	Date
	Smithville, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Brantford, Canada	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Lasqueti, Canada	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Peterborough, Canada	2018-05-08
	Hamilton, Canada	2018-05-08

Name	Location	Date
	Leduc, Alberta, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	Mission, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Brandon, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Bruce Mines, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kamloops, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Flin flon, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Markham, Canada	2018-05-08
	Delta, Canada	2018-05-08
	US	2018-05-08
	Lorette, MB, Canada	2018-05-08
	Sydney, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Penetanguishene, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	London, Canada	2018-05-08
	Langley, Canada	2018-05-08
	US	2018-05-08
	Nelson, Canada	2018-05-08
	Dorval, Qc, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	London, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vegreville, Canada	2018-05-08
	US	2018-05-08
	Valleyview, Canada	2018-05-08
	Wasaga Beach, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Victoria, BC, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Kendal, England, UK	2018-05-08
	Toronto, Canada	2018-05-08
	Athabasca, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Hanover, Canada	2018-05-08
	North Saanich, Canada	2018-05-08
	Niagara Falls, Canada	2018-05-08
	UK	2018-05-08
	Abbotsford, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ohaton, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Cumberland, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Bowen Island, Canada	2018-05-08
	US	2018-05-08
	victoria, Canada	2018-05-08

Name	Location	Date
	Gibsons, Canada	2018-05-08
	US	2018-05-08
	Hudson, Canada	2018-05-08
	Antigonish, Canada	2018-05-08
	Cowan,MB, Canada	2018-05-08
	Edmonton Alberta, Canada	2018-05-08
	US	2018-05-08
	Courtice, Canada	2018-05-08
	Longueuil, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Courtenay, Canada	2018-05-08
	Paradise, Canada	2018-05-08
	regina, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Salt Spring Island, BC, Canada	2018-05-08
	US	2018-05-08
	Whistler, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	North Battleford, Canada	2018-05-08
	Dunrobin, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	Uxbridge, Canada	2018-05-08
	Hanna, Canada	2018-05-08
	US	2018-05-08
	Verdun, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Brampton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	North Saanich, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Hamilton, Ont, Canada	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Kitchener, ON, Canada	2018-05-08
	calgary, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Saint John, Canada	2018-05-08
	US	2018-05-08
	Stratford, Canada	2018-05-08
	Airdrie, Canada	2018-05-08
	US	2018-05-08
	Laval, Canada	2018-05-08

Name	Location	Date
	Kelowna, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Canmore, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Regina, Canada	2018-05-08
	US	2018-05-08
	SSI, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Dunstaffnage, PEI, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Medicine Hat, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Grande Prairie, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Saint-Georges, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Estevan, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Luxembourg, Luxembourg	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Rimbey, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Canmore, Canada	2018-05-08
	US	2018-05-08
	Chilliwack, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	toronto, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	Appin, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Gabriola, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	White Rock, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Richmond, Canada	2018-05-08
	Orillia, Canada	2018-05-08
	Pakenham ON, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Sidney, Canada	2018-05-08
	Rothesay, Canada	2018-05-08
	US	2018-05-08
	TORONTO, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Stouffville, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Langley, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Scarborough, Canada	2018-05-08
	Campbell River, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Williams Lake, Canada	2018-05-08
	Kelvington, Canada	2018-05-08
	Magog, Canada	2018-05-08
	US	2018-05-08
	toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Conception Bay South, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Port Moody, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Ontario, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Chauvin, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Woodbridge, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Saint-Philippe, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Burlington, Canada	2018-05-08

Name	Location	Date
	Laval, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Canada	2018-05-08
	havelock, Canada	2018-05-08
	US	2018-05-08
	Stratford, Canada	2018-05-08
	Parksville, Canada	2018-05-08
	North West River NL, Canada	2018-05-08
	Nanoose Bay, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kahnawake, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Saint Marys, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Peterborough, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	New Denver, Canada	2018-05-08
	Whitchurch-Stouffville, Canada	2018-05-08
	Parksville, Canada	2018-05-08
	US	2018-05-08
	Acton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Richmond, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Ladysmith, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Hamilton, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	Belle River, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	montreal, Canada	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, B.C., Canada	2018-05-08
	Saanichton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Richmond, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Tilbury, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	US	2018-05-08
	guelph, Canada	2018-05-08
	US	2018-05-08
	Chilliwack, Canada	2018-05-08
	Sherwood Park, Canada	2018-05-08
	Vaudreuil-Dorion, Canada	2018-05-08
	Laval, Canada	2018-05-08
	Grande Prairie, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08

Name	Location	Date
	Whitchurch-Stouffville, Canada	2018-05-08
	Thunder Bay, Canada	2018-05-08
	Squamish, Canada	2018-05-08
	US	2018-05-08
	Kelowna, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Châteauguay, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Canada	2018-05-08
	Prince George, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08

Name	Location	Date
	Sooke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Beverly Hills, California, US	2018-05-08
	Edmonton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton AB, Canada	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Revelstoke, Canada	2018-05-08
	Foothills, Canada	2018-05-08
	Salt spring island, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	Moncton, Canada	2018-05-08

Name	Location	Date
	Nanaimo, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Carnarvon, Canada	2018-05-08
	White Rock, BC, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	West Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	St. Albert, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08

Name	Location	Date
	Surrey, Canada	2018-05-08
	Lloydminster, Canada	2018-05-08
	Campbellford, Canada	2018-05-08
	US	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Napanee, Canada	2018-05-08
	Burnaby, B.C., Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Brigden, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Warkworth, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Oshawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	US	2018-05-08
	Prince George, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Fredericton, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Rockwood, Canada	2018-05-08
	Sooke, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Campbell River, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Sackville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Campbell River, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Québec City, Canada	2018-05-08
	Pointe Claire, Canada	2018-05-08
	Edmonton, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Amherst, NS, Canada	2018-05-08
	Canada	2018-05-08
	Lac La Biche, Canada	2018-05-08
	Tofino, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	priddis, Canada	2018-05-08
	Langley, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Trochu, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Bowmanville, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	Bass River, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Meaford, Canada	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Nelson, Canada	2018-05-08
	US	2018-05-08
	Aurora, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Malahat, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	US	2018-05-08
	Hubley, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	Whitby, Canada	2018-05-08
	US	2018-05-08
	Humboldt, Canada	2018-05-08
	Comox, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Torrance, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Spruce Home, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Haisla, Canada	2018-05-08

Name	Location	Date
	Niagara-on-the-Lake, Canada	2018-05-08
	Port Hope, Canada	2018-05-08
	Prince Rupert, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salt Springs, Canada	2018-05-08
	New Glasgow, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Nelson, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	King City, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	Cochrane, Canada	2018-05-08
	Gatineau, Canada	2018-05-08
	US	2018-05-08
	Oliver BC, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	outremont, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Dunnville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	New Westminster, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Scarborough, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Regina, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Saint Catharines, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	walkerton, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Charlottetown,PEI, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Port Alberni, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Williams Lake, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Castor, Canada	2018-05-08
	Lunenburg, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Markham, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	Brentwood Bay, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Czech Republic	2018-05-08
	US	2018-05-08
	Bloomfield, Canada	2018-05-08
	Sidney, B.C., Canada	2018-05-08
	Deep River, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Galiano Island, Canada	2018-05-08
	US	2018-05-08
	Sherwood Park, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	New Westminster, Canada	2018-05-08
	Vancouver, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Carleton Place, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax,Nova Scotia, Canada	2018-05-08
	Prince George, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kamloops, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	brownsville, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Sturgeon County, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Sherwood Park, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	pemberton, Canada	2018-05-08
	Welland, Canada	2018-05-08
	Williams Lake, Canada	2018-05-08
	US	2018-05-08
	Arden, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Wood Buffalo, Canada	2018-05-08
	Saint John, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Errington, Canada	2018-05-08
	Terrace, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Saint-Jean-sur-Richelieu, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Rimouski, Canada	2018-05-08
	US	2018-05-08
	Napanee, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Grindrod, Canada	2018-05-08
	US	2018-05-08
	Cowichan Bay, Canada	2018-05-08
	Campbell river, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Springfield, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	US	2018-05-08
	Smithers, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Chase, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Québec, Canada	2018-05-08
	Medicine Hat, Canada	2018-05-08
	London, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	victoria, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	Whitby, Canada	2018-05-08
	Ladysmith, B.C., Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Del Mar, California, US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	St. John's, Canada	2018-05-08
	New Westminster, BC, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	US	2018-05-08
	Mono, Canada	2018-05-08
	US	2018-05-08
	Victoria, B.C., Canada	2018-05-08

Name	Location	Date
	Oliver, BC, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Port Alberni, Canada	2018-05-08
	Port Coquitlam, Canada	2018-05-08
	Bathurst, Canada	2018-05-08
	Port Blandford, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Longueuil, Canada	2018-05-08
	Sarnia, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	Port Moody, Canada	2018-05-08
	Chesley, Canada	2018-05-08
	Port Alberni, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Duncan, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Delta, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Richmond, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Copenhagen, Denmark	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Roberts Creek, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	London, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Kanata, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Stettler, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Nanoose Bay, Canada	2018-05-08
	Sherwood Park, Canada	2018-05-08
	US	2018-05-08
	Richmond, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Breslau, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	Okotoks, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Fergus, Canada	2018-05-08

Name	Location	Date
	Duncan, Canada	2018-05-08
	Longueuil, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Shelburne N. S., Canada	2018-05-08
	Oliver, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	US	2018-05-08
	Caledon, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Castlegar, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Montague, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08

Name	Location	Date
	parksville, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Mahone Bay, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Scarborough, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Vancouver BC, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	East Gore, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Saint Thomas, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Amherst, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Victoria, Canada	2018-05-08

Name	Location	Date
	Gabriola Island BC, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Nanoose Bay, Canada	2018-05-08
	King City, Ontario, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Sechelt, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Brookside, Canada	2018-05-08
	Moncton, Canada	2018-05-08
	Niagara-on-the-Lake, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Regina, Canada	2018-05-08

Name	Location	Date
	arkham, Canada	2018-05-08
	udbury, Canada	2018-05-08
	alifax, Canada	2018-05-08
	. Catharines, Canada	2018-05-08
	oronto, Ontario, Canada	2018-05-08
	oronto, Canada	2018-05-08
	oncton, Canada	2018-05-08
	S	2018-05-08
	oronto, Canada	2018-05-08
	hunder Bay, Canada	2018-05-08
	S	2018-05-08
	anaimo, Canada	2018-05-08
	atineau, Canada	2018-05-08
	ttawa, Canada	2018-05-08
	S	2018-05-08
	elowna, Canada	2018-05-08
	S	2018-05-08
	S	2018-05-08
	oronto, Canada	2018-05-08
	S	2018-05-08
	ttawa, Canada	2018-05-08
	almon Arm, BC, Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Ladysmith, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Medicine Hat Alberta, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	North vancouver, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	St. John's, Canada	2018-05-08
	St. Catharines, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Gabriola, Canada	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Prince Rupert, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Osoyoos, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	US	2018-05-08
	North York, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	salt spring island, Canada	2018-05-08

Name	Location	Date
	Hamilton, Canada	2018-05-08
	Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Woodbridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saint Catharines, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Cranbrook, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Timberlea, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Hamilton, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Amherst, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Georgetown, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Canmore, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Kamloops, Canada	2018-05-08
	Orangeville, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Gatineau, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	Toronto On, Canada	2018-05-08
	Ponoka, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Niagara-on-the-Lake, Canada	2018-05-08
	US	2018-05-08
	Alliston, Canada	2018-05-08
	US	2018-05-08
	Pitt Meadows, Canada	2018-05-08
	Hamilton..ON, Canada	2018-05-08
	Heriot Bay, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	victoria, Canada	2018-05-08
	Hornby Island, BC, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Saint Thomas, Canada	2018-05-08
	Georgina, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Westport, Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Whitecourt, Canada	2018-05-08
	US	2018-05-08
	Langley, Canada	2018-05-08

Name	Location	Date
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Dollard-Des Ormeaux, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Pakenham, Canada	2018-05-08
	UK	2018-05-08
	Dieppe, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	UK	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08

Name	Location	Date
	Nanaimo, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Cambridge, Canada	2018-05-08
	Cobourg, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	North Rustico, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Galiano Island, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Prince George, Canada	2018-05-08
	New Glasgow, Canada	2018-05-08
	Courtenay, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Brighton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Cochrane, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Keewatin, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Bridge Lake, Canada	2018-05-08
	PEI, Canada	2018-05-08
	Tweed, ON, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Port Perry, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	Vernon, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Sooke, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Nelson, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salisbury, Canada	2018-05-08
	US	2018-05-08
	Sutton, Canada	2018-05-08
	US	2018-05-08
	Georgetown, Canada	2018-05-08
	US	2018-05-08
	Alliston, Canada	2018-05-08
	Niagara-on-the-Lake, Canada	2018-05-08

Name	Location	Date
	Fredericton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	US	2018-05-08
	North vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Port Alice, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	toronto, Canada	2018-05-08
	St. Albert, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Hastings, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Mesachie Lake, BC, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Peachland, Canada	2018-05-08

Name	Location	Date
	Windsor, Canada	2018-05-08
	UK	2018-05-08
	Burlington, Canada	2018-05-08
	Merville, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Oakbankmb, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Delta, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Thornhill, Canada	2018-05-08
	Sawyerville, QC, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Oshawa, Canada	2018-05-08
	Peterborough, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Delhi, Canada	2018-05-08
	US	2018-05-08
	Okotoks, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Chemainus, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Gatineau, Canada	2018-05-08
	US	2018-05-08
	Petawawa, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	North Saanich, Canada	2018-05-08

Name	Location	Date
	urnaby, Canada	2018-05-08
	ontréal, Canada	2018-05-08
	S	2018-05-08
	a Salle, Canada	2018-05-08
	atamagouche, Canada	2018-05-08
	racebridge, Canada	2018-05-08
	agensborg, Canada	2018-05-08
	oronto, Canada	2018-05-08
	ancouver, Canada	2018-05-08
	oronto, Canada	2018-05-08
	S	2018-05-08
	almon Arm, BC, Canada	2018-05-08
	kanagan Falls, Canada	2018-05-08
	awson, Canada	2018-05-08
	S	2018-05-08
	oronto, Canada	2018-05-08
	ttawa, Canada	2018-05-08
	S	2018-05-08
	algary, AB, Canada	2018-05-08
	alifax, Canada	2018-05-08
	lliot Lake, Canada	2018-05-08
	S	2018-05-08

Name	Location	Date
	Prince George, Canada	2018-05-08
	Tsawwassen, Canada	2018-05-08
	70 Mile House, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	White Rock, Canada	2018-05-08
	st-eustache, Canada	2018-05-08
	US	2018-05-08
	Kelowna, B.C., Canada	2018-05-08
	Stratford, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Caledon, Canada	2018-05-08
	Terrace, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Surrey, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	100 Mile House, Canada	2018-05-08
	Déléage, Canada	2018-05-08
	Pickering, Canada	2018-05-08
	US	2018-05-08
	Hamilton, Canada	2018-05-08
	Whitby, Canada	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Châteauguay, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Vaughan, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Hilton Beach, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Paris, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	Shawnigan lake, Canada	2018-05-08
	Penticton, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08

Name	Location	Date
	Hamilton, Canada	2018-05-08
	Fort Worth, Texas, US	2018-05-08
	Callander, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Dieppe, Canada	2018-05-08
	UK	2018-05-08
	Antigonish, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Edmonton, Canada	2018-05-08
	Parksville, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	Pender Island, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Elizabeth, New Jersey, US	2018-05-08
	Kingston, Canada	2018-05-08
	US	2018-05-08
	Whistler, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Abbotsford, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	ottawa, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	Nepean, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Cranbrook, Canada	2018-05-08

Name	Location	Date
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Kelowna, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Malahat, Canada	2018-05-08
	Salmon Arm, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	St-Zénon, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	La Prairie, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	manitoba, Canada	2018-05-08
	Georgina, Canada	2018-05-08
	Québec, Canada	2018-05-08
	Chatham, Canada	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Kitchener, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	St. Albert, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	New Westminster, Canada	2018-05-08
	St. Albert, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	vancouver, bc, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	UK	2018-05-08
	Maple Ridge, Canada	2018-05-08

Name	Location	Date
	Edmonton, Canada	2018-05-08
	Chesley, Canada	2018-05-08
	Maple Ridge, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kanata, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Regina, Canada	2018-05-08
	US	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Neerlandia, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Italy	2018-05-08
	Vernon, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Cochrane, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	Heriot Bay, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	MONTREAL, Canada	2018-05-08
	North Saanich, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	TORONTO, Canada	2018-05-08
	US	2018-05-08
	Lindsay, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Gibsons, BC, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Fernie, Canada	2018-05-08
	Greenfield, Canada	2018-05-08
	Sechelt, Canada	2018-05-08
	US	2018-05-08
	Salt Spring Island, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hamilton, Canada	2018-05-08

Name	Location	Date
	Acton, Canada	2018-05-08
	US	2018-05-08
	Brampton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Vancouver BC, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Galiano Island, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Washago, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Sherwood Park, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Newcastle, Canada	2018-05-08
	UK	2018-05-08
	Port Alberni, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Camrose, Canada	2018-05-08
	US	2018-05-08
	Courtenay, Canada	2018-05-08
	UK	2018-05-08
	Qualicum Beach, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	Dieppe, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Coldstream, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Hearst Ontario, Canada	2018-05-08
	Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Schomberg, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	UK	2018-05-08
	London, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Arnprior, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Mayne Island, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Summerland, Canada	2018-05-08
	Beausejour MB, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Yellowknife, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	gatineau, Canada	2018-05-08
	parksville bc, Canada	2018-05-08
	UK	2018-05-08

Name	Location	Date
	Bowmanville, Canada	2018-05-08
	Sangudo, Canada	2018-05-08
	US	2018-05-08
	Musgravetown, Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	UK	2018-05-08
	Rigaud, Qc., Canada	2018-05-08
	US	2018-05-08
	Kimberley, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Ottawa, Canada	2018-05-08
	White Rock, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Winlaw, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Whitchurch-Stouffville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Blind River Ontario, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	Coe Hill, Canada	2018-05-08
	millarville, Canada	2018-05-08
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Keremeos, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Rycroft, Canada	2018-05-08
	Québec, Canada	2018-05-08

Name	Location	Date
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Ladysmith, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Chambly, Canada	2018-05-08
	US	2018-05-08
	Grimsby, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Denver, Colorado, US	2018-05-08
	Saint Thomas, Canada	2018-05-08
	Montréal, Canada	2018-05-08

Name	Location	Date
	Ladysmith, Canada	2018-05-08
	London, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	Whitby, Canada	2018-05-08
	US	2018-05-08
	Camrose, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	The Pas, Canada	2018-05-08
	Moose Jaw, Canada	2018-05-08
	Gibsons, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Welland, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Shawnigan Lake, Canada	2018-05-08
	kenora, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Pitt Meadows, Canada	2018-05-08
	Belfast, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	West Kelowna, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Cambridge, Canada	2018-05-08
	Mont-Tremblant, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Kitchener, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Aurora, Canada	2018-05-08
	US	2018-05-08
	Thornhill, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Pierrefonds Quebec, Canada	2018-05-08
	laval, Canada	2018-05-08
	Barneys River Station, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Pitt Meadows, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Airdrie, Canada	2018-05-08
	Hamilton, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Port Sydney, Canada	2018-05-08
	Meteghan River, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	North Vancouver, Canada	2018-05-08
	Niagara-on-the-Lake, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Burns Lake, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Sherwood Park, Canada	2018-05-08
	Regina, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Emsdale, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	New Liskeard, Canada	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Stratford, Canada	2018-05-08
	Utterson, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Coldwater, Canada	2018-05-08
	US	2018-05-08
	Oshawa ont., Canada	2018-05-08
	Canada	2018-05-08
	Prince George, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Oshawa, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	North Vancouver, BC, Canada	2018-05-08
	Lethbridge, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	UK	2018-05-08
	Wasaga Beach, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	Calgary, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	Port Rowan, Canada	2018-05-08
	UK	2018-05-08
	VICTORIA, Canada	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08
	Fort McMurray, Canada	2018-05-08
	Fort McMurray, Canada	2018-05-08
	US	2018-05-08
	toronto, Canada	2018-05-08
	Florissant, Colorado, US	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Etobicoke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08

Name	Location	Date
	US	2018-05-08
	Salmon Arm, Canada	2018-05-08
	Summerland, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	St Catharines, Canada	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Victoria, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08

Name	Location	Date
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Calgary, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Wellington, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ingleside, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Langley, Canada	2018-05-08
	UK	2018-05-08
	Montreal, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	Paradise, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	Aylesford, Canada	2018-05-08
	Delta, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Denman Island, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Britannia Beach, Canada	2018-05-08
	US	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	Bedford, Nova Scotia, Canada	2018-05-08
	Canada	2018-05-08
	Sherbrooke, Canada	2018-05-08
	West vancouver, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	De Winton, Canada	2018-05-08
	Niagara Falls, Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Pictou, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	Racine, QC, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	Lake Echo, Canada	2018-05-08
	Merrickville, Canada	2018-05-08
	Kelowna, B. C., Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	London, Canada	2018-05-08
	Caledon, Canada	2018-05-08
	Dalhousie, Canada	2018-05-08
	US	2018-05-08
	Winlaw, Canada	2018-05-08
	Brighton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08

Name	Location	Date
	Burnaby, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Fort Langley, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Langley, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	Québec, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	La Pêche, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Mission, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Moncton, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Fall River, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Vaughan, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	UK	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Argentina	2018-05-08
	sooke, Canada	2018-05-08
	Markham, Canada	2018-05-08
	Prince George, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Galiano Island, Canada	2018-05-08
	US	2018-05-08
	St-Jean-sur-Richelieu, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Scarborough, Canada	2018-05-08
	US	2018-05-08
	Orillia, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Ayr, Canada	2018-05-08
	Grafton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Saskatoon SK, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Tofield, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Grandhaven, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	West Kelowna, Canada	2018-05-08
	US	2018-05-08
	Carp, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Burnaby, Canada	2018-05-08

Name	Location	Date
	King City, Canada	2018-05-08
	West Vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	Thompson, Canada	2018-05-08
	Collingwood, Canada	2018-05-08
	Gimli, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Central Butte, Canada	2018-05-08
	US	2018-05-08
	Bristol, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Westholme, Canada	2018-05-08
	Carcross, Canada	2018-05-08
	Hudson, Canada	2018-05-08
	London, Canada	2018-05-08
	Delta, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Berwyn, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	Sioux Lookout, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Kamloops, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Lantz, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Dartmouth, Canada	2018-05-08
	Wasaga Beach, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Roberts Creek, Canada	2018-05-08
	US	2018-05-08
	Lower Sackville, Canada	2018-05-08

Name	Location	Date
	Lower Sackville, Canada	2018-05-08
	Montague, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Torontm, Canada	2018-05-08
	Headingley, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	London, Canada	2018-05-08
	Delta, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Medicine Hat, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Caledon on, Canada	2018-05-08
	Prince Albert, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Bouctouche NB, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Milton, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Chilliwack, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	estevan, Canada	2018-05-08
	Sydenham, Canada	2018-05-08
	US	2018-05-08
	Peterborough, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	Saanichton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	ottawa, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Burlington, Canada	2018-05-08
	Mahone Bay, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Trois-Rivières, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	tecumseh ont., Canada	2018-05-08
	Oak Bay, Canada	2018-05-08
	Castlegar, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Halifax, NS, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Germany	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	Brandon, Canada	2018-05-08

Name	Location	Date
	Santiago, Chile	2018-05-08
	Belleville, Canada	2018-05-08
	Kelowna, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	Brantford, Canada	2018-05-08
	UK	2018-05-08
	Dartmouth, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Lower Prospect, Canada	2018-05-08
	US	2018-05-08
	Etobicoke, Canada	2018-05-08
	Thornhill, ON, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Kamloops, Canada	2018-05-08
	Markham, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Welland, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Twillingate, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Heathcote Ontario, Canada	2018-05-08
	Oshawa, Canada	2018-05-08
	US	2018-05-08
	Saint John, Canada	2018-05-08
	Cobble Hill, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	UK	2018-05-08
	Squamish, Canada	2018-05-08

Name	Location	Date
	Victoria, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	toronto, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Canada	2018-05-08
	Barrie, Canada	2018-05-08
	Burlington, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Whistler, Canada	2018-05-08
	UK	2018-05-08
	North Vancouver, Canada	2018-05-08
	UK	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08

Name	Location	Date
	US	2018-05-08
	Manchester, England, UK	2018-05-08
	Laval, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Cartago, Costa Rica	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Hacketts Cove, Canada	2018-05-08
	London, Canada	2018-05-08
	Sechelt, Canada	2018-05-08
	courtenay, Canada	2018-05-08
	US	2018-05-08
	Carleton Place, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Saint-Bruno-De-Montarville, Canada	2018-05-08
	Montreal Qc., Canada	2018-05-08
	Armagh, Canada	2018-05-08
	Port Alberni, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Richmond, Canada	2018-05-08
	Candiac, Canada	2018-05-08
	Glace Bay, Canada	2018-05-08
	Saint-Lazare, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Elmira, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	st-sauveur, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Charlottetown, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	London, Canada	2018-05-08
	Brampton, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	London, Canada	2018-05-08
	US	2018-05-08
	Conway, South Carolina, US	2018-05-08
	US	2018-05-08
	Delta, Canada	2018-05-08
	Plympton ,N.S., Canada	2018-05-08
	Sainte-Adèle, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Halifax, Canada	2018-05-08

Name	Location	Date
	VERNON, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Surrey, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Gaspé, Canada	2018-05-08
	UK	2018-05-08
	Newcastle, Canada	2018-05-08
	US	2018-05-08
	Surrey, Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Whitchurch-Stouffville, Canada	2018-05-08
	US	2018-05-08
	Saskatoon, Canada	2018-05-08
	Canada	2018-05-08
	New Glasgow. RR #2, NS, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Leamington, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Coquitlam, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	North Saanich, Canada	2018-05-08
	Stoney Creek, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	US	2018-05-08
	Burlington, Canada	2018-05-08
	Swan River MB, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	London, Canada	2018-05-08
	Brantford, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Longueuil, Canada	2018-05-08
	US	2018-05-08
	Newmarket, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	Napanee, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Sainte Marie De Kent, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hawkestone, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	Bowen Island, Canada	2018-05-08
	Saint-hyacinthe, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	Collingwood, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Brights Grove, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Hampton, Canada	2018-05-08
	US	2018-05-08
	Guelph, ON, Canada	2018-05-08
	US	2018-05-08
	Thunder Bay, Canada	2018-05-08
	US	2018-05-08
	Steinbach, Canada	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	MTL, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	St. John's, Canada	2018-05-08
	Dartmouth, Canada	2018-05-08

Name	Location	Date
	London, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Middleton, Canada	2018-05-08
	US	2018-05-08
	Niagara Falls, Canada	2018-05-08
	Ajax, Canada	2018-05-08
	Lynn, Canada	2018-05-08
	US	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Châteauguay, Canada	2018-05-08
	US	2018-05-08
	Sainte-Hélène-de-Chester, Canada	2018-05-08
	Economy, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Trout River, Canada	2018-05-08
	Chemainus, Canada	2018-05-08
	US	2018-05-08
	Lumby, Canada	2018-05-08
	Hazelton, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Kingston, Canada	2018-05-08
	Penhold, AB., Canada	2018-05-08
	UK	2018-05-08
	Sudbury, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	Kelowna, Canada	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Courtenay, Canada	2018-05-08
	Pembroke, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Saint-Lazare, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Brampton, Canada	2018-05-08
	Richmond, Canada	2018-05-08

Name	Location	Date
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	St Margaret's Bay, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Calgary, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Saskatoon, SK, Canada	2018-05-08
	US	2018-05-08
	ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	South Africa	2018-05-08
	UK	2018-05-08
	Osgoode, Canada	2018-05-08
	kemptville, Canada	2018-05-08
	US	2018-05-08
	West Vancouver, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Tumbler Ridge, Canada	2018-05-08
	US	2018-05-08
	Medicine Hat, Canada	2018-05-08
	US	2018-05-08
	Porier sub ., Canada	2018-05-08
	Cobourg, Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
Lynda Henry	Rockwood, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Vankleek Hill, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Dorchester, ON, Canada	2018-05-08
	Canada	2018-05-08
	Montréal, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Richmond Hill, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Santiago, Chile	2018-05-08
	Winnipeg, Canada	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Owen Sound, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Pointe-Claire, Qc, Canada	2018-05-08
	Liverpool, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Ladysmith, Canada	2018-05-08
	London Ont., Canada	2018-05-08
	vancouver, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Waterloo, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	Canada	2018-05-08
	Calgary, Canada	2018-05-08
	CONSTANCE LAKE, Canada	2018-05-08
	Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Cornwall, Canada	2018-05-08
	US	2018-05-08
	St. Catharines, Canada	2018-05-08
	Almonte, Canada	2018-05-08
	St. John's, Canada	2018-05-08
	UK	2018-05-08
	Dolbeau-Mistassini, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	Calgary, Canada	2018-05-08

Name	Location	Date
	Montague, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Kirkland, Canada	2018-05-08
	Laval, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Dorset, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Newmarket, Canada	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	Windsor, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Pender Island BC, Canada	2018-05-08
	Canmore, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Kelowna, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Martensville, Canada	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	Vancouver, Canada	2018-05-08
	Oakville, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Abbotsford, B.C., Canada	2018-05-08
	UK	2018-05-08
	Thornhill, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	granby qc, Canada	2018-05-08
	US	2018-05-08
	Bowen Island, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Vancouver, Canada	2018-05-08
	Sandy Hook, Canada	2018-05-08
	Portage la Prairie, Canada	2018-05-08
	US	2018-05-08
	Lake Country, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	UK	2018-05-08
	Victoria, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	Valemount, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	London, Canada	2018-05-08
	Cornwall, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Limehouse, Canada	2018-05-08
	Mahone Bay, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Jaffray, Canada	2018-05-08
	Canada	2018-05-08
	Hanwell, Canada	2018-05-08

Name	Location	Date
	Winnipeg, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08
	Oakville, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Kingston, Canada	2018-05-08
	Grand Forks, Canada	2018-05-08
	Pembroke, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	Gabriola, Canada	2018-05-08
	Battersea, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Red Deer, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Garson, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Port Moody, Canada	2018-05-08
	Clayton, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	Cochrane, Canada	2018-05-08
	Saint-Sauveur, Canada	2018-05-08
	4533 Millvale Rd RR2 Breadalbane, Canada	2018-05-08
	US	2018-05-08
	Brampton, Canada	2018-05-08
	Canada	2018-05-08
	Calgary, Canada	2018-05-08
	Hudson, Canada	2018-05-08

Name	Location	Date
	Calgary, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	New Tecumseth, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Salmon Arm, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Montréal, Canada	2018-05-08
	Falmouth, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Cavan, Canada	2018-05-08
	US	2018-05-08
	Halton Hills, Canada	2018-05-08
	US	2018-05-08
	Spain	2018-05-08
	Vancouver, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Kitchener, Canada	2018-05-08

Name	Location	Date
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Collingwood, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montréal, Canada	2018-05-08
	Canada	2018-05-08
	calgary, Canada	2018-05-08
	Vancouver, Canada	2018-05-08
	Smiths Falls, Canada	2018-05-08
	Saskatoon, Canada	2018-05-08
	UK	2018-05-08
	Charlottetown, Canada	2018-05-08
	Saint Thomas, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Edmonton, Canada	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	New Harbour, Canada	2018-05-08
	US	2018-05-08
	cap santé, Canada	2018-05-08
	Lund, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Wasaga Beach, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Newmarket, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Sooke, Canada	2018-05-08
	Vankleek Hill, Canada	2018-05-08
	Richmond Hill, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Toronto, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Markham, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	US	2018-05-08
	Dartmouth, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	passang, Canada	2018-05-08
	Ucluelet, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Lower Sackville, Canada	2018-05-08
	Montréal, Canada	2018-05-08
	Lampman, Canada	2018-05-08
	Nanaimo, Canada	2018-05-08
	London, Canada	2018-05-08
	Lyndhurst, Canada	2018-05-08
	Gatineau, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	UK	2018-05-08
	Barrie, Canada	2018-05-08
	Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	UK	2018-05-08
	London, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Sturgeon County, Canada	2018-05-08
	Bruce Mines, Canada	2018-05-08
	Hornby Island, B.C., Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	Montreal, Canada	2018-05-08

Name	Location	Date
	Langley, Canada	2018-05-08
	Halifax, Canada	2018-05-08
	Duncan, Canada	2018-05-08
	US	2018-05-08
	WPG. MB., Canada	2018-05-08
	Parry Sound, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Pickering, Canada	2018-05-08
	banff, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	Hamilton Ontario, Canada	2018-05-08
	Calgary, Canada	2018-05-08
	US	2018-05-08
	Lethbridge, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Nelson, Canada	2018-05-08

Name	Location	Date
	Vancouver, Canada	2018-05-08
	St-Jérôme, Canada	2018-05-08
	High River, Canada	2018-05-08
	Little Current, Canada	2018-05-08
	Lantzville, Canada	2018-05-08
	Pickering, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Woodstock, Canada	2018-05-08
	US	2018-05-08
	Coaldale, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	US	2018-05-08
	Grimsby, Canada	2018-05-08
	Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Alberta, Canada	2018-05-08
	US	2018-05-08
	Burlington, Canada	2018-05-08

Name	Location	Date
	Prince Rupert, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Courtenay, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Calgary, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Guelph, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Goodwood, Canada	2018-05-08
	kitchener, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Canada	2018-05-08
	US	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Canada	2018-05-08

Name	Location	Date
	Ottawa, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Thornhill, Canada	2018-05-08
	Winnipeg, Canada	2018-05-08
	Summerside, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Foxboro, Canada	2018-05-08
	Montreal, Canada	2018-05-08
	UK	2018-05-08
	US	2018-05-08
	Cobourg, Canada	2018-05-08
	Saint John's, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Canada	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Cambridge, Canada	2018-05-08
Laura Oakley	Vancouver, Canada	2018-05-08

Name	Location	Date
	Bedford, Canada	2018-05-08
	US	2018-05-08
	Toronto, On, Canada	2018-05-08
	US	2018-05-08
	Victoria, Canada	2018-05-08
	Lively,Ont, Canada	2018-05-08
	Fredericton, Canada	2018-05-08
	France	2018-05-08
	Sault Sainte Marie, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	New Westminster, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Mississauga, Canada	2018-05-08
	Cochrane AB., Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Montreal, Canada	2018-05-08
	Belle River, Canada	2018-05-08
	St. Albert, Canada	2018-05-08
	Kitchener, Canada	2018-05-08
	Stephenville Crossing, Canada	2018-05-08

Name	Location	Date
	Toronto, Canada	2018-05-08
	Wiarton, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	US	2018-05-08
	Toronto, Canada	2018-05-08
	Osgoode, Canada	2018-05-08
	Victoria, Canada	2018-05-08
	Burnaby, Canada	2018-05-08
	Kinburn, Canada	2018-05-08
	Saint Thomas, Canada	2018-05-08
	US	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Duncan, Canada	2018-05-08
	Moncton, Canada	2018-05-08
	Niagara Falls, Ontario, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Saint John, Canada	2018-05-08

Name	Location	Date
	Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	Langley Township, Canada	2018-05-08
	UK	2018-05-08
	Ottawa, Canada	2018-05-08
	US	2018-05-08
	Drummondville, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	US	2018-05-08
	Canada	2018-05-08
	North Vancouver, Canada	2018-05-08
	vancouver bc, Canada	2018-05-08
	Singapore	2018-05-08
	TWEED, Canada	2018-05-08
	Abbotsford, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Sherbrooke, Québec, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08

Name	Location	Date
	US	2018-05-08
	Vaughan, Canada	2018-05-08
	Toronto, Canada	2018-05-08
	Hamilton, Canada	2018-05-08
	Milton, Canada	2018-05-08
	Canada	2018-05-08
	Barrie, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Garson, Canada	2018-05-08
	US	2018-05-08
	US	2018-05-08
	Coquitlam, Canada	2018-05-08
	Maple, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	vancouver, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	shediac cape, Canada	2018-05-09
	Cambridge, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Calgary, Canada	2018-05-09

Name	Location	Date
	Nottawa, Canada	2018-05-09
	Gunn, Canada	2018-05-09
	US	2018-05-09
	New Westminster, Canada	2018-05-09
	Dollard-Des Ormeaux, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Richmond, Canada	2018-05-09
	Wolfville, Canada	2018-05-09
	Guelph, Canada	2018-05-09
	Innisfil, Ontario, Canada	2018-05-09
	Sherwood Park, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	Singapore	2018-05-09
	Douglassville, Pennsylvania, US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Hope, Canada	2018-05-09
	Thunder Bay, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Pembroke, Canada	2018-05-09
	Ennismore, Canada	2018-05-09
	Duncan, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	Maniwaki, Canada	2018-05-09
	Canada	2018-05-09
	Sherbrooke, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Kingston, Canada	2018-05-09
	St. Albert, Canada	2018-05-09
	port hope, Canada	2018-05-09
	Greely, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09

Name	Location	Date
	deux montagnes, Canada	2018-05-09
	US	2018-05-09
	Kingston, Canada	2018-05-09
	Lloydminster, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Nanaimo, Canada	2018-05-09
	UK	2018-05-09
	Schomberg, Canada	2018-05-09
	Seagrave, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	Trail, Canada	2018-05-09
	Port Perry, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	US	2018-05-09
	Edmonton, Canada	2018-05-09
	Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Langley, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Tottenham, ON, Canada	2018-05-09

Name	Location	Date
	Agassiz, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Charlottetown, Canada	2018-05-09
	Mississauga, Canada	2018-05-09
	US	2018-05-09
	Stoney Creek, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Winlaw BC, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Cobble Hill, Canada	2018-05-09
	toronto, Canada	2018-05-09
	US	2018-05-09
	Burnaby, Canada	2018-05-09
	US	2018-05-09
	Pointe Claire, QC, Canada	2018-05-09
	Mississauga, Canada	2018-05-09
	Kitchener, Canada	2018-05-09

Name	Location	Date
	Halton Hills, Canada	2018-05-09
	Goderich, Canada	2018-05-09
	Langley, Canada	2018-05-09
	Kitchener, Canada	2018-05-09
	Middle Sackville, Canada	2018-05-09
	Newmarket, Canada	2018-05-09
	Souris, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	West Vancouver, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Moncton, Canada	2018-05-09
	DUNDAS, Canada	2018-05-09
	New Westminster, Canada	2018-05-09
	Carleton Place, Canada	2018-05-09
	Nobleton, Canada	2018-05-09
	Mooretown, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09

Name	Location	Date
	Langley, Canada	2018-05-09
	Wetaskiwin, Canada	2018-05-09
	US	2018-05-09
	London, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Quispamsis, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Vancouver, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	Campbell River, Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	Fredericton, Canada	2018-05-09
	Toronto, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Mississauga, Canada	2018-05-09
	US	2018-05-09
	Simcoe, Canada	2018-05-09
	US	2018-05-09
	kincardine, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Burlington, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	Abbotsford, Canada	2018-05-09
	US	2018-05-09
	London, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Mississauga, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Bradford, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Port Coquitlam, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Mississauga, Canada	2018-05-09
	US	2018-05-09
	Leduc, Canada	2018-05-09
	Burnaby, Canada	2018-05-09
	US	2018-05-09
	Whitney, Canada	2018-05-09
	Halifax, NS, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	St-Lazare, Canada	2018-05-09

Name	Location	Date
	North Vancouver, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Qualicum Beach, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Stratford, Canada	2018-05-09
	Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	US	2018-05-09
	Edmonton, Canada	2018-05-09
	barrington, Canada	2018-05-09
	Peterborough, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Cambridge, On, Canada	2018-05-09
	Halton Hills, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09

Name	Location	Date
	US	2018-05-09
	Toronto, Canada	2018-05-09
	South River, Canada	2018-05-09
	Saskatoon, Canada	2018-05-09
	Canada	2018-05-09
	Guelph, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	St. Jacobs, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Halton Hills, Canada	2018-05-09
	Halifax NS, Canada	2018-05-09
	Mount Pearl, Canada	2018-05-09
	Belle River, Canada	2018-05-09
	Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Whitby, Canada	2018-05-09
	Ottawa, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Port Colborne, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Boulder CO, Colorado, US	2018-05-09
	London, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Langley, Canada	2018-05-09
	Oshawa, Canada	2018-05-09
	US	2018-05-09
	Maple Ridge, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	Pointe-Claire, Canada	2018-05-09
	Rigaud, Canada	2018-05-09
	Sydenham, Canada	2018-05-09
	Toronto, Canada	2018-05-09

Name	Location	Date
	Rhinelander, Wisconsin, US	2018-05-09
	Winnipeg, Canada	2018-05-09
	US	2018-05-09
	Montreal, Canada	2018-05-09
	US	2018-05-09
	Union Bay, Canada	2018-05-09
	US	2018-05-09
	Kelowna BC, Canada	2018-05-09
	US	2018-05-09
	Mason City, Iowa, US	2018-05-09
	White Plains, New York, US	2018-05-09
	Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	Montréal, Québec, Canada	2018-05-09
	Gyeonggi-do, South Korea	2018-05-09
	Campbell River, Canada	2018-05-09
	Maple Ridge, Canada	2018-05-09
	Kingston, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Dollard-Des Ormeaux, Canada	2018-05-09
	Victoria, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Canada	2018-05-09
	Montreal, Canada	2018-05-09
	US	2018-05-09
	Mississauga, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	London, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Burnaby, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Sechelt, Canada	2018-05-09
	Duncan, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Chelsea, Canada	2018-05-09

Name	Location	Date
	Ammon, Canada	2018-05-09
	Courtenay, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Vaughan, Canada	2018-05-09
	Squamish, Canada	2018-05-09
	US	2018-05-09
	Québec, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	Courtenay, Canada	2018-05-09
	Miami, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Maple Ridge, Canada	2018-05-09
	US	2018-05-09
	Belgium	2018-05-09
	US	2018-05-09
	Waterloo, ON, Canada	2018-05-09
	Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	Regina, Canada	2018-05-09

Name	Location	Date
	Port Alberni, Canada	2018-05-09
	rothesay, Canada	2018-05-09
	Parkhill, Canada	2018-05-09
	North York, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	Surrey, Canada	2018-05-09
	Saint Thomas, Canada	2018-05-09
	Chilliwack, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Perth, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Abbotsford, Canada	2018-05-09
	US	2018-05-09
	Mississauga, Canada	2018-05-09
	Chatham-Kent, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Kitchener, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Dundas, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	West Kelowna, Canada	2018-05-09
	Angus, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Longueuil, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	Canada	2018-05-09
	Calgary, Canada	2018-05-09
	US	2018-05-09
	Beaconsfield, Canada	2018-05-09
	Quesnel, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Montréal, Canada	2018-05-09
	Saint John, Canada	2018-05-09

Name	Location	Date
	Victoria, Canada	2018-05-09
	Regina, Canada	2018-05-09
	Enfield, Canada	2018-05-09
	Canada	2018-05-09
	Swan River, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Fort Frances, Canada	2018-05-09
	Nanaimo, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	London, Canada	2018-05-09
	Brampton, Canada	2018-05-09
	Hudson, Canada	2018-05-09
	Prince George, Canada	2018-05-09
	Niagara-on-the-Lake, Canada	2018-05-09
	Οτάβα, Canada	2018-05-09
	US	2018-05-09
	Sooke, Canada	2018-05-09
	Pointe-claire, Canada	2018-05-09
	Regina, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Kitchener, Canada	2018-05-09
	US	2018-05-09
	Quebec, Canada	2018-05-09
	Montreal West, Canada	2018-05-09
	Saint-Prosper, Canada	2018-05-09
	US	2018-05-09
	Fergus, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Westville, NS, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Oakville, Canada	2018-05-09
	US	2018-05-09
	Kamloops, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09
	Redvers, Canada	2018-05-09
	richmond, Canada	2018-05-09
	US	2018-05-09
	Kamloops, Canada	2018-05-09
	Nanaimo, Canada	2018-05-09
	Campbell River, Canada	2018-05-09
	US	2018-05-09
	Grimsby, Canada	2018-05-09
	Sooke, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Canada	2018-05-09
	London, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	Sault Ste. Marie, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	US	2018-05-09
	Brossard, Canada	2018-05-09
	Campbell River, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	West Vancouver, Canada	2018-05-09
	US	2018-05-09
	Lethbridge, Canada	2018-05-09
	Canada	2018-05-09
	Gilford, Canada	2018-05-09
	Beirut, Canada	2018-05-09
	US	2018-05-09
	pt. coquitlam, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Boulder, Colorado, US	2018-05-09

Name	Location	Date
	Lethbridge, Canada	2018-05-09
	Harriston, ON, Canada	2018-05-09
	Lethbridge, Canada	2018-05-09
	New Westminster, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	windsor, nova scotia, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	London, Canada	2018-05-09
	Magog, Canada	2018-05-09
	Quesnel, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Strathroy, Canada	2018-05-09
	Carignan, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Whistler, Canada	2018-05-09
	Gatineau, Canada	2018-05-09
	US	2018-05-09
	Lindsay, Canada	2018-05-09
	Blackstock, Canada	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Saguenay, Canada	2018-05-09
	North Saanich, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Poplar Point, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Drumheller, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	US	2018-05-09
	US	2018-05-09
	Winnipeg, Canada	2018-05-09
	Ladysmith, Canada	2018-05-09
	US	2018-05-09
	North Vancouver, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Fort Erie, Canada	2018-05-09
	US	2018-05-09
	Edmonton, Canada	2018-05-09
	Nanaimo, BC, Canada	2018-05-09
	BRAMPTON, Canada	2018-05-09
	US	2018-05-09
	Coquitlam, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Vernon, Canada	2018-05-09
	SAINT-JÉRÔME, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Montreal, Canada	2018-05-09
	Chilliwack, Canada	2018-05-09
	Comox, Canada	2018-05-09
	Weslaco, Texas, US	2018-05-09
	Whistler, Canada	2018-05-09
	US	2018-05-09
	Fordwich, Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	SASKATOON, Canada	2018-05-09
	Richmond Hill, Canada	2018-05-09
	US	2018-05-09
	Vernon, Canada	2018-05-09
	Kelowna, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Langley, Canada	2018-05-09
	US	2018-05-09
	Winnipeg, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	US	2018-05-09
	Surrey, Canada	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09
	US	2018-05-09
	Langley Township, Canada	2018-05-09
	Stratford, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Courtenay, Canada	2018-05-09
	US	2018-05-09
	New Denver, Canada	2018-05-09
	Saskatoon, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Port Elgin, On, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Grande Prairie, Canada	2018-05-09

Name	Location	Date
	Calgary, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09
	Lac la Biche, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	US	2018-05-09
	Waterloo, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Surrey, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Burnaby, Canada	2018-05-09
	Port Moody, Canada	2018-05-09
	UK	2018-05-09

Name	Location	Date
	Sudbury, Canada	2018-05-09
	Evansburg, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	Sidney, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Nanaimo, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	Fort Erie, Canada	2018-05-09
	Richmond Hill, Canada	2018-05-09
	Lindsay, Canada	2018-05-09
	Cannington, Canada	2018-05-09
	Surrey, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	Windsor, Canada	2018-05-09
	US	2018-05-09
	Port Alberni, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Lethbridge, Canada	2018-05-09
	US	2018-05-09
	Rijeka, Croatia	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Stoney Creek, Canada	2018-05-09
	Pickering, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Sylvan Lake, Canada	2018-05-09
	US	2018-05-09
	Prince George, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Vancouver, BC, Canada	2018-05-09
	Winkler, Canada	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	US	2018-05-09
	Russia	2018-05-09
	Uxbridge, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Melville, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Gibsons, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Victoria, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	US	2018-05-09
	Salt Spring Island BC, Canada	2018-05-09
	Shawnigan Lake, B.C., Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Calgary, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	Comox, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Edmonton, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Victoria, Canada	2018-05-09
	UK	2018-05-09
	Victoria, Canada	2018-05-09
	Worcester, UK	2018-05-09
	Vancouver, Canada	2018-05-09
	Spain	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	UK	2018-05-09
	Portugal	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	White Rock, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Whitby, Canada	2018-05-09

Name	Location	Date
	Red Deer, Canada	2018-05-09
	Newmarket, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Saint Kilda, Australia	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Delta, Canada	2018-05-09
	London, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09

Name	Location	Date
	UK	2018-05-09
	Calgary, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Lake Country, Canada	2018-05-09
	UK	2018-05-09
	., Canada	2018-05-09
	Rossburn, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Adelaide, Australia	2018-05-09
	Barrhead, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Abbotsford, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	whitby, Canada	2018-05-09
	Barrie, Canada	2018-05-09
	Kitchener, Canada	2018-05-09
	Miramichi, Canada	2018-05-09
	Ridgeway, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Georgetown, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Hamilton, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Kitchener, Canada	2018-05-09
	US	2018-05-09
	Mississauga, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Singapore	2018-05-09
	UK	2018-05-09
	Ottawa, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Halifax, Canada	2018-05-09
	US	2018-05-09
	Kingston, Canada	2018-05-09
	Harvey, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	UK	2018-05-09
	Markham, Canada	2018-05-09
	Durham, Canada	2018-05-09
	Huntsville, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Sainte-Adèle, Canada	2018-05-09
	Montreal Quebec, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Brantford, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Oshawa, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Foxhole, England, UK	2018-05-09
	Longueuil, Canada	2018-05-09
	Spain	2018-05-09
	Montreal, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Oakville, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Elora, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Vaughan, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Green Bay, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Scoudouc Road, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Bonaventure, Canada	2018-05-09
	US	2018-05-09
	Calgary, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Hanwell, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	India	2018-05-09
	North View, Canada	2018-05-09
	Dunnville, ON, Canada	2018-05-09
	Ipswich, England, UK	2018-05-09
	Innisfil, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Saint John, Canada	2018-05-09
	UK	2018-05-09
	Bath, Canada	2018-05-09
	Kincardine, Canada	2018-05-09
	Oshawa, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Whitby, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Halifax, Canada	2018-05-09
	Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	Deux-montagnes, Canada	2018-05-09
	Canada	2018-05-09
	Napanee, Canada	2018-05-09
	Comox, Canada	2018-05-09
	Canada	2018-05-09
	Pickering, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Kinuso, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Halifax, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	South Porcupine, Canada	2018-05-09
	US	2018-05-09
	Peterborough, Canada	2018-05-09
	Riverview, Canada	2018-05-09
	Canada	2018-05-09
	Lévis, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Saugeen Shores, Ontario, Canada	2018-05-09
	Hearst, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Saint-Pacôme, Canada	2018-05-09
	Québec, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Cambridge, Canada	2018-05-09
	nestleton, Canada	2018-05-09
	Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Aurora, Canada	2018-05-09
	North Saanich, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	US	2018-05-09
	North Tetagouche, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Russia	2018-05-09
	Canada	2018-05-09
	Jonquière, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Pickering, Canada	2018-05-09
	Rouyn-Noranda, Canada	2018-05-09
	US	2018-05-09
	ste-marguerite, Canada	2018-05-09
	US	2018-05-09
	Bécancour, Canada	2018-05-09
	Canada	2018-05-09
	Peterborough, Canada	2018-05-09
	Thamesford, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Shuniah, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Tsawwassen, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Orleans, Canada	2018-05-09
	Canada	2018-05-09
	Montréal, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Kitchener, Canada	2018-05-09
	Kinmount, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09

Name	Location	Date
	UK	2018-05-09
	Thorold, Canada	2018-05-09
	Medicine Hat, Canada	2018-05-09
	Fort Saskatchewan, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Watford, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	Newmarket, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	Uxbridge, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Grimsby, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Peterborough, Canada	2018-05-09
	Deep River, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	ORILLIA, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Beaver Creek, Canada	2018-05-09
	US	2018-05-09
	Kelowna, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Canada	2018-05-09
	Westmount, Canada	2018-05-09
	Antigonish, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Stoney Creek, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	London, Canada	2018-05-09
	laval, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	New Glasgow, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Antigonish, Canada	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	toronto, Canada	2018-05-09
	Granville Ferry, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Sudbury, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	FORT FRANCES, Canada	2018-05-09
	Canada	2018-05-09
	Richmond Hill, Canada	2018-05-09
	Montréal, Canada	2018-05-09
	US	2018-05-09
	Port Hope, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Edmonton, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Port Sydney, Canada	2018-05-09
	Hfx, Canada	2018-05-09

Name	Location	Date
	Montréal, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Canada	2018-05-09
	Dryden, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	UK	2018-05-09
	North Vancouver, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	Salaberry-de-Valleyfield, Canada	2018-05-09
	US	2018-05-09
	Goderich, Canada	2018-05-09
	Lilburn, Georgia, US	2018-05-09
	Kitchener, Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	simcoe, Canada	2018-05-09

Name	Location	Date
	Calgary, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	US	2018-05-09
	Halifax, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Waverley, Canada	2018-05-09
	US	2018-05-09
	Guelph, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Videbaek, Denmark	2018-05-09
	Canada	2018-05-09
	Port Coquitlam, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Pictou Landing, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Toronto, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Pictou, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	Brantford, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Oliver, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Creston, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Chatham-Kent, Canada	2018-05-09
	Canada	2018-05-09
	Pictou, Canada	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Fort Erie, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09
	Paradise, Canada	2018-05-09
	US	2018-05-09
	Pictou, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	Abbotsford, Canada	2018-05-09
	Winnipeg, Canada	2018-05-09
	Montréal, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	US	2018-05-09
	Oshawa, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Brampton, Canada	2018-05-09
	Lévis, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Richmond Hill, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Montréal, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Halifax, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Richmond Hill, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Courtenay, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Mascouche, Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Burlington, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Saint Albert, Canada	2018-05-09
	Sangudo, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	White Rock, Canada	2018-05-09
	Canada	2018-05-09
	Oshawa, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	East Zorra-Tavistock, Canada	2018-05-09
	Kentville, Canada	2018-05-09
	UK	2018-05-09
	Sherwood Park, Canada	2018-05-09
	Canada	2018-05-09
	London, Canada	2018-05-09
	Sydney, Canada	2018-05-09
	Scotsburn, Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Victoria, Canada	2018-05-09

Name	Location	Date
	Montreal, Canada	2018-05-09
	US	2018-05-09
	Stellarton, Canada	2018-05-09
	US	2018-05-09
	Hamilton, Canada	2018-05-09
	Sofia, Bulgaria	2018-05-09
	Guelph, Canada	2018-05-09
	US	2018-05-09
	Toney River, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Brampton, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Cairo, Egypt	2018-05-09
	North Wiltshire, Canada	2018-05-09
	Glen Haven, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Squamish, Canada	2018-05-09
	Burlington, Canada	2018-05-09
	Canada	2018-05-09
	Sharbot lake, Canada	2018-05-09
	Middleton, Canada	2018-05-09
	Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Prince George, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09

Name	Location	Date
	Vancouver, Canada	2018-05-09
	UK	2018-05-09
	Kamloops, Canada	2018-05-09
	Saltspring Island, BC, Canada	2018-05-09
	Burnaby, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Vernon, Canada	2018-05-09
	UK	2018-05-09
	Boucherville, Canada	2018-05-09
	Montréal, Canada	2018-05-09
	pictou, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	CALGARY, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Woodville, Canada	2018-05-09
	Newmarket, Canada	2018-05-09
	HALIBURTON, Canada	2018-05-09
	US	2018-05-09
	Pictou, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Montréal, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Smithers, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Calgary, Canada	2018-05-09

Name	Location	Date
	Victoria, Canada	2018-05-09
	Dawson, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Whitchurch-Stouffville, Canada	2018-05-09
	Riverview, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Saskatoon, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Coldstream, B.C., Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Victoria, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Canada	2018-05-09
	Maple Ridge, Canada	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Redwood Meadows, Canada	2018-05-09
	New glasgow, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	TORONTO, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Calgary, Canada	2018-05-09
	Nictaux, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Wentworth, Canada	2018-05-09
	US	2018-05-09
	Kitchener, Canada	2018-05-09

Name	Location	Date
	US	2018-05-09
	Red Deer, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Windsor, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Victoria, Canada	2018-05-09
	US	2018-05-09
	Smithers, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	UK	2018-05-09

Name	Location	Date
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	US	2018-05-09
	Keremeos, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Canada	2018-05-09
	Montréal, Canada	2018-05-09
	Prince Edward, Canada	2018-05-09
	Newmarket, Canada	2018-05-09
	Canada	2018-05-09
	London, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	Verdun, QC, Canada	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Kitchener, Canada	2018-05-09
	Laval, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Summerside, Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	Kelowna, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09

Name	Location	Date
	Antigonish, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Brampton, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Surrey, Canada	2018-05-09
	US	2018-05-09
	Scarborough, Canada	2018-05-09
	West Vancouver, B.C., Canada	2018-05-09
	Rockwood, Canada	2018-05-09
	Canada	2018-05-09
	Richmond Hill, Canada	2018-05-09
	Canada	2018-05-09
	Beaubassin East, Canada	2018-05-09
	Canada	2018-05-09
	Merville, Canada	2018-05-09
	Moncton, Canada	2018-05-09

Name	Location	Date
	Thornbury, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Nanaimo, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	North Vancouver, Canada	2018-05-09
	UK	2018-05-09
	cochrane, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Courtenay, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Little River, Canada	2018-05-09
	UK	2018-05-09
	Montreal, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Covington, Louisiana, US	2018-05-09
	Kelowna, Canada	2018-05-09
	UK	2018-05-09
	Vernon, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Kirkland, Canada	2018-05-09
	New Glasgow nova scotia, Canada	2018-05-09
	Canada	2018-05-09
	Dubai, England, UK	2018-05-09
	US	2018-05-09
	Whistler, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	Hamilton, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Creston, Canada	2018-05-09
	Hunter river, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Middle Sackville, Canada	2018-05-09
	Canada	2018-05-09
	High River, Canada	2018-05-09
	Brandon, Canada	2018-05-09
	Penticton, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Bolton, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Fort Collins, Colorado, US	2018-05-09
	US	2018-05-09
	halifax, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Vancouver, Canada	2018-05-09
	Hagersville, Canada	2018-05-09
	Bonshaw, Canada	2018-05-09
	Devon AB, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Medicine Hat, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Langley, Canada	2018-05-09
	Sudbury, Canada	2018-05-09
	Canada	2018-05-09
	Ontario, Canada	2018-05-09
	US	2018-05-09
	Riverview, Canada	2018-05-09
	Victoria, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Halifax,NS, Canada	2018-05-09
	Canada	2018-05-09
	Halifax, Canada	2018-05-09
	US	2018-05-09
	Winnipeg, Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09

Name	Location	Date
	Calgary, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Belle River, Canada	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	Canada	2018-05-09
	Waterloo, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Welland, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Scotsburn, Canada	2018-05-09
	pictou, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Sault Ste. Marie, Canada	2018-05-09
	UK	2018-05-09
	Winnipeg, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	New Glasgow, Canada	2018-05-09
	Oromocto, Canada	2018-05-09
	Cobourg, Canada	2018-05-09
	UK	2018-05-09
	Cranbrook, Canada	2018-05-09
	West Vancouver, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Peterborough, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Courtenay, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Burnaby, Canada	2018-05-09
	Victoria, Canada	2018-05-09
	Canada	2018-05-09
	Prince George, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Sandy Lake, Canada	2018-05-09
	Amherst, Canada	2018-05-09
	Pompano Beach, Florida, US	2018-05-09
	Ottawa, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Montréal, Canada	2018-05-09

Name	Location	Date
	Thunder Bay, Canada	2018-05-09
	UK	2018-05-09
	Dartmouth, Canada	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Surrey, Canada	2018-05-09
	Thorburn, Canada	2018-05-09
	Canada	2018-05-09
	Victoria BC, Canada	2018-05-09
	Canada	2018-05-09
	Vernon, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Pictou, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	UK	2018-05-09
	Bear River, Canada	2018-05-09
	Belleville, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Souris, Canada	2018-05-09
	Ottawa, Canada	2018-05-09
	Montague, Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Hamilton, on, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	UK	2018-05-09
	Fredericton, Canada	2018-05-09
	UK	2018-05-09
	Toronto, Canada	2018-05-09
	US	2018-05-09
	Montréal, Canada	2018-05-09
	Milton, Canada	2018-05-09

Name	Location	Date
	UK	2018-05-09
	Langley, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	UK	2018-05-09
	Yarmouth, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Thunder Bay, Canada	2018-05-09
	Canada	2018-05-09
	Longueuil, Canada	2018-05-09
	US	2018-05-09
	Gatineau, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Warburg, Canada	2018-05-09
	Moncton, Canada	2018-05-09
	New Glasgow, Canada	2018-05-09
	East Gwillimbury, Canada	2018-05-09
	Markham, Canada	2018-05-09
	Calgary, Canada	2018-05-09

Name	Location	Date
	Ottawa, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	souris, Canada	2018-05-09
	Silver Spring, Maryland, US	2018-05-09
	Abbotsford, Canada	2018-05-09
	Whistler, Canada	2018-05-09
	Whitehorse, Canada	2018-05-09
	Bridgewater, Canada	2018-05-09
	Chilliwack, Canada	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	Burlington, Canada	2018-05-09
	Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Westville, Canada	2018-05-09
	Truro, Canada	2018-05-09
	Canada	2018-05-09
	Barrie, Canada	2018-05-09
	Hawkesbury, Canada	2018-05-09
	Pictou, Canada	2018-05-09
	Toronto, Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Burlington, Canada	2018-05-09
	Canada	2018-05-09
	Brampton, Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	Westville, Canada	2018-05-09
	Orlando, Florida, US	2018-05-09
	Canada	2018-05-09
	London, Canada	2018-05-09
	Dartmouth, Canada	2018-05-09
	Canada	2018-05-09
	Houston, Texas, US	2018-05-09
	Boularderie CB NS, Canada	2018-05-09
	Scotsburn, Canada	2018-05-09
	Thorburn, Canada	2018-05-09
	Nova Scotia, Canada	2018-05-09
	Canada	2018-05-09
	Montague, Canada	2018-05-09
	Armstrong, Canada	2018-05-09
	New Glasgow, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Canada	2018-05-09
	Leduc,Alberta, Canada	2018-05-09
	UK	2018-05-09
	UK	2018-05-09
	US	2018-05-09
	Surrey, Canada	2018-05-09
	Calgary, Canada	2018-05-09
	Argentina	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Dayton, Ohio, US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Nanaimo, Canada	2018-05-09
	US	2018-05-09
	Nelson, BC, Canada	2018-05-09
	Canada	2018-05-09
	Campbell River, Canada	2018-05-09
	Edmonton, Canada	2018-05-09
	Canada	2018-05-09
	Toronto, Canada	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Manchester, New Hampshire, US	2018-05-09
	Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Barrie, Canada	2018-05-09
	Canada	2018-05-09
	Hamilton, Canada	2018-05-09
	Lakeville, Canada	2018-05-09
	Trenton, Canada	2018-05-09
	Coquitlam, Canada	2018-05-09
	Antigonish, Canada	2018-05-09
	Huntington, New York, US	2018-05-09
	Norfolk, Massachusetts, US	2018-05-09
	Antigonish, Canada	2018-05-09
	US	2018-05-09
	Toronto, Canada	2018-05-09
	Truro, Canada	2018-05-09
	Pictou, Canada	2018-05-09
	Montreal, Canada	2018-05-09
	Guadalajara, US	2018-05-09
	Canada	2018-05-09

Name	Location	Date
	Arlington, Massachusetts, US	2018-05-09
	Calgary, Alberta, Canada	2018-05-09
	West Hartford, Connecticut, US	2018-05-09
	US	2018-05-09
	Moncton, Canada	2018-05-09
	UK	2018-05-09
	Canada	2018-05-09
	Powerview, Canada	2018-05-09
	Seabright, Canada	2018-05-09
	Winnipeg Beach, Canada	2018-05-09
	Mississauga, Canada	2018-05-09
	Souris, Canada	2018-05-09
	Oakville, Canada	2018-05-09
	Langley, Canada	2018-05-09
	Halifax, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Desable, Canada	2018-05-09
	Windsor, Canada	2018-05-09
	US	2018-05-09

Name	Location	Date
	US	2018-05-09
	Gatineau, Canada	2018-05-09
	US	2018-05-09
	Gatineau, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	US	2018-05-09
	Calgary, Canada	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Canada	2018-05-09
	US	2018-05-09
	Ottawa, Canada	2018-05-09
	Canada	2018-05-10
	US	2018-05-10
	Banff, Canada	2018-05-10
	Edmonton, Canada	2018-05-10
	Fort Erie, Canada	2018-05-10
	Edmonton, Canada	2018-05-10
	Wallace, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Dunvegan, Canada	2018-05-10
	Diligent River, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Cochrane, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Victoria, Canada	2018-05-10
	Canada	2018-05-10
	Toronto, Canada	2018-05-10
	US	2018-05-10
	London, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Calgary, Canada	2018-05-10
	Oakville, Canada	2018-05-10
	Canada	2018-05-10
	Dartmouth, Canada	2018-05-10
	Pictou, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Vancouver, BC, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	canada, Canada	2018-05-10
	US	2018-05-10
	Winnipeg, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Merigomish, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	North Vancouver, Canada	2018-05-10
	Stratford, Canada	2018-05-10
	Antigonish, Canada	2018-05-10
	Canada	2018-05-10
	Longwood, Florida, US	2018-05-10
	Westville, Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Peterborough, Canada	2018-05-10
	US	2018-05-10

Name	Location	Date
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	St. John's, Canada	2018-05-10
	Canada	2018-05-10
	Calgary, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Montréal, Canada	2018-05-10
	Canada	2018-05-10
	Stellarton, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Lake Mary, Florida, US	2018-05-10
	HAMILTON, Canada	2018-05-10
	US	2018-05-10
	Durango, Colorado, US	2018-05-10
	Canada	2018-05-10
	Colorado Springs, Colorado, US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Squamish, Canada	2018-05-10
	US	2018-05-10
	Ontario, Canada	2018-05-10
	Sydney, Canada	2018-05-10
	New Hamburg, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Palo Alto, California, US	2018-05-10
	Canada	2018-05-10
	Edmonton, Canada	2018-05-10
	Trail, Canada	2018-05-10
	US	2018-05-10
	Weyburn, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Collingwood, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Edmonton, Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Lloydminster, Canada	2018-05-10
	US	2018-05-10
	Summerside, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Toronto, Canada	2018-05-10
	US	2018-05-10
	Westland, Michigan, US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Townsend, Massachusetts, US	2018-05-10
	Millbrook, Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Rossland, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Gatineau, Canada	2018-05-10
	Stellarton, Canada	2018-05-10
	RR2 Staffa, Canada	2018-05-10
	Canada	2018-05-10
	Surrey, Canada	2018-05-10
	Lake Villa, Illinois, US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Brooklyn, Connecticut, US	2018-05-10
	Canada	2018-05-10
	Strathmore, Canada	2018-05-10
	Kamloops, BC, Canada	2018-05-10
	Comox, Canada	2018-05-10
	Dartmouth, Canada	2018-05-10

Name	Location	Date
	White Rock, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	High River, Canada	2018-05-10
	Burnaby, Canada	2018-05-10
	Ajax, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Montreal, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Kelowna, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Burlington, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Thornhill, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Bow Island, Canada	2018-05-10
	Canada	2018-05-10
	Montreal, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	victoria, Canada	2018-05-10
	New Westminster, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Port Caledonia, Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Victoria, BC, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	US	2018-05-10
	Millville, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Edmonton, Canada	2018-05-10
	Vancouver, Canada	2018-05-10
	Fort Saint John, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Highland Park, New Jersey, US	2018-05-10
	Kitchener, Canada	2018-05-10
	Libertyville, Illinois, US	2018-05-10
	Mississauga, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Vancouver, Canada	2018-05-10
	Victoria Harbour, Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Sundridge, Canada	2018-05-10
	UK	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Fernie, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Campbell River, BC, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Stevensville on., Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Dryden, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Maple Ridge, Canada	2018-05-10
	Thornhill, Canada	2018-05-10
	Burnaby, Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Richmond, Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	White Rock, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Vancouver, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10

Name	Location	Date
	UK	2018-05-10
	Stoney Creek, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	montreal, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	York, England, UK	2018-05-10
	UK	2018-05-10
	Victoria, Canada	2018-05-10
	Calgary, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Langley, Canada	2018-05-10
	North Vancouver, Canada	2018-05-10
	Constanta, Romania	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Qualicum Beach, Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Toronto, Canada	2018-05-10
	kitchener, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Caledonia, Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Blakelands, England, UK	2018-05-10
	Hanwell, Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Victoria, B. C., Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Dartmouth, Canada	2018-05-10
	UK	2018-05-10
	Hope Town, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Halifax, Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Antigonish, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Leyton, England, UK	2018-05-10
	Halifax, Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Dartmouth N.S., Canada	2018-05-10
	Antigonish, Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Oakville, Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Montreal, Canada	2018-05-10
	UK	2018-05-10
	Toronto, Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	RR # 1 New Glasgow, N.S., Canada	2018-05-10
	Canada	2018-05-10
	Embrun, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Halifax, Canada	2018-05-10
	Dartmouth, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Canso, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Polska, Poland	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Toronto, Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	Canada	2018-05-10
	Dundas, Canada	2018-05-10
	Katy, Texas, US	2018-05-10
	Canada	2018-05-10
	Scotsburn, Canada	2018-05-10
	Barrie, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Etobicoke, Canada	2018-05-10
	Bolton, Canada	2018-05-10
	UK	2018-05-10
	Calgary, Canada	2018-05-10
	Halifax, Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Battersea, Canada	2018-05-10
	Toronto, Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Montreal, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Denver, Colorado, US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Uxbridge, England, UK	2018-05-10
	Canada	2018-05-10
	Pictou, Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Kentville, Nova Scotia, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Kingston, Ontario, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Regina, Canada	2018-05-10
	Grovedale, Canada	2018-05-10
	Canada	2018-05-10
	Germany	2018-05-10
	las vegas, Nevada, US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10

Name	Location	Date
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Chatham, England, UK	2018-05-10
	Niagara Falls, Canada	2018-05-10
	Canada	2018-05-10
	Antigonish, Canada	2018-05-10
	Canada	2018-05-10
	Munster, Canada	2018-05-10
	New glasgow, Canada	2018-05-10
	Canada	2018-05-10
	Shelburne, Nova Scotia, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Market Rasen, England, UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Dartmouth, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Scarborough, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Shelburne, Canada	2018-05-10
	Campbell River, Canada	2018-05-10
	Canada	2018-05-10
	Calgary, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Toronto, Canada	2018-05-10

Name	Location	Date
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Winnipeg, Canada	2018-05-10
	Lytton, Canada	2018-05-10
	Jamaica, New York, US	2018-05-10
	Canada	2018-05-10
	Winnipeg, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Port Elgin, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Nelson, Canada	2018-05-10
	Vancouver, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Barrie, Canada	2018-05-10
	US	2018-05-10
	Toronto, Canada	2018-05-10
	UK	2018-05-10

Name	Location	Date
	US	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Hamilton, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Toronto, Canada	2018-05-10
	Stellarton, Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Vancouver, Canada	2018-05-10
	Roberts Creek, Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	NEPEAN, ON, Canada	2018-05-10
	Canada	2018-05-10
	Woodstock, Canada	2018-05-10
	Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Canada	2018-05-10
	Port Moody, Canada	2018-05-10
	grafton, Canada	2018-05-10
	Canada	2018-05-10
	Saint-charles-borromée, Canada	2018-05-10
	Surrey, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Montréal, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Keswick, Canada	2018-05-10
	Canada	2018-05-10
	Burnaby, Canada	2018-05-10
	Winnipeg, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Blind Bay, Canada	2018-05-10
	US	2018-05-10
	Cornwall ,PE, Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	delta, bc, Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Sainte Anne DE Bellevue, Canada	2018-05-10
	Canada	2018-05-10
	Victoria, Canada	2018-05-10
	Edmonton, Canada	2018-05-10
	US	2018-05-10
	Upper Northfield, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Tweed, Canada	2018-05-10
	Canada	2018-05-10
	Mission BC, Canada	2018-05-10

Name	Location	Date
	White Rock, Canada	2018-05-10
	Canada	2018-05-10
	Summerside, Canada	2018-05-10
	Canada	2018-05-10
	Powell River, Canada	2018-05-10
	Canada	2018-05-10
	Brentwood Bay, Canada	2018-05-10
	Lethbridge, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	France	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Windsor, Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10

Name	Location	Date
	US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Sydney, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Barrie, Canada	2018-05-10
	Sackville, Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Winnipeg, Canada	2018-05-10
	UK	2018-05-10
	Edmonton, Canada	2018-05-10
	Bracebridge, Canada	2018-05-10
	Oshawa, Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Niagara Falls, Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Mobile, Alabama, US	2018-05-10
	Bras d'Or N.S., Canada	2018-05-10
	Okotoks, Canada	2018-05-10
	Truro, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Milton, Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	US	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Hamilton, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Pictou, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Saint Thomas, Canada	2018-05-10
	Gernsbach, Germany	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Richmond, Canada	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Victoria, Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10

Name	Location	Date
	UK	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	MONTREAL, Canada	2018-05-10
	US	2018-05-10
	Halifax, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Halifax, Canada	2018-05-10
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	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Belcarra, Canada	2018-05-10
	Bruxelles (NoH), Belgium	2018-05-10
	Pictou, Canada	2018-05-10

Name	Location	Date
	UK	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	Roberts Creek B.C., Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Brampton, Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Bathurst, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Gatineau, Canada	2018-05-10
	Anon, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Cloverdale, BC, Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Millcove, PEI, Canada	2018-05-10
	Powell River, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Israel	2018-05-10
	UK	2018-05-10
	Delta, Canada	2018-05-10
	Canada	2018-05-10
	Gatineau, Canada	2018-05-10
	Canada	2018-05-10
	Saskatoon, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Middle Sackville, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Dartmouth, Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
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	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	Lubbock, Texas, US	2018-05-10
	Nelson, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Elgin, Canada	2018-05-10
	Canada	2018-05-10
	Toronto, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Montreal, Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Brantford, Canada	2018-05-10
	Canada	2018-05-10
	Pictou, Canada	2018-05-10
	Saint-Basile-le-Grand, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Summerside, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Newmarket, Canada	2018-05-10
	Scotsburn, N.S., Canada	2018-05-10
	Winnipeg, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Leamington, Canada	2018-05-10

Name	Location	Date
	Monks Head, Canada	2018-05-10
	Canada	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	Sydney, Canada	2018-05-10
	Canada	2018-05-10
	Mississauga, Canada	2018-05-10
	UK	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	US	2018-05-10
	US	2018-05-10
	UK	2018-05-10
	US	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Vancouver, Canada	2018-05-10
	Canada	2018-05-10
	Salt Spring Island, Canada	2018-05-10

Name	Location	Date
	Canada	2018-05-10
	Canada	2018-05-10
	Roberts Creek, Canada	2018-05-10
	Barrie, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Pictou, Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
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	Canada	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10
	New Glasgow, Canada	2018-05-10
	US	2018-05-10
	Canada	2018-05-10
	Canada	2018-05-10

Name	Location	Date
	Stellarton, Canada	2018-05-10
	Canada	2018-05-10
	Ottawa, Canada	2018-05-10
	Scotsburn, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Abbotsford, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Halifax, Canada	2018-05-11
	Gore, Canada	2018-05-11
	Eel Ground, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	US	2018-05-11
	River john, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Salt Springs, Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Londonderry, Canada	2018-05-11
	Lower Sackville, Canada	2018-05-11
	Canada	2018-05-11
	Midhurst, Canada	2018-05-11
	Canada	2018-05-11
	New Glasgow, Canada	2018-05-11
	Canada	2018-05-11
	Duncan, Canada	2018-05-11
	Oakville, Canada	2018-05-11
	Canada	2018-05-11
	Lantzville, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	US	2018-05-11
	Roxboro, Canada	2018-05-11
	US	2018-05-11
	Vancouver, Canada	2018-05-11

Name	Location	Date
	Calgary, Canada	2018-05-11
	Canada	2018-05-11
	Wellesley, Canada	2018-05-11
	US	2018-05-11
	Charlottetown, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Nanaimo, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Digby, Canada	2018-05-11
	US	2018-05-11
	Vancouver, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Ottawa, Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Stellarton, Canada	2018-05-11
	Pointe-Claire, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Stratford, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Beaverton, Oregon, US	2018-05-11
	Boutiliers Point, Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Lethbridge, Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Victoria, Canada	2018-05-11
	Canada	2018-05-11
	Montréal, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Charlottetown, Canada	2018-05-11
	Halifax, Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	US	2018-05-11

Name	Location	Date
	US	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	napanee, Canada	2018-05-11
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	Gabriola, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Victoria, Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	ada	2018-05-11
		2018-05-11
	nipeg, Canada	2018-05-11
	ada	2018-05-11
	ada	2018-05-11
	ada	2018-05-11
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	ada	2018-05-11
	ra, Canada	2018-05-11
	ada	2018-05-11
		2018-05-11
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	ada	2018-05-11
		2018-05-11
		2018-05-11
	ada	2018-05-11
		2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Kitchener, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	New Glasgow, Canada	2018-05-11
	Canada	2018-05-11
	London, Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Bath, England, UK	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Ghana	2018-05-11
	Ottawa, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Enderby, Canada	2018-05-11
	Sandton, South Africa	2018-05-11
	Canada	2018-05-11
	Cambridge, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	Stockholm, Sweden	2018-05-11
	Montréal, Canada	2018-05-11

Name	Location	Date
	Mâcon, France	2018-05-11
	Canada	2018-05-11
	Durham, UK	2018-05-11
	Bridgewater, Canada	2018-05-11
	Surrey, Canada	2018-05-11
	Hot Springs Village, Arkansas, US	2018-05-11
	Pictou, Canada	2018-05-11
	Burnley, England, UK	2018-05-11
	Beckenham, England, UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	Lower Sackville, Canada	2018-05-11
	Orr Lake, Canada	2018-05-11
	US	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	Halifax, Canada	2018-05-11

Name	Location	Date
	Ottawa, Canada	2018-05-11
	Halifax, Canada	2018-05-11
	Stellarton, Canada	2018-05-11
	Canada	2018-05-11
	Sudbury, Canada	2018-05-11
	New Waterford, Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	New Glasgow, Canada	2018-05-11
	Laguna Woods, California, US	2018-05-11
	Joliet, Illinois, US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Baden, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Scotsburn, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Windsor, Canada	2018-05-11
	Canada	2018-05-11
	North Myrtle Beach, South Carolina, US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Abercrombie, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Calgary, Canada	2018-05-11
	New York, New York, US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Saltcoats, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Montreal, Canada	2018-05-11
	Canada	2018-05-11
	Pictou,N.S., Canada	2018-05-11
	Canada	2018-05-11
	Vancouver, Canada	2018-05-11
	UK	2018-05-11
	Winnipeg, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Shubenacadie, Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	London, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Liverpool, UK	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	Braga, Rhode Island, US	2018-05-11
	UK	2018-05-11
	UK	2018-05-11
	Charlottetown, Canada	2018-05-11
	Westville, Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	New Hamburg, Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Whitby, Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Mountain, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Montréal, Canada	2018-05-11
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	Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Kelowna, Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
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	US	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Little Fort, Canada	2018-05-11
	Amaranth, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Wadena, Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Welland, Canada	2018-05-11
	UK	2018-05-11

Name	Location	Date
	UK	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Mount Albert, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Langley, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	London, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Trenton, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
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	UK	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Hillsborough, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Tofino, Canada	2018-05-11
	US	2018-05-11
	UK	2018-05-11
	US	2018-05-11
	Whitehorse, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Dingwall, Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Toronto, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Anmore, Canada	2018-05-11
	UK	2018-05-11
	Vancouver, Canada	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Ottawa, Canada	2018-05-11
	New Glasgow, Canada	2018-05-11
	Canada	2018-05-11
	Calgary, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Waterloo, Canada	2018-05-11
	Vancouver, Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Binbrook, Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11

Name	Location	Date
	UK	2018-05-11
	Canada	2018-05-11
	Princeton, Canada	2018-05-11
	Halifax, Canada	2018-05-11
	Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Isaacs Harbour, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Winnipeg, Canada	2018-05-11
	Winnipeg, Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Finland	2018-05-11
	Canada	2018-05-11
	Courtenay, Canada	2018-05-11
	Canada	2018-05-11
	Nanaimo, Canada	2018-05-11
	Canada	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Brampton, Canada	2018-05-11
	Montreal, Canada	2018-05-11
	US	2018-05-11
	UK	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	Canada	2018-05-11
	newmarket, Canada	2018-05-11
	Canada	2018-05-11
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	Consecon, Canada	2018-05-11
	Roxton Pond, Canada	2018-05-11
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Name	Location	Date
	Toronto, Canada	2018-05-11
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	Ladysmith, BC, Canada	2018-05-11
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Name	Location	Date
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	Kelowna, Canada	2018-05-11
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	Winnipeg, Canada	2018-05-11
	US	2018-05-11
	Canada	2018-05-11
	Sydney, Canada	2018-05-11
	Quispamsis, Canada	2018-05-11
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	Beaconsfield, Canada	2018-05-11
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	Ottawa, Canada	2018-05-11
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	US	2018-05-11
	Canada	2018-05-11

Name	Location	Date
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	Kitchener, Canada	2018-05-11
	Canada	2018-05-11
	Edmonton, Canada	2018-05-11
	medfield, Massachusetts, US	2018-05-11
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	Ottawa, Canada	2018-05-11
	Denman Island, Canada	2018-05-11
	Surrey, Canada	2018-05-11
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	Salt Springs, Canada	2018-05-11
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	Castlegar, Canada	2018-05-11
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	UK	2018-05-11

Name	Location	Date
	Canada	2018-05-11
	Ajax, Canada	2018-05-11
	Halifax, Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	Kelowna, Canada	2018-05-11
	Oromocto, Canada	2018-05-11
	Sherbrooke, Canada	2018-05-11
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	White Rock, Canada	2018-05-11
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Name	Location	Date
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	Etobicoke, Canada	2018-05-11
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Name	Location	Date
	Montague, Canada	2018-05-11
	US	2018-05-11
	New Glasgow, Canada	2018-05-11
	L'Hospitalet, Spain	2018-05-11
	Canada	2018-05-11
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	Canada	2018-05-11
	San Juan, Argentina	2018-05-11
	New Glasgow, Canada	2018-05-11
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	Canada	2018-05-11
	Canada	2018-05-11
	UK	2018-05-11
	River Denys, Canada	2018-05-11
	US	2018-05-11
	Tampa, Florida, US	2018-05-11
	UK	2018-05-11

Name	Location	Date
	US	2018-05-11
	UK	2018-05-11
	Halifax, Canada	2018-05-11
	Ajax, Canada	2018-05-11
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	Redwood Meadows, Canada	2018-05-11
	Waterloo, Canada	2018-05-11
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Name	Location	Date
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	Caledon, Canada	2018-05-12
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	Vancouver, Canada	2018-05-12
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	Toronto, Canada	2018-05-12
	Canada	2018-05-12
	Athens, Canada	2018-05-12
	Little Harbour, Canada	2018-05-12
	US	2018-05-12
	US	2018-05-12
	Charlottetown, Canada	2018-05-12
	US	2018-05-12
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	Brampton, Canada	2018-05-12

Name	Location	Date
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	Canada	2018-05-12
	Canada	2018-05-12
	Charlottetown, Canada	2018-05-12
	US	2018-05-12
	Plantagenet, Canada	2018-05-12
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	US	2018-05-12
	Hamilton, Canada	2018-05-12
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Name	Location	Date
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	Ottawa, Canada	2018-05-12
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Name	Location	Date
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	Duncan, Canada	2018-05-12
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	US	2018-05-12

Name	Location	Date
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	Prineville, Oregon, US	2018-05-12
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	East Saint Paul, Canada	2018-05-12
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	Hammonds plains, Canada	2018-05-12
	Montague, Canada	2018-05-12

Name	Location	Date
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	Whistler, Canada	2018-05-12
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Name	Location	Date
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	Charlottetown, Canada	2018-05-12
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	Canso, Canada	2018-05-12
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	Australia	2018-05-12
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	Canada	2018-05-12

Name	Location	Date
	Ottawa, Canada	2018-05-12
	Canso, Canada	2018-05-12
	Vaughan, Canada	2018-05-12
	Canada	2018-05-12
	Halifax, Canada	2018-05-12
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	pictou, Canada	2018-05-12
	Canada	2018-05-12
	Brampton, Canada	2018-05-12
	Stittsville on, Canada	2018-05-12
	Mermaid, Canada	2018-05-12
	Canada	2018-05-12
	Nobleton, Canada	2018-05-12
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	Canada	2018-05-12
	Salt Springs, Canada	2018-05-12
	Amherst Shore, Canada	2018-05-12
	Canada	2018-05-12

Name	Location	Date
	US	2018-05-12
	Canada	2018-05-12
	Vaughan, Canada	2018-05-12
	UK	2018-05-12
	US	2018-05-12
	US	2018-05-12
	UK	2018-05-12
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	US	2018-05-12
	Canada	2018-05-12
	UK	2018-05-12
	US	2018-05-12
	Toronto, Canada	2018-05-12
	Napanee, Canada	2018-05-12
	Canada	2018-05-12
	Brockville, Canada	2018-05-12
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	Canada	2018-05-12
	Canada	2018-05-12
	Charlottetown, Canada	2018-05-12

Name	Location	Date
	UK	2018-05-12
	Canada	2018-05-12
	Orillia, ON, Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Montague, Canada	2018-05-12
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Name	Location	Date
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	Hamtramck, Michigan, US	2018-05-12
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	Montreal, Canada	2018-05-12
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Name	Location	Date
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	Portdover, Canada	2018-05-12
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Name	Location	Date
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	Canada	2018-05-12
	Union, New Jersey, US	2018-05-12
	Canada	2018-05-12
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	Aurora, Canada	2018-05-12
	Canada	2018-05-12
	US	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Markham, Canada	2018-05-12
	Canada	2018-05-12

Name	Location	Date
	Sudbury, Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	US	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Whistler, Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Plainfield, Indiana, US	2018-05-12
	Canada	2018-05-12
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	US	2018-05-12
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Name	Location	Date
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	US	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Devlin, Canada	2018-05-12
	Richmond, Canada	2018-05-12
	Canada	2018-05-12

Name	Location	Date
	UK	2018-05-12
	Canada	2018-05-12
	Taunton, UK	2018-05-12
	UK	2018-05-12
	Canada	2018-05-12
	Dartmouth, Canada	2018-05-12
	Canada	2018-05-12
	UK	2018-05-12
	US	2018-05-12
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	Canada	2018-05-12
	Toronto, Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Shawnigan Lake, Canada	2018-05-12

Name	Location	Date
	US	2018-05-12
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	Dartmouth, Nova Scotia, Canada	2018-05-12
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	Canada	2018-05-12
	Calgary, Canada	2018-05-12

Name	Location	Date
	Canada	2018-05-12
	Canada	2018-05-12
	UK	2018-05-12
	Canada	2018-05-12
	Halifax, Canada	2018-05-12
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	Calgary, Canada	2018-05-12
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	Canada	2018-05-12
	Hamilton, Canada	2018-05-12
	Canada	2018-05-12
	Abbotsford, Canada	2018-05-12
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	Canada	2018-05-12

Name	Location	Date
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	Stirling, Canada	2018-05-12
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	Mount Forest, Canada	2018-05-12
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	Vancouver, Canada	2018-05-12
	Cranbrook, Canada	2018-05-12
	Canada	2018-05-12
	Canada	2018-05-12
	Kelowna, Canada	2018-05-12
	Crescent Valley, Canada	2018-05-12
	Canada	2018-05-12
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	Canada	2018-05-12

Name	Location	Date
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	terence Bay, Canada	2018-05-13
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	US	2018-05-13

Name	Location	Date
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	Gatineau, Canada	2018-05-13
	US	2018-05-13
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	Montréal, Canada	2018-05-13
	Stanwood, Washington, US	2018-05-13
	Canada	2018-05-13
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	Tangier, Canada	2018-05-13
	Edmonton, Canada	2018-05-13
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	Cyprus	2018-05-13
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	Canada	2018-05-13
	Mississauga, Canada	2018-05-13
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Name	Location	Date
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	Canada	2018-05-13
	Calgary, Canada	2018-05-13
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	Tacoma, Washington, US	2018-05-13
	Burnaby, Canada	2018-05-13
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	Kindersley, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Statesville, North Carolina, US	2018-05-13

Name	Location	Date
	Canada	2018-05-13
	Canada	2018-05-13
	Lund, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Ssrsfield, On., Canada	2018-05-13
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	Ingersoll, Canada	2018-05-13
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	Canada	2018-05-13
	US	2018-05-13
	US	2018-05-13
	US	2018-05-13
	Courtenay, Canada	2018-05-13
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Name	Location	Date
	UK	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Nanaimo, Canada	2018-05-13
	US	2018-05-13
	Canada	2018-05-13
	Whistler, Canada	2018-05-13
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	UK	2018-05-13

Name	Location	Date
	UK	2018-05-13
	UK	2018-05-13
	US	2018-05-13
	UK	2018-05-13
	Richmond, Canada	2018-05-13
	UK	2018-05-13
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	UK	2018-05-13
	Canada	2018-05-13
	Attleborough, England, UK	2018-05-13
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	UK	2018-05-13
	Comox, Canada	2018-05-13
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Name	Location	Date
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	Canada	2018-05-13
	Mulgrave-et-Derry, Canada	2018-05-13
	Brookside, Canada	2018-05-13
	Canada	2018-05-13
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Name	Location	Date
	Waterford, Canada	2018-05-13
	Canada	2018-05-13
	Pictou, NS, Canada	2018-05-13
	Arlington, Massachusetts, US	2018-05-13
	Canada	2018-05-13
	magland, France	2018-05-13
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	Canada	2018-05-13
	Breteuil, France	2018-05-13
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	Canada	2018-05-13
	cheshire, Connecticut, US	2018-05-13
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Name	Location	Date
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	UK	2018-05-13
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	Carignan, Canada	2018-05-13
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	Canada	2018-05-13
	UK	2018-05-13
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	UK	2018-05-13

Name	Location	Date
	Kingston, Ontario, Canada	2018-05-13
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	Mississauga, Canada	2018-05-13
	Canada	2018-05-13
	Toronto, Canada	2018-05-13
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	Canada	2018-05-13

Name	Location	Date
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	Pictuo, Canada	2018-05-13
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	Burlington, Canada	2018-05-13
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	Canada	2018-05-13
	Airdrie, Canada	2018-05-13

Name	Location	Date
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	Winnipeg, MB, Canada	2018-05-13
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	Canada	2018-05-13

Name	Location	Date
	Canada	2018-05-13
	Canada	2018-05-13
	Kelowna, Canada	2018-05-13
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	UK	2018-05-13
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	UK	2018-05-13
	CLEARWATER BC, Canada	2018-05-13
	US	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	US	2018-05-13
	Toronto, Canada	2018-05-13

Name	Location	Date
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Name	Location	Date
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	Canada	2018-05-13
	Hornby Island, Canada	2018-05-13
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	Canada	2018-05-13
	Waterloo, Canada	2018-05-13
	Winona, Minnesota, US	2018-05-13
	Cleveland, Ohio, US	2018-05-13
	Gainesville, Florida, US	2018-05-13
	Marblehead, Massachusetts, US	2018-05-13
	Littleton, Colorado, US	2018-05-13
	Morehead City, North Carolina, US	2018-05-13
	Canada	2018-05-13
	US	2018-05-13
	Bloomfield, New Jersey, US	2018-05-13
	Millstone, New Jersey, US	2018-05-13
	US	2018-05-13

Name	Location	Date
	UK	2018-05-13
	San Jose, California, US	2018-05-13
	Memphis, Tennessee, US	2018-05-13
	Canada	2018-05-13
	US	2018-05-13
	Canada	2018-05-13
	San Francisco, California, US	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Ottawa, Canada	2018-05-13
	North Vancouver, Canada	2018-05-13
	MORRISON, Colorado, US	2018-05-13
	alameda, California, US	2018-05-13
	Calabash, North Carolina, US	2018-05-13
	Durham, North Carolina, US	2018-05-13
	Surrey, Canada	2018-05-13
	Canada	2018-05-13
	Mississauga, Canada	2018-05-13
	Lafayette, California, US	2018-05-13
	Bronx, New York, US	2018-05-13
	BATTLE CREEK, Michigan, US	2018-05-13
	Canada	2018-05-13

Name	Location	Date
	London, England, UK	2018-05-13
	palmdale, California, US	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Edmonton, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
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	Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Perkins, Oklahoma, US	2018-05-13
	Thunder Bay, Canada	2018-05-13
	State College, Pennsylvania, US	2018-05-13
	Fredericton, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Cochrane, Canada	2018-05-13
	Canada	2018-05-13
	Mohnton, Pennsylvania, US	2018-05-13
	Canada	2018-05-13

Name	Location	Date
	Canada	2018-05-13
	Quebec City, Canada	2018-05-13
	Canada	2018-05-13
	Thunder Bay, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Saint Paul, Minnesota, US	2018-05-13
	Edmonton, Canada	2018-05-13
	Canada	2018-05-13
	Greely, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Vancouver, Canada	2018-05-13
	Kouchibouguac, Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Canada	2018-05-13
	Vancouver, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Poughkeepsie, New York, US	2018-05-14
	US	2018-05-14

Name	Location	Date
	Canada	2018-05-14
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	Kitchener, Canada	2018-05-14
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	Canada	2018-05-14
	Canada	2018-05-14
	Les Coteaux, Canada	2018-05-14
	Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Houston, Texas, US	2018-05-14
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Name	Location	Date
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	Canada	2018-05-14
	Edmonton, Canada	2018-05-14
	Canada	2018-05-14
	Farmingdale, New York, US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Lafayette, California, US	2018-05-14
	Edinburgh, Scotland, UK	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canastota, Canada	2018-05-14
	Sault Sainte Marie, Canada	2018-05-14
	Rutland, Vermont, US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
	Victoria, Canada	2018-05-14
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	Canada	2018-05-14
	Canada	2018-05-14
	Baton Rouge, Louisiana, US	2018-05-14
	Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Salt Lake City, U.S. Outlying Islands	2018-05-14
	US	2018-05-14
	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
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	Powell River, Canada	2018-05-14
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	Canada	2018-05-14
	Australia	2018-05-14
	Germany	2018-05-14
	Montreal, Canada	2018-05-14
	Edmonton, Canada	2018-05-14
	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	UK	2018-05-14
	Ireland	2018-05-14
	Orleans, Canada	2018-05-14
	Covent Garden, UK	2018-05-14
	Canada	2018-05-14
	Crescent Valley, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Gainesville, Florida, US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Antioch, Kansas, US	2018-05-14
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Name	Location	Date
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	Toronto, Canada	2018-05-14
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Name	Location	Date
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	Canada	2018-05-14
	Lethbridge, Canada	2018-05-14
	Canada	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	San Antonio, Texas, US	2018-05-14
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	Canada	2018-05-14
	Canada	2018-05-14
	Toronto, Canada	2018-05-14
	Lakeside, Ohio, US	2018-05-14
	Nashville, Tennessee, US	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
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	Calgary, Canada	2018-05-14
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Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
	Beaumont, Texas, US	2018-05-14
	Canada	2018-05-14
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	Canada	2018-05-14
	Canada	2018-05-14
	Toronto, Canada	2018-05-14
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Name	Location	Date
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	Canada	2018-05-14
	Canada	2018-05-14
	Toronto, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Lincoln, Canada	2018-05-14
	Canada	2018-05-14
	Moncton, Canada	2018-05-14
	Overland Park, Kansas, US	2018-05-14
	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
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	Port Hope, Canada	2018-05-14
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	Canada	2018-05-14
	New Haven, Connecticut, US	2018-05-14
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	US	2018-05-14
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Name	Location	Date
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	Ottawa, Canada	2018-05-14
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Name	Location	Date
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	Maple, Canada	2018-05-14
	Canada	2018-05-14
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	Canada	2018-05-14
	Toronto, Canada	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
	Washington, Missouri, US	2018-05-14
	Canada	2018-05-14
	Calumet Island, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Toronto, Canada	2018-05-14
	Oakville, Canada	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
	Windsor, Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
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	Canada	2018-05-14
	Germany	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Salmon Arm, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Taylorsville, Utah, US	2018-05-14

Name	Location	Date
	Washington, North Carolina, US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Denver, Colorado, US	2018-05-14
	US	2018-05-14
	Dollard-Des Ormeaux, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Manitou Springs, Colorado, US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Quebec, Canada	2018-05-14

Name	Location	Date
	Long Eaton, England, UK	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	North York, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Alcove, Canada	2018-05-14
	Oakville, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Denman Island, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Montréal, Canada	2018-05-14
	UK	2018-05-14
	Regina, Canada	2018-05-14
	UK	2018-05-14
	UK	2018-05-14
	US	2018-05-14

Name	Location	Date
	UK	2018-05-14
	UK	2018-05-14
	UK	2018-05-14
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	UK	2018-05-14
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	UK	2018-05-14
	UK	2018-05-14
	UK	2018-05-14
	US	2018-05-14
	UK	2018-05-14
	Kingston, Canada	2018-05-14
	Brevard, North Carolina, US	2018-05-14
	UK	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14

Name	Location	Date
	US	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Montréal, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Pacifica, California, US	2018-05-14
	Toronto, Canada	2018-05-14
	Canada	2018-05-14
	Saint-Bruno-de-Montarville, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Inverness, Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14
	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Truro, Canada	2018-05-14
	Canada	2018-05-14
	Cape Breton, Canada	2018-05-14
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	Beaumont, Canada	2018-05-14
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	Ottawa, Canada	2018-05-14
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	Canada	2018-05-14
	Dartmouth, Canada	2018-05-14
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	Canada	2018-05-14

Name	Location	Date
	Canada	2018-05-14
	Canada	2018-05-14
	Pictou, Canada	2018-05-14
	UK	2018-05-14
	Edmonton, Canada	2018-05-14
	Canada	2018-05-14
	US	2018-05-14
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	Summerside, Canada	2018-05-14
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Name	Location	Date
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	Chilliwack, Canada	2018-05-14
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Name	Location	Date
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	Burlington, Canada	2018-05-15
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	New Glasgow, Canada	2018-05-15
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	Surrey, Canada	2018-05-15

Name	Location	Date
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Name	Location	Date
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	St. John's, Canada	2018-05-15
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Name	Location	Date
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Name	Location	Date
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	Revelstoke, Canada	2018-05-16
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	Corner Brook, Canada	2018-05-16
	Moncton, Canada	2018-05-16
	UK	2018-05-16

Name	Location	Date
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	Washington, District of Columbia, US	2018-05-16
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	Toronto, Canada	2018-05-16
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	Orinda, California, US	2018-05-16
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	Saint-Cyr-sur-Loire, France	2018-05-16
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Name	Location	Date
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	Canada	2018-05-16
	UK	2018-05-16
	Summerside, Canada	2018-05-16
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	St. John's, Canada	2018-05-16
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	US	2018-05-16
	Corner Brook, Canada	2018-05-16
	Burnaby, Canada	2018-05-16
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	Bowmanville, Canada	2018-05-16
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Name	Location	Date
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Name	Location	Date
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	Canada	2018-05-16
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	Saint John, Canada	2018-05-16
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	Oakville, Canada	2018-05-17
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	RR# 6 Orillia, ON, Canada	2018-05-17
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	Manchester, Iowa, US	2018-05-17
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	Toronto, Canada	2018-05-17

Name	Location	Date
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	Corner Brook, Canada	2018-05-17
	Halifax, Canada	2018-05-17
	St. John's, Canada	2018-05-17
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Name	Location	Date
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	Ajax, Ontario, Canada	2018-05-17
	NewGlasgow, Canada	2018-05-17
	London, Canada	2018-05-17
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Name	Location	Date
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	Lvov, Ukraine	2018-05-17
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	UK	2018-05-17
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	Stockport, England, UK	2018-05-17
	shediac, Canada	2018-05-17
	Lantz, Canada	2018-05-17
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	Halifax, Canada	2018-05-17
	Canada	2018-05-17

Name	Location	Date
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	Beaubassin East, Canada	2018-05-17
	Canada	2018-05-17
	Scotsburn, Canada	2018-05-17
	Halifax, Canada	2018-05-17
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	US	2018-05-17
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	Oshawa, Canada	2018-05-17
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	Saint-quentin, Canada	2018-05-17
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	Coventry, Rhode Island, US	2018-05-17
	Canada	2018-05-17

Name	Location	Date
	UK	2018-05-17
	Delta, Canada	2018-05-17
	US	2018-05-17
	Saint Isidore, Canada	2018-05-17
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	Canada	2018-05-17
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	UK	2018-05-17
	Canada	2018-05-17
	Westville, Canada	2018-05-17
	Vancouver, Canada	2018-05-17
	Canada	2018-05-17
	Canada	2018-05-17
	Scotsburn, Canada	2018-05-17
	burlington, Canada	2018-05-17
	Dartmouth, Canada	2018-05-17
	US	2018-05-17
	Canada	2018-05-17
	Canada	2018-05-17
	US	2018-05-17
	US	2018-05-17
	Salt Springs, Canada	2018-05-17

Name	Location	Date
	Canada	2018-05-17
	Canada	2018-05-17
	Halifax, Canada	2018-05-17
	Canada	2018-05-17
	Canada	2018-05-17
	Sunderland, Canada	2018-05-17
	pictou,ns, Canada	2018-05-17
	SIMPSONVILLE, South Carolina, US	2018-05-17
	Canada	2018-05-17
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	Canada	2018-05-17
	US	2018-05-17
	District Heights, Delaware, US	2018-05-17
	US	2018-05-17
	Halifax, Canada	2018-05-17
	Canada	2018-05-17
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	UK	2018-05-17
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	Canada	2018-05-17
	UK	2018-05-17

Name	Location	Date
	UK	2018-05-17
	Dartmouth, Canada	2018-05-17
	Canada	2018-05-17
	UK	2018-05-17
	Liverpool, Canada	2018-05-17
	Woodstock, New York, US	2018-05-17
	New Glasgow, Canada	2018-05-17
	Singapore	2018-05-17
	Canada	2018-05-17
	Toronto, Canada	2018-05-17
	New Waterford, Canada	2018-05-17
	Canada	2018-05-17
	Thunder Bay, Canada	2018-05-17
	Canada	2018-05-17
	Sarnia, Canada	2018-05-17
	US	2018-05-17
	Port Dufferin, Canada	2018-05-17
	Dumfries, Canada	2018-05-17
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	Canada	2018-05-17
	Canada	2018-05-17
	US	2018-05-17

Name	Location	Date
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	London, Canada	2018-05-18
	Ottawa, Canada	2018-05-18
	Toronto, Canada	2018-05-18
	US	2018-05-18
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	Canada	2018-05-18
	Paterson, New Jersey, US	2018-05-18
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	US	2018-05-18
	US	2018-05-18
	Canada	2018-05-18
	Canada	2018-05-18

Name	Location	Date
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	Saskatoon, Canada	2018-05-18
	UK	2018-05-18
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Name	Location	Date
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Name	Location	Date
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	Salt Springs, Canada	2018-05-18
	UK	2018-05-18
	Canada	2018-05-18
	UK	2018-05-18
	Tatamagouche, Canada	2018-05-18
	Canada	2018-05-18
	Canada	2018-05-18
	Halifax, Canada	2018-05-18
	Canada	2018-05-18
	Toronto, Canada	2018-05-18
	new glasgow, Canada	2018-05-18

Name	Location	Date
	Toronto, Canada	2018-05-18
	Hammonds Plains, Canada	2018-05-18
	UK	2018-05-18
	Canada	2018-05-18
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	Canada	2018-05-18
	Edmonton, Canada	2018-05-18
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	US	2018-05-18
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	Dunrobin, Canada	2018-05-18
	Canada	2018-05-18
	UK	2018-05-18

Name	Location	Date
	Canada	2018-05-18
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	Halifax, Canada	2018-05-18
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	US	2018-05-18
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	Canada	2018-05-18
	Regina, Canada	2018-05-18
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	Merigomish, Canada	2018-05-18
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	Canada	2018-05-18

Name	Location	Date
	US	2018-05-18
	Etobicoke, Canada	2018-05-18
	Canada	2018-05-18
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	Kitchener, Canada	2018-05-18
	UK	2018-05-19
	Fall River, Canada	2018-05-19
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	US	2018-05-19
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	Canada	2018-05-19

Name	Location	Date
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	UK	2018-05-19

Name	Location	Date
	UK	2018-05-19
	UK	2018-05-19
	Dartmouth, Canada	2018-05-19
	Bolton, Canada	2018-05-19
	Canada	2018-05-19
	UK	2018-05-19
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	Halifax, Canada	2018-05-19
	UK	2018-05-19
	Canada	2018-05-19
	Canada	2018-05-19
	Mount Pearl, Canada	2018-05-19
	Canada	2018-05-19
	Canada	2018-05-19
	Salmo, Canada	2018-05-19
	Tottenham, Canada	2018-05-19
	Canada	2018-05-19
	Hong Kong	2018-05-19

Name	Location	Date
	Canada	2018-05-19
	Canada	2018-05-19
	Canada	2018-05-19
	US	2018-05-19
	US	2018-05-19
	Regina, Canada	2018-05-19
	aleza lake bc, Canada	2018-05-19
	Calgary, Canada	2018-05-19
	US	2018-05-19
	US	2018-05-19
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	Canada	2018-05-19
	US	2018-05-19
	UK	2018-05-19
	US	2018-05-19
	Saint-quentin, Canada	2018-05-19
	Dacula, Georgia, US	2018-05-19
	Canada	2018-05-19
	Lion's Head, Canada	2018-05-19

Name	Location	Date
	Canada	2018-05-19
	Brampton, Canada	2018-05-19
	Newmarket, Canada	2018-05-19
	Coquitlam, Canada	2018-05-19
	US	2018-05-19
	Canada	2018-05-19
	St. Thomas, Canada	2018-05-19
	UK	2018-05-19
	UK	2018-05-19
	Slovenia	2018-05-19
	Canada	2018-05-19
	Calgary, Canada	2018-05-19
	US	2018-05-19
	Tiny, Canada	2018-05-19
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	Canada	2018-05-20
	UK	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
	US	2018-05-20
	Vernon, Canada	2018-05-20
	UK	2018-05-20

Name	Location	Date
	Canada	2018-05-20
	Surrey, Canada	2018-05-20
	US	2018-05-20
	US	2018-05-20
	US	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
	Nanaimo, Canada	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
	US	2018-05-20
	Athens, Greece	2018-05-20
	UK	2018-05-20
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	UK	2018-05-20
	UK	2018-05-20
	Creemore, Canada	2018-05-20

Name	Location	Date
	US	2018-05-20
	UK	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
	Collingwood, Canada	2018-05-20
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	UK	2018-05-20
	US	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
	Leeds, England, UK	2018-05-20
	US	2018-05-20
	New Glasgow, Canada	2018-05-20
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	Canada	2018-05-20
	US	2018-05-20
	Canada	2018-05-20

Name	Location	Date
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	UK	2018-05-20
	Calgary, Canada	2018-05-20
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	UK	2018-05-20
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	Canada	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Watchet, England, UK	2018-05-20

Name	Location	Date
	Canada	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Canada	2018-05-20
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	US	2018-05-20
	Bonshaw, PEI, Canada	2018-05-20
	Moncton, Canada	2018-05-20
	Canada	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
	US	2018-05-20
	US	2018-05-20

Name	Location	Date
	Canada	2018-05-20
	Toronto, Canada	2018-05-20
	UK	2018-05-20
	US	2018-05-20
	Canoe Cove, Canada	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
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	Canada	2018-05-20
	US	2018-05-20
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	Canada	2018-05-20
	US	2018-05-20
	US	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Kensington, Canada	2018-05-20
	US	2018-05-20

Name	Location	Date
	Cornwall, Canada	2018-05-20
	Surrey, Canada	2018-05-20
	Canada	2018-05-20
	Australia	2018-05-20
	Charlottetown, Canada	2018-05-20
	Englewood, Florida, US	2018-05-20
	US	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	UK	2018-05-20
	US	2018-05-20
	Canada	2018-05-20
	Ottawa, Canada	2018-05-20
	Burkina Faso	2018-05-20
	Canada	2018-05-20
	Edmonton, Canada	2018-05-20
	Charlottetown, Canada	2018-05-20
	Charlottetown, Canada	2018-05-20
	UK	2018-05-20
	Canada	2018-05-20
	Sterling, Virginia, US	2018-05-20
	Netherlands	2018-05-20

Name	Location	Date
	US	2018-05-20
	UK	2018-05-20
	UK	2018-05-20
	UK	2018-05-20
	Netherlands	2018-05-20
	Canada	2018-05-20
	Montréal, Canada	2018-05-20
	Canada	2018-05-20
	Umeå, Sweden	2018-05-21
	UK	2018-05-21
	Canada	2018-05-21
	US	2018-05-21
	Canada	2018-05-21
	US	2018-05-21
	US	2018-05-21
	US	2018-05-21
	Canada	2018-05-21
	Lethbridge, Canada	2018-05-21
	UK	2018-05-21
	Canada	2018-05-21
	Canada	2018-05-21

Name	Location	Date
	US	2018-05-21
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	UK	2018-05-21
	UK	2018-05-21
	US	2018-05-21
	Guatemala, Guatemala	2018-05-21
	Canada	2018-05-21
	UK	2018-05-21
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	Canada	2018-05-21
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	Fredericton, Canada	2018-05-21
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	Canada	2018-05-21
	St-Ignace, Canada	2018-05-21
	Canada	2018-05-21
	Canada	2018-05-21

Name	Location	Date
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	Canada	2018-05-21
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	Canada	2018-05-21
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	UK	2018-05-21
	Canada	2018-05-21
	Canada	2018-05-21
	Toronto, Canada	2018-05-21
	UK	2018-05-21
	US	2018-05-21
	Oldbury, England, UK	2018-05-21
	Canada	2018-05-21
	US	2018-05-21
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	Canada	2018-05-21

Name	Location	Date
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	US	2018-05-21
	Canada	2018-05-21
	Canada	2018-05-21
	Charlottetown, Canada	2018-05-21
	Canada	2018-05-21
	Summerside, Canada	2018-05-21
	Vancouver, Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22
	US	2018-05-22
	US	2018-05-22

Name	Location	Date
	Canada	2018-05-22
	Canada	2018-05-22
	Costa Rica	2018-05-22
	Canada	2018-05-22
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	Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22
	Gibsons, Canada	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	Penticton, Canada	2018-05-22
	US	2018-05-22
	US	2018-05-22
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	US	2018-05-22
	US	2018-05-22
	UK	2018-05-22
	US	2018-05-22
	Canada	2018-05-22

Name	Location	Date
	Toronto, Canada	2018-05-22
	Nanaimo, Canada	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
	Tunisia	2018-05-22
	UK	2018-05-22
	Dartmouth, Canada	2018-05-22
	Australia	2018-05-22
	pictou, Canada	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22
	Ottawa, Canada	2018-05-22
	UK	2018-05-22
	Canada	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
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	UK	2018-05-22

Name	Location	Date
	UK	2018-05-22
	UK	2018-05-22
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	UK	2018-05-22
	Los Angeles, California, US	2018-05-22
	UK	2018-05-22
	US	2018-05-22
	UK	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22

Name	Location	Date
	Toronto, Canada	2018-05-22
	Canada	2018-05-22
	Dartmouth, Canada	2018-05-22
	Canada	2018-05-22
	US	2018-05-22
	Canada	2018-05-22
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	UK	2018-05-22
	UK	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	Canada	2018-05-22
	Formby, England, UK	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
	UK	2018-05-22
	Canada	2018-05-22
	Laval, Canada	2018-05-22

Name	Location	Date
	Hamilton, Canada	2018-05-22
	HALIFAX, Canada	2018-05-22
	Canada	2018-05-22
	Hammonds Plains, Canada	2018-05-22
	US	2018-05-22
	Toronto, Canada	2018-05-22
	UK	2018-05-22
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	Hamilton, Canada	2018-05-22
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	Langley, Canada	2018-05-22
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	Sturgis, Michigan, US	2018-05-22
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	Portage, Michigan, US	2018-05-22
	Halifax, Canada	2018-05-22
	Ottawa, Canada	2018-05-22

Name	Location	Date
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	Memphis, Tennessee, US	2018-05-22
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	Ingersoll, Canada	2018-05-22
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	Mabou, Canada	2018-05-22
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	Richmond, Canada	2018-05-24
	India	2018-05-24
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	Rochester, New York, US	2018-05-24
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	Oshawa, Canada	2018-05-25
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	Canada	2018-05-25
	US	2018-05-25
	Canada	2018-05-25

Name	Location	Date
	Canada	2018-05-25
	Sydney, Canada	2018-05-25
	Saltsprings, pictou county, Canada	2018-05-25
	Buena Vista, Virginia, US	2018-05-25
	Pictou, Canada	2018-05-25
	Pictou, Canada	2018-05-25
	Edmonton, Canada	2018-05-25
	Westlock, Canada	2018-05-25
	Canada	2018-05-25
	Taiwan	2018-05-25
	US	2018-05-25
	Canada	2018-05-25
	Lower Sackville, Canada	2018-05-25
	Canada	2018-05-25
	Tempe, Arizona, US	2018-05-25
	Charlottetown, Canada	2018-05-25
	West River Station, Canada	2018-05-25
	Canada	2018-05-25
	Iraq	2018-05-25
	Edmonton, Canada	2018-05-25
	Westville, Canada	2018-05-25
	US	2018-05-25

Name	Location	Date
	Skutvik, Norway	2018-05-25
	New Westminster, Canada	2018-05-25
	London, UK	2018-05-25
	North Saanich, BC, Canada	2018-05-25
	UK	2018-05-25
	Westville, Canada	2018-05-25
	Pictou, Canada	2018-05-25
	Coquitlam, Canada	2018-05-26
	Canada	2018-05-26
	US	2018-05-26
	West Kelowna, Canada	2018-05-26
	US	2018-05-26
	US	2018-05-26
	Canada	2018-05-26
	Canada	2018-05-26
	Nanaimo, Canada	2018-05-26
	Canada	2018-05-26
	US	2018-05-26
	UK	2018-05-26
	Toronto, Canada	2018-05-26
	Canada	2018-05-26
	Knoxville, Tennessee, US	2018-05-26

Name	Location	Date
	New Waterford, Canada	2018-05-26
	US	2018-05-26
	US	2018-05-26
	Canada	2018-05-26
	Edmonton, Canada	2018-05-26
	Canada	2018-05-26
	Panama	2018-05-26
	US	2018-05-26
	Canada	2018-05-26
	Canada	2018-05-26
	Laval, Canada	2018-05-26
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	Iran	2018-05-26
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	Canada	2018-05-26
	US	2018-05-27
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	US	2018-05-27
	Canada	2018-05-27
	Canada	2018-05-27

Name	Location	Date
	Lower Sackville, Canada	2018-05-27
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	Canada	2018-05-27
	US	2018-05-27
	UK	2018-05-27
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	Malaysia	2018-05-27
	Canada	2018-05-27
	UK	2018-05-27
	Canada	2018-05-27
	Spain	2018-05-27
	New Glasgow, Canada	2018-05-27
	Toronto, Canada	2018-05-27
	UK	2018-05-27
	US	2018-05-27
	US	2018-05-27
	UK	2018-05-27
	UK	2018-05-27
	US	2018-05-27
	Ottawa, Canada	2018-05-27
	Canada	2018-05-27

Name	Location	Date
	Canada	2018-05-27
	UK	2018-05-27
	Canada	2018-05-27
	US	2018-05-27
	Taiwan	2018-05-27
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	UK	2018-05-27

Name	Location	Date
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	Squamish, Canada	2018-05-28
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	Canada	2018-05-28
	US	2018-05-28
	North York, Canada	2018-05-28
	Canada	2018-05-28
	Canada	2018-05-28
	Hong Kong	2018-05-28
	Saskatoon, Canada	2018-05-28
	US	2018-05-28
	UK	2018-05-28
	El Salvador	2018-05-28
	Canada	2018-05-28
	Canada	2018-05-28

Name	Location	Date
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	Belgium	2018-05-28
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	Toronto, Canada	2018-05-28
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	Plymouth, Massachusetts, US	2018-05-28
	Canada	2018-05-28
	Canada	2018-05-28
	Elora, Canada	2018-05-28
	UK	2018-05-28

Name	Location	Date
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	Prince George, Canada	2018-05-29
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	US	2018-05-29
	Calgary, Canada	2018-05-29
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	Canada	2018-05-29
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Name	Location	Date
	US	2018-05-29
	Canada	2018-05-29
	US	2018-05-29
	Toronto, Canada	2018-05-29
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	US	2018-05-29
	Berkley, Michigan, US	2018-05-29
	Canada	2018-05-29
	Canada	2018-05-29
	UK	2018-05-29
	Canada	2018-05-29

Name	Location	Date
	Secaucus, New Jersey, US	2018-05-29
	Pictou, Canada	2018-05-29
	Halifax, Canada	2018-05-29
	UK	2018-05-30
	UK	2018-05-30
	US	2018-05-30
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	UK	2018-05-30
	UK	2018-05-30
	UK	2018-05-30
	Pictou, Canada	2018-05-30
	Canada	2018-05-30
	Saint Louis, Missouri, US	2018-05-30
	US	2018-05-30
	UK	2018-05-30
	Canada	2018-05-30
	UK	2018-05-30
	Canada	2018-05-30
	Bellingham, Washington, US	2018-05-30
	US	2018-05-30

Name	Location	Date
	US	2018-05-30
	UK	2018-05-30
	US	2018-05-30
	River John, Canada	2018-05-30
	US	2018-05-30
	US	2018-05-30
	Pictou, Canada	2018-05-30
	Halifax, Canada	2018-05-30
	US	2018-05-30
	Dartmouth, Canada	2018-05-30
	Dartmouth, Canada	2018-05-30
	Toronto, Canada	2018-05-30
	Amherst, Canada	2018-05-30
	Nova Scotia, California, US	2018-05-30
	Halifax, Canada	2018-05-30
	Wellington, New Zealand	2018-05-30
	Central North River, Canada	2018-05-30
	Halifax, Canada	2018-05-30
	Canada	2018-05-30
	Newmarket, Canada	2018-05-30
	New Glasgow, Canada	2018-05-30
	Canada	2018-05-30

Name	Location	Date
	Perth, Canada	2018-05-30
	US	2018-05-30
	Chino Valley, Arizona, US	2018-05-30
	Toronto, Canada	2018-05-30
	Canada	2018-05-30
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Name	Location	Date
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	UK	2018-05-30
	South Africa	2018-05-30
	Lords Cove, Canada	2018-05-30
	Canada	2018-05-30
	Halifax,ns, Canada	2018-05-30
	Westville, Canada	2018-05-30
	Burlington, Canada	2018-05-30
	Trenton, Canada	2018-05-30
	Renfrew, Canada	2018-05-30
	Montague, Canada	2018-05-30
	Sainte-Anne-des-Lacs, Canada	2018-05-30
	Fredericton, Canada	2018-05-30
	Pictou, Canada	2018-05-30
	Dartmouth, NS, Canada	2018-05-30
	Lexington, Kentucky, US	2018-05-30
	Canaan, Canada	2018-05-30
	Vernon, Canada	2018-05-30
	Kawartha Lakes, Canada	2018-05-30
	Sidney, Canada	2018-05-30
	Halifax, Canada	2018-05-30
	Dartmouth, Canada	2018-05-30

Name	Location	Date
	Canada	2018-05-30
	UK	2018-05-30
	Canada	2018-05-30
	Canada	2018-05-30
	Halifax, Canada	2018-05-30
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	Canada	2018-05-30
	Netherlands	2018-05-30
	Winnipeg, Canada	2018-05-30
	Halifax, Nova Scotia, Canada	2018-05-30
	New Glasgow, Canada	2018-05-30
	Canada	2018-05-30
	Whitehorse, Canada	2018-05-30
	Canada	2018-05-30
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Name	Location	Date
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Name	Location	Date
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	Mount Horeb, Wisconsin, US	2018-05-30
	US	2018-05-30

Name	Location	Date
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	Ottawa, Canada	2018-05-30
	Toronto, Canada	2018-05-30
	US	2018-05-30

Name	Location	Date
	Canada	2018-05-30
	Halifax, Canada	2018-05-30
	US	2018-05-30
	US	2018-05-30
	Wickham, Canada	2018-05-30
	Antigonish, Canada	2018-05-30
	Canada	2018-05-30
	Lower Sackville, Canada	2018-05-30
	Dartmouth, Canada	2018-05-30
	Canada	2018-05-30
	Ottawa, Canada	2018-05-30
	Ancaster, Canada	2018-05-30
	Coleman, Canada	2018-05-30
	US	2018-05-30
	Halifax, Canada	2018-05-31
	Newcastle, Canada	2018-05-31
	US	2018-05-31
	Dartmouth, Canada	2018-05-31
	US	2018-05-31
	Canada	2018-05-31
	Austria	2018-05-31
	Canada	2018-05-31

Name	Location	Date
	Canada	2018-05-31
	Canada	2018-05-31
	Ottawa, Canada	2018-05-31
	Canada	2018-05-31
	Toronto, Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Philippines	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Ottawa, Canada	2018-05-31
	Rye, New Hampshire, US	2018-05-31
	Canada	2018-05-31
	Ottawa, Canada	2018-05-31
	Nosara, Costa Rica	2018-05-31
	Smiths Falls, Canada	2018-05-31
	Ottawa, Canada	2018-05-31
	Belgium	2018-05-31
	Halifax, Canada	2018-05-31
	Germany	2018-05-31
	Canada	2018-05-31

Name	Location	Date
	Mississauga, Canada	2018-05-31
	US	2018-05-31
	St. John's, Canada	2018-05-31
	Westville, Canada	2018-05-31
	Iran	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	Canada	2018-05-31
	US	2018-05-31
	US	2018-06-01
	US	2018-06-01
	Dartmouth, Canada	2018-06-01
	Malaysia	2018-06-01
	Toronto, Canada	2018-06-01
	Winnipeg, Manitoba, Alabama, US	2018-06-01
	US	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	Bc, Canada	2018-06-01

Name	Location	Date
	Winnipeg, Canada	2018-06-01
	Los Angeles, California, US	2018-06-01
	Vietnam	2018-06-01
	Burlington, Canada	2018-06-01
	Markham, Canada	2018-06-01
	Moncton, Canada	2018-06-01
	US	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	US	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	US	2018-06-01
	New Glasgow, Canada	2018-06-01
	US	2018-06-01
	Scotsburn, Canada	2018-06-01
	Coalburn, Canada	2018-06-01
	Sudbury, Canada	2018-06-01

Name	Location	Date
	Denver, Colorado, US	2018-06-01
	US	2018-06-01
	UK	2018-06-01
	Vancouver, Canada	2018-06-01
	US	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
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	US	2018-06-01
	Canada	2018-06-01
	UK	2018-06-01
	US	2018-06-01
	UK	2018-06-01
	UK	2018-06-01
	Canada	2018-06-01
	UK	2018-06-01

Name	Location	Date
	Canada	2018-06-01
	Pictou, Canada	2018-06-01
	Canada	2018-06-01
	Canada	2018-06-02
	Merigomish, Canada	2018-06-02
	US	2018-06-02
	Dieppe, Canada	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	West Chester, Pennsylvania, US	2018-06-02
	US	2018-06-02
	UK	2018-06-02
	US	2018-06-02
	US	2018-06-02

Name	Location	Date
	UK	2018-06-02
	UK	2018-06-02
	US	2018-06-02
	Canada	2018-06-02
	UK	2018-06-02
	UK	2018-06-02
	Markham, Canada	2018-06-02
	US	2018-06-02
	Saint John, Canada	2018-06-02
	Winnipeg, Canada	2018-06-03
	Canada	2018-06-03
	France	2018-06-03
	Toronto, Canada	2018-06-03
	Dundee, Canada	2018-06-03
	US	2018-06-03
	Creston, Canada	2018-06-03
	Canada	2018-06-03
	UK	2018-06-03
	Canada	2018-06-03
	US	2018-06-04
	US	2018-06-04
	US	2018-06-04

Name	Location	Date
	Beechville, Canada	2018-06-04
	Westmount, Canada	2018-06-04
	Canada	2018-06-04
	Canada	2018-06-04
	Calgary, Canada	2018-06-04
	Germany	2018-06-04
	Calgary, Canada	2018-06-04
	Lewedorp, Netherlands	2018-06-04
	Austria	2018-06-04
	US	2018-06-04
	Canada	2018-06-05
	UK	2018-06-05
	US	2018-06-05
	LaSalle, Ontario, Canada, Canada	2018-06-05
	Tempe, Arizona, US	2018-06-05
	New Zealand	2018-06-05
	Toronto, Canada	2018-06-05
	Richmond Hill, Canada	2018-06-05
	US	2018-06-05
	US	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05

Name	Location	Date
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	UK	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	Canada	2018-06-05
	US	2018-06-05
	Canada	2018-06-05
	US	2018-06-05
	Canada	2018-06-05
	Tucson, Arizona, US	2018-06-05
	US	2018-06-05
	Canada	2018-06-06
	Burnaby, Canada	2018-06-06
	US	2018-06-06

Name	Location	Date
	Vancouver, Canada	2018-06-06
	Egypt	2018-06-06
	US	2018-06-06
	UK	2018-06-06
	US	2018-06-06
	Toronto, Canada	2018-06-06
	Canada	2018-06-06
	Canada	2018-06-06
	Canada	2018-06-07
	Otterburn Park, Canada	2018-06-07
	US	2018-06-07
	Stettler, Canada	2018-06-07
	US	2018-06-07
	US	2018-06-07
	Sorel, Canada	2018-06-07
	Canada	2018-06-08
	Montréal, Canada	2018-06-08
	Calgary, Canada	2018-06-08
	Calgary, Canada	2018-06-08
	Calgary, Canada	2018-06-09
	Denmark	2018-06-09
	Ottawa, Canada	2018-06-10

Name	Location	Date
	Elk River, Minnesota, US	2018-06-11
	Ottawa, Canada	2018-06-11
	London, Canada	2018-06-12
	Pictou, Canada	2018-06-12
	Canada	2018-06-12
	Canada	2018-06-12
	Canada	2018-06-12
	US	2018-06-12
	Canada	2018-06-12
	UK	2018-06-12
	Westville, Canada	2018-06-12
	Halifax, Canada	2018-06-12
	North Vancouver, Canada	2018-06-12
	Halifax, Canada	2018-06-12
	Wilton, Connecticut, US	2018-06-12
	Halifax, Canada	2018-06-12
	london, England, UK	2018-06-13
	London, Canada	2018-06-13
	Toronto, Canada	2018-06-13
	Halifax, Canada	2018-06-13
	Toronto, Canada	2018-06-13
	Blainville, Canada	2018-06-13

Name	Location	Date
	O'Leary, Canada	2018-06-13
	UK	2018-06-13
	US	2018-06-13
	UK	2018-06-13
	UK	2018-06-13
	UK	2018-06-13
	Pictou NS, Canada	2018-06-13
	Westville, Canada	2018-06-13
	Stellarton, Canada	2018-06-14
	Halifax, Canada	2018-06-14
	Pictou, Canada	2018-06-14
	Markham, Canada	2018-06-14
	Sydney, Canada	2018-06-14
	New glasgow, Canada	2018-06-14
	Stellarton, Canada	2018-06-14
	Wedgeport, Canada	2018-06-14
	Victoria, Canada	2018-06-14
	Halifax, Canada	2018-06-14
	Halifax, Canada	2018-06-14
	Dollard-des-ormeaux, Canada	2018-06-14
	River John, Canada	2018-06-15
	New Glasgow, Canada	2018-06-15

Name	Location	Date
	Pictou, Canada	2018-06-15
	Glace Bay, Canada	2018-06-15
	Dartmouth, Canada	2018-06-15
	Port Hawkesbury, Canada	2018-06-15
	Canada	2018-06-15
	Australia	2018-06-15
	Germany	2018-06-15
	ottawa, Canada	2018-06-15
	Brant, Canada	2018-06-16
	Victoria, Canada	2018-06-16
	Victoria, Canada	2018-06-17
	new york, New York, US	2018-06-17
	Charlottetown, Canada	2018-06-18
	Pictou, Canada	2018-06-18
	US	2018-06-18
	Dieren, Netherlands	2018-06-18
	Charlottetown, PE, Canada	2018-06-18
	Rice Point, Canada	2018-06-18
	Akron, Ohio, US	2018-06-18
	Charlottetown, Canada	2018-06-18
	Peace River, Canada	2018-06-18
	Halifax, Canada	2018-06-18

Name	Location	Date
	Silver Spring, Maryland, US	2018-06-19
	Atlanta, Georgia, US	2018-06-19
	Hillsboro, Oregon, US	2018-06-19
	Hudson, Canada	2018-06-19
	Toronto, Canada	2018-06-19
	Gimli, Canada	2018-06-19
	Cornwall, Canada	2018-06-19
	Orange, New Jersey, US	2018-06-19
	Toronto, Canada	2018-06-19
	Mississauga, Canada	2018-06-19
	Guelph, Canada	2018-06-20
	Oshawa, Canada	2018-06-20
	Gatineau, Canada	2018-06-21
	US	2018-06-21
	Trenton, Canada	2018-06-21
	Montréal, Canada	2018-06-21
	Dana Point, California, US	2018-06-21
	Halifax, Canada	2018-06-21
	Halifax Nova Scotia, Canada	2018-06-22
	Vancouver, Canada	2018-06-22
	Bonita springs, Florida, US	2018-06-22
	NEW GLASGOW, NS, Canada	2018-06-22

Name	Location	Date
	t Vancouver, Canada	2018-06-22
	gonish, Canada	2018-06-22
	ville, Canada	2018-06-22
	ax, Canada	2018-06-22
	nto, Canada	2018-06-23
	ter River, Canada	2018-06-23
	ville, Canada	2018-06-23
		2018-06-24
	n Head Island, South Carolina, US	2018-06-24
	ada	2018-06-24
	ria, Canada	2018-06-24
	ax, Canada	2018-06-25
	u, Canada	2018-06-26
	ada	2018-06-26
	icton, Canada	2018-06-27
	market, Canada	2018-06-27
	, Canada	2018-06-27
		2018-06-28
	on Hills, Canada	2018-06-29
	enix, Oregon, US	2018-06-30
	onderry, NS, Canada	2018-06-30
	Bay, Canada	2018-07-02

Name	Location	Date
	San Antonio, Texas, US	2018-07-02
	Micmac, Canada	2018-07-02
	Victoria, Canada	2018-07-02
	Charlottetown, Canada	2018-07-03
	Charlottetown, Canada	2018-07-03
	Charlottetown, Canada	2018-07-03
	Montague, Canada	2018-07-03
	Kitchener, Canada	2018-07-03
	Montague, Canada	2018-07-03
	Montague, Canada	2018-07-03
	Montage, Canada	2018-07-03
	Grandview, Canada	2018-07-03
	Hammonds Plains, Canada	2018-07-03
	North River Bridge, Canada	2018-07-03
	Mabou, Canada	2018-07-03
	Canada	2018-07-04
	Toronto, Canada	2018-07-04
	Canada	2018-07-04
	New Glasgow, Canada	2018-07-04
	Kissimmee, Florida, US	2018-07-04
	Dartmouth, Canada	2018-07-04
	Judique, Canada	2018-07-04

Name	Location	Date
	Charlottetown, Canada	2018-07-04
	Glace Bay, Canada	2018-07-04
	Bedford, Canada	2018-07-04
	Lower Sackville, Canada	2018-07-04
	Conway, Massachusetts, US	2018-07-04
	Pictoulanding, Canada	2018-07-04
	ottawa, Canada	2018-07-04
	Summerside, Canada	2018-07-05
	Scotsburn, Canada	2018-07-05
	Castlegar, Canada	2018-07-05
	Halifax, Canada	2018-07-05
	Wetzlar, Germany	2018-07-05
	Bedford, Canada	2018-07-05
	Canada	2018-07-05
	US	2018-07-05
	Canada	2018-07-05
	Canada	2018-07-05
	Canada	2018-07-05
	Canada	2018-07-05
	Ingonish, Canada	2018-07-05
	UK	2018-07-05
	New Ross, Canada	2018-07-05

Name	Location	Date
	US	2018-07-05
	UK	2018-07-05
	US	2018-07-05
	UK	2018-07-05
	UK	2018-07-05
	UK	2018-07-05
	UK	2018-07-05
	Westville, Canada	2018-07-05
	Canada	2018-07-05
	UK	2018-07-05
	UK	2018-07-05
	Canada	2018-07-05
	New Glasgow, Canada	2018-07-05
	Stellarton, Canada	2018-07-05
	New Glasgow, Canada	2018-07-05
	UK	2018-07-05
	US	2018-07-05
	US	2018-07-05
	US	2018-07-05
	Bromont, Canada	2018-07-05
	US	2018-07-06
	Canada	2018-07-06

Name	Location	Date
	Canada	2018-07-06
	UK	2018-07-06
	US	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	US	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	UK	2018-07-06
	UK	2018-07-06
	UK	2018-07-06
	Canada	2018-07-06
	UK	2018-07-06
	US	2018-07-06
	Canada	2018-07-06
	Dartmouth, Canada	2018-07-06
	UK	2018-07-06
	UK	2018-07-06
	UK	2018-07-06
	Canada	2018-07-06
	UK	2018-07-06

Name	Location	Date
	Canada	2018-07-06
	UK	2018-07-06
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	Canada	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	Mississauga, Canada	2018-07-06
	summerside, Canada	2018-07-06
	Orillia, Canada	2018-07-06
	Lower Sackville, Canada	2018-07-06
	Charlottetown, Canada	2018-07-06
	Vancouver, Canada	2018-07-06
	Duncan's First Nation, Canada	2018-07-06
	Hinton, Canada	2018-07-06
	Ottawa, Canada	2018-07-06

Name	Location	Date
	Dauphin, Canada	2018-07-06
	Ottawa, Canada	2018-07-06
	Toronto, Canada	2018-07-06
	UK	2018-07-06
	Victoria, Canada	2018-07-06
	Kingsville, Canada	2018-07-06
	Canada	2018-07-06
	bedford, Canada	2018-07-06
	Kelowna, Canada	2018-07-06
	Canada	2018-07-06
	Ottawa, Canada	2018-07-06
	Ucluelet, Canada	2018-07-06
	Calgary, Canada	2018-07-06
	Canada	2018-07-06
	Canada	2018-07-06
	Dartmouth, Canada	2018-07-06
	Gibsons, Canada	2018-07-06
	Newmarket, Canada	2018-07-06
	Canada	2018-07-06
	London, Canada	2018-07-06
	New Glasgow, Canada	2018-07-06
	trenton, Canada	2018-07-06

Name	Location	Date
	US	2018-07-06
	US	2018-07-06
	Winnipeg, Canada	2018-07-06
	Winnipeg, Canada	2018-07-06
	Makawao, Hawaii, US	2018-07-06
	Montreal, Canada	2018-07-06
	US	2018-07-06
	US	2018-07-06
	US	2018-07-06
	Toronto, Canada	2018-07-06
	Canada	2018-07-06
	US	2018-07-06
	Oakville, Canada	2018-07-06
	Ganges, Canada	2018-07-07
	Canada	2018-07-07
	Montreal, Canada	2018-07-07
	Kelowna, Canada	2018-07-07
	Gabriola, Canada	2018-07-07
	Canada	2018-07-07
	Deux-montagnes, Canada	2018-07-07
	New Liskeard, Canada	2018-07-07
	Winnipeg, Canada	2018-07-07

Name	Location	Date
	Canada	2018-07-07
	US	2018-07-07
	Oshawa, Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Bowmanville, Canada	2018-07-07
	Tacoma, Washington, US	2018-07-07
	Perth, Canada	2018-07-07
	Vancouver, Canada	2018-07-07
	US	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Calgary, Canada	2018-07-07
	UK	2018-07-07
	Canada	2018-07-07
	Trenton, Canada	2018-07-07
	Grande-Digue, Canada	2018-07-07

Name	Location	Date
	Canada	2018-07-07
	Miramichi, Canada	2018-07-07
	Royal Oak, Michigan, US	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
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	Canada	2018-07-07
	Montreal, Canada	2018-07-07
	Canada	2018-07-07
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Name	Location	Date
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Name	Location	Date
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	Canada	2018-07-07
	Canada	2018-07-07
	Victoria, Canada	2018-07-07

Name	Location	Date
	Canada	2018-07-07
	Canada	2018-07-07
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Name	Location	Date
	Canada	2018-07-07
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	Ireland	2018-07-07
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Name	Location	Date
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	Canada	2018-07-07
	UK	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Red Deer, Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
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	Canada	2018-07-07
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Name	Location	Date
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	Canada	2018-07-07
	NANAIMO, BC, Canada	2018-07-07
	Canada	2018-07-07

Name	Location	Date
	Canada	2018-07-07
	Canada	2018-07-07
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Name	Location	Date
	Canada	2018-07-07
	London, Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
	Canada	2018-07-07
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Name	Location	Date
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	Pictou County, Canada	2018-07-08
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	Germany	2018-07-09
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	NiagaraFalls, Canada	2018-07-09
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	Richmond, Canada	2018-07-09
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	Pictou, Canada	2018-07-09
	West Kelowna, Canada	2018-07-09
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	France	2018-07-13
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Name	Location	Date
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	Turkey	2018-07-17
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Name	Location	Date
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	New Glasgow, Canada	2018-07-18
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	Bogotá, Colombia	2018-07-18
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Name	Location	Date
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	Toronto, Canada	2018-07-20
	New glasgow, Canada	2018-07-20
	UK	2018-07-20
	US	2018-07-20
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	Guayaquil, Ecuador	2018-07-20
	Aurora, Canada	2018-07-20
	Stellarton, Canada	2018-07-20
	Canada	2018-07-20
	Toronto, Canada	2018-07-20
	Niagara-on-the-Lake, Canada	2018-07-20
	Canada	2018-07-20
	dartmouth, Canada	2018-07-20
	Gloucester, England, UK	2018-07-20
	Gloucester, UK	2018-07-20
	Canada	2018-07-20
	New Glasgow, Canada	2018-07-20
	BeaverBank, Canada	2018-07-20
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	Margaree Valley, Canada	2018-07-20

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	Canada	2018-07-20
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	Canada	2018-07-20
	UK	2018-07-20
	Dartmouth, Canada	2018-07-20
	Canada	2018-07-21
	Winnipeg, Canada	2018-07-21
	Westville, Canada	2018-07-21
	Canada	2018-07-21
	Canada	2018-07-21
	Canada	2018-07-21
	New Glasgow, Canada	2018-07-21
	UK	2018-07-21
	Hong Kong	2018-07-21
	ABERCROMBIE, Canada	2018-07-21
	Dartmouth, Canada	2018-07-21
	Gloucester, UK	2018-07-21

Name	Location	Date
	Canada	2018-07-21
	UK	2018-07-21
	UK	2018-07-21
	Lansdowne, Canada	2018-07-21
	Killeen, Texas, US	2018-07-21
	Australia	2018-07-21
	Wallace, Canada	2018-07-21
	Baddeck, Canada	2018-07-21
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	Toronto, Canada	2018-07-21
	Canada	2018-07-21
	Windsor, Canada	2018-07-22
	US	2018-07-22
	Windsor, Canada	2018-07-22
	US	2018-07-22
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	UK	2018-07-22
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	Canada	2018-07-22

Name	Location	Date
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	US	2018-07-22
	US	2018-07-22
	Montréal, Canada	2018-07-23
	US	2018-07-23
	Canada	2018-07-23
	Canada	2018-07-23
	Brookfield, Canada	2018-07-23
	Hong Kong	2018-07-23
	Canada	2018-07-24
	Canada	2018-07-24
	Canada	2018-07-24
	Windsor, Canada	2018-07-24
	Norway	2018-07-24
	Long Eaton, England, UK	2018-07-24
	antigonish, Canada	2018-07-24

Name	Location	Date
	Newcastle upon Tyne, England, UK	2018-07-24
	Canada	2018-07-24
	North York, Canada	2018-07-24
	New Glasgow, Canada	2018-07-24
	Dartmouth, Canada	2018-07-24
	Trenton, Canada	2018-07-25
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	Big Island, NS, Canada	2018-07-25
	Canada	2018-07-25
	Moncton, Canada	2018-07-25
	Fredericton, Canada	2018-07-25
	halifax, Canada	2018-07-25
	Canada	2018-07-25
	Point Aconi ,Nova Scotia, Canada	2018-07-25
	Glace Bay, Canada	2018-07-25
	Lund, Canada	2018-07-25
	Canada	2018-07-26
	Trenton, Canada	2018-07-26

Name	Location	Date
	Dartmouth, Canada	2018-07-26
	Glace Bay, Canada	2018-07-26
	Masstown, Canada	2018-07-26
	Netherlands	2018-07-27
	Halifax, Canada	2018-07-27
	Bedford, Canada	2018-07-27
	Canada	2018-07-28
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	Canada	2018-07-28
	Halifax, Canada	2018-07-28
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	Martinique	2018-07-29
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Name	Location	Date
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	Guadeloupe	2018-07-29
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	Martinique	2018-07-29
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	Hammonds Plains, Canada	2018-07-29
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	Guadeloupe	2018-07-29
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Name	Location	Date
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	Guadeloupe	2018-07-29
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Name	Location	Date
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	Canada	2018-07-29
	Guadeloupe	2018-07-29
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	Canada	2018-07-29

Name	Location	Date
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	Martinique	2018-07-29
	Canada	2018-07-29
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Name	Location	Date
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	France	2018-07-30
	Martinique	2018-07-30
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	France	2018-07-30
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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Name	Location	Date
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	France	2018-07-30

Name	Location	Date
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	French Guiana	2018-07-30
	Canada	2018-07-30
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	Greece	2018-07-30
	France	2018-07-30
	Canada	2018-07-30
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	France	2018-07-30
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	Canada	2018-07-30
	France	2018-07-30
	France	2018-07-30
	Sweden	2018-07-30

Name	Location	Date
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	Canada	2018-07-30
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Name	Location	Date
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	Canada	2018-07-30
	Canmore, Canada	2018-07-30
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	Canada	2018-07-30
	France	2018-07-30
	Guadeloupe	2018-07-30
	France	2018-07-30
	French Polynesia	2018-07-30
	France	2018-07-30
	Canada	2018-07-30
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	Canada	2018-07-30
	France	2018-07-30

Name	Location	Date
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	France	2018-07-30
	Canada	2018-07-30
	France	2018-07-30
	US	2018-07-30
	US	2018-07-30
	UK	2018-07-30
	Canada	2018-07-30
	Congo (Republic)	2018-07-30
	Canada	2018-07-30
	lower sackville, Canada	2018-07-30
	Canada	2018-07-30
	France	2018-07-30
	Canada	2018-07-30
	Canada	2018-07-30
	Canada	2018-07-31
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	Canada	2018-07-31

Name	Location	Date
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	Canada	2018-07-31
	Australia	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	New Zealand	2018-07-31
	UK	2018-07-31
	Canada	2018-07-31
	UK	2018-07-31
	UK	2018-07-31
	Turkey	2018-07-31
	UK	2018-07-31
	US	2018-07-31
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	US	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	UK	2018-07-31
	US	2018-07-31

Name	Location	Date
	US	2018-07-31
	Canada	2018-07-31
	France	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	Netherlands	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	Innisfil, Canada	2018-07-31
	Canada	2018-07-31
	Canada	2018-07-31
	UK	2018-07-31
	Canada	2018-08-01
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	Canada	2018-08-01
	Canada	2018-08-01
	French Guiana	2018-08-01
	Canada	2018-08-01

Name	Location	Date
	US	2018-08-01
	Canada	2018-08-02
	Canada	2018-08-02
	US	2018-08-02
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	Canada	2018-08-02
	France	2018-08-02
	Canada	2018-08-02
	Canada	2018-08-02
	UK	2018-08-02
	Borden, Canada	2018-08-02
	UK	2018-08-02
	UK	2018-08-02
	Market Rasen, England, UK	2018-08-02
	Canada	2018-08-03
	Apache Junction, Arizona, US	2018-08-03
	Canada	2018-08-03
	Spruce Grove, Canada	2018-08-03

Name	Location	Date
	US	2018-08-03
	Canada	2018-08-03
	UK	2018-08-03
	UK	2018-08-03
	UK	2018-08-03
	UK	2018-08-03
	Brazil	2018-08-03
	Canada	2018-08-03
	US	2018-08-03
	UK	2018-08-03
	Canada	2018-08-03
	Mississauga, Canada	2018-08-03
	UK	2018-08-03
	Doncaster, UK	2018-08-03
	Canada	2018-08-03
	Canada	2018-08-03
	Canada	2018-08-03
	Edmonton, Canada	2018-08-03
	Canada	2018-08-03
	Bermuda	2018-08-03
	UK	2018-08-03
	US	2018-08-03

Name	Location	Date
	UK	2018-08-03
	UK	2018-08-03
	US	2018-08-03
	Canada	2018-08-03
	Canada	2018-08-03
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	Canada	2018-08-04
	US	2018-08-04
	Canada	2018-08-04
	Canada	2018-08-04
	UK	2018-08-04
	UK	2018-08-04
	UK	2018-08-04
	Netherlands	2018-08-04
	US	2018-08-04
	UK	2018-08-04
	Canada	2018-08-04

Name	Location	Date
	Chester, Canada	2018-08-04
	Canada	2018-08-04
	Fort Saskatchewan, Canada	2018-08-04
	Westville, Canada	2018-08-04
	UK	2018-08-04
	Canada	2018-08-04
	Canada	2018-08-04
	UK	2018-08-04
	Canada	2018-08-04
	Canada	2018-08-04
	US	2018-08-04
	US	2018-08-04
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	Canada	2018-08-05
	Canada	2018-08-05

Name	Location	Date
	Canada	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
	Janesville, Wisconsin, US	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
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	Canada	2018-08-05

Name	Location	Date
	UK	2018-08-05
	US	2018-08-05
	UK	2018-08-05
	Canada	2018-08-05
	Canada	2018-08-05
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	UK	2018-08-05
	Canada	2018-08-05
	US	2018-08-06
	Canada	2018-08-06
	UK	2018-08-06
	UK	2018-08-06
	Canada	2018-08-06
	Canada	2018-08-06
	Canada	2018-08-06
	Canada	2018-08-06
	Truro, Canada	2018-08-06
	UK	2018-08-06
	US	2018-08-06

Name	Location	Date
	UK	2018-08-06
	Canada	2018-08-06
	UK	2018-08-06
	Portsmouth, UK	2018-08-06
	US	2018-08-07
	US	2018-08-07
	Canada	2018-08-07
	UK	2018-08-07
	Canada	2018-08-07
	UK	2018-08-07
	US	2018-08-07
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	US	2018-08-07
	US	2018-08-07
	India	2018-08-08
	Canada	2018-08-08
	Canada	2018-08-08
	Canada	2018-08-09
	Canada	2018-08-09
	Canada	2018-08-09
	Canada	2018-08-09
	Canada	2018-08-10

Name	Location	Date
	Canada	2018-08-10
	Canada	2018-08-10
	Canada	2018-08-10
	Canada	2018-08-10
	UK	2018-08-11
	Guernsey Cove, Canada	2018-08-11
	UK	2018-08-11
	UK	2018-08-11
	UK	2018-08-11
	UK	2018-08-11
	UK	2018-08-11
	US	2018-08-12
	Kirn, Scotland, UK	2018-08-12
	Moser river, Canada	2018-08-14
	Stellarton, Canada	2018-08-14
	New Glasgow, Canada	2018-08-14
	Pictou, Canada	2018-08-14
	France	2018-08-14
	Ottawa, Canada	2018-08-14
	trenton, Canada	2018-08-14
	Halifax, Canada	2018-08-14
	Brookside, Canada	2018-08-14

Name	Location	Date
	Halifax, Canada	2018-08-14
	pictou, Canada	2018-08-14
	Pictou, Canada	2018-08-15
	Tignish, Canada	2018-08-15
	Merigomish, Canada	2018-08-15
	Mabou, Canada	2018-08-15
	Antigonish, Canada	2018-08-15
	Sydney, Canada	2018-08-15
	st peters, Canada	2018-08-15
	New Glasgow, Canada	2018-08-15
	Nova scotia, Canada	2018-08-15
	New Glasgow, Canada	2018-08-15
	Meteghan, Canada	2018-08-15
	US	2018-08-15
	US	2018-08-15
	UK	2018-08-15
	Pictou, Canada	2018-08-15
	Port Hope, Canada	2018-08-15
	UK	2018-08-15
	Canada	2018-08-15
	Canada	2018-08-15
	Canada	2018-08-15

Name	Location	Date
	Canada	2018-08-15
	Canada	2018-08-15
	UK	2018-08-15
	Canada	2018-08-15
	US	2018-08-15
	Canada	2018-08-16
	Norton, Canada	2018-08-16
	US	2018-08-16
	Pictou, Canada	2018-08-16
	US	2018-08-16
	US	2018-08-16
	US	2018-08-16
	UK	2018-08-16
	UK	2018-08-16
	Canada	2018-08-16
	US	2018-08-16
	US	2018-08-16
	US	2018-08-16
	US	2018-08-16
	US	2018-08-16
	Canada	2018-08-16
	Memphis, Tennessee, US	2018-08-16

Name	Location	Date
	Canada	2018-08-16
	pictou ns, Canada	2018-08-16
	New Glasgow, Canada	2018-08-16
	UK	2018-08-16
	Canada	2018-08-16
	US	2018-08-16
	US	2018-08-16
	Canada	2018-08-16
	Halifax, Canada	2018-08-16
	scotsburn rd., Canada	2018-08-16
	Truro, Canada	2018-08-17
	Murray River PE, Canada	2018-08-17
	Toronto, Canada	2018-08-17
	Surrey, Canada	2018-08-17
	Canada	2018-08-17
	Canada	2018-08-17
	US	2018-08-17
	US	2018-08-17
	Canada	2018-08-17
	Canada	2018-08-17
	US	2018-08-17
	Sudbury, Canada	2018-08-17

Name	Location	Date
	Canada	2018-08-17
	Jarrow, England, UK	2018-08-17
	US	2018-08-17
	Tempe, Arizona, US	2018-08-17
	UK	2018-08-17
	Canada	2018-08-17
	UK	2018-08-17
	UK	2018-08-17
	UK	2018-08-17
	Tyne Valley, Canada	2018-08-17
	UK	2018-08-17
	Canada	2018-08-17
	UK	2018-08-17
	UK	2018-08-17
	US	2018-08-17
	UK	2018-08-17
	Canada	2018-08-17
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	Canada	2018-08-17
	Canada	2018-08-17

Name	Location	Date
	Canada	2018-08-17
	US	2018-08-17
	UK	2018-08-17
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	US	2018-08-17
	Canada	2018-08-18
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	UK	2018-08-18
	US	2018-08-18
	Canada	2018-08-18
	Hamilton, Canada	2018-08-18
	Canada	2018-08-18
	UK	2018-08-18
	Ottawa, Canada	2018-08-18
	Canada	2018-08-18
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	Canada	2018-08-18

Name	Location	Date
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	Canada	2018-08-19
	US	2018-08-19

Name	Location	Date
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	Canada	2018-08-19
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	Canada	2018-08-19
	Canada	2018-08-19

Name	Location	Date
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	Canada	2018-08-20
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	Canada	2018-08-20
	Ireland	2018-08-20
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Name	Location	Date
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Name	Location	Date
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	US	2018-08-20
	US	2018-08-20
	Greece	2018-08-20
	US	2018-08-21
	Canada	2018-08-21
	Sweden	2018-08-21
	Canada	2018-08-21

Name	Location	Date
	Canada	2018-08-21
	Canada	2018-08-22
	US	2018-08-22
	Portugal	2018-08-22
	Canada	2018-08-22
	Canada	2018-08-22
	UK	2018-08-22
	US	2018-08-23
	Dartmouth, Canada	2018-08-23
	Halifax, Canada	2018-08-23
	Sydney, Canada	2018-08-23
	Canada	2018-08-23
	Bangladesh	2018-08-24
	US	2018-08-24
	US	2018-08-24
	Canada	2018-08-24
	India	2018-08-24
	Canada	2018-08-24
	US	2018-08-25
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Name	Location	Date
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Name	Location	Date
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	Canada	2018-08-26
	US	2018-08-26
	US	2018-08-26
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	US	2018-08-27
	US	2018-08-27
	US	2018-08-27
	US	2018-08-27
	US	2018-08-27
	US	2018-08-27
	Ottawa, Canada	2018-08-27
	Canada	2018-08-28
	US	2018-08-28

Name	Location	Date
	US	2018-08-28
	US	2018-08-28
	UK	2018-08-28
	Stratford, Canada	2018-08-28
	Canada	2018-08-28
	UK	2018-08-28
	UK	2018-08-28
	Canada	2018-08-28
	Felton, Pennsylvania, US	2018-08-28
	Canada	2018-08-28
	Canada	2018-08-28
	US	2018-08-28
	US	2018-08-28
	Belle River, Canada	2018-08-28
	London, Canada	2018-08-28
	Charlottetown, Canada	2018-08-28
	Charlottetown, Canada	2018-08-28
	Mission, Canada	2018-08-28
	Stratford, Canada	2018-08-28
	Canada	2018-08-29
	US	2018-08-29
	Ottawa, Canada	2018-08-29

Name	Location	Date
	US	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Ottawa, Canada	2018-08-29
	Canada	2018-08-29
	Hampton, Canada	2018-08-29
	Montréal, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Cornwall, Canada	2018-08-29
	Borden-Carleton, Canada	2018-08-29
	York, Canada	2018-08-29
	Shreveport, Louisiana, US	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Hampton, Canada	2018-08-29
	Belle River, Canada	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	US	2018-08-29

Name	Location	Date
	US	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Crapaud, Canada	2018-08-29
	Kensington, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Nine Mile Creek, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	montague, Canada	2018-08-29
	Cornwall, Canada	2018-08-29
	US	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Charlottetown, Canada	2018-08-29
	Morell, Canada	2018-08-29
	Canada	2018-08-29
	Montague, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Stratford, Canada	2018-08-29
	US	2018-08-29

Name	Location	Date
	Fredericton, Canada	2018-08-29
	Montreal QC, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Stratford, P.E.I, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Canada	2018-08-29
	Borden-Carleton, Canada	2018-08-29
	Kensington, Canada	2018-08-29
	york, Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	US	2018-08-29
	Belle Chasse, Louisiana, US	2018-08-29
	US	2018-08-29
	Port Moody, Canada	2018-08-29
	Ottawa, Canada	2018-08-29
	Canada	2018-08-29
	Handen, Sweden	2018-08-29
	US	2018-08-29

Name	Location	Date
	US	2018-08-29
	US	2018-08-29
	Windsor, Canada	2018-08-29
	Gabriola, Canada	2018-08-29
	Bedford, Canada	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Brockville, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Ellerslie, Canada	2018-08-29
	Montague, Canada	2018-08-29
	US	2018-08-29
	Morell, Canada	2018-08-29
	Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	St Ann, Canada	2018-08-29
	Wellington, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Souris, Canada	2018-08-29
	SouthGranvile, Canada	2018-08-29

Name	Location	Date
	Summerside, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	Victoria, Canada	2018-08-29
	Lusby, Maryland, US	2018-08-29
	London, England, UK	2018-08-29
	Saint Catherines, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	Canada	2018-08-29
	Caldwell, New Jersey, US	2018-08-29
	Teddington, England, UK	2018-08-29
	UK	2018-08-29
	Saint John, Canada	2018-08-29
	US	2018-08-29
	Cardigan, Canada	2018-08-29
	Edmundston, Canada	2018-08-29
	US	2018-08-29
	Charlottetown, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29

Name	Location	Date
	Charlottetown, Canada	2018-08-29
	Ottawa, Canada	2018-08-29
	Cornwall, Canada	2018-08-29
	US	2018-08-29
	US	2018-08-29
	Red Deer, Canada	2018-08-29
	Kenner, Louisiana, US	2018-08-29
	Montague, Canada	2018-08-29
	charlottetown, Canada	2018-08-29
	Ch'town, Canada	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	Miramichi, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Canada	2018-08-29
	Florida, US	2018-08-29
	Canada	2018-08-29
	WATERLOO, Canada	2018-08-29
	Montague, Canada	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29

Name	Location	Date
	Red Deer County, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Cornwall, Canada	2018-08-29
	Vernon River, Canada	2018-08-29
	Wasaga Beach, Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Dartmouth, Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	Blind bay bc, Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Charlottetown, Canada	2018-08-29

Name	Location	Date
	France	2018-08-29
	Dartmouth, Canada	2018-08-29
	UK	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Charlottetown, Canada	2018-08-29
	Canada	2018-08-29
	Montague, Canada	2018-08-29
	Nottingham, UK	2018-08-29
	UK	2018-08-29
	UK	2018-08-29
	UK	2018-08-29
	UK	2018-08-29
	Ottawa, Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	Charlottetown, Canada	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	UK	2018-08-29

Name	Location	Date
	Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Montague, Canada	2018-08-29
	UK	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	UK	2018-08-29
	red deer, Canada	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	US	2018-08-29
	Granville Ferry, NS, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Stratford, Canada	2018-08-29
	Parry Sound, Canada	2018-08-29
	Summerside, Canada	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	US	2018-08-29

Name	Location	Date
	US	2018-08-29
	Fredericton, Canada	2018-08-29
	Charlottetown, Canada	2018-08-29
	Belfast, Canada	2018-08-29
	Crapaud, Canada	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
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	UK	2018-08-29
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	Canada	2018-08-29
	Canada	2018-08-29
	US	2018-08-29
	Canada	2018-08-29
	UK	2018-08-29
	Summerside, Canada	2018-08-29
	Canada	2018-08-29

Name	Location	Date
	US	2018-08-29
	Kelly's cross, Canada	2018-08-29
	Crapaud, P.E.I., Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
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	UK	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	Albany, Canada	2018-08-29
	Canada	2018-08-29
	Canada	2018-08-29
	UK	2018-08-29
	US	2018-08-29
	Ottawa, Canada	2018-08-29
	Ottawa, Canada	2018-08-29

Name	Location	Date
	Moncton, Canada	2018-08-29
	UK	2018-08-29
	Charlottetown, Canada	2018-08-29
	Montague, Canada	2018-08-29
	charlottetown, Canada	2018-08-29
	Mission, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
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	US	2018-08-30
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	Montague, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Montague, Canada	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	Montague, Canada	2018-08-30

Name	Location	Date
	Dominican Republic	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Charlottetown, Canada	2018-08-30
	US	2018-08-30
	US	2018-08-30
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	US	2018-08-30
	Montague, Canada	2018-08-30
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	Canada	2018-08-30
	US	2018-08-30
	US	2018-08-30
	Dartmouth, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30

Name	Location	Date
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
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	Charlottetown, Canada	2018-08-30
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	UK	2018-08-30
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	UK	2018-08-30
	UK	2018-08-30
	Charlottetown, Canada	2018-08-30

Name	Location	Date
	UK	2018-08-30
	Portsmouth, England, UK	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	Mont-royal, Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Fayetteville, North Carolina, US	2018-08-30
	Mt.Stewart, Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Pownal, Canada	2018-08-30
	Montague, Canada	2018-08-30
	Canada	2018-08-30
	Staynet, Canada	2018-08-30
	Canada	2018-08-30
	Charlottetown, Canada	2018-08-30
	Canada	2018-08-30

Name	Location	Date
	US	2018-08-30
	Edmonton, Canada	2018-08-30
	Stanhope, Canada	2018-08-30
	Summerside, Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Halifax, Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	US	2018-08-30
	US	2018-08-30

Name	Location	Date
	Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Charlottetown, Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
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	Canada	2018-08-30
	Canada	2018-08-30
	Charlottetown, Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Charlottetown, Canada	2018-08-30
	UK	2018-08-30
	UK	2018-08-30

Name	Location	Date
	UK	2018-08-30
	US	2018-08-30
	Charlottetown, Canada	2018-08-30
	Canada	2018-08-30
	Charlotteown, Canada	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Charlottetown, Canada	2018-08-30
	Miscouche, Canada	2018-08-30
	Charlottetown, Canada	2018-08-30
	UK	2018-08-30
	France	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	Montague, Canada	2018-08-30
	Kensington, Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	UK	2018-08-30

Name	Location	Date
	UK	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	UK	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	UK	2018-08-30
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	Canada	2018-08-30
	UK	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Charlottetown,, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Summerside, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Pickering, Canada	2018-08-30
	UK	2018-08-30

Name	Location	Date
	UK	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	US	2018-08-30
	UK	2018-08-30
	Canada	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	Stratford, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	Belle River, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30
	US	2018-08-30
	Canada	2018-08-30
	Fredericton, Canada	2018-08-30
	Canada	2018-08-30
	Canada	2018-08-30

Name	Location	Date
	Waterloo, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Bonshaw, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	Conquerall Bank, Canada	2018-08-31
	Bermuda	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31

Name	Location	Date
	Canada	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Port Colborne, Canada	2018-08-31
	Canada	2018-08-31
	St. Catharines, Canada	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	Newton, Massachusetts, US	2018-08-31
	US	2018-08-31
	Westmount, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Calgary, Canada	2018-08-31
	UK	2018-08-31
	north york, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31

Name	Location	Date
	UK	2018-08-31
	UK	2018-08-31
	Canada	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	Charlottetown, Canada	2018-08-31
	Cornwall, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Stratford, Canada	2018-08-31
	Canada	2018-08-31
	Breadalbane, Canada	2018-08-31
	Canada	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	Charlottetown, Canada	2018-08-31

Name	Location	Date
	Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Canada	2018-08-31
	Oshawa, Canada	2018-08-31
	North Rustico, Canada	2018-08-31
	Canada	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	UK	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Montague, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Ottawa, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Canada	2018-08-31
	Montague, Canada	2018-08-31
	UK	2018-08-31
	US	2018-08-31
	Montréal, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31

Name	Location	Date
	Canada	2018-08-31
	US	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	North Milton, Canada	2018-08-31
	Miscouche, Canada	2018-08-31
	Sammamish, Washington, US	2018-08-31
	UK	2018-08-31
	US	2018-08-31
	Bedford, UK	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Oakville, Canada	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Bonshaw, Canada	2018-08-31
	Wellington, Canada	2018-08-31
	Montréal, Canada	2018-08-31
	Charlottetown, Canada	2018-08-31
	Canada	2018-08-31
	Long Beach, California, US	2018-08-31

Name	Location	Date
	Canada	2018-08-31
	Canada	2018-08-31
	UK	2018-08-31
	Spring Hill, Florida, US	2018-08-31
	US	2018-08-31
	UK	2018-08-31
	Canada	2018-08-31
	Canada	2018-08-31
	Charlottetown, Canada	2018-09-01
	Cornwall P.E.I., Canada	2018-09-01
	Canada	2018-09-01
	US	2018-09-01
	Ottawa, Canada	2018-09-01
	Canada	2018-09-01
	Rice Point, Canada	2018-09-01
	US	2018-09-01
	Canada	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	UK	2018-09-01

Name	Location	Date
	UK	2018-09-01
	UK	2018-09-01
	Canada	2018-09-01
	Canada	2018-09-01
	las vegas, Nevada, US	2018-09-01
	Borden-Carleton, Canada	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	UK	2018-09-01
	Canada	2018-09-01
	San Mateo, California, US	2018-09-01
	Canada	2018-09-01
	Charlottetown, Canada	2018-09-01
	US	2018-09-01
	UK	2018-09-01
	Canada	2018-09-01
	UK	2018-09-01
	Canada	2018-09-01
	Canada	2018-09-01
	US	2018-09-01
	Charlottetown, Canada	2018-09-01

Name	Location	Date
	Canada	2018-09-01
	Cornwall, Canada	2018-09-01
	UK	2018-09-01
	Canada	2018-09-01
	UK	2018-09-01
	Canada	2018-09-02
	UK	2018-09-02
	Canada	2018-09-02
	Kilmuir, Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	US	2018-09-02
	Canada	2018-09-02
	UK	2018-09-02
	UK	2018-09-02
	Lebanon	2018-09-02
	UK	2018-09-02
	UK	2018-09-02

Name	Location	Date
	UK	2018-09-02
	York, Canada	2018-09-02
	Canada	2018-09-02
	Ajax, Canada	2018-09-02
	US	2018-09-02
	UK	2018-09-02
	Canada	2018-09-02
	US	2018-09-02
	Canada	2018-09-02
	UK	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Charlottetown, Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-02
	Canada	2018-09-03
	Canada	2018-09-03
	Philippines	2018-09-03
	Montague, Canada	2018-09-03
	Canada	2018-09-03
	US	2018-09-03
	Canada	2018-09-03

Name	Location	Date
	cambridge, Canada	2018-09-03
	US	2018-09-03
	Canada	2018-09-03
	US	2018-09-03
	Canada	2018-09-03
	US	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Ottawa, Canada	2018-09-03
	Millbrook, Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
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	Canada	2018-09-03

Name	Location	Date
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
	Canada	2018-09-03
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	Canada	2018-09-04

Name	Location	Date
	Canada	2018-09-04
	Canada	2018-09-04
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	Canada	2018-09-04
	Canada	2018-09-04
	Mauritius	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-04
	charlottetown, Canada	2018-09-04
	Belle River, Canada	2018-09-04
	Canada	2018-09-04
	Lamartine, Canada	2018-09-04
	Belleville, Canada	2018-09-04
	US	2018-09-04

Name	Location	Date
	US	2018-09-04
	Canada	2018-09-04
	Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	Edmonton, Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	UK	2018-09-05
	Canada	2018-09-05
	US	2018-09-05
	Calgary, Canada	2018-09-05
	Canada	2018-09-05
	San Antonio, Texas, US	2018-09-05
	Canada	2018-09-05
	Mississauga, Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	US	2018-09-05
	Canada	2018-09-05

Name	Location	Date
	Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-05
	Canada	2018-09-06
	Georgina, Canada	2018-09-06
	Canada	2018-09-06
	Peterborough, Canada	2018-09-06
	US	2018-09-06
	Canada	2018-09-06
	Trenton, Canada	2018-09-06
	US	2018-09-07
	wyoming, Rhode Island, US	2018-09-07
	US	2018-09-07
	Canada	2018-09-08
	US	2018-09-08
	Canada	2018-09-08
	US	2018-09-08
	Ashwell, UK	2018-09-09
	US	2018-09-10
	Canada	2018-09-10
	France	2018-09-11
	US	2018-09-12

Name	Location	Date
	Canada	2018-09-12
	Gardner Creek, Canada	2018-09-15
	Halifax, Canada	2018-09-15
	nova scotia, Canada	2018-09-23
	white point, Canada	2018-09-23
	Vernon Bridge, Canada	2018-09-26
	Halifax, Canada	2018-09-27
	Canada	2018-10-01
	France	2018-10-01
	UK	2018-10-01
	UK	2018-10-01
	Canada	2018-10-01
	US	2018-10-01
	UK	2018-10-01
	London, England, UK	2018-10-01
	UK	2018-10-01
	UK	2018-10-01
	Ottawa, Canada	2018-10-01
	UK	2018-10-01
	Canada	2018-10-01
	US	2018-10-01
	UK	2018-10-01

Name	Location	Date
	UK	2018-10-01
	UK	2018-10-01
	UK	2018-10-01
	Canada	2018-10-01
	UK	2018-10-01
	UK	2018-10-01
	US	2018-10-01
	US	2018-10-01
	Canada	2018-10-01
	Canada	2018-10-01
	Canada	2018-10-01
	Canada	2018-10-01
	Canada	2018-10-02
	Canada	2018-10-02
	US	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	US	2018-10-02
	US	2018-10-02
	US	2018-10-02
	US	2018-10-02
	Canada	2018-10-02

Name	Location	Date
	US	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	Canada	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	UK	2018-10-02
	Canada	2018-10-02
	US	2018-10-02
	el paso, Texas, US	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	Haverfordwest, Wales; Cymru, UK	2018-10-02
	US	2018-10-02
	Winnipeg, Canada	2018-10-02
	Plymouth, UK	2018-10-02
	US	2018-10-02

Name	Location	Date
	UK	2018-10-02
	US	2018-10-02
	UK	2018-10-02
	US	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	Canada	2018-10-02
	US	2018-10-02
	Canada	2018-10-02
	US	2018-10-02
	Canada	2018-10-03
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	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03

Name	Location	Date
	Canada	2018-10-03
	Canada	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	Lewes, UK	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	US	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Winnipeg, Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	UK	2018-10-03
	Canada	2018-10-03
	UK	2018-10-03
	UK	2018-10-03

Name	Location	Date
	UK	2018-10-03
	Canada	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	Chicago, Illinois, US	2018-10-03
	Canada	2018-10-03
	US	2018-10-03
	Canada	2018-10-03
	Chicago, Illinois, US	2018-10-03
	Meknes, Morocco	2018-10-03
	UK	2018-10-03
	UK	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03
	Charlottetown, Canada	2018-10-03
	Canada	2018-10-03
	Canada	2018-10-03

Name	Location	Date
	US	2018-10-03
	Canada	2018-10-03
	US	2018-10-03
	Ottawa, Canada	2018-10-03
	Canada	2018-10-04
	US	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	US	2018-10-04
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	US	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04
	Canada	2018-10-04

Name	Location	Date
	Canada	2018-10-04
	Chicopee, Massachusetts, US	2018-10-04
	US	2018-10-04
	US	2018-10-04
	UK	2018-10-04
	US	2018-10-04
	Vietnam	2018-10-04
	UK	2018-10-04
	US	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	Canada	2018-10-04
	US	2018-10-04
	Canada	2018-10-04
	US	2018-10-04
	Munster, Indiana, US	2018-10-04
	Ottawa, Canada	2018-10-04
	US	2018-10-04
	Newport, Canada	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04

Name	Location	Date
	Canada	2018-10-04
	US	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04
	UK	2018-10-04
	UK	2018-10-04
	UK	2018-10-04
	UK	2018-10-04
	US	2018-10-04
	Walton, Kentucky, US	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04
	US	2018-10-04
	Canada	2018-10-04
	UK	2018-10-04
	Canada	2018-10-04
	US	2018-10-04
	UK	2018-10-04
	Canada	2018-10-05
	Canada	2018-10-05
	Canada	2018-10-05
	US	2018-10-05

Name	Location	Date
	US	2018-10-05
	US	2018-10-05
	Canada	2018-10-05
	US	2018-10-05
	UK	2018-10-05
	UK	2018-10-05
	UK	2018-10-05
	UK	2018-10-05
	Hamilton, Canada	2018-10-05
	UK	2018-10-05
	UK	2018-10-05
	US	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05
	US	2018-10-05
	US	2018-10-05
	Canada	2018-10-05
	Canada	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05

Name	Location	Date
	Canada	2018-10-05
	Canada	2018-10-05
	US	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05
	Canada	2018-10-05
	Canada	2018-10-05
	UK	2018-10-05
	France	2018-10-05
	US	2018-10-05
	Qatar	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05
	Canada	2018-10-05
	UK	2018-10-05
	Canada	2018-10-05
	US	2018-10-05
	Canada	2018-10-06
	US	2018-10-06
	Canada	2018-10-06
	Canada	2018-10-06

Name	Location	Date
	Canada	2018-10-06
	US	2018-10-06
	UK	2018-10-06
	US	2018-10-06
	Canada	2018-10-06
	US	2018-10-06
	UK	2018-10-06
	UK	2018-10-06
	Canada	2018-10-06
	Canada	2018-10-06
	UK	2018-10-06
	Canada	2018-10-06
	US	2018-10-06
	US	2018-10-06
	Canada	2018-10-06
	UK	2018-10-06
	Canada	2018-10-06
	Lees, England, UK	2018-10-06
	Canada	2018-10-06
	Canada	2018-10-06
	UK	2018-10-06
	US	2018-10-07

Name	Location	Date
	US	2018-10-07
	Canada	2018-10-08
	Canada	2018-10-08
	US	2018-10-08
	Canada	2018-10-08
	Canada	2018-10-09
	Canada	2018-10-09
	Charilttrown, Canada	2018-10-09
	Canada	2018-10-09
	US	2018-10-09
	Canada	2018-10-09
	Cornwall, Canada	2018-10-09
	US	2018-10-09
	France	2018-10-09
	Canada	2018-10-09
	UK	2018-10-09
	Beaver Bank, Canada	2018-10-09
	Charlottetown, Canada	2018-10-09
	Chelsea, NS, Canada	2018-10-09
	Canada	2018-10-09
	UK	2018-10-09
	Canada	2018-10-09

Name	Location	Date
	Canada	2018-10-09
	France	2018-10-09
	Windsor, Canada	2018-10-09
	Canada	2018-10-09
	UK	2018-10-09
	Canada	2018-10-10
	UK	2018-10-10
	Canada	2018-10-10
	Canada	2018-10-10
	US	2018-10-10
	UK	2018-10-10
	Toronto, Canada	2018-10-10
	UK	2018-10-10
	UK	2018-10-10
	Canada	2018-10-10
	US	2018-10-10
	Canada	2018-10-10
	UK	2018-10-10
	Canada	2018-10-10
	UK	2018-10-10
	UK	2018-10-10
	Canada	2018-10-10

Name	Location	Date
	UK	2018-10-10
	Canada	2018-10-10
	Canada	2018-10-10
	UK	2018-10-10
	Canada	2018-10-10
	US	2018-10-10
	Canada	2018-10-10
	Canada	2018-10-10
	Falmouth, UK	2018-10-10
	Canada	2018-10-11
	Canada	2018-10-11
	US	2018-10-11
	Canada	2018-10-11
	Canada	2018-10-11
	UK	2018-10-11
	UK	2018-10-11
	UK	2018-10-11
	UK	2018-10-11
	Westville, Canada	2018-10-11
	UK	2018-10-11
	Canada	2018-10-11
	Canada	2018-10-11

Name	Location	Date
	Canada	2018-10-11
	UK	2018-10-11
	Scotsburn, Canada	2018-10-11
	Stellarton, Canada	2018-10-11
	UK	2018-10-11
	Canada	2018-10-11
	Canada	2018-10-11
	UK	2018-10-11
	Canada	2018-10-11
	Canada	2018-10-11
	France	2018-10-12
	Halifax, Canada	2018-10-12
	US	2018-10-12
	UK	2018-10-12
	US	2018-10-12
	US	2018-10-12
	Canada	2018-10-12
	UK	2018-10-12
	Canada	2018-10-12
	UK	2018-10-12
	Inverness, Canada	2018-10-12
	UK	2018-10-12

Name	Location	Date
	Kings Lynn, England, UK	2018-10-12
	UK	2018-10-12
	UK	2018-10-12
	UK	2018-10-12
	UK	2018-10-12
	Canada	2018-10-12
	Hamilton, Canada	2018-10-12
	Canada	2018-10-12
	Canada	2018-10-13
	Canada	2018-10-13
	Canada	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	Balnaguard, UK	2018-10-13
	Scotland, Scotland, UK	2018-10-13
	US	2018-10-13
	Canada	2018-10-13

Name	Location	Date
	UK	2018-10-13
	UK	2018-10-13
	US	2018-10-13
	UK	2018-10-13
	UK	2018-10-13
	US	2018-10-13
	US	2018-10-14
	Canada	2018-10-14
	Canada	2018-10-14
	Mississauga, Canada	2018-10-14
	Pictou, Canada	2018-10-14
	Baddeck, Canada	2018-10-14
	US	2018-10-14
	US	2018-10-15
	UK	2018-10-15
	France	2018-10-15
	Creston, Canada	2018-10-15
	Canada	2018-10-16
	US	2018-10-16
	Canada	2018-10-16
	Canada	2018-10-16
	Hamilton, Canada	2018-10-16

Name	Location	Date
	Canada	2018-10-16
	UK	2018-10-16
	Canada	2018-10-16
	Brampton, Canada	2018-10-16
	Canada	2018-10-16
	Brampton, Canada	2018-10-17
	Canada	2018-10-17
	US	2018-10-17
	Porters Lake, Canada	2018-10-17
	US	2018-10-17
	Pictou, Canada	2018-10-17
	Frasers Mountain, Canada	2018-10-17
	US	2018-10-17
	Bogotá, Colombia	2018-10-18
	Canada	2018-10-18
	Canada	2018-10-18
	Westville, Canada	2018-10-18
	US	2018-10-21
	Toronto, Canada	2018-10-22
	Canada	2018-10-23
	Orleans, Canada	2018-10-24
	London, UK	2018-10-25

Name	Location	Date
	New Glasgow, Canada	2018-10-25
	Montréal, Canada	2018-10-25
	Yarmouth, Canada	2018-10-25
	Scotsburn, Canada	2018-10-25
	pictou, Canada	2018-10-25
	Pictou, Canada	2018-10-25
	new glasgow, Canada	2018-10-25
	Bible hill, Canada	2018-10-25
	Trenton, Canada	2018-10-25
	Toronto, Canada	2018-10-25
	Mt. Pearl, Canada	2018-10-25
	New Glasgow, Canada	2018-10-25
	Perrysburg, Ohio, US	2018-10-26
	Markham, Canada	2018-10-26
	Oshawa, Canada	2018-10-26
	Saint John, Canada	2018-10-26
	Peterborough, Canada	2018-10-26
	Springfield, Tennessee, US	2018-10-26
	Toronto, Canada	2018-10-26
	Fraserville, Canada	2018-10-26
	Fraserville, Canada	2018-10-26
	Port Hope ON, Canada, Canada	2018-10-27

Name	Location	Date
	Wallace, Canada	2018-10-27
	ajax, Canada	2018-10-27
	London, Canada	2018-10-27
	Toronto, Canada	2018-10-27
	Truro, Canada	2018-10-28
	UK	2018-10-29
	Canada	2018-10-29
	UK	2018-10-29
	Canada	2018-10-29
	Victoria, Canada	2018-10-30
	Oakville, Canada	2018-10-30
	Wichita, US	2018-10-30
	Belfast, UK	2018-10-30
	Lancashire, UK	2018-10-30
	Wetaskiwin, Canada	2018-10-30
	Perth, UK	2018-10-30
	Toronto, Canada	2018-10-30
	Bozeman, US	2018-10-30
	Ottawa, Canada	2018-10-30
	Egham, UK	2018-10-30
	London, UK	2018-10-30
	Rotherham, UK	2018-10-30

Name	Location	Date
	Winnipeg, Canada	2018-10-31
	Palm Harbor, US	2018-10-31
	TERRE COTTA, Canada	2018-10-31
	Bletchley, UK	2018-10-31
	Winnipeg, Canada	2018-10-31
	Toronto, Canada	2018-10-31
	west kelowna, Canada	2018-10-31
	UK	2018-10-31
	Sussex, US	2018-10-31
	Kamloops, Canada	2018-10-31
	Nelson, Canada	2018-10-31
	Brandon, Canada	2018-10-31
	France	2018-10-31
	France	2018-10-31
	Toulouse, France	2018-10-31
	Port Moody, Canada	2018-10-31
	Cornwall, Canada	2018-11-01
	Taber, Canada	2018-11-01
	Lichfield, UK	2018-11-01
	Vancouver, Canada	2018-11-01
	UK	2018-11-01
	Avon, France	2018-11-01

Name	Location	Date
	Harlow, UK	2018-11-01
	Miami, US	2018-11-01
	Liverpool, UK	2018-11-01
	Barrie, Canada	2018-11-01
	Wrexham, UK	2018-11-02
	Wakefield, UK	2018-11-02
	Heinsburg, Canada	2018-11-02
	San Diego, US	2018-11-02
	los Angeles, US	2018-11-02
	Vancouver, Canada	2018-11-02
	Hemel Hempstead, UK	2018-11-02
	Winnipeg, Canada	2018-11-02
	Clawson, Michigan, US	2018-11-02
	Canada	2018-11-02
	Ashton-under-lyne, UK	2018-11-02
	Brixham, UK	2018-11-02
	UK	2018-11-02
	Rendlesham, UK	2018-11-02
	Stalybridge, UK	2018-11-02
	UK	2018-11-02
	Airdrie, Canada	2018-11-02
	sandy, Utah, US	2018-11-02

Name	Location	Date
	UK	2018-11-02
	Knighton, UK	2018-11-02
	Poole, UK	2018-11-02
	Hamilton, Canada	2018-11-03
	Akron, US	2018-11-03
	Crescent city, US	2018-11-03
	Stockport, UK	2018-11-03
	Romford, UK	2018-11-03
	Claygate, UK	2018-11-03
	Comox, Canada	2018-11-03
	Surrey, Canada	2018-11-03
	Victoria, Canada	2018-11-03
	Niagara Falls, Canada	2018-11-04
	Ottawa, Canada	2018-11-04
	newbury, UK	2018-11-04
	Hull, UK	2018-11-04
	Ashford, UK	2018-11-04
	Winsford, UK	2018-11-04
	Montague, Canada	2018-11-04
	Edmonton, Canada	2018-11-04
	Mckinney, US	2018-11-04
	Llanelli, UK	2018-11-04

Name	Location	Date
	Guildford, UK	2018-11-04
	Davis, California, US	2018-11-04
	Houston, US	2018-11-04
	Vancouver, Canada	2018-11-04
	Medicine Hat, Canada	2018-11-05
	Toronto, Canada	2018-11-05
	Vancouver, Canada	2018-11-05
	Scraptoft, UK	2018-11-05
	Elizabethtown, Canada	2018-11-05
	New York, US	2018-11-05
	Shipley, UK	2018-11-05
	Findlay, US	2018-11-05
	Winnipeg, Canada	2018-11-05
	Victoria, Canada	2018-11-05
	Prince George, Canada	2018-11-05
	Surprise, US	2018-11-05
	Medicine Hat, Canada	2018-11-05
	Mattice, Canada	2018-11-05
	Cardiff, UK	2018-11-05
	Kokomo, US	2018-11-05
	Toronto, Canada	2018-11-05

Name	Location	Date
	Toronto, Canada	2018-11-06
	Creston BC, Canada	2018-11-06
	St. John's, Canada	2018-11-06
	Toronto, Canada	2018-11-06
	Vancouver, Canada	2018-11-06
	Canada	2018-11-06
	Preston, UK	2018-11-06
	Québec, Canada	2018-11-06
	Calgary, Canada	2018-11-06
	Minneapolis, US	2018-11-06
	Paris, France	2018-11-06
	Newquay, UK	2018-11-06
	Pointe-du-Chêne, Canada	2018-11-06
	Winnipeg, Canada	2018-11-06
	Baselland, Switzerland	2018-11-06
	London, Canada	2018-11-06
	Bridgend, UK	2018-11-06
	leeds, UK	2018-11-06
	Battle, UK	2018-11-07
	Westville, Canada	2018-11-08
	Pictou, Canada	2018-11-08
	Split, Croatia	2018-11-08

Name	Location	Date
	inclair's island., Canada	2018-11-08
	Jew Glasgow, Canada	2018-11-08
	ronx, US	2018-11-08
	Drummondville, Canada	2018-11-11
	oncord, US	2018-11-11
	nontreal quebec, Canada	2018-11-14
	Winnipeg, Canada	2018-11-14
	0, France	2018-11-14
	ruro, UK	2018-11-14
	rance	2018-11-14
	Meopham, UK	2018-11-14
	Jew York, New York, US	2018-11-14
	Honiton, UK	2018-11-14
	ridge of weir, UK	2018-11-14
	hicago, US	2018-11-14
	eeds, UK	2018-11-15
	Mississauga, Canada	2018-11-15
	headle Hulme, UK	2018-11-15
	anada	2018-11-15
	ancho Murieta, US	2018-11-15
	acramento, US	2018-11-15
	udbury, Canada	2018-11-15

Name	Location	Date
	Kanata, Canada	2018-11-15
	Milwaukee, US	2018-11-15
	LONDON, UK	2018-11-15
	Paris, France	2018-11-15
	Brampton, Canada	2018-11-15
	Camberley, UK	2018-11-15
	Minot, US	2018-11-15
	Tecumseh, Canada	2018-11-15
	West Point, New York, US	2018-11-15
	Shrewsbury, UK	2018-11-15
	Toronto, Canada	2018-11-15
	Palm Harbor, Florida, US	2018-11-15
	Lloydminster, Canada	2018-11-15
	Reading, UK	2018-11-15
	Choiceland, Canada	2018-11-15
	Edmonton, Canada	2018-11-15
	Antigonish, Canada	2018-11-15
	Calgary, Canada	2018-11-15
	Cardiff, UK	2018-11-15
	Calgary, Canada	2018-11-15
	Landerneau, France	2018-11-15
	Bloomington, Indiana, US	2018-11-15

Name	Location	Date
	Canada	2018-11-15
	Windsor, Canada	2018-11-16
	Costa Mesa, US	2018-11-16
	Lindfield, UK	2018-11-16
	UK	2018-11-16
	Gillingham, UK	2018-11-16
	Birmingham, UK	2018-11-16
	Sacramento, US	2018-11-16
	New York, US	2018-11-16
	Strathmore, Canada	2018-11-16
	Hacienda Heights, US	2018-11-16
	Stellarton, Canada	2018-11-16
	Fredericton, Canada	2018-11-17
	France	2018-11-18
	Kentville, Canada	2018-11-18
	Montréal, Canada	2018-11-19
	Fort Myers, Florida, US	2018-11-20
	Brampton, Canada	2018-11-20
	Brampton, Canada	2018-11-20
	Cloverdale, NS, Canada	2018-11-20
	El Paso, US	2018-11-21
	Surrey, Canada	2018-11-21

Name	Location	Date
	Canada	2018-11-21
	Ilford, UK	2018-11-21
	Dartmouth, Canada	2018-11-21
	STILLWATER, Canada	2018-11-21
	Stroud, UK	2018-11-21
	London, UK	2018-11-21
	Kentville, Canada	2018-11-21
	Wolfville, Canada	2018-11-21
	Trowbridge, UK	2018-11-21
	Niagara Falls, Canada	2018-11-21
	Canada	2018-11-21
	Inverness, Canada	2018-11-21
	Halifax, Canada	2018-11-21
	Hammonds Plains, Canada	2018-11-21
	Bridgewater, Canada	2018-11-21
	Halifax, Canada	2018-11-21
	Docking, UK	2018-11-22
	Gatineau, Canada	2018-11-22
	Harrogate, UK	2018-11-22
	Mississauga, Canada	2018-11-22
	Chilliwack, Canada	2018-11-22
	Luton, UK	2018-11-22

Name	Location	Date
	Bassingbourn, UK	2018-11-22
	Rugby, UK	2018-11-22
	Halifax, Canada	2018-11-22
	Hubbards, Canada	2018-11-22
	Halifax, Canada	2018-11-22
	coizard-joches, France	2018-11-22
	France	2018-11-22
	Saint-Jean-Sur-Richelieu, Canada	2018-11-22
	Fort Payne, US	2018-11-22
	Devon, Canada	2018-11-22
	Victoria, Canada	2018-11-22
	Northwood, UK	2018-11-22
	Mérignac, France	2018-11-22
	Colomiers, France	2018-11-22
	Okotoks, Canada	2018-11-22
	Cambridge, Canada	2018-11-22
	Chester, UK	2018-11-22
	Wickham, UK	2018-11-22
	Bournemouth, UK	2018-11-22
	London, UK	2018-11-22
	Bromsgrove, UK	2018-11-22
	Stellarton, Canada	2018-11-22

Name	Location	Date
	Middlewich, UK	2018-11-22
	Kanata, Canada	2018-11-22
	Halifax, Canada	2018-11-22
	Denton, UK	2018-11-22
	Halifax, Canada	2018-11-22
	Bournemouth, UK	2018-11-22
	Pictou, Canada	2018-11-22
	London, UK	2018-11-22
	Stirling, Canada	2018-11-22
	Fulwood, UK	2018-11-22
	Halifax, Canada	2018-11-22
	Nova Scotia, Canada	2018-11-22
	Edmonton, Canada	2018-11-22
	бровары, Ukraine	2018-11-22
	Port Hawkesbury, Canada	2018-11-22
	Marsden, UK	2018-11-22
	Lunenburg, Canada	2018-11-22
	Lakefield, Canada	2018-11-22
	Norman, US	2018-11-22
	Silver Spring, US	2018-11-22
	Steyning, UK	2018-11-22
	Old Lyme, Connecticut, US	2018-11-22

Name	Location	Date
	Shelburne, Canada	2018-11-22
	Bitterne Manor, UK	2018-11-22
	Halifax, UK	2018-11-22
	Liverpool, UK	2018-11-22
	canning, Canada	2018-11-22
	Sutton Coldfield, UK	2018-11-23
	Surrey, Canada	2018-11-23
	Mississauga, Canada	2018-11-23
	Micklefield, UK	2018-11-23
	Montréal, Canada	2018-11-23
	Saco, US	2018-11-23
	Le Havre, France	2018-11-23
	Glasgow, UK	2018-11-23
	France	2018-11-23
	Glasgow, Scotland, UK	2018-11-23
	Alveston, UK	2018-11-23
	LEED, UK	2018-11-23
	France	2018-11-23
	Thorburn, Canada	2018-11-23
	Durham, UK	2018-11-23
	Truro, UK	2018-11-23
	Westville, Canada	2018-11-23

Name	Location	Date
	Dukinfield, UK	2018-11-23
	Bristol, UK	2018-11-23
	ajaccio, France	2018-11-23
	Hermelinghen, France	2018-11-23
	Toronto, Canada	2018-11-23
	France	2018-11-23
	Cheltenham, UK	2018-11-23
	Memphis, US	2018-11-23
	Aberdeen, UK	2018-11-23
	Victoria, Canada	2018-11-23
	France	2018-11-23
	El Paso, US	2018-11-23
	New Glasgow, NS, Canada	2018-11-23
	Hillsboro, US	2018-11-23
	Earl Shilton, UK	2018-11-23
	Port Coquitlam, Canada	2018-11-23
	Colchester, UK	2018-11-23
	UK	2018-11-23
	London, UK	2018-11-23
	Cachan, France	2018-11-23
	Bangor, UK	2018-11-23
	Winnipeg, Canada	2018-11-23

Name	Location	Date
	Toronto, Canada	2018-11-23
	Scarborough, Canada	2018-11-23
	Fredericton, Canada	2018-11-24
	BENTON, US	2018-11-24
	Mississauga, Canada	2018-11-24
	Calgary, Canada	2018-11-24
	London, UK	2018-11-24
	Ontario, Canada	2018-11-24
	Stockport, UK	2018-11-24
	Toulouse, France	2018-11-24
	Saltford, UK	2018-11-24
	Vitry-sur-seine, France	2018-11-24
	Saint Leonards-on-sea, UK	2018-11-24
	Didsbury, Canada	2018-11-24
	Ottawa, Canada	2018-11-24
	France	2018-11-24
	Peterborough, UK	2018-11-24
	Gennevilliers, France	2018-11-24
	France	2018-11-24
	Holmer Green, UK	2018-11-24
	Scarborough, Canada	2018-11-24
	Halifax, Canada	2018-11-24

Name	Location	Date
	Birstall, UK	2018-11-24
	kalispell, US	2018-11-24
	Kamloops, Canada	2018-11-24
	Sale, UK	2018-11-24
	Hamilton, Canada	2018-11-24
	Saint Helier, Jersey	2018-11-24
	Netherlands	2018-11-25
	France	2018-11-25
	Brampton, Canada	2018-11-25
	Kimberly, US	2018-11-25
	Coatesville, US	2018-11-25
	Alberta, Canada	2018-11-25
	Calgary, Canada	2018-11-25
	Everson, US	2018-11-25
	Edmonton, Canada	2018-11-25
	Wisconsin Rapids, US	2018-11-25
	Clearwater, Canada	2018-11-25
	Bronx, US	2018-11-25
	Issoire, France	2018-11-25
	Surrey, Canada	2018-11-25
	London, UK	2018-11-25
	Memeville, US	2018-11-25

Name	Location	Date
	Falkirk, UK	2018-11-25
	Les Ulis, France	2018-11-25
	London, UK	2018-11-25
	UK	2018-11-25
	Valley Stream, US	2018-11-25
	Sydney, Canada	2018-11-25
	Brest, France	2018-11-25
	Warrior, US	2018-11-25
	Canada	2018-11-25
	Thunder Bay, Canada	2018-11-25
	Paris, France	2018-11-25
	Scholes, UK	2018-11-25
	London, UK	2018-11-25
	Canada	2018-11-25
	Strwiacke, Canada	2018-11-25
	Calgary, Canada	2018-11-25
	Mississauga, Canada	2018-11-25
	Bristol, UK	2018-11-25
	Ogden, US	2018-11-25
	Naples, US	2018-11-25
	Cardiff, UK	2018-11-25
	Hampshire, UK	2018-11-25

Name	Location	Date
	Marvejols, France	2018-11-25
	Hartlepool, UK	2018-11-25
	Bay Shore, US	2018-11-25
	Mill Hill, UK	2018-11-25
	Cerritos, US	2018-11-25
	Ajax, Canada	2018-11-26
	Richmond Hill, Canada	2018-11-26
	Surprise, US	2018-11-26
	Sutton, UK	2018-11-26
	Atlanta, Spain	2018-11-26
	Warman, Canada	2018-11-26
	Wheeling, US	2018-11-26
	Sherwood Park, Canada	2018-11-26
	Orléans, Canada	2018-11-26
	Calgary, Canada	2018-11-26
	Vacaville, US	2018-11-26
	Chippenham, UK	2018-11-26
	Victoria, B.C., US	2018-11-26
	US	2018-11-26
	Callington, UK	2018-11-26
	Winnipeg, Canada	2018-11-26
	MIAMI, US	2018-11-27

Name	Location	Date
	Pine Falls, Canada	2018-11-27
	Peak Forest, UK	2018-11-27
	Winnipeg, Canada	2018-11-27
	Markham, Canada	2018-11-27
	Ottawa, Canada	2018-11-27
	Scotland, UK	2018-11-27
	Gatineau, Canada	2018-11-27
	Oakville, Canada	2018-11-27
	Moncton, Canada	2018-11-27
	Winnipeg, Canada	2018-11-27
	Netherlands	2018-11-28
	Burnaby, Canada	2018-11-28
	Skegness, England, UK	2018-11-28
	greater manchester, UK	2018-11-28
	Chatham, Canada	2018-11-29
	Winnipeg, Canada	2018-11-29
	Port Alberni, Canada	2018-11-29
	port alberni, Canada	2018-11-29
	Winnipeg, Canada	2018-11-29
	Fredericton, Canada	2018-11-29
	Port Alberni, Canada	2018-11-29
	Minneapolis, US	2018-11-29

Name	Location	Date
	Victoria, Canada	2018-11-29
	St. Catharines, ON, Canada	2018-11-29
	Minto New Brunswick, Canada	2018-11-30
	Beaverton, US	2018-11-30
	Calgary, Canada	2018-11-30
	Central District, Hong Kong	2018-11-30
	Longueuil, Canada	2018-11-30
	Seattle, US	2018-11-30
	Springfield, US	2018-11-30
	Saint Petersburg, US	2018-11-30
	Winnipeg, Canada	2018-12-01
	Port Alberni, Canada	2018-12-01
	Charlevoix, US	2018-12-01
	Sebastopol, Australia	2018-12-01
	Espoo, Finland	2018-12-01
	US	2018-12-01
	Aurora, US	2018-12-01
	Table Grove, US	2018-12-01
	Halifax, Canada	2018-12-02
	Dartmouth, Canada	2018-12-02
	Halifax, Canada	2018-12-02
	Toronto, Canada	2018-12-02

Name	Location	Date
	Nova Scotia, Canada	2018-12-02
	Kitchener, Canada	2018-12-02
	Halifax, Canada	2018-12-02
	Smithfield, US	2018-12-03
	Kennetcook, Canada	2018-12-03
	Washington, US	2018-12-03
	Halifax, Canada	2018-12-04
	Courtenay, Canada	2018-12-04
	Nanaimo, Canada	2018-12-05
	Westville, Canada	2018-12-05
	France	2018-12-05
	Brooke, UK	2018-12-05
	Bronxville, US	2018-12-05
	Brownsville, US	2018-12-05
	tourrette levens, France	2018-12-05
	Halifax, Canada	2018-12-05
	Lyon, France	2018-12-05
	Manchester, UK	2018-12-05
	Orleans, Canada	2018-12-06
	Newcastle, UK	2018-12-06
	Madisonville, US	2018-12-06
	Bayside, US	2018-12-06

Name	Location	Date
	Castleton On Hudson, US	2018-12-06
	Richmond hill, Canada	2018-12-06
	Pelican Narrows, Canada	2018-12-07
	Blockhouse, Canada	2018-12-07
	Saskatoon, Canada	2018-12-07
	France	2018-12-07
	Vass, US	2018-12-07
	France	2018-12-07
	Brandon, Canada	2018-12-07
	Kitchener, Canada	2018-12-07
	Paris, France	2018-12-07
	Lincoln, UK	2018-12-07
	Mckinney, US	2018-12-07
	Las Vegas, US	2018-12-08
	Winnipeg, Canada	2018-12-08
	France	2018-12-08
	Fougere, France	2018-12-08
	Jericho, US	2018-12-08
	New Orleans, US	2018-12-08
	Colebatch, UK	2018-12-08
	Whitby, Canada	2018-12-08
	Geneseo, US	2018-12-08

Name	Location	Date
	Buffalo, US	2018-12-08
	Canada	2018-12-08
	Maple, Canada	2018-12-09
	Bury Saint Edmunds, UK	2018-12-09
	Paris, France	2018-12-09
	Saint-Nazaire, France	2018-12-09
	pinxton, UK	2018-12-09
	Edinburgh, UK	2018-12-09
	Pictou, Canada	2018-12-10
	Porters Lake, Canada	2018-12-10
	New Glasgow, Canada	2018-12-10
	Halifax, Canada	2018-12-10
	Dallas, US	2018-12-10
	Hopewell, Canada	2018-12-10
	El Dorado Hills, US	2018-12-10
	New Glasgow, Canada	2018-12-10
	Priceville, Canada	2018-12-10
	Halifax, Canada	2018-12-10
	Petit-Rocher, Canada	2018-12-10
	France	2018-12-10
	Brighton, UK	2018-12-10
	Toronto, Canada	2018-12-10

Name	Location	Date
	Pictou, Canada	2018-12-10
	Stellarton, Canada	2018-12-10
	Canada	2018-12-10
	Caribou island, Canada	2018-12-10
	New glagow, Wisconsin, US	2018-12-10
	stellarton, Canada	2018-12-10
	Wolfville, Canada	2018-12-10
	Halifax, Canada	2018-12-11
	Pictou, Canada	2018-12-11
	Fredericton, Canada	2018-12-11
	Saint Mellons, UK	2018-12-11
	Pictou, Canada	2018-12-11
	Toronto, Canada	2018-12-11
	Pictou, Canada	2018-12-11
	Grimsby, Canada	2018-12-11
	Halifax, Canada	2018-12-11
	Montréal, Canada	2018-12-11
	Moncton, Canada	2018-12-11
	Waukegan, US	2018-12-11
	Port Howe, Canada	2018-12-11
	Cupar, Scotland, UK	2018-12-11
	biglerville, US	2018-12-11

Name	Location	Date
	Digby, Canada	2018-12-11
	Baddeck, Canada	2018-12-11
	Pictou county, Canada	2018-12-11
	Lethbridge, Canada	2018-12-11
	Halifax, Canada	2018-12-11
	Merrimack, US	2018-12-11
	Wolfville, Canada	2018-12-11
	Winnipeg, Canada	2018-12-11
	Stratford, Canada	2018-12-11
	Dallas, US	2018-12-11
	Sydney, Canada	2018-12-11
	New York, US	2018-12-11
	Canada	2018-12-11
	Canada	2018-12-11
	Dartmouth, Canada	2018-12-11
	NEW GLASGOW, Canada	2018-12-11
	tallahassee, US	2018-12-11
	Cap-pelé, Canada	2018-12-11
	Sydney, Canada	2018-12-11
	le pradet, France	2018-12-11
	Nova Scotia, Canada	2018-12-11
	Tahlequah, Oklahoma, US	2018-12-11

Name	Location	Date
	Hamilton, Canada	2018-12-11
	France	2018-12-11
	Biscarrosse, France	2018-12-11
	New Glasgow, Canada	2018-12-12
	Clark's Harbour, Canada	2018-12-12
	Boston, US	2018-12-12
	Toronto, Canada	2018-12-12
	Sydney, Canada	2018-12-12
	Markham, Canada	2018-12-12
	Canmore, Canada	2018-12-12
	Madeira Park, Canada	2018-12-12
	Ottawa Ontario, Canada	2018-12-12
	Newport, Canada	2018-12-12
	Nelson, Canada	2018-12-12
	Hyderabad, India	2018-12-12
	France	2018-12-12
	France	2018-12-12
	France	2018-12-12
	Toronto, Canada	2018-12-12
	Dallas, US	2018-12-12
	Rockville, US	2018-12-12
	West Covina, US	2018-12-12

Name	Location	Date
	Buffalo, US	2018-12-12
	Thunder Bay, Canada	2018-12-12
	Ellershouse, Canada	2018-12-12
	London, Canada	2018-12-12
	Thunder Bay, Canada	2018-12-12
	France	2018-12-12
	Ottawa, Canada	2018-12-12
	Shepherds Bush, UK	2018-12-12
	Manvel, US	2018-12-12
	Shreveport, US	2018-12-12
	montreal, Canada	2018-12-12
	Odem, US	2018-12-12
	Halifax, Canada	2018-12-13
	Prince George, Canada	2018-12-13
	Meridian, US	2018-12-13
	Montpellier, France	2018-12-13
	Pictou, Canada	2018-12-13
	Canmore, Canada	2018-12-13
	Calgary, Canada	2018-12-13
	Eagle, US	2018-12-13
	San Leandro, US	2018-12-13
	Peachland, Canada	2018-12-13

Name	Location	Date
	Clearfield, US	2018-12-13
	Lizard, UK	2018-12-13
	Moncton, Canada	2018-12-13
	Calgary, Canada	2018-12-13
	Quispamsis, Canada	2018-12-14
	Hood River, US	2018-12-14
	Sanford, Colorado, US	2018-12-14
	Fremont, US	2018-12-14
	Georgina, Canada	2018-12-14
	Cambridge, Canada	2018-12-14
	Port Saint Lucie, US	2018-12-14
	saltspring island, Canada	2018-12-14
	Kuala Lumpur, UK	2018-12-14
	Nottingham, UK	2018-12-14
	Worksop, UK	2018-12-14
	Manchester, UK	2018-12-14
	Eccleshall, UK	2018-12-14
	France	2018-12-14
	sparta, US	2018-12-14
	France	2018-12-14
	Halifax, Canada	2018-12-14
	Portugal Cove-St. Philip's, Canada	2018-12-14

Name	Location	Date
	lyon, France	2018-12-14
	Halifax, Canada	2018-12-14
	US	2018-12-14
	Melancthon, Canada	2018-12-14
	Hamilton, Canada	2018-12-14
	Summerland, Canada	2018-12-15
	Canada	2018-12-15
	Tatamagouche, Canada	2018-12-15
	Newton Abbot, UK	2018-12-15
	Milan, Italy	2018-12-16
	Toronto, Canada	2018-12-16
	Ottawa, Canada	2018-12-16
	Brampton, Canada	2018-12-16
	Barrie, Canada	2018-12-17
	Halifax, Canada	2018-12-17
	Halifax, Canada	2018-12-17
	Cow Bay, Canada	2018-12-17
	Hampton, Canada	2018-12-17
	Sudbury, Canada	2018-12-17
	Walton, Canada	2018-12-17
	Sarnia, Canada	2018-12-17
	Vancouver, Canada	2018-12-17

Name	Location	Date
	Dartmouth, Canada	2018-12-17
	Asheville, US	2018-12-17
	Ancaster, Canada	2018-12-17
	Bronxville, US	2018-12-17
	Hampton, Canada	2018-12-17
	Varna, Bulgaria	2018-12-18
	Pivka, Slovenia	2018-12-18
	Van Nuys, US	2018-12-18
	Swansea, UK	2018-12-18
	Moonbeam, Canada	2018-12-19
	Toronto, Canada	2018-12-19
	Mississauga, Canada	2018-12-19
	Evans, US	2018-12-19
	Ottawa, Canada	2018-12-20
	Ontario, Canada	2018-12-21
	France	2018-12-23
	Noirmoutier-en-l'Île, France	2018-12-24
	Canada	2018-12-25
	Ashland, Oregon, US	2018-12-28
	BOSTON, Massachusetts, US	2018-12-31
	Davayat, France	2019-01-06
	Courtenay, Canada	2019-02-02

Name	Location	Date
	Ville Saint-Laurent, Canada	2019-02-03
	Charlottetown, Canada	2019-02-03
	Charlottetown, Canada	2019-02-03
	Toronto, Canada	2019-02-03
	Vancouver, Canada	2019-02-03
	Ontario, Canada	2019-02-03
	Inverness, Canada	2019-02-03
	New Glasgow, Canada	2019-02-03
	Calgary, Canada	2019-02-03
	Victoria, Canada	2019-02-03
	Central West River, Canada	2019-02-03
	Halifax, Canada	2019-02-03
	Canada	2019-02-04
	Canada	2019-02-04
	Caribou, Canada	2019-02-04
	River John, Canada	2019-02-04
	Canada	2019-02-04
	Scotsburn, Canada	2019-02-04
	New Glasgow, Canada	2019-02-04
	Caribou River, NS, Canada	2019-02-04
	New Glasgow, Canada	2019-02-04
	Pictou, Canada	2019-02-04

Name	Location	Date
	Halethorpe, US	2019-02-04
	Fairfax, US	2019-02-04
	Greensboro, US	2019-02-04
	Tyler, US	2019-02-04
	Miscou, Canada	2019-02-04
	St. Peter's Bay, Canada	2019-02-04
	Dartmouth, Canada	2019-02-04
	PLFN, Canada	2019-02-04
	miscou, Canada	2019-02-04
	Calgary, Canada	2019-02-04
	Calgary, Canada	2019-02-04
	Collingwood, Canada	2019-02-04
	New Glasgow, Canada	2019-02-04
	Gaspé, Canada	2019-02-04
	Trenton, Canada	2019-02-04
	Pictou Landing, Canada	2019-02-04
	San Jose, California, US	2019-02-05
	Dartmouth, NS, Canada	2019-02-05
	Miscou, Canada	2019-02-05
	Lamèque, Canada	2019-02-05
	Lamèque, Canada	2019-02-05
	Caraquet, Canada	2019-02-05

Name	Location	Date
	Canada	2019-02-05
	Moncton, Canada	2019-02-05
	Miscou, Canada	2019-02-05
	Moncton, Canada	2019-02-05
	Lameque, Canada	2019-02-05
	Caraquet, Canada	2019-02-05
	pictou, Canada	2019-02-05
	Bracebridge, Canada	2019-02-05
	Moncton, Canada	2019-02-05
	Ajax, Canada	2019-02-05
	Nanaimo, Canada	2019-02-05
	Pictou, Canada	2019-02-05
	Trenton, Canada	2019-02-05
	Lamèque, Canada	2019-02-05
	Dartmouth, Canada	2019-02-05
	Antigonish, Canada	2019-02-05
	Toney River, Canada	2019-02-05
	New Glasgow, Canada	2019-02-05
	Clifton, Canada	2019-02-05
	river john, Canada	2019-02-05
	Trenton, Canada	2019-02-05
	Shippagan, Canada	2019-02-05

Name	Location	Date
	Meteghan, Canada	2019-02-05
	Lamèque, Canada	2019-02-05
	Little Brook, Canada	2019-02-05
	Halifax, Canada	2019-02-06
	Pictou, Canada	2019-02-06
	Shippagan, Canada	2019-02-06
	antigonish, Canada	2019-02-06
	Ottawa, Canada	2019-02-06
	Grand Rapids, Canada	2019-02-06
	Pictou, Canada	2019-02-06
	River John, Canada	2019-02-06
	Eskasoni, Canada	2019-02-06
	Pictou, Canada	2019-02-06
	Ptbo, Canada	2019-02-06
	Canada	2019-02-06
	Hauula, US	2019-02-06
	Langley, Canada	2019-02-06
	Toronto, Canada	2019-02-06
	Saulnierville Station, Canada	2019-02-06
	Pictou, Canada	2019-02-06
	Stellarton, Canada	2019-02-06
	Amherst, Canada	2019-02-06

Name	Location	Date
	RR2 Scotsburn, Canada	2019-02-06
	Toronto, Canada	2019-02-06
	West Chester, US	2019-02-06
	London, Canada	2019-02-06
	Roseburg, US	2019-02-06
	Mulmur, Canada	2019-02-06
	Toronto, Canada	2019-02-06
	Lameque, Canada	2019-02-06
	Pictou, Canada	2019-02-06
	Toronto, Canada	2019-02-06
	Coteau Road, Canada	2019-02-06
	Bathurst, Canada	2019-02-06
	stellarton ns, Canada	2019-02-07
	Toronto, Canada	2019-02-07
	Antigonish, Canada	2019-02-07
	PICTOU, Canada	2019-02-07
	Longueuil, Canada	2019-02-07
	Trenton, Canada	2019-02-07
	pictou, Canada	2019-02-07
	Staten Island, US	2019-02-07
	Piscataway, US	2019-02-07
	Toronto, Canada	2019-02-07

Name	Location	Date
	Sittingbourne, UK	2019-02-07
	Pictou, Canada	2019-02-07
	Bristow, US	2019-02-07
	Brooklyn, US	2019-02-07
	Moncton, Canada	2019-02-07
	Halifax NS, Canada	2019-02-07
	Wood Buffalo, Canada	2019-02-08
	Wishaw, UK	2019-02-08
	Navarre, US	2019-02-08
	Trenton, Canada	2019-02-08
	Toronto, Canada	2019-02-08
	pictou, Canada	2019-02-08
	Camarillo, US	2019-02-08
	Wheatland, US	2019-02-08
	Miami, US	2019-02-08
	Salisbury, UK	2019-02-08
	Windsor, Canada	2019-02-08
	Saint Catharines, Canada	2019-02-08
	Tre-boeth, UK	2019-02-08
	Thornhill, Canada	2019-02-08
	Stratford, Canada	2019-02-08
	newark, US	2019-02-08

Name	Location	Date
	New Glasgow, Canada	2019-02-08
	Casselton, US	2019-02-08
	North Bay, Canada	2019-02-08
	Victoria, Canada	2019-02-08
	Modesto, Canada	2019-02-08
	Hadfield, UK	2019-02-08
	US	2019-02-08
	yoronto, Canada	2019-02-08
	Ypsilanti, US	2019-02-08
	Toronto, Canada	2019-02-08
	Minneapolis, US	2019-02-08
	Blockhouse, Canada	2019-02-08
	Farmington, US	2019-02-08
	Calgary, Canada	2019-02-08
	Arthur Ontario, Canada	2019-02-08
	Canada	2019-02-08
	Fredericton, Canada	2019-02-08
	Toronto, Canada	2019-02-08
	Hamilton, Canada	2019-02-08
	Kitchener, Canada	2019-02-08
	Antigonish, Canada	2019-02-08
	Carriere, US	2019-02-08

Name	Location	Date
	Calgary, Canada	2019-02-08
	Gatineau, Canada	2019-02-08
	Scarborough, Canada	2019-02-08
	Winkler, Canada	2019-02-08
	Vancouver, Canada	2019-02-08
	Littleton, Colorado, US	2019-02-09
	Oshawa, Canada	2019-02-09
	Nova Scotia, Canada	2019-02-09
	Warm Springs, US	2019-02-09
	Toronto, Canada	2019-02-09
	Montréal, Canada	2019-02-09
	Halifax, Canada	2019-02-09
	Norman Wells, Canada	2019-02-09
	Manchester, UK	2019-02-09
	Lakehurst, Canada	2019-02-09
	Beaconsfield, Canada	2019-02-09
	Merigomish, Canada	2019-02-09
	Toronto, Canada	2019-02-09
	Barrie, Canada	2019-02-09
	North Augusta, Canada	2019-02-09
	Durham, Canada	2019-02-09
	Mississauga, Canada	2019-02-09

Name	Location	Date
	Richmond, Canada	2019-02-09
	Portslade, UK	2019-02-09
	Horsham, UK	2019-02-09
	Stellarton, Canada	2019-02-09
	Ottawa, Canada	2019-02-10
	Burlington, Canada	2019-02-10
	South Ozone Park, US	2019-02-10
	Kelowna, Canada	2019-02-10
	Winnipeg, Canada	2019-02-10
	Calgary, Canada	2019-02-10
	Toronto, Canada	2019-02-10
	Saint Paul, US	2019-02-10
	Calgary, Canada	2019-02-10
	Sorel-Tracy, Canada	2019-02-10
	Edmonton, Canada	2019-02-10
	Bonney Lake, US	2019-02-10
	Pulham Saint Mary, UK	2019-02-10
	Toronto, Eritrea	2019-02-10
	Cambridge, Canada	2019-02-10
	Mono, Canada	2019-02-10
	Halifax, Canada	2019-02-10
	Manchester, UK	2019-02-10

Name	Location	Date
	Calgary, Canada	2019-02-10
	Oxford, UK	2019-02-10
	Crown Point, US	2019-02-10
	Toronto, Canada	2019-02-10
	Brooklyn, US	2019-02-10
	B, Canada	2019-02-10
	Charlottetown, Canada	2019-02-10
	Keansburg, US	2019-02-10
	Kitchener, Canada	2019-02-10
	Birmingham, UK	2019-02-10
	Aurora, Canada	2019-02-10
	Toronto, Canada	2019-02-10
	Milton, Canada	2019-02-10
	Newcastle upon Tyne, UK	2019-02-10
	Yarmouth, Canada	2019-02-10
	Madoc, Canada	2019-02-10
	Richland, US	2019-02-10
	Halifax, Canada	2019-02-10
	Troy, US	2019-02-10
	Salt Lake City, US	2019-02-10
	Calgary, Canada	2019-02-11
	Toronto, Canada	2019-02-11

Name	Location	Date
	Mississauga, Canada	2019-02-11
	Toronto, Canada	2019-02-11
	Toronto, Canada	2019-02-11
	Burnaby, Canada	2019-02-11
	Delta, Canada	2019-02-11
	Brantford, Canada	2019-02-11
	Arnprior, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Burnaby, Canada	2019-02-11
	Calgary, Canada	2019-02-11
	Delta, Canada	2019-02-11
	MoNTREAL, Canada	2019-02-11
	Springfield, US	2019-02-11
	Delta, Canada	2019-02-11
	New Westminster, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Delta, Canada	2019-02-11
	richmond, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11

Name	Location	Date
	Coquitlam, Canada	2019-02-11
	Burnaby, Canada	2019-02-11
	New Westminster, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Langley, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Langley, Canada	2019-02-11
	Port Moody, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Port Coquitlam, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Canada	2019-02-11
	Surrey, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Burnaby, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Maple Ridge, Canada	2019-02-11

Name	Location	Date
	Richmond, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Port Coquitlam, Canada	2019-02-11
	Edmonton, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Port Coquitlam, Canada	2019-02-11
	Delta, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Port Moody, Canada	2019-02-11
	Coquitlam, Canada	2019-02-11
	Delta, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Port Moody, Canada	2019-02-11
	Port Moody, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11

Name	Location	Date
	Thrissur, India	2019-02-11
	Québec, Canada	2019-02-11
	Lewes, US	2019-02-11
	Rimouski, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Colfax, US	2019-02-11
	Montréal, Canada	2019-02-11
	Charlesbourg, Canada	2019-02-11
	Ormond Beach, Florida, US	2019-02-11
	North Vancouver, Canada	2019-02-11
	Surrey, Canada	2019-02-11
	Burnaby, Canada	2019-02-11
	Calgary, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	v3v 1v8delta, Canada	2019-02-11
	Dartmouth, Canada	2019-02-11
	Maple Ridge, Canada	2019-02-11
	Eastern passage, Canada	2019-02-11
	Charlottetown, Canada	2019-02-11
	Walsall, UK	2019-02-11
	Santa Cruz, US	2019-02-11
	Richmond, Canada	2019-02-11

Name	Location	Date
	Oshawa, Canada	2019-02-11
	Moncton, Canada	2019-02-11
	st paul, Minnesota, US	2019-02-11
	Gibsons, Canada	2019-02-11
	Sturminster Newton, UK	2019-02-11
	Rochester, US	2019-02-11
	Deux-Montagnes, Canada	2019-02-11
	Hawi, Hawaii, US	2019-02-11
	Dartmouth, Canada	2019-02-11
	Richmond, Canada	2019-02-11
	Hollywood, US	2019-02-11
	Vancouver, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Richmond, Canada	2019-02-11
	Maple Ridge, Canada	2019-02-11
	Richmond, Canada	2019-02-11
	Vancouver, Canada	2019-02-11
	Saint-Placide, Canada	2019-02-11
	Lévis, Canada	2019-02-11
	Chicoutimi, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Fermont, Canada	2019-02-11

Name	Location	Date
	Jonquiere, Canada	2019-02-11
	Sté -rherese, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	La Tuque, Canada	2019-02-11
	Laval, Canada	2019-02-11
	Saint-jean-sur-richelieu, Canada	2019-02-11
	Québec, Canada	2019-02-11
	Magog, Canada	2019-02-11
	Cold Lake, Canada	2019-02-11
	Canada	2019-02-11
	m, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Burlington, Canada	2019-02-11
	Saint hubert, Canada	2019-02-11
	Joliette, Canada	2019-02-11
	Valleyfield, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Blainville, Canada	2019-02-11
	Canada	2019-02-11
	Québec, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Saint-Jérôme, Canada	2019-02-11

Name	Location	Date
	Sherbrooke, Canada	2019-02-11
	Québec, Canada	2019-02-11
	Calgary, Canada	2019-02-11
	Québec, Canada	2019-02-11
	Beaconsfield, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Sherbrooke, Canada	2019-02-11
	Shawinigan, Canada	2019-02-11
	Magog, Canada	2019-02-11
	Québec, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Saguenay, Canada	2019-02-11
	Ottawa, Canada	2019-02-11
	Sainte-Martine, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	trois-rivières, Canada	2019-02-11
	Sudbury, Canada	2019-02-11
	Saint-Jérôme, Canada	2019-02-11
	Gatineau, Canada	2019-02-11
	Trois-Rivières, Canada	2019-02-11
	lameque, Canada	2019-02-11
	Montréal, Canada	2019-02-11

Name	Location	Date
	Montréal, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Deux-Montagnes, Canada	2019-02-11
	Chandler, Canada	2019-02-11
	Laval, Canada	2019-02-11
	Gatineau, Canada	2019-02-11
	Montreal, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Richmond, Canada	2019-02-11
	Saint-Augustin-de-Desmaures, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Bécancour, Canada	2019-02-11
	Repentigny, Canada	2019-02-11
	Bromont, Canada	2019-02-11
	Québec, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Alma, Canada	2019-02-11
	Toronto, Canada	2019-02-11
	Val-d'or, Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Châteauguay, Canada	2019-02-11

Name	Location	Date
	Charlemagne, Canada	2019-02-11
	Chambly, Canada	2019-02-11
	Canada	2019-02-11
	Montréal, Canada	2019-02-11
	Trois Rivières, Canada	2019-02-11
	Gatineau, Canada	2019-02-12
	MASCOUCHE, Canada	2019-02-12
	L'Épiphanie, Canada	2019-02-12
	st-jean sur richelieu, Canada	2019-02-12
	Trois-Rivièred, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Ste-Catherne-de-la-J.C., Canada	2019-02-12
	Trois-Rivières, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Saint-nicolas, Canada	2019-02-12
	Sherbrooke, Canada	2019-02-12
	Quebec, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Berthierville, Canada	2019-02-12

Name	Location	Date
	Montréal, Canada	2019-02-12
	Saint-leonard-d'aston, Canada	2019-02-12
	St-joseph-du-lac, Canada	2019-02-12
	St-Jean-sur-Richelieu, Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Mont Rolland, Canada	2019-02-12
	Saint-Lazare, Canada	2019-02-12
	Delta, Canada	2019-02-12
	brownsburg chatham, Canada	2019-02-12
	Charny, Canada	2019-02-12
	Prince George, Canada	2019-02-12
	WINDSOR, NS, Canada	2019-02-12
	North Vancouver, Canada	2019-02-12
	Pitt Meadows, Canada	2019-02-12
	Sept-îles, Canada	2019-02-12
	Port Coquitlam, Canada	2019-02-12
	Burnaby, Canada	2019-02-12
	quebec, Canada	2019-02-12
	Nicolet, Canada	2019-02-12
	Sept-îles, Canada	2019-02-12
	Brossard, Canada	2019-02-12
	Saint-Amable, Canada	2019-02-12

Name	Location	Date
	Québec, Canada	2019-02-12
	Caraquet, Canada	2019-02-12
	St honore temiscouata sur le lac, Canada	2019-02-12
	Vaudreuil, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Asbestos, Canada	2019-02-12
	Verdun, Canada	2019-02-12
	Ste-marthe-sur-le-lac, Canada	2019-02-12
	Saint-nicolas, Canada	2019-02-12
	brossard, Canada	2019-02-12
	Jonquiere, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Pointe-aux-Trembles, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Orillia, Canada	2019-02-12
	Magog, Canada	2019-02-12
	Richmond, Canada	2019-02-12

Name	Location	Date
	Pompano Beach, US	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Athabasca, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	Edmundston, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Gatineau, Canada	2019-02-12
	Brossard, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Warwick, Canada	2019-02-12
	Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Saint-jérôme, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Canada	2019-02-12

Name	Location	Date
	Montréal, Canada	2019-02-12
	Brossard, Canada	2019-02-12
	Beauharnois, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Lachine, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Trois -Rivières, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Deux-Montagne, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Ste-Anne-des-Lacs, Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Atlanta, US	2019-02-12
	Livermore, US	2019-02-12
	Maple Ridge, Canada	2019-02-12
	Saint-georges, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Coquitlam, Canada	2019-02-12
	Orford, Canada	2019-02-12
	Québec, Canada	2019-02-12

Name	Location	Date
	Surrey, Canada	2019-02-12
	Saint-eustache, Canada	2019-02-12
	Rimouski, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Blainville, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Vaudreuil, Canada	2019-02-12
	Lévis, Canada	2019-02-12
	Labelle, Canada	2019-02-12
	Val-David, Canada	2019-02-12
	L'assomption, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Boucherville, Canada	2019-02-12
	Gatineau, Canada	2019-02-12
	Lorraine, Canada	2019-02-12
	Napierville, Canada	2019-02-12
	Trois-rivières, Canada	2019-02-12
	Sainte Adèle Quebec, Canada	2019-02-12
	Trois-Rivières, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Vaudreuil, Canada	2019-02-12
	Montréal, Canada	2019-02-12

Name	Location	Date
	Montréal, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Bridgetown, Barbados	2019-02-12
	Montréal, Canada	2019-02-12
	Mont-tremblant, Canada	2019-02-12
	L’Assomption, Canada	2019-02-12
	Île-aux-Noix, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Boucherville, Canada	2019-02-12
	Vaudreuil-Dorion, Canada	2019-02-12
	Montreal, Canada	2019-02-12
	Rimouski, Canada	2019-02-12
	Sherbrooke, Canada	2019-02-12
	Laval, Canada	2019-02-12
	LaSalle Québec, Canada	2019-02-12
	North Vancouver, Canada	2019-02-12
	Saint-nicolas, Canada	2019-02-12
	Prince George, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Winnipeg, Canada	2019-02-12
	Maple Ridge, Canada	2019-02-12
	Duncan, Canada	2019-02-12

Name	Location	Date
	Montreal, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Ottawa, Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Chertsey, Canada	2019-02-12
	Verdun, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Canada	2019-02-12
	Coquitlam, Canada	2019-02-12
	Shannon, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	Delta, Canada	2019-02-12
	Saint-sauveur, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Mont-laurier, Canada	2019-02-12
	Trois-rivières, Canada	2019-02-12
	St-Polycarpe, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Montréal, Canada	2019-02-12

Name	Location	Date
	Maple Ridge, Canada	2019-02-12
	Santo Domingo, Dominican Republic	2019-02-12
	New Westminster, Canada	2019-02-12
	North Vancouver, Canada	2019-02-12
	nelson, Canada	2019-02-12
	Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Burnaby, Canada	2019-02-12
	Lévis, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	Penticton, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Ottawa, Canada	2019-02-12
	Richmond, Canada	2019-02-12
	New Westminster, Canada	2019-02-12
	Vancouver, Canada	2019-02-12
	Crosby-on-Eden, UK	2019-02-12
	Ellensburg, US	2019-02-12
	terh, US	2019-02-12

Name	Location	Date
	Saint-François-de-la-Rivière-du-Sud, Canada	2019-02-12
	Brighton, UK	2019-02-12
	Toronto, Canada	2019-02-12
	Saint-Damase, Canada	2019-02-12
	Dagenham, UK	2019-02-12
	Gimli, Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Sabrevois, Canada	2019-02-12
	Beckenham, UK	2019-02-12
	St Ignace, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Harrowsmith, Canada	2019-02-12
	eskasoni, nova scotia, Canada	2019-02-12
	Saint-Mathieu, Canada	2019-02-12
	Saguenay, Canada	2019-02-12
	Chambly, Canada	2019-02-12
	Cambridge, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Dundas, Canada	2019-02-12
	Greenwood, Canada	2019-02-12

Name	Location	Date
	Laval, Canada	2019-02-12
	Surrey, Canada	2019-02-12
	St-Hyacinthe, Canada	2019-02-12
	Jonquière, Canada	2019-02-12
	Saint John, Canada	2019-02-12
	Grimsby, Canada	2019-02-12
	Saint-jérôme, Canada	2019-02-12
	Candiac, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Stillwater Lake, Canada	2019-02-12
	Saint-sauveur, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Châteauguay, Canada	2019-02-12
	Sylvan lake, Canada	2019-02-12
	Drummondville, Canada	2019-02-12
	Lakeside, Canada	2019-02-12
	trois-rivieres, Canada	2019-02-12
	Bushnell, US	2019-02-12
	Saint-jérôme, Canada	2019-02-12
	terrebonne, Canada	2019-02-12
	Calgary, Canada	2019-02-12

Name	Location	Date
	Montréal, Canada	2019-02-12
	Tadoussac, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Sherbrooke, Canada	2019-02-12
	Terre Haute, US	2019-02-12
	Burlington, Canada	2019-02-12
	Baie-Comeau, Canada	2019-02-12
	Lac-mégantic, Canada	2019-02-12
	Canada	2019-02-12
	canton tremblay, Canada	2019-02-12
	Jonquière, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Laval, Canada	2019-02-12
	montreal, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Udaipur, India	2019-02-12
	Vancouver, Canada	2019-02-12
	Port Hardy, Canada	2019-02-12
	Dollard-des-Ormeaux, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Châteauguay, Canada	2019-02-12
	Montmagny, Canada	2019-02-12

Name	Location	Date
	Joliette, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Montreal, Canada	2019-02-12
	Essex, Canada	2019-02-12
	Montreal, Canada	2019-02-12
	Saint-georges, Canada	2019-02-12
	Ottawa, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Markham, Canada	2019-02-12
	Ivory Coast	2019-02-12
	Surrey, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Saint-Eustache, Canada	2019-02-12
	Neuville, Canada	2019-02-12
	Dartmouth, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Laval, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Trois-Rivieres, Canada	2019-02-12

Name	Location	Date
	Ottawa, Canada	2019-02-12
	Magog, Canada	2019-02-12
	Vaughan, Canada	2019-02-12
	Mont-Royal, Canada	2019-02-12
	Terrebonne, Canada	2019-02-12
	Victoriaville, Canada	2019-02-12
	mississsuga, Canada	2019-02-12
	Kitchener, Canada	2019-02-12
	Sept-îles, Canada	2019-02-12
	Sault Sainte Marie, Canada	2019-02-12
	Canada	2019-02-12
	Longueuil, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Chandler, Canada	2019-02-12
	Outremont, Canada	2019-02-12
	Saint-jérôme, Canada	2019-02-12
	lebanon, Oregon, US	2019-02-12
	Beauceville, Canada	2019-02-12
	Leicester, UK	2019-02-12
	Montréal, Canada	2019-02-12
	Toronto, Canada	2019-02-12

Name	Location	Date
	Montréal, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Coaticook, Qc, Canada	2019-02-12
	DARWEN, UK	2019-02-12
	Sherbrooke, Canada	2019-02-12
	Gatineau, Canada	2019-02-12
	Berthierville, Canada	2019-02-12
	Rouyn-Noranda, Canada	2019-02-12
	North Bay, Canada	2019-02-12
	Thetford Mines, Canada	2019-02-12
	Pittsburgh, US	2019-02-12
	Wolfville, Canada	2019-02-12
	Sullivan, US	2019-02-12
	Sherbrooke, Canada	2019-02-12
	Granby, Canada	2019-02-12
	Tunisia	2019-02-12
	Québec, Canada	2019-02-12
	Coquitlam, Canada	2019-02-12
	Canada	2019-02-12
	Ormstown, Canada	2019-02-12
	London, UK	2019-02-12
	North Cadbury, UK	2019-02-12

Name	Location	Date
	Kamloops BC, Canada	2019-02-12
	Newark, US	2019-02-12
	Alma, Canada	2019-02-12
	Mount pearl, Canada	2019-02-12
	Rimouski, Canada	2019-02-12
	Montreal, Canada	2019-02-12
	Coventry, UK	2019-02-12
	Trois-Rivières, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	Willow Grove, US	2019-02-12
	Kirkland, Canada	2019-02-12
	Brampton, Canada	2019-02-12
	Comanche, US	2019-02-12
	Moncton, Canada	2019-02-12
	Québec, Canada	2019-02-12
	Terrebonne, Canada	2019-02-12
	Burnaby, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Windsor, Canada	2019-02-12
	Barrie, Canada	2019-02-12
	Toronto, Canada	2019-02-12

Name	Location	Date
	Edmonton, Canada	2019-02-12
	Sechelt, Canada	2019-02-12
	Magog, Canada	2019-02-12
	Aurora, Canada	2019-02-12
	San Jose, US	2019-02-12
	Trimdon, UK	2019-02-12
	Montréal, Canada	2019-02-12
	Regina, Canada	2019-02-12
	Sarnia, Canada	2019-02-12
	Guelph, Canada	2019-02-12
	Montréal, Canada	2019-02-12
	penticton, Canada	2019-02-12
	Calgary, Canada	2019-02-12
	new-york city, U.S. Outlying Islands	2019-02-12
	Bristol, UK	2019-02-12
	Renfrew, Canada	2019-02-12
	Parrsboro, Canada	2019-02-12
	Norwich, UK	2019-02-12
	Clayton, US	2019-02-12
	Apex, US	2019-02-12
	Lenoir City, US	2019-02-12
	Hinton, Canada	2019-02-12

Name	Location	Date
	Kingston, Canada	2019-02-12
	Port Colborne, Canada	2019-02-12
	Vernon, Canada	2019-02-12
	Penticton, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Lasalle, Canada	2019-02-12
	Toronto, Canada	2019-02-12
	Victoria, Canada	2019-02-12
	Langley, Canada	2019-02-12
	Ottawa, Canada	2019-02-13
	Kingston, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Ottawa, Canada	2019-02-13
	Mississauga, Canada	2019-02-13
	campbell river, Canada	2019-02-13
	Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	Kingston, Canada	2019-02-13
	Canada	2019-02-13
	Brandon, Canada	2019-02-13
	Waterloo, Canada	2019-02-13
	Toronto, Canada	2019-02-13

Name	Location	Date
	Waterloo, Canada	2019-02-13
	Porter, US	2019-02-13
	Markham, Canada	2019-02-13
	Barrie, Canada	2019-02-13
	London, Canada	2019-02-13
	Ridgeway, Canada	2019-02-13
	Montréal, Canada	2019-02-13
	Portugal Cove-St. Philips, Canada	2019-02-13
	Brandon Mb, Canada	2019-02-13
	London, Canada	2019-02-13
	Wetaskiwin, Canada	2019-02-13
	White City, Canada	2019-02-13
	Maple, Canada	2019-02-13
	Canada	2019-02-13
	Calgary, Canada	2019-02-13
	Fort Saskatchewan, Canada	2019-02-13
	Peace River, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Lower Sackville, Canada	2019-02-13
	Cornwall, Canada	2019-02-13
	Pomaria, US	2019-02-13
	Ottawa, Canada	2019-02-13

Name	Location	Date
	Sundown, Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	Delta, Canada	2019-02-13
	Mississauga, Canada	2019-02-13
	Sainte-clotilde-de-châteauguay, Canada	2019-02-13
	Kamloops, Canada	2019-02-13
	Calgary, Canada	2019-02-13
	St. John's, Canada	2019-02-13
	richmond, Canada	2019-02-13
	Windsor, Canada	2019-02-13
	Gatineau, Canada	2019-02-13
	Bobcaygeon, Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	oromocto, Canada	2019-02-13
	Canada	2019-02-13
	Mississauga, Canada	2019-02-13
	Angus, Canada	2019-02-13
	Winnipeg, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Scarborough, Canada	2019-02-13
	Lethbridge, Canada	2019-02-13

Name	Location	Date
	Edmonton, Canada	2019-02-13
	Sudbury, Canada	2019-02-13
	Oakville, Canada	2019-02-13
	Ottawa, Canada	2019-02-13
	Tecumseh, Canada	2019-02-13
	George Town, Cayman Islands	2019-02-13
	Guelph, Canada	2019-02-13
	Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Peace River, Canada	2019-02-13
	Knoxville, US	2019-02-13
	London, Canada	2019-02-13
	Prince George, Canada	2019-02-13
	Calgary, Canada	2019-02-13
	Drummondville, Canada	2019-02-13
	Lasalle, Canada	2019-02-13
	North Vancouver, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Brampton, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	West Vancouver, Canada	2019-02-13

Name	Location	Date
	Lansing, US	2019-02-13
	Brampton, Canada	2019-02-13
	OSHAWA, Canada	2019-02-13
	Milton, Canada	2019-02-13
	Ottawa, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Brockville, Canada	2019-02-13
	DDO, Canada	2019-02-13
	New Delhi, India	2019-02-13
	Brampton, Canada	2019-02-13
	Winnipeg, Canada	2019-02-13
	Scarborough, Canada	2019-02-13
	mission, Canada	2019-02-13
	Surrey, Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	Whitby, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Boucherville, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Brossard, Canada	2019-02-13
	New Westminster, Canada	2019-02-13
	Vancouver, Canada	2019-02-13

Name	Location	Date
	St Thomas, Canada	2019-02-13
	Victoria, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Penticton, Canada	2019-02-13
	Surrey, Canada	2019-02-13
	Delta, Canada	2019-02-13
	Baddeck, Canada	2019-02-13
	Тюмень, Russia	2019-02-13
	Calgary, Canada	2019-02-13
	Whitby, Canada	2019-02-13
	West Valley City, US	2019-02-13
	Quesnel, Canada	2019-02-13
	Welland, Canada	2019-02-13
	Burnaby, Canada	2019-02-13
	Brooks Alberta, Canada	2019-02-13
	Calgary, Canada	2019-02-13
	Brampton, Canada	2019-02-13
	Langley, Canada	2019-02-13
	Vernon, Canada	2019-02-13
	Delta, Canada	2019-02-13
	Qualicum Beach, Canada	2019-02-13
	kamloops, Canada	2019-02-13

Name	Location	Date
	India	2019-02-13
	Calgary, Canada	2019-02-13
	Kelowna, Canada	2019-02-13
	Nanoose Bay, Canada	2019-02-13
	Oshawa, Canada	2019-02-13
	Vancouver, Canada	2019-02-13
	Montréal, Canada	2019-02-13
	Oshawa, Canada	2019-02-13
	Southport, UK	2019-02-13
	St. John's, Canada	2019-02-13
	Leslieville, Canada	2019-02-13
	UK	2019-02-13
	Lincoln, Canada	2019-02-13
	Pulborough, UK	2019-02-13
	Coboconk, Canada	2019-02-13
	Summersville, US	2019-02-13
	Hanmer, Canada	2019-02-13
	Gatineau, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Orleans, Canada	2019-02-13
	Ottawa, on, Canada	2019-02-13
	Sutton Coldfield, UK	2019-02-13

Name	Location	Date
	Dartmouth, Canada	2019-02-13
	Sherbrooke, Canada	2019-02-13
	Bradford, Canada	2019-02-13
	Montréal, Canada	2019-02-13
	Kitchener, Canada	2019-02-13
	Portage la Prairie, Canada	2019-02-13
	oshawa, Canada	2019-02-13
	Leduc, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Mississauga, Canada	2019-02-13
	Barrie, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	london, Canada	2019-02-13
	Tottenham, Canada	2019-02-13
	Sudbury, Canada	2019-02-13
	London, Canada	2019-02-13
	Digby, Canada	2019-02-13
	Windsor, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Saskatoon, Canada	2019-02-13
	aberdeen, UK	2019-02-13

Name	Location	Date
	Winnipeg, Canada	2019-02-13
	Walford Station, Canada	2019-02-13
	Repentigny, Canada	2019-02-13
	Hanmer, Canada	2019-02-13
	Valleyfield, Canada	2019-02-13
	Halifax, Canada	2019-02-13
	Kitchener, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Londonderry, UK	2019-02-13
	Bridgewater, Canada	2019-02-13
	Ajax, Canada	2019-02-13
	Mississauga, Canada	2019-02-13
	Courtice, Canada	2019-02-13
	Walsall, UK	2019-02-13
	whitby, Canada	2019-02-13
	Sherbrooke, Canada	2019-02-13
	St. John's, Canada	2019-02-13
	Moncton, Canada	2019-02-13
	Oshawa, Canada	2019-02-13
	Dartmouth, Canada	2019-02-13
	Calgary, Canada	2019-02-13
	London, Canada	2019-02-13

Name	Location	Date
	Knoxville, US	2019-02-13
	Gatineau, Canada	2019-02-13
	Québec, Canada	2019-02-13
	Maple Ridge, Canada	2019-02-13
	Ottawa, Canada	2019-02-13
	New Hamburg, Canada	2019-02-13
	Halifax Nova Scotia., Canada	2019-02-13
	Halifax, Canada	2019-02-13
	Winnipeg, Canada	2019-02-13
	Truro, Canada	2019-02-13
	Oakville, Canada	2019-02-13
	Coquitlam, Canada	2019-02-13
	Port Robinson, Canada	2019-02-13
	Whitby, Canada	2019-02-13
	Quinte West, Canada	2019-02-13
	Kitchener, Canada	2019-02-13
	Canada	2019-02-13
	Grove Hill, Canada	2019-02-13
	London, UK	2019-02-13
	Maple ridge, Canada	2019-02-13
	new west, Canada	2019-02-13
	Huntsville, Canada	2019-02-13

Name	Location	Date
	Montreal, Canada	2019-02-13
	Montréal, Canada	2019-02-13
	Sherbrooke, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Kanata, Canada	2019-02-13
	Idaho Falls, US	2019-02-13
	Scarborough, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Liverpool, UK	2019-02-13
	Grimsby, Canada	2019-02-13
	Vernon, Canada	2019-02-13
	Pembroke, Canada	2019-02-13
	Pigeon, Michigan, US	2019-02-13
	Kamloops, Canada	2019-02-13
	Brampton, Canada	2019-02-13
	Dallas, US	2019-02-13
	granby, Canada	2019-02-13
	Blind River, Canada	2019-02-13
	Cleveland, Ohio, US	2019-02-13
	Port Coquitlam, Canada	2019-02-13
	Burnaby, Canada	2019-02-13
	Shawinigan, Canada	2019-02-13

Name	Location	Date
	Berwick, Canada	2019-02-13
	Barrie, Canada	2019-02-13
	Saint-Jérôme, Canada	2019-02-13
	Oshawa, Canada	2019-02-13
	Vancouver, Canada	2019-02-13
	Manchester, UK	2019-02-13
	Fulham, UK	2019-02-13
	Coquitlam, Canada	2019-02-13
	North Battleford, Canada	2019-02-13
	Berwick, Canada	2019-02-13
	Edmonton, Canada	2019-02-13
	Holybourne, UK	2019-02-13
	Calmar, Canada	2019-02-13
	Gravesend, UK	2019-02-13
	Halifax, Canada	2019-02-13
	Coquitlam, Canada	2019-02-13
	Baie-comeau, Canada	2019-02-13
	Barrie, Canada	2019-02-13
	MONTRÉAL, Canada	2019-02-13
	Wolverhampton, UK	2019-02-13
	Kingston, Canada	2019-02-13
	Omemee, Canada	2019-02-13

Name	Location	Date
	london, Canada	2019-02-13
	Winnipeg, Canada	2019-02-13
	Australia	2019-02-13
	Nottinghamshire, UK	2019-02-13
	Montréal, Canada	2019-02-13
	Montréal, Canada	2019-02-13
	Johnson Creek, US	2019-02-13
	Aberdeen, UK	2019-02-13
	Elgin, US	2019-02-13
	London, UK	2019-02-13
	Toronto, Canada	2019-02-13
	Oakville, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	Hamilton, Canada	2019-02-13
	Burnaby, Canada	2019-02-13
	Pembroke, Canada	2019-02-13
	Toronto, Canada	2019-02-13
	India	2019-02-14
	Calgary, Canada	2019-02-14
	Red Deer, Canada	2019-02-14
	Saint John, Canada	2019-02-14
	Vancouver, Canada	2019-02-14

Name	Location	Date
	Victoria, Canada	2019-02-14
	Vancouver, Canada	2019-02-14
	Stoney creek, Canada	2019-02-14
	Hamilton, Canada	2019-02-14
	Warren, US	2019-02-14
	Port Coquitlam, Canada	2019-02-14
	Val-des-Monts, Canada	2019-02-14
	Gatineau, Canada	2019-02-14
	Georgina, Canada	2019-02-14
	West Vancouver, Canada	2019-02-14
	Chelmsford, Canada	2019-02-14
	Dartmouth, Canada	2019-02-14
	Stratford, Canada	2019-02-14
	Brampton, Canada	2019-02-14
	Burnaby, Canada	2019-02-14
	Calgary, Canada	2019-02-14
	Montréal, Canada	2019-02-14
	East Haven, Connecticut, US	2019-02-14
	Camrose, Alberta, Canada	2019-02-14
	Calgary, Canada	2019-02-14
	castlegar, Canada	2019-02-14
	Murray, US	2019-02-14

Name	Location	Date
	US	2019-02-14
	Vancouver, Canada	2019-02-14
	Chevy Chase, US	2019-02-14
	Sydney, Canada	2019-02-14
	WINNIPEG, Canada	2019-02-14
	Bedford, Canada	2019-02-14
	London, Canada	2019-02-14
	Ottawa, Canada	2019-02-14
	Ajax, Canada	2019-02-14
	Chicoutimi, Canada	2019-02-14
	Whistler, Canada	2019-02-14
	Canada	2019-02-14
	UK	2019-02-14
	Millbrook, Canada	2019-02-14
	Toronto, Canada	2019-02-14
	Mississauga, Canada	2019-02-14
	London, UK	2019-02-14
	London, Canada	2019-02-14
	Newbury Park, US	2019-02-14
	birmingham, UK	2019-02-14
	Georgetown, US	2019-02-14
	chatham kent, Canada	2019-02-14

Name	Location	Date
	Oxnard, US	2019-02-14
	Vancouver, Canada	2019-02-14
	Amritsar, India	2019-02-14
	Calgary, Canada	2019-02-14
	India	2019-02-14
	Castle Gresley, UK	2019-02-14
	Livingston, US	2019-02-14
	Edmonton, Canada	2019-02-14
	Central District, Hong Kong	2019-02-14
	Newcastle, UK	2019-02-14
	Pefferlaw, Canada	2019-02-14
	Halifax, Canada	2019-02-14
	Prince George, Canada	2019-02-14
	L'Épiphanie, Canada	2019-02-14
	Fergus, Canada	2019-02-14
	Ottawa, Canada	2019-02-14
	Thunder Bay, Canada	2019-02-14
	Cliffside Park., New Jersey, US	2019-02-14
	Ajax, Canada	2019-02-14
	Richmond, UK	2019-02-14
	Doncaster, UK	2019-02-14
	Montreal, Canada	2019-02-14

Name	Location	Date
	Emmet, US	2019-02-14
	Markham, Canada	2019-02-14
	Canada	2019-02-14
	Chillicothe, US	2019-02-14
	Hamilton, Canada	2019-02-14
	Victoriaville, Canada	2019-02-14
	Toronto, Canada	2019-02-14
	Woodbridge, US	2019-02-14
	Alma, US	2019-02-14
	Athabasca, Canada	2019-02-14
	Kingston, Canada	2019-02-14
	Huntingtown, US	2019-02-14
	Kamloops, Canada	2019-02-14
	Prosper, US	2019-02-14
	Toronto, Canada	2019-02-14
	Milton, US	2019-02-14
	Washington, US	2019-02-14
	Coquitlam, Canada	2019-02-14
	London, Canada	2019-02-14
	Sullivan, US	2019-02-14
	Vancouver, Canada	2019-02-14
	Minneapolis, US	2019-02-14

Name	Location	Date
	Gatineau, Canada	2019-02-14
	Sintra, Portugal	2019-02-14
	Longueuil, Canada	2019-02-14
	Orem, US	2019-02-14
	Halifax, Canada	2019-02-14
	New York, US	2019-02-14
	Iligan, Philippines	2019-02-14
	Canada	2019-02-14
	Liverpool, UK	2019-02-14
	Mogadishu, Somalia	2019-02-14
	Victoria, Canada	2019-02-14
	Cambridge, Canada	2019-02-14
	Princeton, US	2019-02-14
	Winnipeg, Canada	2019-02-14
	Saint Thomas, Canada	2019-02-14
	Moose Jaw, Canada	2019-02-14
	Clinton, US	2019-02-14
	Bournemouth, UK	2019-02-14
	Renous, Canada	2019-02-14
	US	2019-02-14
	Montréal, Canada	2019-02-14
	Surrey, Canada	2019-02-14

Name	Location	Date
	Bolton, Canada	2019-02-14
	UK	2019-02-14
	Toronto, Canada	2019-02-14
	Winnipeg, Canada	2019-02-14
	Birmingham, UK	2019-02-14
	Ennismore, Canada	2019-02-14
	Trois-Rivières, Canada	2019-02-14
	Porthcawl, UK	2019-02-14
	Thorold, Canada	2019-02-14
	Lethbridge, Canada	2019-02-14
	Canada	2019-02-14
	Toronto, Canada	2019-02-14
	Matawan, US	2019-02-14
	Coquitlam, Canada	2019-02-14
	MERRILL, US	2019-02-14
	WESTVILLE, Canada	2019-02-14
	Montréal, Canada	2019-02-14
	Longueuil, Canada	2019-02-14
	Edmonton, Canada	2019-02-14
	Port Moody, Canada	2019-02-14
	London, Canada	2019-02-14
	Ottawa, Canada	2019-02-14

Name	Location	Date
	Calgary, Canada	2019-02-14
	St. Albert, Canada	2019-02-15
	Surrey, Canada	2019-02-15
	Mississauga, Canada	2019-02-15
	Calgary, Canada	2019-02-15
	Markham, Canada	2019-02-15
	columbia city, US	2019-02-15
	Toronto, Canada	2019-02-15
	markham, Canada	2019-02-15
	pickering, Canada	2019-02-15
	Trenton, Canada	2019-02-15
	Sydney, Canada	2019-02-15
	London, Canada	2019-02-15
	Victoria, Canada	2019-02-15
	Prince George, Canada	2019-02-15
	Lake Cowichan, Canada	2019-02-15
	Mississauga, Canada	2019-02-15
	Whycocomagh, Canada	2019-02-15
	Newburgh, US	2019-02-15
	Vancouver, Canada	2019-02-15
	Brantford, Canada	2019-02-15
	Sudbury, Canada	2019-02-15

Name	Location	Date
	Aurora, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Richmond Hill, Canada	2019-02-15
	Okotoks, Canada	2019-02-15
	Calgary, Canada	2019-02-15
	London, Canada	2019-02-15
	Petawawa, Canada	2019-02-15
	Oakville, Canada	2019-02-15
	Niagara Falls, Canada	2019-02-15
	Milton, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Windsor, Canada	2019-02-15
	Milton, Canada	2019-02-15
	Barrie, Canada	2019-02-15
	Kitchener, Canada	2019-02-15
	Matane, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Windsor, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Maple Ridge, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	US	2019-02-15

Name	Location	Date
	Edmonton, Canada	2019-02-15
	Parry Sound, Canada	2019-02-15
	Douglas, Canada	2019-02-15
	Surrey, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Canada	2019-02-15
	Mississauga, Canada	2019-02-15
	Quinte West, Canada	2019-02-15
	Brackendale, Canada	2019-02-15
	Aldergrove, Canada	2019-02-15
	Winnipeg, Canada	2019-02-15
	Surrey, Canada	2019-02-15
	Niagara Falls, Canada	2019-02-15
	Montréal, Canada	2019-02-15
	Levis, Canada	2019-02-15
	Augusta, US	2019-02-15
	Toronto, Canada	2019-02-15
	Wetaskiwin, Canada	2019-02-15
	Belleville, Canada	2019-02-15
	Brooklyn, New York, US	2019-02-15
	Hearst, Canada	2019-02-15
	Toronto, Canada	2019-02-15

Name	Location	Date
	Waterford, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Burlington, Canada	2019-02-15
	Peterborough, Canada	2019-02-15
	Thunder Bay, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Burlington, Canada	2019-02-15
	Vancouver, Canada	2019-02-15
	Vancouver, Canada	2019-02-15
	Okotoks, Canada	2019-02-15
	Twickenham, UK	2019-02-15
	Toronto, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	penticton, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Canada	2019-02-15
	CODSALL, UK	2019-02-15
	eksjö, Sweden	2019-02-15
	Winnipeg, Canada	2019-02-15
	Abbotsford, Canada	2019-02-15
	Bristol, UK	2019-02-15
	Spruce Grove, Canada	2019-02-15

Name	Location	Date
	Wirral, UK	2019-02-15
	London, UK	2019-02-15
	Montréal, Canada	2019-02-15
	Canada	2019-02-15
	Oakville, Canada	2019-02-15
	Plymouth, UK	2019-02-15
	Ancaster, Canada	2019-02-15
	Birmingham, UK	2019-02-15
	Edmonton, Canada	2019-02-15
	Halifax, Canada	2019-02-15
	Corunna, Canada	2019-02-15
	Mount Royal, Canada	2019-02-15
	Saskatoon, Canada	2019-02-15
	Hamilton, Canada	2019-02-15
	Newmarket, Canada	2019-02-15
	Nashua, US	2019-02-15
	Whitby, Canada	2019-02-15
	Sacramento, US	2019-02-15
	Calgary, Canada	2019-02-15
	London, Canada	2019-02-15
	Barrie, Canada	2019-02-15
	Toronto, Canada	2019-02-15

Name	Location	Date
	Rigaud, Canada	2019-02-15
	Markham, Canada	2019-02-15
	Mississauga, Canada	2019-02-15
	WINDSOR, Canada	2019-02-15
	Hammonds plains, Canada	2019-02-15
	Nobleton, Canada	2019-02-15
	Northampton, UK	2019-02-15
	Vaughan, Canada	2019-02-15
	Merritt, Canada	2019-02-15
	Corbeil, Canada	2019-02-15
	Fort Frances, Canada	2019-02-15
	Verdun, Canada	2019-02-15
	Centerville, US	2019-02-15
	Hascombe, UK	2019-02-15
	Surrey, Canada	2019-02-15
	North Walsham, UK	2019-02-15
	Southampton, UK	2019-02-15
	Gloucestershire, UK	2019-02-15
	Watford, UK	2019-02-15
	Ankeny, US	2019-02-15
	Camberwell, UK	2019-02-15
	TAMWORTH, UK	2019-02-15

Name	Location	Date
	Morden, UK	2019-02-15
	Tulsa, US	2019-02-15
	Edmonton, Canada	2019-02-15
	Red Deer, Canada	2019-02-15
	Canada	2019-02-15
	Barrie, Canada	2019-02-15
	Toronto, Canada	2019-02-15
	Canada	2019-02-15
	Berea, US	2019-02-15
	Toronto, Canada	2019-02-15
	Belleville, Canada	2019-02-15
	Reading, UK	2019-02-15
	Deal, UK	2019-02-15
	Haisla, Canada	2019-02-15
	Wainwright, Canada	2019-02-15
	House Springs, US	2019-02-16
	Alliston, Canada	2019-02-16
	Surrey, Canada	2019-02-16
	Windsor, Canada	2019-02-16
	Pickering, Canada	2019-02-16
	Toronto, Canada	2019-02-16
	Tears, British Virgin Islands	2019-02-16

Name	Location	Date
	Caledonia, Canada	2019-02-16
	Ludhiana, India	2019-02-16
	Nelson, B.C., Canada	2019-02-16
	New York, US	2019-02-16
	Manila, Philippines	2019-02-16
	Renfrew, Canada	2019-02-16
	Quesnel, Canada	2019-02-16
	Remington, US	2019-02-16
	Maple, Canada	2019-02-16
	Toronto, Canada	2019-02-16
	Thorndale, Canada	2019-02-16
	Toronto, Canada	2019-02-16
	Tenby, UK	2019-02-16
	Barrie, Canada	2019-02-16
	Red Deer, Canada	2019-02-16
	St leonard, Canada	2019-02-16
	Montréal, Canada	2019-02-16
	Vancouver, Canada	2019-02-16
	Salmon Arm, Canada	2019-02-16
	Vernon, Canada	2019-02-16
	Surrey, Canada	2019-02-16
	Vancouver, Canada	2019-02-16

Name	Location	Date
	Toronto, Canada	2019-02-16
	Edmonton, Canada	2019-02-16
	Vaughan, Canada	2019-02-16
	Calgary, Canada	2019-02-16
	Vancouver, Canada	2019-02-16
	Abbotsford, Canada	2019-02-16
	Reading, UK	2019-02-16
	Vancouver, Canada	2019-02-16
	Victoria, Canada	2019-02-16
	Southend-on-sea, UK	2019-02-16
	London, UK	2019-02-16
	Montgomery, UK	2019-02-16
	London, UK	2019-02-16
	Hornsey, UK	2019-02-16
	Kindersley, SK, Canada	2019-02-16
	Kelowna, Canada	2019-02-16
	Sherbrooke, Canada	2019-02-16
	London, UK	2019-02-16
	Prescot, UK	2019-02-16
	Penetanguishene, Canada	2019-02-16
	Grange, UK	2019-02-16
	Saint Leonards, UK	2019-02-16

Name	Location	Date
	Weston-super-Mare, UK	2019-02-16
	Kitchener, Canada	2019-02-16
	Oakville, Canada	2019-02-16
	Temple Grafton, UK	2019-02-16
	Ingleside, Canada	2019-02-16
	Brantford, Canada	2019-02-16
	Swansea, UK	2019-02-16
	York, UK	2019-02-16
	Antigonish, Canada	2019-02-16
	Beachwood, US	2019-02-16
	Reading, UK	2019-02-16
	Sudbury, Canada	2019-02-16
	Brooklyn, New York, US	2019-02-16
	Cambridge, Canada	2019-02-16
	Kitchener, Canada	2019-02-16
	Saint-Jean-sur-Richelieu, Canada	2019-02-16
	Oxford, UK	2019-02-16
	Waterloo, Canada	2019-02-16
	Cochrane, Canada	2019-02-16
	North Bay, Canada	2019-02-16
	durham, UK	2019-02-16
	Pagosa Springs, US	2019-02-16

Name	Location	Date
	Harpenden, UK	2019-02-16
	Stoke-on-Trent, UK	2019-02-16
	Westminster, UK	2019-02-16
	Strathmore, Canada	2019-02-16
	outremont, Canada	2019-02-16
	Toronto, Canada	2019-02-16
	Northallerton, UK	2019-02-16
	Quebec, Canada	2019-02-16
	Jinja, Uganda	2019-02-16
	Maple, Canada	2019-02-16
	Πάτρα, Canada	2019-02-16
	Stamford, UK	2019-02-16
	Cambridge, Canada	2019-02-16
	Windsor, Canada	2019-02-16
	Montréal, Canada	2019-02-16
	Loveland, US	2019-02-16
	Baddeck, Canada	2019-02-16
	Montreal, Canada	2019-02-16
	Fernie, Canada	2019-02-16
	Port of Menteith, UK	2019-02-16
	Stockport, UK	2019-02-16
	Edmonton, Canada	2019-02-17

Name	Location	Date
	Montréal, Canada	2019-02-17
	Westville, Canada	2019-02-17
	Toronto, Canada	2019-02-17
	Slidell, US	2019-02-17
	newry, UK	2019-02-17
	Vancouver, Canada	2019-02-17
	Nanaimo, Canada	2019-02-17
	Fraserburgh, UK	2019-02-17
	Burlington, Canada	2019-02-17
	Philadelphia, US	2019-02-17
	Fredericton, Canada	2019-02-17
	Scarborough, Canada	2019-02-17
	Sault Ste.Marie, Canada	2019-02-17
	Sudbury, Canada	2019-02-17
	Albuquerque, US	2019-02-17
	Maple Ridge, Canada	2019-02-17
	Canada	2019-02-17
	Taylor, Canada	2019-02-17
	Fort Saskatchewan, Canada	2019-02-17
	Lucasville, Canada	2019-02-17
	Etobicoke, Canada	2019-02-17
	Male, Maldives	2019-02-17

Name	Location	Date
	Ottawa, Canada	2019-02-17
	Toronto, Canada	2019-02-17
	Cochrane, Canada	2019-02-17
	Grassmoor, UK	2019-02-17
	Birmingham, UK	2019-02-17
	Slough, UK	2019-02-17
	Montreal, Canada	2019-02-17
	Winnipeg, Canada	2019-02-17
	Loughton, UK	2019-02-17
	Lowestoft Suffolk, UK	2019-02-17
	Phnom Penh, UK	2019-02-17
	Newbury, UK	2019-02-17
	Hornsey, UK	2019-02-17
	Sherbrooke, Canada	2019-02-17
	Pictou, Canada	2019-02-17
	Loughborough, UK	2019-02-17
	Skelmersdale, UK	2019-02-17
	Leoben, Austria	2019-02-17
	Gien, France	2019-02-17
	Virginia Beach, US	2019-02-17
	Ringwood, UK	2019-02-17
	Brampton, Canada	2019-02-17

Name	Location	Date
	Valleyfield, Canada	2019-02-17
	Magog, Canada	2019-02-17
	kitchener, Canada	2019-02-17
	Barons, Canada	2019-02-17
	Union City, US	2019-02-17
	UK	2019-02-17
	North York, Canada	2019-02-17
	Valley Village, US	2019-02-17
	Olopa, Guatemala	2019-02-17
	Saint John, Canada	2019-02-17
	Coventry, UK	2019-02-17
	Charlottetown, Canada	2019-02-17
	Mount Herbert, Canada	2019-02-17
	Penrith, UK	2019-02-17
	Mississauga, Canada	2019-02-17
	Toronto, Canada	2019-02-17
	Worcestershire, UK	2019-02-17
	Edmonton, Canada	2019-02-17
	Milton Keynes, UK	2019-02-17
	Montréal, Canada	2019-02-18
	Rochester, UK	2019-02-18

Name	Location	Date
	Charlottetown, Canada	2019-02-18
	Canada	2019-02-18
	Ottawa, Canada	2019-02-18
	Winnipeg, Canada	2019-02-18
	Belfast, Canada	2019-02-18
	Lake Cowichan, Canada	2019-02-18
	Charlottetown, Canada	2019-02-18
	Canada	2019-02-18
	Pointe-Claire, Canada	2019-02-18
	Abbotsford, Canada	2019-02-18
	Dundee, Canada	2019-02-18
	Key Largo, US	2019-02-18
	Charlottetown, Canada	2019-02-18
	Quesnel, Canada	2019-02-18
	Lloydminster, Canada	2019-02-18
	Brampton, Canada	2019-02-18
	Managua, Nicaragua	2019-02-18
	Montague, Canada	2019-02-18
	Saint Albert, Canada	2019-02-18
	Milton, Canada	2019-02-18
	Sheffield, UK	2019-02-18
	Edmonton, Canada	2019-02-18

Name	Location	Date
	Bournemouth, UK	2019-02-18
	Brossard, Canada	2019-02-18
	Milton, Canada	2019-02-18
	Sutton Coldfield, UK	2019-02-18
	Brixham, UK	2019-02-18
	Doncaster, UK	2019-02-18
	UK	2019-02-18
	Canterbury, UK	2019-02-18
	Woking, UK	2019-02-18
	stoke on trent, UK	2019-02-18
	Albaston, UK	2019-02-18
	Charlottetown, Canada	2019-02-18
	St-mathias, Canada	2019-02-18
	Pune, India	2019-02-18
	Oxford, England, UK	2019-02-18
	Hamilton, Canada	2019-02-18
	Markham, Canada	2019-02-18
	warren bond, UK	2019-02-18
	Charlottetown, Canada	2019-02-18
	Halifax, Canada	2019-02-18
	Oakville, Canada	2019-02-18
	Charlottetown, Canada	2019-02-18

Name	Location	Date
	Winnipeg, Canada	2019-02-18
	Orillia, Canada	2019-02-18
	Canada	2019-02-18
	Eustis, US	2019-02-18
	La Salle, Canada	2019-02-18
	England, North Korea	2019-02-18
	Québec, Canada	2019-02-18
	Edmonton, Canada	2019-02-18
	Charlottetown, Canada	2019-02-18
	Montréal, Canada	2019-02-18
	Gibsons, Canada	2019-02-18
	BISHOPS STORTFORD, UK	2019-02-18
	Irvine, UK	2019-02-18
	liverpool, UK	2019-02-18
	Guelph, Canada	2019-02-18
	Newport, UK	2019-02-18
	Marysville, US	2019-02-18
	Rushden, UK	2019-02-18
	Vancouver, Canada	2019-02-18
	Truro, Canada	2019-02-18
	edmonton, Canada	2019-02-18

Name	Location	Date
	Timberlea, Canada	2019-02-18
	Newmarket, Canada	2019-02-18
	Brampton, Canada	2019-02-19
	Arthur, Canada	2019-02-19
	Vancouver, Canada	2019-02-19
	Calgary, Canada	2019-02-19
	rosemere, Canada	2019-02-19
	Toronto, Canada	2019-02-19
	Vancouver, Canada	2019-02-19
	Dartmouth, Canada	2019-02-19
	Milton, Canada	2019-02-19
	Ottawa, Canada	2019-02-19
	Dartmouth, Canada	2019-02-19
	Lasalle, Canada	2019-02-19
	Woodbridge, Canada	2019-02-19
	Winnipeg, Canada	2019-02-19
	Bandung, Indonesia	2019-02-19
	Middle River, US	2019-02-19
	Puyallup, US	2019-02-19
	Barnsley, UK	2019-02-19
	Northampton, UK	2019-02-19
	Montevideo, Uruguay	2019-02-19

Name	Location	Date
	Gateshead, UK	2019-02-19
	Leeds, UK	2019-02-19
	Dartmouth, Canada	2019-02-19
	Douglasville, US	2019-02-19
	Boyers, US	2019-02-19
	Loretto, Canada	2019-02-19
	Cornwall, Canada	2019-02-19
	Tatamagouche, Canada	2019-02-19

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 9:47:26 AM

Project: replacement_effluent_treatment_facility_project Comments: As a former resident of the Town of Pictou, I agree that the Mill has provided jobs over the past years. However, that is the past. My understanding is the number of actual people employed on site is around 100. The other jobs relate to the foresty industry. I think it is time to take a step back and find other markets for the wood harvests. The Mill has been polluting Boat Harbour since inception, never mind polluting the air that residents breath. The promise to close Boat Harbour MUST BE KEPT, but UNDER NO CIRCUMSTANCES should treated waste be dumped into Northumberland Strait. It would be a travesty, not just for N.S., but for PEI, NB, Magdeline Islands, etc. Name: Email: @gmail.com Addres

Privacy-Statement: agree x: 44 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 9:56:00 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe the existing science and extensive studies on effluent will show it has done little harm to the environment. A balance between the environment and good jobs has to be found we dont need another 1000 Nova Scotians heading west for work!!! Boat Harbour has drained into the Northumberland Strait for 51yrs and has not harmed the fishery. I strongly believe a modern new effluent treatment plant will be a great improvement for the area and allow the Open Septic tank of boat harbor to close even if a one year extension is required. Further to this all effluent leaving NP will now be treated preventing any future risk of a spill!!! Lets keep good jobs in our Forests industry! Thank you Name: Email: @gmail.com Address

: Privacy-Statement: agree x: 72 y: 18

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 20, 2019 10:05:25 AM

Project: replacement_effluent_treatment_facility_project Comments: I am from a home town that lost their main industry the little now village of Canso, we died after that, if this assessment is not approved and if the plant is not given an extension even 6 months more would make a big difference, I see the future of Pictou where Canso is now essentially non existent. Keep in mind the people complaining majority are retired so they donâ?Tt have to worry about staying at home and when discussed with them their response is well the youth will have to go elsewhere to work no regard for us . We want to stay home our families want to. Northern pulp helps families multiple at Christmas I mean multiple disadvantaged families , I have yet to see a fisherman come in to pay for Christmas for a local family. Do not kid yourself they put on poor face but they are millionaires whom are self employed yet get EI in the off season . No one else self employed gets this . Itâ?Ts time people see this for what it is a company trying to right itâ?Ts wr ongs and to save a county. If it is not given the time say goodbye to multiple businesses and to the county in general. This is not just 300 jobs locally this is thousands locally approx 8000 and 12,500 across province maybe more. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 52 y: 18

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:06:22 AM

Project: replacement_effluent_treatment_facility_project Comments: 2019 and we STILL have NP who allow such destruction in all forms from this out dated Company that relies on the death to our forests ,our waterways our animals on land and aquatic animals. Spewing poison into our Harbour. Ignoring the Indigenous people by destroying their land . Our Government in cahoots with NP since Forever. Cancers and asthma along with other diseases. Canâ?Tt breath in that community. Yet NP thinks they can get a extension. Hell No. #NOPIPE#NOEXTENSION Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 65 y: 26

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:21:52 AM

Project: replacement_effluent_treatment_facility_project Comments: No need for a federal assessment Government needs to make reasonable regulations and enforce them. I am more concerned about raw sewage entering Northumberland Strait from all the properties that have no or improper septic systems Name: Email: @gmail.com

Privacy-Statement: agree x: 85 y: 32

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:26:10 AM

Project: replacement_effluent_treatment_facility_project Comments: Give northern pulp the ok to build the facility and give them the extension so they can run with out a shut down. This project is one of many of its kind we know the technology works and dumping in the strait is nothing new. We need more employers in Nova Scotia that are willing to upgrade old plants and build new ones. I think other companyâ?Ts like Pierdae energy are sitting back watching this unfold and depending the outcome may or may not make the final investment in their gas plant in goldbaro. We need to make Nova Scotia a welcoming place for businessâ?T willing to come here. Name: Email: @hotmail.com Address

Privacy-Statement: agree x: 38 y: 34

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:31:14 AM

Project: replacement_effluent_treatment_facility_project Comments: This project is a must to maintain good paying jobs in rural Nova Scotia. The present Boat Harbour lagoon is an effluent treatment system, it was converted to one by the province. A person would not swim in the New Glasgow or Halifax treatment systems. The treated effluent has been going to the Strait for 50 years with no effect to fisheries, in fact some fishers have seen an increase in the fisheries. Look at all the facts when your decision is made, donâ?Tt make it on emotions and fake news! Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: Privacy-Statement: agree x: 62 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:34:04 AM

Project: replacement_effluent_treatment_facility_project Comments: It has polluted our beautiful province enough. Tourism and fishing are valuable jobs. Come up with a good compensation package for the employees .I would rather spend tax payers money helping the employees re educate or a compensation package. We should demand if the company wants to remain it has a system where no effluent goes into our waters Name: Email: @gmail.com Address: Municipality: : Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 50 y: 10

From:
To: Environment Assessment Web Account
Cc: CEAA.BoatHarbour.ACEE@canada.ca; info@friendsofthenorthumberlandstrait.ca
Subject: Citizen Submission for Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: February 20, 2019 10:36:19 AM

To: Canadian Environmental Assessment Agency (CEAA)
Re: Support for Federal Environmental Assessment of Northern Pulp's Replacement Effluent Treatment Facility Project

Dear Minister

We are submitting our comments on Northern Pulp's proposed Replacement Effluent Treatment Project.

Our comments are intended to help you decide if Northern Pulp's proposal warrants Environmental Assessment due to the possible adverse environmental effects on the region, and to determine if those effects can be mitigated, eliminated, reduced or controlled.

Addressing directly adverse effects on the environment, the damaging effects of the effluent on Boat Harbour has been very clear. The current proposal of Northern Pulp to move their dumping from that harbour to Caribou Harbour does not in any way reassure us and other citizens of Pictou area that these damaging effects will not occur again. One of the most reliable scientific studies that can be pointed to is the direct results of past actions. The results of pouring pulp effluent into Boat Harbor has tragically harmed that environment and the health and economy of the people living in that environment. The trauma of living by waters that are polluted is evident and long-standing. This evidence alone points to what would be the future of Caribou Harbour and the citizens of our local region should this proposal go ahead as planned. We are writing to be clear that we do not want a repeat of a situation that would cause obvious damage to the environment, the local economy and the people's enjoyment of that environment.

We live directly on Caribou Harbor and participate daily in the enjoyment of its clean, so far, environment, side by side with the lobster fisheries and tourism industries that are based in these waters. In our community, for instance, there is are two wharves from where fisherman operate their boats. We have first-hand relationships with them as our neighbours and as part of our local economy. We also live next to a Provincial Park, and the highly popular Pictou Lodge.

Personally, we have been living on this shore for the last 30 years. In the summer we swim in the ocean on a daily basis, and since moving to Caribou Harbour, also enjoy daily walks along the shoreline to Munroe Island. We live next to the Caribou Provincial Park, which would be negatively affected by the dumping of effluent in these waters. This park is one of the most popular in the province, and attracts people from all over the Maritimes, and the country, as well as international visitors. If you have ever visited here to see the beautiful beach and what this area offers, what I am saying would be clear to you.

Besides the local environment and economy, clearly our property values would decrease significantly if we lived on polluted water. What attracts people to live here is this beautiful, fresh, clean environment. Caribou Harbor is a sought-after area now, for these reasons. It is clear that this would change very quickly with the sheer volume of effluent being proposed to be dumped in our water, let alone its toxicity levels.

The current proposal for cleanup of the effluent to make it less toxic does not reassure us that it would be sufficient to mitigate the problems we would be experiencing in the Caribou Harbour region. To this end we request that the Minister, whose job is to protect the environment and the citizens, order an Environmental Assessment Report.

Based in a review of Northern Pulp's past actions and their detrimental effects to the environment and the people that live in the Boat Harbour environment, it seems clear and obvious that the Caribou Harbour environment and the people living here would also be directly affected if this plan went through, especially if done without the checkpoints and monitoring of an Environmental Assessment.

Should there not be an Environmental Assessment, we submit to the Minister that from our point of view we, the public, would have every right and justification for suing our government for lack of protection of the environment and the people affected.

Our hope is that our government will act responsibly and move in the direction of resolving this issue.

Thank you for reviewing our submission.

Respectfully,

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:39:23 AM

Project: replacement_effluent_treatment_facility_project Comments: The current treatment system planned is a release system off shore not in a harbour or confided testible location and itâ?Ts designed that way to midigate/avoid the ability to scientifically verify any future effects caused by this facilities Effluent period. The NS Government will always be able to avoid dealing with harm done to the environment with this plan as will the company that owns or in future will own this facility, this is s very dangerous path. Job are very important, not just at the mill but also on he waters, this risks the Nova Scotia Brand Of sea food. The company and or our Grovernment must find a better solution for all. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 75 y: 15

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:51:15 AM

Project: replacement_effluent_treatment_facility_project Comments: I strongly believe you cannot put effluent into our ocean and we do not need another study.Back in the 1960 I use to attend Sunday School Picnic at Chance Harbor and swim at the shore. No one can swim there, the water is black.Please do not let them put effluent into the ocean.Common sense please. Name: Email: @live.ca Address:

Privacy-Statement: agree x: 57 y: 19

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 10:54:01 AM

Project: replacement_effluent_treatment_facility_project Comments: I am in favor of approval of the Northern Pulp Pioeline project. Northern Pulp is of vital importance to economic stability not just of northern Nova Scotia, but the entire province. The new pipeline, from all that I have read will be much cleaner that the Boat Harbour outflow. It is my understanding that where the treated waste exits the pipe, there will be no discernible chemical residue beyond 100 feet of the pipe. Environmental standards are much more stringent than they were 50 years ago. I believe this system meets or surpasses current environmental standards. Therefore is should and must be approved. The naysayers do not appear to have credible evidence, scientifically based, to support their reasoning to deny the pipeline and system that NP are attempting to use. Name: Email: @eastlink.ca Address:

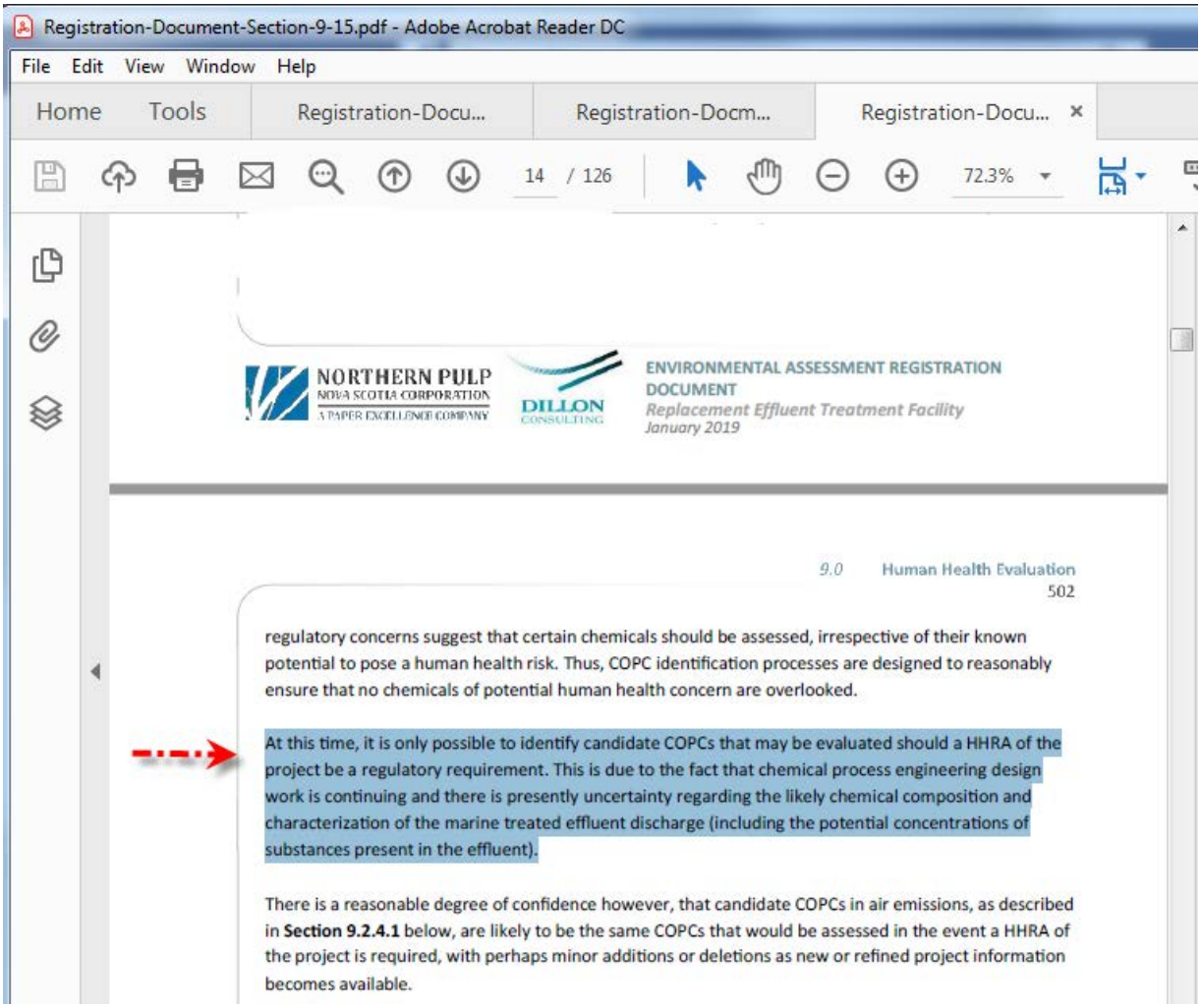
Privacy-Statement: agree x: 74 y: 25

From:
To: Environment Assessment Web Account
Subject: Effluent Qualities Unknown! Huge Red Flag ! Feedback opposing the Northern Pulp Waste Proposal
Date: February 20, 2019 10:55:03 AM
Attachments: image.png

Hello Premier McNeil and Minister Miller,

This statement within the NP EA is a huge red flag! How can anyone have trust and confidence that this effluent is safe for human health, marine species and the overall environment when the contents are still unknown and will remain unknown until its being pumped into the ocean. At that point, it is to late at 90,000,000 Litres per day!

"At this time, it is only possible to identify candidate COPCs that may be evaluated should a HHRA of the project be a regulatory requirement. This is due to the fact that chemical process engineering design work is continuing and there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential concentrations of substances present in the effluent)."



Sincerely,

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 20, 2019 10:58:41 AM

Project: replacement_effluent_treatment_facility_project Comments: This is 2019 a environmental assessment should of been done long ago. I am tired of the smell the plant produces and we worry for our health from the effects of the mill. Fishing is a huge importance for the province. They shouldnt be even a question if they can dump the effluent in our water!!!! NO!!! The average person is bound to environment standards but people who can pay off other people can flog the system. We need the provincial and federal government to stand up and say enough is enough!! NO PIPE!! Name: Email: @hotmail.com Address:

Privacy-Statement: agree

x: 76 y: 20

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 11:30:08 AM

Project: replacement_effluent_treatment_facility_project Comments: Heres my view, stop giving all our tax dollars away to other countries and spend it on solving Canadas issues,, theres a solution to almost ever problem, but it cost money, money we dont have because people keep trying to save the world while youre boat is sinking in the middle of the Atlantic ocean Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 40 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 11:38:54 AM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp should be required to treat its effluent internally with a closed-loop system, and should not be allowed to continue polluting our environment in Nova Scotia. I have serious concerns about air quality, water pollution, dioxins and furans, and their impact on surrounding communities health - not to mention the other species that call the Northumberland Strait home. Remember this is home to one of the last remaining Atlantic Salmon populations. This pulp mill has been sucking taxpayer dollars out of this province, poisoning the land and water of Indigenous communities and poisoning the air of everyone, for far too long. This new effluent treatment plan is no better than Boat Harbour, and simply shifts the burden of toxins to a different area. If the pulp mill cannot deal with its effluent internally with a closed-loop system, without foisting its pollution on the surrounding environment, it must be concluded that they are not equipped to function responsibly in our province. This effluent facility should not be approved. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 52 y: 9

From:
To: Environment Assessment Web Account
Subject: End of Northern Pulp not the end of the world
Date: February 20, 2019 11:48:33 AM

Closing Northern Pulp would not be the end of the world. After all, in 2012 Bowater Mersey in Liverpool and Minas Basin Pulp and Power both closed, with a total loss of 455 jobs, yet Nova Scotia didn't fold. Indeed, there was at least one positive impact resulting from those closures; they reduced the demand for coal-generated electricity and reduced Nova Scotia's GHG emissions significantly.

The closing of Northern Pulp could have several positive effects on our province. First, our emissions from coal-generated electricity would be further reduced; second, the air and water quality in the Pictou area would be greatly improved; third, the threat to our fishery would be removed; and fourth, and most importantly, the loss of jobs in Pictou could lead to the development of many more jobs elsewhere in the province.

If the province lifted the moratorium on hydraulic fracturing the harvesting of our onshore natural gas and the building of pipelines to distribute it would create hundreds of jobs. It would also allow us to cut our CO2 emissions from electricity generation in half and divert millions of dollars from South America where we purchase coal, to Cumberland and Colchester Counties where the bulk of our onshore natural gas is found. Furthermore, it would deliver millions of dollars of income to the government; income that could be used to fund improved health care, education and infrastructure. It could also be used to lower business taxes and help grow our economy for years to come.

The closure of Northern Pulp would not be the end of the world. In fact, it could be the beginning of a bright new world for Nova Scotia.

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 11:49:21 AM

Project: replacement_effluent_treatment_facility_project Comments: I am a retired employee of the mill and I know how important this project is for people who depend on this mill for a living, nearby 10,000 people in all....I did when I worked there having three children and a husband who worked in construction, my Blue Cross for all. of us, drugs, dental and many more benefits...I was able to put two children through university without student loans ...these jobs are important to Nova Scotians.....and our economy....and families need to stay together...not working away and that jobs are suffering out west because of the oil pipeline.... Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 64 y: 12

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 11:58:42 AM

Project: replacement_effluent_treatment_facility_project Comments: I am very opposed to this. I cant believe that in this day and age that anyone would even consider letting an industry pollute our precious water. I dont care how safe you think it will be it will NEVER BE SAFE and pollution spreads. This is a drastic idea that will have far-reaching effects. A real tragedy if our Government thinks this is ok! Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 89 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 12:02:44 PM

Project: replacement_effluent_treatment_facility_project Comments: Do not allow the pipe to go into the northumberland straight. Shut the plant down Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 45 y: 26

From:
To: Minister, Env; Environment Assessment Web Account
Subject: Northern pulp mill concerns
Date: February 20, 2019 12:04:14 PM

The Canadian Environmental Assessment Agency
1801 Hollis Street
Halifax, Nova Scotia B3J 3N4
Telephone: 902-426-0564
Email: ea@novascotia.ca

Dear Minister of the Environment,
I am writing to provide feedback to the Northern Pulp's 1200 page proposal to conduct a new effluent treatment facility at its Abercrombie Point location in respect to whether or not your department should recommend a federal environmental assessment.

Taken from NP proposal:
"The proposed project will consist of building a new effluent treatment facility (ETF) on NPNS property including a pipeline to transport treated effluent to Caribou Harbour. Ultimately, the effluent discharge will be into the Northumberland Strait, as has been the case since 1967 via the existing facility. The installation of a modern engineered diffuser provides an improvement in effluent dispersion. The improvement is such that as unlike the visual impact experienced today, it is anticipated that the effluent plume will not be visible when it reaches the water's surface."

This opening statement shows exactly how the rest of the document will read. NP calls it a "new effluent treatment facility" which in itself should trigger the federal assessment. NP then states that the effluent discharge will be into the Northumberland Strait as has been the case since 1967 via the existing facility. We have seen what that has done to Boat Harbour and the surrounding area so why is it o.k. to continue to pollute the Strait in an area where it will not be visible to the majority of the public. How many people other than fishers will be in boats 4 miles off the coastline? Does this make it o.k. to pump the effluent into the Strait because no one can see it happening or because it has been happening for the last 50 years as the proposal states? Just because the new diffuser will supposedly provide an improvement in effluent dispersion doesn't mean that it is better (see comments below) . What about the temperature difference of the effluent? According to NP the area affected will only be 100m from the discharge site. This is based on supposition not scientific fact and will have severe consequences to the fisheries (food over pulp please) for years to come.

Potential environmental effects are identified and predicted for both the construction and the operation and maintenance phases of the project. The residual environmental effects of each project phase are evaluated as either not significant ("NS"), significant ("S"), with the likelihood of occurrence identified in such cases, or positive ("P"). The environmental effects of accidents, malfunctions and unplanned events as well as cumulative environmental effects of the project in combination with other past, present, or reasonably foreseeable future projects or activities are also assessed.

The table that is listed on page xxiv of the proposal summarized the studies, and the effect of the project for the significance of the project related residual environmental effects of the project. I was amazed to see that all categories were predicted as NS - No Significant Residual Environmental Effects Predicted. However, in reading further into the proposal I have discovered many other areas of concern.

"Detailed design has not been completed for the construction of the marine outfall and pipeline. The preferred method for trenching the marine pipeline will likely be by side-cast excavation methods with re-use of bottom materials without bringing to surface". And comments such as "The treated effluent is anticipated to meet compliance"etc. are littered throughout the document. The whole document is written with "not been completed" or "to be determined". On numerous items the proposal states that it is not possible to know or needs more assessment due to the pipeline being defined in the fall of 2018. Again another reason for a federal assessment.

Although NP has had 5 years to adjust to the new reality that Boat Harbour was closing, they have submitted a half-baked proposal, at the 11 hour with lots of what if and projections without any scientific data to back them up. This is not the fault of the population of Nova Scotia but we will have to suffer the costs both in air and water quality for NP dragging their feet and now trying to ram their proposal through.

As one writer to the Herald stated “If one lobster from the Northumberland Strait is found to be tainted with chemicals, it will not be recorded as a Northumberland Strait lobster, but a Maritime lobster. The whole Maritime fishing industry is at stake.

The damage that NP has done to the forests of Nova Scotia should also be considered.
The Lahey report summaries that there is and has been too much clear cutting in Nova Scotia and the health of the forest ecosystems and wildlife is declining as a result. Coupled with the spraying of Glyphosate (a herbicide that remains the world's most ubiquitous weed killer that has raised concerns regarding risk of cancer to those exposed to it by 41%,) the whole project should be studied from all sides and definitely in depth. A federal proposal is required.
I understand that jobs are at stake here but there is more to consider than the economic benefit from one mill. There will always be a market for lumber and the independent foresters and the majority of Nova Scotians would like to see changes to the clear cutting that NP has been getting away with for so long. There are other industries that are affected by NP destruction of the environment notably the fisheries (1 Billion) and tourism (2.7 billion). Together these two industries outstrip the benefits of NP.

The health reasons of dumping 85,000 litres per day of a noxious mixture of dioxins, furans, metals and solids and other contaminates into a water source is inconceivable to me in this day and age of knowledge. Coupled with that, the mill wants to burn the sludge in the power boiler. This is the same boiler that has failed stack emissions tests (Northern Pulp's failed stack test happened the week of June 6 at a reading of 224, 50% over allowable levels) although I understand from NP proposal that "A frequent exceedance is defined as one that occurs more than 1% of the time".

On page 140 under section 8.1.2.2 the proposal states that there have been no exceedances of maximum allowances. This is based on their own assessment. In the proposal NP quotes a recent paper by Hoffman et al. (2017) who evaluated ambient air levels of seven volatile organic compounds (VOCs), based on ambient monitoring data reported from the National Air Pollution Surveillance Network (NAPS). There are two NAPS monitoring stations near the NPNS mill that have historically monitored for VOCs. This paper focused on ambient monitoring data for the following VOCs: chloroform; 1,3-butadiene; vinyl chloride; benzene; carbon tetrachloride; trichloroethylene; and, perchloroethylene. The paper reported that results of the conducted temporal and spatial statistical analyses indicated that 1,3-butadiene, benzene, and carbon tetrachloride air concentrations routinely exceeded EPA air toxics-associated cancer risk thresholds, and that 1,3-butadiene and perchloroethylene levels in air were significantly higher when the prevailing wind direction blew from the northeast and the NPNS mill towards the Granton NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. These outcomes have not been corroborated by regulatory agencies or other parties at this time. While this study was quick to attribute elevated ambient VOC concentrations to the NPNS mill based on a spatial and temporal evaluation only (i.e., a statistical evaluation of ambient data in correlation with wind direction, without further site specific investigation), it did not attempt to rule out contributions from other potential sources of VOCs in the area (e.g., transportation sources, or other industrial sources like the Michelin tire plant or the Trenton coal-fired power plant, presumably all sources of VOC emissions to some degree). So NP refuses to believe that they could be the source of air pollution but would prefer to blame it on other industries in the area.

As far as the total environment foot print, meeting current PPE regulations does not mean that harm is not happening. Regulations for pulp mills were updated in 1992 and are concerned with biochemical demand and suspended solids. As it stands now, there are no CCME guidelines established for some of the different chemicals and compounds that make up the pulp mill effluent. It is not acceptable to follow 27 year old legislation so once again, a federal assessment should be considered.

The new treatment facility is being touted as better than the old. I have several concerns and comments on this. It is my understanding that the current set up has the discharge going into the Northumberland Strait after a 12 hour

primary treatment in the settling ponds, then moves to an aeration basin where effluent is placed in contact with micro-organisms and sits there for 8 days after which the effluent is discharged into Boat Harbour lagoon (basin) where it remains for an additional 20-30 days. Further aeration, settling, cooling, volatilization and breakdown of materials take place during that time. In the proposed new Activated Sludge Treatment (AST) system on the mill site, effluent will move through a primary clarifier to an aeration basin using micro-organisms to break down pollutants, and then to a secondary clarifier. The process will take less than 24 hours. Northern Pulp states that effluent from the new system, including an added oxygen delignification system, will be similar to treated effluent leaving the present system at point C, with some (unspecified) reduction in biochemical oxygen demand (BOD.) However, the effluent being released from the proposed new system directly into the deep waters of the Strait will not benefit from the considerable reduction in BOD, Total Suspended Solids (TSS) and other contaminants including heavy metals which takes place during the 20-30 days that effluent presently remains in the Boat Harbour Basin stabilization lagoon. Northern Pulp has not provided a detailed comparison between the effluent which presently reaches the edge of the Strait and the effluent they propose to release into the fishing grounds with the new system. The present effluent outfall location at the shore edge does not disperse effluent in the Strait in the same way that the proposed new outfall site would. With the proposed new system, 70+million litres of treated effluent would be pumped directly and continuously into the prime fishing areas of the Strait every day.

Ocean environments are increasingly stressed. The Northumberland Strait Ecosystem Overview Report, prepared for DFO in 2007, documents increasing stresses on the Strait. To state that there are other industries producing stresses does not make it alright for NP to increase this toxicity and to think otherwise is just plain insanity.

In terms of toxicity, my understanding is that there is only one test required to meet federal regulations. This test measures acute toxicity -- whether 50% of rainbow trout die when exposed to effluent for 96 hours. It does not measure impacts on fish growth or reproduction or on fish habitat. No toxicity test on salt water fish is required to meet federal regulations. There are no federal regulations for a number of known harmful substances in pulp effluent, including AOX and phenols so further study is needed before this pipe is installed. We cannot wait for updated PPER legislation slated for publication in 2022.

NP lists Alternatives Considered for Final Discharge Location or Method. Discharging into Pictou Harbour is not recommended due to the lack of mixing with the Strait (as if mixing with a larger body of water is acceptable), Release into the Middle River upstream was not considered due to expectations that it will increase chlorides in the Middle River and potentially affect the maintenance of the equipment at the Middle River Pumping Station and inside the mill (but once again it is o.k. to dump on fishing grounds). The municipal stations and private facilities do not have the capabilities to handle the volume nor is a land based option available because as proposal states: Land application of wastewater effluent has not yet been approved in Nova Scotia (small wonders), Trucking or barging the sludge to a different location is not recommended. I found the barging comments interesting: A pier for barge loading would be necessary - assumed to not be at the NPNS mill location. Liquid would have to be either stored and trucked or stored and pumped to a facility to offload to an ocean going barge/tanker to be discharged outside of coastal waters in an approved area, with a large number of tankers. There would be increased industrial vessel movements in the Northumberland
Strait, potentially disrupting fisheries. Project specific permits would be required as the effluent does not fall under materials permitted to dispose of offshore. NP is concerned about the increase in traffic in the Strait but not about the effluent that will be pumped there. Why would they need project specific permits if effluent does not fall under material permitted to dispose of offshore but using a pipeline to dump the effluent is allowed?

A closed loop system is not economically viable according to Northern Pulp. NP also states: The main problems with the bleach plant effluent recovery are equipment corrosion and accumulation of chloride and non-process elements in the mill's water systems. Accumulation of chlorides and potassium are especially corrosive for the mill's boilers and often lead to scale build-up which would require the replacement of the boiler over time. However NP also argues that it would not be economically viable for NP however they are quick to boast of the annual volume of income at $535 million. If the chemicals used are too corrosive for the river and too corrosive to recycle in their own equipment, how can pumping the effluent into the Northumberland Strait be a viable solution? Surely dispersing sludge over a larger area is not the answer. And what happens if NP sticks around until the end of the lease in 2030. Who is going to clean up the mess then? Who is going to compensate the fishing and tourist industry? This are too many other stakeholders involved to let this go through without a Federal Assessment.

I haven't even commented on the state of the health industry in Nova Scotia that could use the money being spent

on NP. NP has already received $127 million dollars in tax payer's dollars over the years. We have paid for the design process of the proposed effluent process at a cost of $6 million dollars and will be expected to cover the cost of the construction, installation, labour etc. for the proposed pipe estimated at $100 million dollars. How can NP be allowed to pollute the environment as they have in the past and how can we as citizens believe anything that NP puts out in the media about how wonderful they are when history has shown otherwise? I would rather put my tax dollars towards the penalty of breaking the lease if need be.

On top of all that, I have now read that there is a conflict of interest from the minister of the environment: As Ecojustice wrote on behalf of Friends of the Northumberland Strait," the minister has a clear financial interest in making sure the environmental assessment process is over and done with as quickly as possible. Our clients also say the minister's ongoing contracts with Northern Pulp give the impression that the minister is not able to make a fair decision about whether or not to approve the project. These conflicts of interest violate the public's right to a thorough and unbiased assessment. That is why we are calling on the minister to step away from the assessment process and make way for a federal environmental assessment."

In summary, a federal assessment is required. I will accept the outcome of that but nothing less.
Sincerely,

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 12:35:19 PM

Project: replacement_effluent_treatment_facility_project Comments: I donâ?Tt support the pipe into the Strait, period! Name: Email: @outlook.com Address:

Privacy-Statement: agree x: 80 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 2:01:52 PM

Project: replacement_effluent_treatment_facility_project Comments: I am years old and i have breathed and tasted the stench in my mouth.I recall as a child the horrible smell

and studies prove whats causing it!! West river is

which has killed many people throughout the years. Did you know this water has not been tested for over 20 years? paid to have the water and soil tested after many fish died and were all around the coastline then DOF put signs all around the lake that reads contaminated shellfish. Last July 2018 i called Pictou several times who told me they do not do the water and soil testing i explained my concern about the dogs that died in the lakes in Halifax 2018 from bacteria in the water i simply was told by her just dont let your dogs in the water i was giving the number of DOF and r came the next day but guess what they dont test the water either the next day Pictou RCMP arrived at my door wondering why he was called?? i did not call him DOF did. After many phone calls and much frustration i was told by NS environment ..NS DOF ...and pictou municipality no one does testing nor follow ups in this water i was told. I have brought my concerns and left it with my MLA Karla MacFarlane who is looking into it since July 2018. My questions are ~ Who will be monitoring the waters surrounding this pipe? what is in the effluent and where will this pipe end? we the public deserve these answers and proper information to be detailed before ANY approval we are fighting our own government for clean air and water which in my opinion is a disgrace!! Shut that cancer polluting mill down its way past its stay here in Pictou County Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 73 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 2:39:34 PM

Project: replacement_effluent_treatment_facility_project Comments: I support the protection of The Northumberland Strait from Northern Pulp. I support PLFN. I support our fishermen and fisherwomen. I support The Fishery. I support the rock crab nurseries located in The Northumberland Strait, Caribou Harbour. I have read that, excavating a trench through the center of this very special ecosystem, by Northern Pulp, may spell the end of this nursery and threaten the lobster fishery in this area. I support the Environment - Land, Air and Water. I support the clean-up of Boat Harbour. #protecttheprolificfisheryofNovaScotiaandPEI #thankyou #nopipe #noextension Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 72 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 3:54:20 PM

Project: replacement_effluent_treatment_facility_project Comments: To whom this may concern I have been a resident in the Pictou County area all of my life. I am 51 years old with grandchildren. My concern of this facility and their shortfall on facts of the serious adverse affects this may have on our land and sea. I do understand the complexity of this regarding job loss, spin offs however when a reasonable consideration of this projected pipe into our rich fishing grounds and beaches is compromised... where is the scale of risk leaning? I for 1 am very proud of our diverse industries ie tourism, fishing... I worked in both and I know first hand the loss as a community to share our riches with the world will be affected. I am putting my trust in you to lead us through this and do the right thing.. Safe air, safe water and land.. that is a reasonable request. Please stop this abuse of our community and be proactive in ceasing this pollution. Our lives and welfare depend on just that. Respectfully

Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 58 y: 35

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 20, 2019 5:05:47 PM

Project: replacement_effluent_treatment_facility_project Comments: 100 for the mills operation. For 50 years the plfn fished lobster no more than 1km from the outflow of boat harbour, and lots other fisheries in close by areas. Plfn are known for having high lobster catches in the direct area. Not only that but in the outflow area the water is shallow and would not provide the same mixing as a pipe 60ft with diffusers. Let paper excellence do this right! Name: Email: @gmail.com Address: Municipality: Postal-Code: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 19 y: 28

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 5:17:12 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp should be given the extension on Boat Harbour and the new system be installed and this new system will be an updated more advanced and more efficient than the old one. It will save our forest industry and the nova Scotia economy and no harm to the Fisheries. Name:
Email: @gmail.com Address:

: Privacy-

Statement: agree x: 57 y: 12

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 5:58:35 PM

Project: replacement_effluent_treatment_facility_project Comments: I have 3 comments: 1. The proposed effluent creation is a function of one possible mechanical process to create pulp. There are more modern clean alternatives to pulp creation. 2. I believe people and industry would be willing to help fund the cleaner process. Of course the stake holders should carry the bulk of that expense. 3. Long term environmental impacts are not known therefore the question should not be considered answered appropriately by the applicant. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 66 y: 9

From: @grandnarrows.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 6:20:14 PM

Project: replacement_effluent_treatment_facility_project Comments: Please stop this poison! We need new sources of power!! Name: Email: @grandnarrows.com Address:

: Privacy-Statement: agree x: 41

y: 31

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 7:14:11 PM

Project: replacement_effluent_treatment_facility_project Comments: I heard about the destruction of Boat Harbor due to Northern Pulp before my first vacation to our East Coast. The air pollution was a horrible stench and sight when we were in the area. How can you as the Government even consider allowing another effluent pipe to be built? We as Canadians and the rest of the world have to know that are oceans and their sea life cannot be replaced or repaired. Stop the Pipe and close them down. Name: Email: @gmail.com Address:

: Privacy-Statement: agree

x: 88 y: 21

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 7:48:05 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel that it is time to close the Boat Harbour Facility and replace it with a modern treatment facility. If this new facility meets the requirements that are set by the various government agencies then it should be allowed to proceed. The future of this project should not be dictated by a group of people who have a different view point of the regulations required to operate an effluent treatment. They were not experts nor are they elected to make the laws and regulations that need to be met. That is your job, do it. Name: Email: @ns.sympatico.ca Address:

: Privacy-Statement: agree x: 67 y: 22

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 9:05:15 PM

Project: replacement_effluent_treatment_facility_project Comments: I fully support this project and would like you to approve it. Name: Email: @gmail.com Address: : Privacy-Statement: agree x: 49 y: 36

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 20, 2019 9:12:47 PM

Project: replacement_effluent_treatment_facility_project Comments: The northern pulp mill is a vital part of the rural economy in nova scotia. Other pulp mills across canada operate within the regulations set forward buy our government. If this new system can operate safely and within the guidelines described for releasing treated effluent into a water body then i would accept a decision from the department of environment allowing the project to move forward. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 81 y: 16

From:	@yahoo.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 20, 2019 10:32:31 PM

Project: replacement_effluent_treatment_facility_project Comments: I am strongly opposed to the dumping of any dilution of effluent into the Northumberland Strait. There is no possible way to know the short or long term effects of such a project. The technology exists to produce Kraft with other methods, our citizens should not have to sacrifice our environment because a company cant or wont invest in a different process. Name: Email: @yahoo.ca Address:

Privacy-Statement:

agree x: 66 y: 9

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 3:56:45 AM

Project: replacement_effluent_treatment_facility_project Comments: No pipe into Northumberland Strait. This is just wrong on so many levels and our environment is a necessity that must be protected at all costs.what we breathe is already affected by this mill and we cant afford to let it affect one of our food sources.This mill is not a necessity to our future but our oceans are. There is no way that this wont affect us in a negative way. NO PIPE Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 53 y: 20

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 7:39:19 AM

Project: replacement_effluent_treatment_facility_project Comments: Dear Minister, Thank you from the opportunity to comment on Northern Pulpâ?Ts environmental assessment registration document. I will preface my remarks by saying, I studied environmental assessment many years ago at Dalhousie University that I have prepared an environmental assessment registration for a project in Nova Scotia, and I am a landscape architect with a background in beaches and shoreline processes. I understand the difficult situation the Minister and the Province find themselves in with respect to closing Boat Harbour and the associated requirement for Northern Pulp to provide an acceptable alternative effluent treatment and disposal plan. I have visited Boat Harbour, and it is an environmental disaster with concentrations of chemicals in the bottom sediments. Hopefully it can be remediated successfully and the years of exposure that Pictou Landing First Nations had to endure must end. Any proposal that involves dumping millions of litres per day of a chemical process effluent into the Northumberland Strait at Caribou Harbour requires careful consideration of the potential environmental impacts at source, at the outfall and downstream . The absolute minimum requirements to assess the potential impacts are : 1] A clear understanding of the chemical composition of the effluent , 2] The design of the outlet, 3] Good baseline information on the Northumberland Strait marine environment and processes, 4] A demonstrable appreciation of the risk factors at the outlet location such as sediment migration and wave energy. 5.] Consideration of the potential impacts of extreme storm or wave events generated in part by climate change. The Registration Document for Northern Pulpâ?Ts proposed effluent treatment plan fails to provide critically important information which is essential to proper environmental assessment. It states on page 502 â?othere is presently uncertainty regarding the likely chemical composition and characterization of the marine effluent discharge â?o . It further admits in 9.2.4 that there are two sources of chemicals of potential concern that may result in potential chronic human exposure to project related chemicals. The potential impacts on the health of area residents must be known and properly evaluated before approval of this project. The document states there is no detailed design available for the main effluent outlet, and that the proposal in the Registration document was prepared without field work in the marine environment. There is no specific discussion or assessment of the potential impacts of climate change in the Registration document. The environment of the proposed effluent outfall is a dynamic, shallow, drowned shoreline with sediment movement that is subject to periodic extreme storm events as low pressure systems track into the Gulf of Saint Lawrence. The proposed effluent outfall location is in close proximity to a site of ecological significance at Monroeâ?Ts Island, an important Provincial Campground and Day Use park at Caribou , and it sits at one of the key tourism entry points to Nova Scotia. The impacts of any potential catastrophic failure of the treatment system would be amplified by this very public and ecologically sensitive location. Any mechanical system is potentially subject to failure and the impacts of such a potential failure cannot be adequately assessed without knowledge of the chemical composition and physical characterization of the effluent. The deficiencies in the document raise serious concerns with respect to its conclusions on the potential significant environmental effects on the valued ecosystem components. The conclusions indicate there will be no significant effects on all components. I submit that without knowing what the effluent contains these conclusions are scientifically impossible. I understand the economic importance of Northern Pulp to Nova Scotia and I sincerely hope that an environmentally acceptable alternative effluent treatment

strategy can be developed that does not risk destroying one of Nova Scotiaâ?Ts most valued marine environments . However, given the serious information deficiencies and uncertainties in the Registration document it cannot be accepted and the project cannot be allowed to proceed until these deficiencies are addressed . Yours truly ,
Nova Scotia Name: Email: @hotmail.ca Address

Privacy-Statement: agree x: 42 y: 23

From: @gmail
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 10:34:27 AM

Project: replacement_effluent_treatment_facility_project Comments: It is a real shame that governments and businesses around the world will not join together to ban the bleaching thus eliminating this pollution everywhere. In the meantime a federal assessment is needed. Even so the pipe is no solution. NO PIPE!! Furthermore it is sickening that the government continues to allow PLFN and residents in the surrounding areas to live so close to and breathe in a bio hazardous cesspool. Name: Email: @gmail Address:

Privacy-Statement: agree x: 72 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 12:10:26 PM

Project: replacement_effluent_treatment_facility_project Comments: Due to the delay of an industrial approval in 2015,NPNS could not design a new treatment facility until 2016.Therefore an extention of 1 year is required to complete the project.This will avoid economic devastation for our struggling province.Please consider the facts and leave emotions aside. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 50 y: 26

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 12:15:55 PM

Project: replacement_effluent_treatment_facility_project Comments: All we need is more time. Red tape is what is holding up getting this new system installed. Without the forestry industry this province will loose many familys. As far as pulp waste in the Strait PHP is using this system we want without problems to fisherpeople. Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 59 y: 19

From: @tncweb.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 1:14:03 PM

Project: replacement_effluent_treatment_facility_project Comments: My wife and I have read the Replace Effuent Treatment Facility Project for Northern Pulp and agree it should be passed Name: Email: @tncweb.ca Address: Privacy-Statement: agree x: 80 y: 18

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 1:30:36 PM

Project: replacement_effluent_treatment_facility_project Comments: As a retired engineer with northern pulp I believe there has been a tremendous amount of misinformation and hype concerning the effluent upgrade. I believe the company contracted to supply equipment and provide technical expertise for the project is a world class company experienced in many types of waste water treatment. I believe when the project is built and properly commissioned the wastewater quality will be monitored continually at the mill site before even being released to the northumberla d Straight. If the quality of effluent does not meet the specifications required for the environmental assessment then the effluent wonâ?Tt be released to the straight. I believe hype and misinformation must be take away from the review process and let the science prevail Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 68 y: 24

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 1:32:04 PM

Project: replacement_effluent_treatment_facility_project Comments: Let the mill improve its system by allowing the time extension needed. Name: Email: Address:

Privacy-Statement: agree x: 57 y: 17

From:
To: Environment Assessment Web Account
Subject: The Concerns of the Mill
Date: February 21, 2019 2:33:02 PM

Sent from my iPhone

>
> This mill is not thinking of our future, the parent company has a track record for the most sinister of ecological and financially destructive practices. We should be doing everything in our power to promote a future of a clean sustainable environment for us and our next generations. This mill has seen its heyday and now should either change with the times and cleanup, or stop before it destroys any hope for a better Nova Scotia. We could rise to the occasion and start a new future for this economy. All this mill is offering us is more pollution/ toxifying our waters and our air as well as decimation of our forests.
> As a Palliative Care Physician I am seeing an alarming rise in cancers and seeing them in younger individuals . It is too difficult to say with certainty if this is a cause and effect of the mill , but it surely is not helping curtail it. Please do not allow this travesty to go on without a federal assessment of the dangers inherent in such an archaic industry practice.

> Aberdeen Hospital New Glasgow
>
> Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 2:45:23 PM

Project: replacement_effluent_treatment_facility_project Comments: This mill is not thinking of our future, the parent company has a track record for the most sinister of ecological and financially destructive practices. We should be doing everything in our power to promote a future of a clean sustainable environment for us and our next generations. This mill has seen its heyday and now should either change with the times and cleanup, or stop before it destroys any hope for a better Nova Scotia. We could rise to the occasion and start a new future for this economy. All this mill is offering us is more pollution/ toxifying our waters and our air as well as decimation of our forests. As a Palliative Care Physician I am seeing an alarming rise in cancers and seeing them in younger individuals . It is too difficult to say with certainty if this is a cause and effect of the mill , but it surely is not helping curtail it. Please do not allow this travesty to go on without a federal assessment of the dangers inherent in such an archaic industry practice. I vote for no extension, enough harm has already been dealt to our indigenous community and the people of Pictou County . Respectfully submitted,

Aberdeen Hospital New Glasgow Name:
Email: @nshealth.ca Address:

Privacy-Statement: agree x: 70 y: 29

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 2:50:17 PM

Project: replacement_effluent_treatment_facility_project Comments: This owner of Northern Pulp is trying to do the right thing for the Environment, the Community, their employees, they should be given a chance. So people of Pictou County donâ?Tt we all need a chance? Who will the non supporters go after next Michelin, Power plant, or Maybe even Pictou Water treatment Plant? Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 64 y: 32

From:	
To:	ec.ministre-minister.ec@canada.ca; jonathon.wilkinson@parl.gc.ca; Minister, Env; ceaa.northernpulp.acee@ceaa-acee.gc.ca; Environment Assessment Web Account
Cc:	thehacaribou@gmail.com
Subject:	re: Caribou Harbour Authority - Request for Federal Environmental Assessment and Comments respecting Provincial Assessment
Date:	February 21, 2019 3:49:59 PM
Attachments:	Catherine McKenna et al_ Northern Pulp_Caribou Harbour Authority Feb 21_19.pdf

Dear Sir or Madam and Ministers:

Please be advised I represent the Harbour Authority of Caribou, Pictou County, Nova Scotia. Please find attached correspondence for submitted for consideration on behalf of the my client.

Yours truly,

MacIsaac Clarke & Duffy
Barristers and Solicitors

195 North Foord Street
PO Box 849
Stellarton, Nova Scotia
B0K 1S0
Tel: (902) 752-5143
Fax: (902) 928-1299

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MacIsaac Clarke & Duffy
Barristers and Solicitors

Hector J MacIsaac
B. Craig Clarke
Bronwyn Duffy

PO Box 849, 195 N Foord Street
Stellarton, Nova Scotia B0K 1S0
P: 902-752-5143 F: 902-928-1299

Honourable Catherine McKenna
Minister of Environment and Climate Change
House of Commons
Ottawa, Ontario
K1A 0A6

ec.ministre-minister.ec@canada.ca

Honourable Jonathan Wilkinson
Minister of Fisheries
Oceans and the Canadian Coast Guard
Room 420-N, Centre Block
Parliament Hill
Ottawa, ON
K1A 0A2
Jonathan.Wilkinson@parl.gc.ca

Honourable Margaret Miller
Department of Environment
1894 Barrington Street, Suite 1800
P.O. Box 442
Halifax, NS
B3J 2P8
Minister.Environment@novascotia.ca

Canadian Environmental Assessment Agency NS Regional Office
200-1801 Hollis Street
Halifax, NS
B3J 3N4

ceaa.northernpulp.acee@ceaa-acee.gc.ca

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8
Fax: (902) 424-6925
EA@novascotia.ca

Dear Sir or Madam and Ministers:

Please be advised we represent the Harbour Authority of Caribou (hereafter the "Authority"), Pictou County, Nova Scotia. Located at the mouth of Caribou Harbour the Authority operates the busiest fishing port in Northern Nova Scotia. It is the hub of fishing activity from April to early December each fishing season. It is accessed via the106 branch of the Trans-Canada Highway and is adjacent to the Northumberland Ferries terminal. The facility managed by the Authority is the 'heart' of the commercial fishing industry in northern mainland Nova Scotia.

The Authority has retained our firm to express its grave concerns regarding Northern Pulp's proposed new treatment facility, which includes an effluent pipe to discharge an estimated minimum of 62 million liters per day, into the mouth of Caribou Harbour. The

Authority's position is that the Northern Pulp's proposal fails to adequately address and in some cases completely fails to address various environmental and navigational concerns which could cause both short and long term harm to the facilities managed by the authority as well as its patrons.

Of major concern is that Northern Pulp's associated effluent will be harmful to the receiving waters of the Northumberland Strait and its marine life habitat. Northern Pulp is considered to be among the 70% of Canadian mills whose effluent has been proven harmful to the receiving waters into which it discharges. I will outline herein several of the Authority's major concerns with Northern Pulp's current proposal.

1. Northern Pulp's current proposal (section 8.11.2.4) confirms that there has been no testing completed with respect to the water composition of Caribou Harbour. Instead Pictou Harbour was used as a proxy for Caribou Harbour with respect to water quality. There is no explanation as to why water quality data for Caribou Harbour was "unavailable". The Authority views such an assumption on water composition as entirely inadequate. There are major distinctions between the two harbours which makes such an assumption tenuous at best. Pictou Harbour has been exposed to sewage from the Town of Pictou and other municipalities for over 200 years. In addition industrial waste from a ship yard, pulp mill, power plant, tire plant and many other businesses has been discharged into Pictou Harbour for over a century. Pictou Harbour also has three major feeding tributaries and Caribou Harbour only has one much smaller tributary. Caribou Harbour's water chemistry is potentially drastically different in comparison to Pictou Harbour.

In the Authority's opinion the assumption and lack of data falls far short of federal and provincial regulatory requirements under legislation such as the Pulp and Paper Effluent Regulations (PPER), the Fisheries Act, the Disposal at Sea Regulations under the Canadian Environmental Protection Act, 1999 (CEPA), and DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2014). The Authority submits that this lack of data and other aspects of Northern Pulp's environmental assessment indicate a 'rushed job' and which lacks substance.

2. The Northern Pulp proposal relies on a receiving water study prepared by Stantec. This study indicates that there will be minimal flow of effluent discharge into Caribou Harbour. The Authority's position is that the methodology used to make this erroneous determination is subpar and inadequate. A significant volume of water from the discharge location flows into Caribou Harbour on a rising tide. The patrons of the Authority will attest to the "allusion" of a rising tide at the proposed discharge point going mainly northwest, when this in fact, is false.

3. Section 6.5 of Northern Pulp's proposal suggests that fishermen have offered "no input to the outfall location". The Authority has been advised by its fisherman patrons that this is a false statement and that Northern Pulp's representatives were informed the entire area outlined and presented to the fishermen of Caribou Harbour, including the pipe route and outfall, is fished at one point or another throughout the year.

4. The Authority is very concerned that its patrons (both commercial and recreational) will have their navigational abilities under *Navigational Protection Act* restricted. This has simply not been addressed adequately in Northern Pulp's proposal. As previously noted herein the patrons of the Authority, in particular seventy (70) plus commercial fishermen, navigate directly across the path of the proposed pipe route in Caribou Harbour, on a daily basis, during regular fishing seasons of lobster, crab, herring and scallop seasons spanning April through November. Fishermen fishing north, northwest and west of the mouth of Caribou Harbour exit the marked channel between the third and fourth red buoys depending on destination daily – saving individual fishermen hundreds of miles of travel and reducing fuel consumption and reducing emissions. There appears to be a general lack of attention paid to these concerns. The Authority's position is that all navigation concerns must be addressed satisfactorily prior to any approval and not be left to be "figured out later".

5. The general consensus among the local fishermen and supported by the Authority is that proposed construction (highlighted on page 14, in appendix F of the proposal) will be insufficient to prevent ice damage. The Authority's experience is that a winter storm from the northeast shifts ice dramatically at mouth of Caribou Harbour. The ice piles up in the shallow water along the proposed pipe route, near the mouth of the harbour in excess of 5 meters. The silt and sand in this area is a 'moving bar' and the Authority does not believe that two (2) meters of pipe cover on this soft bottom is sufficient. A proper assessment would have to monitor the conditions of the ice over more than one winter season. As well an in-depth survey will be required as the density and hardness of the bottom varies dramatically, which will no doubt require further study to prevent pipe fatigue and stress cracking.

6. The dredging of Caribou Harbour in 2007, along the passenger ferry channel, required a Federal Assessment, as did the 2015 upgrading of PEI-New Brunswick Cable Interconnection Upgrade Project. Given that Northern Pulp proposes the dredging and installation of equipment in the same body of water the Authority's position is that this project contains all the criteria for a Federal Environmental Assessment as did the previous mentioned projects, as it pertains to section 67 of the CEAA 2012 Act. Section 67 of CEAA 2012 sets the framework for the environmental assessment of projects being carried out on federal land that are not considered designated projects and for which a full environmental impact assessment under the Regulations Designating Physical Activities is not required. As the seabed of the Northumberland Strait is federal crown land it is subject to requirements under section 67 of CEAA. Section 67 states as follows:

> .....an authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless:
> (a) The authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects; or

(b) The authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 69(3).'

Based on the above the Authority's position is that this project is subject to review by a federal authority in order to determine whether the carrying out of the project will cause significant adverse effects on the surrounding environment, or if any potential significant adverse effects are justifiable.

The Authority requests that Northern Pulp's Effluent Treatment Project be designated a project for Federal Environmental Assessment under Section 14 of the Canadian Environmental Assessment Act (CEAA) 2012.

Please accept the Authority's legitimate concerns and address this crucial matter appropriately.

Yours truly,
MACISAAC CLARKE & DUFFY

cc Client

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 5:02:27 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe a massive project that improves the environment so much should be given time to be finished to ensure the future of the forestry sector. Lets create jobs not unemployment in Nova Scotia. It is bad enough now doctors , nurses and graduating students all leave our province and are replaced with older retiring fixed income people. EVERY job is important . Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 48 y: 13

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 5:41:14 PM

Project: replacement_effluent_treatment_facility_project Comments: No pipee ever Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 25 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 7:46:22 PM

Project: replacement_effluent_treatment_facility_project Comments: Im years old, born and raised in New Glasgow. Im a certified Power Engineer, and I have had the privilege of being employed by Northern Pulp for the last year working in my trade. Northern Pulp has given me the opportunity to work and stay living in my home town and provide me with a well paying job. They have also invested time and money in allowing me to upgrade my licence. Before getting hired I would have had to move out of province to find employment because there simply isnt many other employers willing to hire unexperienced tradesmen in our province. Many of my friends and classmates were not so lucky and had to move out of province or are still unemployed. I have studied wastewater treatment plants with my trade and I see absolute nothing wrong with the new proposed effluent treatment facility we plan to build, this is a more modern and up to date treatment facility then the current Boat Harbour plant. Northern Pulp has been working very hard to comply wi th all the environmental regulations this project requires. I believe Northern Pulp should be given the opportunity to prove that this is a viable solution. I hope to continue working at Northern Pulp for many years to come, because Pictou County needs more employers like them and not fewer. I feel the opposition to this project is based more on emotion then facts. Name:
Email: @gmail.com Address:

: Privacy-

Statement: agree x: 67 y: 31

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 7:55:13 PM

Project: replacement_effluent_treatment_facility_project Comments: I am a resident of New Glasgow, Nova Scotia. This is a company looking to do the right thing . This is a state of the art facility that will meet and exceed any guidelines . This is a practice that is done all over the world . The effluent has been going into the Northumberland Strait for the past 50 plus years and has not harmed the fishing. The only difference is now it will be cleaner and better. The fact that this is even an issue is because of lies and fear mongering on social media . I ask you to please think of the economic disaster it would be if a facility such as this closed because of people spewing untruths. I have lived in communities that have been devistated by facilities such as this closing . Take a drive through Bathurst NB and Dalhousie NB just to name a few . It is real and it is devistating . Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 57 y: 27

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 21, 2019 9:57:07 PM

Project: replacement_effluent_treatment_facility_project Comments: Necessary for the continued financial and economic success of Pictou County and Nova Scotia. An extension is a reasonable resolution. Name: Email: @ns.sympatico.ca Address: Municipality: Postal-Code: Privacy-Statement: agree x: 60 y: 25

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 1:51:14 AM

Project: replacement_effluent_treatment_facility_project Comments: Im in favor of the proposed extension to get the new water treatment up and running. Name:
Email: @hotmail.ca Address:

Privacy-Statement:

agree x: 57 y: 21

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 6:48:08 AM

Project: replacement_effluent_treatment_facility_project Comments: Give this a chance. Go with Science. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 70 y: 24

From: R
To: Environment Assessment Web Account
Subject: NO PIPES
Date: February 22, 2019 7:01:22 AM

NO PIPES NO EXTENSION. SHAME ON YOU

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 8:22:23 AM

Project: replacement_effluent_treatment_facility_project Comments: What is proposed brings current best practice technology to replace 50 year-old technology. There can be no doubt that the effluent entering the receiving water will contain fewer pollutants than it has been receiving for those past 50 years. The fishery has not been adversely impacted over these years indeed, there is anecdotal evidence that it has improved and there is no reason to believe that it will be affected with the new system. The effect on Pictou Landing First Nation is far more serious and it will be rectified when Boat Harbour is no longer receiving the effluent from the mill. For heavens sake, lets do the right thing. Approve this application for the collective good of the Province. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 64 y: 19

From: @ckfinc.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 8:28:01 AM

Project: replacement_effluent_treatment_facility_project Comments: For the love of god please let Northern Pulp complete their effluent treatment project and maintain massive amounts of employment for Nova Scotia. I am confident their treatment plan will be a great improvement, they may need a bit more time to complete this complex project. Without Northern pulp how will we fund our schools, our hospitals, our infrastructure? Nova Scotia needs Northern Pulp and many other manufacturers to allow quality of life in this province. Name: Email: @ckfinc.com Address:

:

Privacy-Statement: agree x: 76 y: 31

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 8:31:15 AM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp should be given the the extension on Boat Harbour so they can construct their new and improved treatment facility and saving the forest industry, trucking and pulp mill jobs. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 48 y: 19

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 8:38:51 AM

Project: replacement_effluent_treatment_facility_project Comments: The government should give the plant the extension they need to make the water from the plant cleaner and safe
Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 64 y: 17

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 9:13:07 AM

Project: replacement_effluent_treatment_facility_project Comments: We need to get them the 1 year extension. That way, that will be done the right way. Name: Email: @hotmail.com Address:

: Privacy-

Statement: agree x: 59 y: 20

From: @freemanlumber.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 9:18:39 AM

Project: replacement_effluent_treatment_facility_project Comments: allow northern pulp a extention for there effient treatment plant and cleanup the boat harbour site Name:
Email: @freemanlumber.com Address:

Privacy-Statement: agree x: 64 y: 38

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 9:32:59 AM

Project: replacement_effluent_treatment_facility_project Comments: We need to give northern pulp time to put a new system in place. They didnâ?Tt create this hazard. They only owned the mill for a few years. They are committed to cleaning up the mess. Give them the time they need. Besides our economy cannot stand to lose the revenue. We are already the highest taxed in Canada. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 66 y: 28

From: @ibew625.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 9:36:38 AM

Project: replacement_effluent_treatment_facility_project Comments: With all i industry there are environmental concerns. If Nova Scotia becomes known for chasing an industry out of the province for not finishing an environmental control before a deadline, we had all better learn to farm and fish. For that will be the only source of jobs left. Name: Email: @ibew625.ca Address:

Privacy-Statement:

agree x: 73 y: 33

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 10:38:48 AM

Project: replacement_effluent_treatment_facility_project Comments: We need this to get done or we are going to lose many tax paying families in this province. It is one of the only things keeping mine and many other families from leaving the province. Name:
Email: @yahoo.ca Address:

: Privacy-

Statement: agree x: 86 y: 24

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 11:01:49 AM

Project: replacement_effluent_treatment_facility_project Comments: To Whom It May Concern: I am an Entrepreneur working in the Commercial Real Estate Sector and in particular, I am passionate about encouraging and working with companies from all over the World to locate and operate in Nova Scotia to the betterment of our society, economy and in the interests of jobs and technology development across our great Province that addresses challenges such as we face today. With so much having been said by so many, it is clear that all sides to this challenge have dug in or are committed to one side or the other. I find this disturbing in that from the outset, the Government of the day had signed a deal with Northern Pulp to allow their management and operation through 2030 [nobody is remembering that] and while I certainly acknowledge the negative implications thereof to the environment in terms of the evolving Boat Harbour situation, I am embarrassed as a Nova Scotian that cooler heads have not prevailed and efforts to mitigate this huge challenge with a comprehensive s olution have been reduced to name calling, anger and related non-productive actions where the focus should and needs to be on solving the problem, which NP is undertaking to do, seemingly against all odds. Why do we not get as passionate about focusing on a solution to, for and with our valued corporate operators that we encouraged and brought here to operate, create wealth, jobs, opportunities and lifestyle instead of turning on them. No Corporation can fiscally plan, act and be responsible within an environment like this where the politics are undertaking to erase the agreements originally made with these people and disregard/change those agreements, seemingly for political gain and to win over people/votes. There has never been a time in our history where we have to step up, get behind those that helped create the very communities that will be destroyed with this business of taking sides. More than anytime in our history, we need decisive leadership, cool heads and a p lan to support the Corporation we brought here and then turned on when the going got tough. Lets become the Community that fixes and supports these corporate leaders with solutions and then sell that ability and positioning around the world, as this is not an isolated case in this industrial world, but a challenge for us to embrace and fix, not be seen as the political fairweather people that back away from our own promises because we make statements at the Leadership level that the Politicians are not prepared to mitigate and protect our own people, jobs, lives, families and thats all our people, not just catering to those whom will take every opportunity to gain their own personal and selective objectives and agenda, whatever they/it may be. If we fix this and show that kind of leadership, embrace the technology, get behind it and support our Corporate Partners who helped create our Communities, we will impress the world, and become who we need to be to be a responsible an d proactive society that welcomes challenges, not shy away from them and hide, when the going gets tough, for this will tell the world we are not a responsible, professional and proactive society that are worthy of their or anyones trust to work together and back up our promises. NP did not create this dilemma, we seem to be simply saying that theyre stuck with it on their own after decades of taking their money. Shame on us!! Name: Email: @eastlink.ca Address:

: Privacy-Statement: agree x: 37 y: 26

From:	@bellaliant.net
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 22, 2019 11:35:07 AM

Project: replacement_effluent_treatment_facility_project Comments: I fully support this project. 1. It should only be a level one assessment and not a level two- federal assessment for the simple reason, it is, as the title states, a replacement effluent treatment facility, not a new one. 2. What Northern Pulp is requesting to do, is to do what they have been doing for the 50 years, put treated effluent into Northumberland Strait. With the modern facility, and only treated effluent leaving the Northern Pulp site, it will be better than the existing site. Other mills and municipalities have been putting treated some municipalities un-treated effluent into the ocean for decades. this is no different. 3. Any wrongs that has been done in the past, in regards to the Boat Harbour facility, cannot be changed it is history. The Province, Northern Pulp and First Nations, should deal with that issue separately, in order to bring closure. 4. The negative economic ramifications of not allowing this project to proceed would be adversely felt, province wide and that includes HRM! Name: Email: @bellaliant.net Address:

:

Privacy-Statement: agree x: 71 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 11:40:12 AM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp should be given an extension on the deadline to shutdown the Boat Harbour treatment plant. If Northern Pulp is forced to shut down production the forestry industry across Nova Scotia will be destroyed. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 54 y: 35

From: @live.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 11:40:26 AM

Project: replacement_effluent_treatment_facility_project Comments: The Pictou County Pulp Mill has been existence for 50 years, during which time the fish stick has been thriving. The existing Boat Harbour treatment facility does a poor job of treating the waste. The new proposal is a world class treatment system which is a vast improvement of the existing scenario. From all of the technical information that I have read, this can only be a positive effect on our environment from current day. The loss of the pulp mill will be a devastating on Pictou County and Nova Scotia, with a loss of thousands of jobs. Northern Pulp is definitely demonstrating due diligence and is doing everything reasonable to make Pictou County a better place to live. We need to grant the extension and let Nova Scotia prosper! Name: Email: @live.com Address: Municipality: Postal-Code: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 61 y: 27

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 11:59:42 AM

Project: replacement_effluent_treatment_facility_project Comments: Fully support Northern Pulp. Extend the deadline to secure the future of all forestry jobs and tax dollars required to fund More Doctors/ Road repairs and projects required for N S taxpayers Name:
Email: @eastlink.ca Address:
Privacy-Statement: agree x: 65 y: 15

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 12:01:13 PM

Project: replacement_effluent_treatment_facility_project Comments: Having read through portions of the Replacement Effluent Treatment Facility Project application, I strongly support this project. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 62 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 12:10:43 PM

Project: replacement_effluent_treatment_facility_project Comments: Grant the EA Approval and let the Pulpmill get to work to correct and improve the process. They have have had too many delays already. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 52 y: 25

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 12:34:51 PM

Project: replacement_effluent_treatment_facility_project Comments: Totally support extending the deadline on boat harbour. Name: Email: @eastlink.ca Address

Privacy-Statement: agree

x: 66 y: 23

February 22, 2019

Dear Minister,

I am submitting my comments on Northern Pulp's proposed replacement effluent treatment facility project.

My name is and I have lived in the Pictou area for 35 years. I had a cottage in Caribou River for 31 years and now live in a waterfront ground level condo frighteningly close to the proposed pipeline route and effluent dumping site just off Caribou Point.

Please reject Northern Pulp's proposal. I believe a long intense scrutiny and a full environmental assessment needs to be done…no matter how long it takes. I do not believe the process has been fair. The public has not had sufficient time to read their lengthy report and Northern Pulp has not offered information sessions on this report to the public. We only have 30 days to respond and Northern Pulp had 5 years to come up with their proposal.
Northern Pulp has not identified what will be in their effluent so how can they know it will be safe? How can they realistically claim their effluent will have no environment effect 2 metres from the end of their pipe? They have not collected data from Caribou Harbour; they are using data they collected from Pictou Harbour. This is insufficient. The waters in the area have not been surveyed. The specific route of the pipeline is unknown. This project could put the Strait at risk for a long time. Harm will be caused constructing, using and decommissioning this project.

Northern Pulp does not care about our environment; they do not care about the people in Pictou County and Nova Scotia. They only alter their equipment when required by the government. All they care about is money…what they can earn and how much they can get from the government to continue polluting the air we breathe. When I open my front door to walk my dogs and the winds come from the south, it stinks. A gift from the mill to the people. Please do not let them pollute our water.

I am a graduate of three Nova Scotian Universities. I have worked as a teacher in this province and run a small business. I am not a scientist but I am an outdoor person who enjoys the ocean, beaches and woods. I have many years of experience with the environment, nature and health.

I walk the beach every day for half the year, often to the end of Munroe's Island (a bird sanctuary). I swim in the waters here from the end of June until the end of September. It is a beautiful beach and area. My neighbour, Caribou Munroe's Island Provincial Park and Campground, teems with locals and tourists, campers from near and far. I have heard a number of people claim it is the nicest campground in the province.

I believe this shore of Nova Scotia is one of our province's hidden secrets. The waters and beaches are pristine. My children grew up summering on the shore, enjoying watching hermit crabs tickle their hands and crabs scurrying sideways before digging into the sandy bottom. I want my granddaughter and all the children yet to come to enjoy these wonders.

The tides go in and the tides go out, bringing unexpected treasures. I fear Northern Pulp's garbage washing up on our shores, day after day. This will endanger our waters and make it unsafe for life in both the sea and the area.

One only has to look at the Boat Harbour mess. The First Nation's treasured water now only stinks and all sea life perished years ago after effluent was piped there.

I would like to see our government make choices for the future of our environment. This would involve not supporting a polluting industry in an outdated facility. Please make choices that support the people with a long term and sustainable future that doesn't destroy the unique gifts of this area and our health.

Your job is to protect the environment and the citizens, now and into the future. Please act responsibly. Reject Northern Pulp's proposal and ask for a full environment assessment.

Thank you for reviewing my submission.

Respectfully,

From:
To: Environment Assessment Web Account
Subject: Feedback on Boat Harbour
Date: February 22, 2019 12:41:41 PM

I am writing out of concern of the health consequences to Nova Scotians. The composition of the toxic effluent will contain dioxins, furans, metals, solids and other contaminates at a rate of 90,000,000 Litres *per day*. Dioxins and furans can cause very serious health issues to humans and our food sources. Shellfish absorb dioxins and furans at 25,000-50,000 times the concentration in the water.

The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the mill's power boiler. The proposal is to "dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mill's power boiler."

This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Lack of appropriate monitoring and enforcement already puts area residents at risk. Now, Northern Pulp is considering adding sludge containing toxins to the combustion mix, increasing health risks from NP's air emissions.

It is also important to note, the route of this effluent pipe goes through the source water supply for the town of Pictou and community of Caribou and surrounding area.

We should **no longer** be putting Nova Scotians' health and environment at risk.

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 2:05:33 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe the effluent treatment facility project should be approved with an extension Name: Email: @msn.com Address:

Privacy-

Statement: agree x: 67 y: 26

From:	@bellaliant.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 22, 2019 2:17:42 PM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia waters support thousands of fishermen. Their products are sold worldwide. Should the effluent from the treatment facility contaminate fisherâ?Ts products the world will recognize this as contaminated fish from Nova Scotia not just from the Northumberland Strait. The resulting downgrade of our fish products will affect all Nova Scotia fish products if not all Canadian fish products and therefore the livelihood of thousands of fishers. The proposed effluent has not been fully tested. In the proposal the effluent is â?oexpectedâ? to be of a certain quality not guaranteed. Therefore should this project go ahead without further evaluation the effect on fish habitat wonâ?Tt be known until itâ?Ts too late. Northern Pulp has a record of delaying corrective measures. It was given 5 years to rectify the Boat Harbour replacement facility. Now with one year to go they want a reprive. I think a Class 2 study at the very least is what is required. The information currently available does not adequately address the fish habitat. Another area that is inadequately addressed is the potential effect on tourism in the area. That area was inadequately addressed a few years ago with the air polution from the smoke stacks at the mill. Tourism was affected for many kilometres around the mill for many years. The air treatment facility should have been addressed and fixed long before it affected the Tourist trade in the area. Now the proposed water effluent into the Northumberland Strait could affect the quality of the water at the numerous beaches in the area as well. A much more thorough study is required. Name: Email: @bellaliant.com Address:

Privacy-Statement: agree x: 58 y: 25

From: @ccrsb.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 2:55:16 PM

Project: replacement_effluent_treatment_facility_project Comments: It is with great concern that I write this letter. The two most important points I must begin with are: my complete distrust of any information coming from Northern Pulp, as well as my uncertainty that the government of NS will do what is morally right for the people of Pictou County. I have been a resident of Pictou County for 57 years therefore I have witnessed the entire history of the mill. I reside near Pictou and have suffered medically and mentally from the daily emissions which range from whitish to black, often times being unable to leave my home due to the potency of the emissions. I also have a summer home on the Northumberland Strait. It was here that I was relieved of the horrible air quality for several months of the year. Unbelievably, my several months of reprieve are now threatened by the piping of effluent into the Strait. Even considering a Level 1 assessment for this process is beyond my comprehension. I am not a scientist or an environmentalist, I am just a citizen of this province who pays taxes and elects governments to represent the best interests of the people. Having read every newspaper article, every document published by the mill, and attended every public meeting, it glaringly obvious that this project requires a full Level 2 Federal Assessment. I recently read information published by Northern Pulp indicating that they will not know the exact potency of the effluent until the process begins. What!! The process can never begin without that information. I spoke with a NP representative at the DeCoste Centre when CBC News was there. I asked him to address this issue and his answer was, â?oWell think of it like buying a new car. Itâ?Ts always going to be better than the old one.â? Seriously, I guess he thought I was an idiot. The number of unknowns is extremely concerning. We have a thriving fishing industry in the exact location that the effluent will be dumped. Have all the questions regarding water temperature, settlement of solids, toxicity been answered? Obviously not and this is simply unacceptable. Will all the questions be answered by a provincial assessment? No! In conclusion Northern Pulp is not the first and will not be the last industry to close its doors in Pictou County. Hundreds of jobs have been lost before and government did not step in and offer these businesses a hand-out. If the only solution to this issue is the closing of the mill then so be it. The people and the environment have suffered long enough. I believe that a full federal assessment will discover that the option of pumping effluent into the Northumberland Strait is simply not feasible. It is now 2019 and I hope we have progressed far enough as a society to put an end to industries that get rich at the expense of the environment. Thank You, Name: Email: @ccrsb.ca Address:

: Privacy-Statement: agree x: 54 y: 21

From: @outlook.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 3:01:43 PM

Project: replacement_effluent_treatment_facility_project Comments: Upon reviewing the proposed Effluent treatment facility project that Northern Pulp has proposed I have come to the conclusion that I fully support this project for the sustainable future of many sectors within Nova Scotia. Being a province that already lacks diversity in the form of many industrial employers we must not chase industry out of the province. I believe that the proposal indicates that they will be prudent and exercise due diligence at all times during the construction and operation of the facility. I also believe the impact to the environment will be minimal, and if any impacts are evident then they can easily be mitigated with no long term ill effects. We must look to other effective usages of this system in other parts of Canada to see that the threat is not valid to the environment and ecosystem. I fully support this proposal. Name: Email: @outlook.com Address: Municipality: Postal-Code: Phone: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 100 y: 34

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 3:54:29 PM

Project: replacement_effluent_treatment_facility_project Comments: We need the Mill to keep jobs in Nova Scotia Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 58 y: 32

From:
To: Environment Assessment Web Account; ceaa.northernpulp.acee@ceaa-acee.gc.ca; CEAA.BoatHarbour.ACEE@canada.ca
Subject: Concerns around Human Health Evaluation - Opposing the NP Waste Proposal
Date: February 22, 2019 4:36:14 PM

I am writing to express my concerns over regarding the weak Human Health Evaluation relating to the NP Waste Proposal.

1. Presently, there is no regulatory requirement to conduct a human health risk assessment (HHRA) study in association with the NPNS project. The project is currently in a Class 1 EA Process in Nova Scotia that does not specifically require the completion of a HHRA in advance of registration of an EA. Section 9-15 page 489

2. The HHE does not include quantitative exposure and risk analysis approaches at this time that would typically comprise the HHRA steps of exposure assessment, toxicity assessment and risk

characterization. The HHE is not a HHRA, though it does necessarily comprise some elements of a HHRA, as noted above. *EA. Section 9-15 page 489*

3. Tasmania Pulp mill used for comparison for the Human Health Evaluation. The Tasmania pulp mill was assumed to process mainly hardwood eucalyptus chips. There is some uncertainty regarding how the wood chips processed at the NPNS mill, which are from softwood coniferous species, would compare to eucalyptus chip processing, with respect to potential effluent chemistry differences. *EA. Section 9-15 page 492*

- Tasmania has not undergone regulatory review by Health Canada
- The Tasmania mill did not open and faced many environmental challenges in court https://en.wikipedia.org/wiki/Bell_Bay_Pulp_Mill

4. Potential Risks

- Chemicals present in treated effluent that is released to the marine receiving environment may come into contact with human receptors in marine sea water or sediments.
- Some of the chemicals present in treated effluent may accumulate within certain marine food items that are harvested by local community members.
- Air emissions of certain contaminants to the atmosphere, during construction and operation (and maintenance) of the project, may present a potential inhalation exposure pathway for human receptors in communities located within the study area.
- As the current proposed pipeline route traverses a drinking water supply area, there is a potential that accidental releases from the effluent pipeline in this area (should they occur) could potentially impact potable water supplies.
- *EA. Section 9-15 page 492*

5. Only using these contaminates for their assessment.
   - Carbon monoxide (CO).
   - Hydrogen sulphide (H2S).
   - Nitrogen dioxide (NO2).
   - Sulphur dioxide (SO2).
   - Total suspended particulate maer (TSP).
   - Fine particulate maer (PM2.5). *EA. Section 9-15 page 503*

6. Downplaying the independent air quality study perform by Hoffman et al from Dal *EA. Section 9-15 page 494*

7. Due to uncertainty regarding effluent composition and approximate concentrations of substances present in the future treated effluent (which will not be verified until the project is operational), the identified candidate COPCs in effluent are considered preliminary at this time. Refinement of the candidate COPCs would be anticipated for a potential HHRA study of the project, should one be required (wherein various screening approaches, as previously described above, would be applied to refine and reduce the candidate list of COPCs down to a more reasonable and representative set of COPCs). The same types of screening considerations apply to the potential assessment of impacted drinking water, in the event the effluent pipeline experiences accidental releases in the sections that traverse drinking water supply areas.

Candidate COPCs in future treated effluent were determined primarily on the basis of:
   - A review and synthesis of historical data and reports for areas near the NPNS project, particularly areas that are or were influenced by the NPNS mill current or historical effluent discharges.
   - The outcomes of the COPC identification processes that were applied in the Toxikos (2006) HHRA study.
   - Selected additional relevant scientific literature. *EA. Section 9-15 page 506*

8. The sludge will be used as a fuel for the NPNS power boiler. A power boiler that has a history of not working properly, and now wanting to burn unknown effluent *EA. Section 1-7 page 43-44*

9. Current NPNS Mill Effluent Chemistry being down played yet they state the end state is unknown. *EA. Section 9-15 page 515*

Sincerely,

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 5:13:53 PM

Project: replacement_effluent_treatment_facility_project Comments: I have read the executive summary and think Northern pulp should be granted the environmental assessment and be allowed to continue with the construction of the new effluent treatment facility. Name:
Email: @yahoo.ca Address:

Privacy-Statement: agree x: 50 y: 31

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 6:05:37 PM

Project: replacement_effluent_treatment_facility_project Comments: The pulp mill in Pictou county is vital for the survival of rural NS. Treated effluent has been flowing into the Strait for 52 years with no ill effects. The new treatment facility will send effluent that will meet and exceed National and international standards. This project should be allowed to proceed to completion with out interruption in production at the mill. Thank you Name:
Email: @eastlink.ca Address:

Privacy-

Statement: agree x: 81 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 6:56:20 PM

Project: replacement_effluent_treatment_facility_project Comments: I have been studying the environmental assessment and find it very enlighten. Based on the science put forth I fully supply the project and the necessary extension for Boat Harbour operation so as to keep Northern Pulp viable. the extension should not be open ended and to respect the PL Band compensate in some manner should be provided as well as the time line for Boat Harbour should be accelerated from current plans. Science and facts should rule the day not emotions and misinformation. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 57 y: 26

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 7:48:51 PM

Project: replacement_effluent_treatment_facility_project Comments: Ive been looking at the diagram of the proposed AST facility for Northern Pulps effluent. Im confused about why the flocculated and dried sludge would be sent to the Bark Boiler. Bearing in mind that Air Emissions are a huge concern here, why not compost the sludge for agricultural or even forestry fertilizer. Local fish waste could be mixed into it as well. Would there be a toxicity problem with this idea? Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 75 y: 11

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 8:11:32 PM

Project: replacement_effluent_treatment_facility_project Comments: By giving them the extra time they need.Many Forestry Workers ,Truck Drivers Sales People And Mill Workers will still have jobs. Name: Email: @eastlink.ca Address:

: Privacy-Statement:

agree x: 43 y: 25

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 9:20:49 PM

Project: replacement_effluent_treatment_facility_project Comments: I vehemently object to the proposed effluent pipe emptying into Northumberland Strait. Let our county flourish without this contamination of our fishery. We have lived 35 years in the stench of this mill. Put it somewhere else. Bedford Basin? Name: MD Email: @gmail.com Address:

Privacy-Statement:

agree x: 66 y: 27

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: February 22, 2019 10:17:54 PM

Dear Sir or Madame:
I grew up in Pictou County and return often to see my family. I also am a Nova Scotian living along its coast line, now in Cape Breton.

I have followed the Northern Pulp debate closely and simply put, the proposed project is concerning. If hastily approved or approved under a short sighted approach or by those in a conflict of interest position, then the long term negative economic, environmental and potential health impacts will be its legacy.
This region's fisheries and tourism are key to its economic survival. A pipe with toxic effluent flowing through these same waters does not promote these industries. Further, the long term impact of millions of litres of effluent a day going into the body of water, needs to be studied and reviewed for impact on water quality, ocean biology impacts, breeding and health of the fin fish and shellfish, human health including swimming and consumption of fish. This same effluent or slight variation thereof has made boat harbour a toxic site unable to support life. Surely, the days of "it goes away" and the ocean is large enough are over in 2019.

We need to be able to trust our government will act in our best interest - on all fronts. This is not a partisan matter. This project is a one time shot, a legacy decision, that may determine the very future of our fisheries, tourism, enjoyment of the waterways, health and our First Nations ability to fulfill their treaty rights.

The time required to do a proper federal or proper assessment cannot be grounds for dismissing or opposing this assessment. We deserve to be protected and have proper due diligence completed. After all, once the pipe is in, the ability to monitor and track its effluent standards becomes difficult. The public lacks confidence those standards will be followed, given the company's public track record of environmental violations to date. We do not have the luxury of a simplistic or short sighted review, as too much is on the line and reversing the pipe impact or even mitigating it may be impossible or take generations. An extensive review and study is required.

Further, on its face Nova Scotia appears to be in a conflict of interest position; as such, a independent authority such as the federal government is an appropriate to step to remove any real or perceived conflict and to ensure due diligence and objectivity.

Regards,

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 22, 2019 10:38:22 PM

Project: replacement_effluent_treatment_facility_project Comments: I am writing this in support of a Class 2 assessment and declining the Class 1, for this project. In fact, I believe there should be a Federal environmental assessment regarding this matter. Since Northern Pulp, itself, admits they do not know what the effluent will contain section 9, page 502, it would be fool hardy to approve this project without a full and complete environmental assessment. Name: Email: @hotmail.com Address

Privacy-Statement: agree x: 48 y: 28

From: @davegunning.com
To: Environment Assessment Web Account; ceaa.boatharbour.acee@canada.ca
Subject: Northern Pulp's replacement ETF
Date: February 22, 2019 11:37:08 PM

Dear Premier McNeil, Minister Miller and CEAA,

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility project.

My name is and I live in Pictou County and have been following this issue very closely for a few years now. I would like to identify some uniquenesses about Northern Pulp, some differences between the current and proposed ETF along with some other concerns that I feel should be taken into consideration by you.

A 2010 AMEC study presented to the Province of NS identified that Northern Pulp were in the 100th percentile when compared to other similar bleached kraft pulp mills in the country for: average flow rate (water usage), COD levels and colour of effluent. And since this study was completed Northern Pulp has not reduced their water usage, still use chlorine dioxide for bleaching and have made no known upgrades that would have improved effluent quality. Bleached kraft mills by nature are the worst polluters out of all the different types of pulp mills in the world. The production yield of a bleached kraft mill is approximately 50% meaning that half of the tree gets used for production and the other half ends up being released into the waste stream. TMP mills like Port Hawkesbury Pulp & Paper have a production yield closer to 95% so 95% of the tree gets used and 5% ends up in the waste stream. Plus bleached kraft pulping requires the use of chemicals to break down the lignin in the wood to make pulp and the use of chlorine dioxide to bleach with versus TMP mills that use thermal mechanical energy to make pulp and peroxide to whiten the product. So by nature, bleached kraft pulp mills are the worst polluters out of all the different pulping processes and Northern Pulp is in the 100 percentile in Canada for water usage, COD levels and colour of effluent. They are the worst of the worst in Canada.

According to the KSH Engineering's projections the new EFT system would be better than Northern Pulp's current system, approximately 20-60% better depending on which variable you view. However, the receiving water now for the treated effluent is the Boat Harbour Basin and not the Northumberland Strait. After leaving the Boat Harbour Treatment Facility - at point C, the treated effluent is then released into the Boat Harbour Basin where it is retained for approximately 20-30 additional days. Point C is the federally regulated point. The new ETF would release the treated effluent directly into the Northumberland Strait without the added bonus of the 20-30 day retention time for additional cooling, dilution and settling in the large Boat Harbour Basin. The elimination of the Boat Harbour Basin is a huge factor because EEM data shows that the Basin has a large effect on effluent quality that is currently reaching the saltwater.

The receiving water for the treated effluent is at point C where it is released into the Boat Harbour Basin. Point D is where it leaves the Boat Harbour Basin at the opposite end and meets the saltwater at the shoreline of Pictou Landing. EEM data from 2014 showed a significant improvement in effluent quality between points C and D proving that the Boat Harbour Basin does have a positive affect on effluent quality. It shows an improvement in TSS of 77.6% to 80.8% during the months of October, November and December between points C and D. And during that same period it showed that BOD levels were improved between 74.1%

and 77.4% between points C and D. Strangely it showed that these numbers were worse at point D during the month of August. One industry professional that we spoke with speculated that there was either a problem with how the data was collected that month or that summertime pollen and dust could have settled on the surface of the Boat Harbour Basin contributing to the results measured. But regardless it is very clear that the elimination of the Basin would have a substantial and negative impact on the effluent quality reaching the Strait. Based on this data there is enough information to conclude that the new ETF would be worse than the old facility because of the elimination of the Boat Harbour Basin. So Northern Pulp is proposing a newer system but a worse location for the receiving water. The elimination of the Boat Harbour Basin would result in more of the toxins reaching the Northumberland Strait.

Many third party consultants have completed studies and documents for Northern Pulp and the Province of NS including: R.V. Anderson, CBCL, Neil McCubbin, Stantec, AMEC plus an internal audit conducted by their parent company. There are known problems internally at Northern Pulp which are causing air emissions problems (i.e. the High Level Roof Vent that is identified in NPulp's current Industrial Approval). Are other Canadian mills allowed to vent unfiltered pollution through high level roof vents? We are unaware of any other Canadian mills allowed this same privilege which is essential a way around the regulations for Northern Pulp given that that stack is not regulated. Northern Pulp's proposed ETF shows that much of the waste sludge would be burned in the power boiler. This is of great concern because the power boiler has no precipitator and there have been several reports about non-functioning scrubbers. And there is no hourly or daily monitoring of the stacks at Northern Pulp, only quarterly self-reported results conducted by Stantec who are hired by Northern Pulp.

Black liquor spills, sometimes referred to as process disturbances or process upsets have been documented by third party consultants as well. These events often result in raw untreated effluent being released from the mill. These statements come from a Neil McCubbin memo to Northern Pulp dated April 6th 2015. "A few other kraft mills operate with annual average COD discharges of 15 kg/ton, demonstrating this level is attainable, but not without considerable effort. I consider that oxygen delignification, improved brown stock washing and screen-room closure, and substantially upgraded spill recovery systems for black liquor would be required to attain such a COD discharge level in the NPNS mill." The report also states, "The data in the AMEC report indicates that the sources of colour discharge are roughly one third each for brown stock washer losses, bleach plant and spills. The sources of COD are probably distributed similarly, except the condensates and causticising department will contribute some COD. These latter two sources will contribute virtually nothing to the COD of the treated effluent since the substances in them are very efficiently oxidized in any kind of biological treatment system." "COD from the bleach plant can be cut by about 40% by installing an oxygen delignification stage. This would leave the so called “spills”, which consist of accidental losses, leaks, draining equipment for maintenance, operator errors, etc. Consideration of the variations in daily COD discharges suggests to me that there is room for fairly inexpensive and substantial improvement in this area. However, it must be recognized that while spills can be reduced, one can no more eliminate spills completely than one can eliminate traffic accidents." The Neil McCubbin memo also states, "Replacing the ASB with an AST system would reduce COD discharges somewhat, probably by roughly 20%. However, the cost would be significant.”

Take away points from above paragraph;
1. There are three main sources of COD, divided evenly at NPNS; brown stock washer loses, bleach plant and spills.

2. An oxygen delignification system would only improve the COD level from the bleach plant by 40%. So that's 1/3 of 40% which equals 13.333%. At best an oxygen delignification would only reduce COD levels at NP by 13.3333 %
3. Northern Pulp would need substantial upgrades to obtain a COD discharge level that matches the level of other bleached kraft pulp mills.
4. The new AST system would likely only reduce COD levels by 20% compared to their current ASB system.

Again, it has been identified that Northern Pulp uses more water per ton of production than any other pulp mill in Canada. The Province of NS is aware of this issue and NSE has listed water use reduction requirements in Northern Pulp's current Industrial Approval. In an email obtained through freedom of information the manager of Northern Pulp informed NSE in November 2017 that they will not be able to reduce their water usage moving forward with the newly proposed ETF even though this was a requirement within the current Industrial Approval.

A study conducted by R.V. Anderson Associates studied Middle River where Northern Pulp draws its water from. "The sustainable water withdrawal rate for the Granton water intake was determined to be 1.10 m3/s (95,040 m3/day)". "The Middle River watershed has a drainage area of 239 km2 at the water intake location in Granton." In an email to Nova Scotia Environment from Northern Pulp dated November 3, 2017 it states, "NPNS will achieve the maximum daily water consumption rate of 92,310 m3/day by the end of the current IA". And it goes on to say "a future 2020 annual water withdrawal limit of 70,000 m3/day is now not realistic or achievable." So Northern Pulp is using almost all of the water that is sustainable in a watershed area of 239 km2 and despite the requirements to reduce water usage to 70,000 m3/day by 2020 they are telling Nova Scotia Environment that they will reach 92,310 m3/day by the end of the current Industrial Approval.

In the EA on page 33, Northern Pulp / via Stantec (who were hired by Northern Pulp) are being very critical of the "Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County Nova Scotia" but they are leaving out important details from the rest of the study. According to the data collected the prevailing wind direction more often blows toward the Town of Pictou than it does toward Granton where the monitor was placed to collect the data for this study. The study concluded that "the mill is a likely contributor to increased concentrations" and "in addition, there are clear seasonal variations of meteorological conditions and VOC concentrations. Southwest prevailing winds blowing towards Pictou dominate during summer months, when people spend more time outdoors, and consequently are exposed to higher concentrations". Northern Pulp is trying to claim that it's really not clear that they are the source of the high VOC levels found present in the air. Yet this is a scientific, peer-reviewed study and the fact that the authors suggested that Northern Pulp is the likely source could also be taken that NP is indeed the source if the rest of the study is considered in its entirety. Given that the cancer risk thresholds were exceeded and that the scientists recommended that more monitors be located in areas of higher population, wouldn't we be better served by listening to the science instead of Northern Pulp / Stantec? With all the talk about "listening to the science" why does Northern Pulp put such an effort into trying to discredit the science. Science that isn't approved by Northern Pulp and their hired consultants does not make it non-science.

So there are air emissions problems, black liquor spills at Northern Pulp and more water per ton of production being used at Northern Pulp when compared to other Canadian bleached

kraft mills. The mill is in need of significant updates internally before a treatment system dumping into the Northumberland Strait can be considered.

This is a very complex issue and one that many including myself have been studying for years. I could send in a hundred pages of comments but I chose just a few things knowing others are covering some of the other important points. Looking back I believe that we started our group with naive intentions. We were hopeful that the mill would clean up its act and that the government would more strongly enforce existing regulations and perhaps tighten up some of the weaker ones that we have in Nova Scotia when compared to the other provinces with regards to pulp and paper effluent and air emissions. My brother and a group of us have made a real effort to become informed and stick to facts. We have been very fortunate that the issue has attracted the attention and support of many local business people, doctors, scientists, lawyers and other concerned citizens along with three pulp and paper experts, including two engineers, a wastewater treatment expert and former employees of Northern Pulp along with third party consultant firms. One of our mill professionals has worked all over the world at many different mills including some zero effluent mills. I'm just a folk-singer but thanks to all of the support from many industry professionals I have become very informed about this issue and at this point it's safe to say that I know more about pulp mills than folk music.

During one government meeting it was said to us that "your group is spreading misinformation and being far too emotional and there are crazy things being posted on your Facebook Group". We were quick to respond that “our group” isn't all of the 5000 plus members on a Facebook Group. The people who've joined the Facebook Group are every kind of person with every kind of opinion on both sides, from mild to extreme. In fact, many of the members include forestry workers and mill workers too. It is social-media and you should think of it as a giant town-hall discussion and not "a group". So to put it bluntly, it's not "our group" - but they are your constituents.

I'll conclude with a list of points in no particular order although the last one has been the fuel for me throughout my involvement with this issue:
1. Northern Pulp’s known and identified internal problems create a unique situation and building a new ETF would not cure the internal problems at the mill.
2. There is an active fishing industry in the Northumberland Strait that needs to be protected.
3. Many of the air pollution issues have not been fixed at the mill despite requests by the community and NSE for Northern Pulp to move forward.
4. Northern Pulp uses more water per ton of production than any other mill in the country and draws upwards of 92 million litres per day from a river that drains an area of 239 square kms and has a sustained recovery rate of only 95 million litres per day. So Northern Pulp is using almost all of the water available within a 239 square km watershed area.
5. The elimination of the Boat Harbour Basin and the change in location for the receiving water means that more pollutants would reach the Northumberland Strait than compared to the current system.
6. I believe there would be a protest of 'never before seen in NS' proportion to stop a Boat Harbour extension and a pipe from going into the Northumberland Strait. And this would not be about a community whining that it didn't "get its way". This has been a 50 year plus battle for a lot of people.
7. Many first nations people and non-natives have had this pollution dumped on them for over 50 years. But our entire, and one and only Mi'kmaq community have been victims of environmental racism from the beginning and throughout the entire history of this mill. It must be stopped and they must be protected and respected in a real and meaningful way moving

forward. Moving the pollution from their backyard to their front yard and putting their fishing fleet at risk would not be the way to do this.

A sincere thank you for the opportunity to be engaged with this very important issue. I do not envy the position you're in but I do know that enough information is available to back your decision should you not approve this project.

#noextension #nopipe #honourtheact

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 12:37:25 AM

Project: replacement_effluent_treatment_facility_project Comments: Give NP the extension required and do not let the mill close even temporarily Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 81 y: 21

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 5:00:37 AM

Project: replacement_effluent_treatment_facility_project Comments: We need to support this project to ensure a prosperous future for our children and their children. The province needs this tax revenue to pay for services that support the human environment Name:
Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 64 y: 25

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Treatment Replacement Facility Project
Date: February 23, 2019 8:11:20 AM
Attachments: Northern Pulp.docx

Hello,
I am pleased to have the opportunity to submit my input in support of a federal environmental assessment, and for a proposal of an in-mill, closed loop solution.
Sincerely,

MSc MD
FRCPC(Int Med) FRCPC(Rad Onc) rtd

To: Our provincial government

Re: Northern Pulp Replacement Effluent Treatment Facility Project

Change is difficult. But this is exactly what both the Ivany Report (2014) and the Independent Review (Lahey, 2018) challenge us to do within the forestry industry in Nova Scotia. Both emphasize the importance of biodiversity and the health of our forests. I am convinced that now, urgently, the forest industry in Nova Scotia must adopt practices to become eco-friendly and sustainable. Never has this been better illustrated than in the Northern Pulp (NP) proposal to run a 15.5 km pipeline for effluent in support of its current activities.

Forestry practices that currently feed Northern Pulp are heavily reliant on clear cutting, and are decimating Acadian woodland biodiversity with monoculture replanting of short turnaround species. It has severely polluted Boat Harbour and environs, and there has been at least one significant effluent pipeline leak on land (47 million litres, June 9, 2014). A few kilometres of pipeline were incompetently maintained and monitored, yet now a line is proposed that traverses the Pictou Harbour Causeway, the Pictou town roundabout, the TransCanada Highway for several kilometres, and enters the harbour at the Ferry Terminal – a proud, major point of entry from PEI, and also of the Pictou Island Ferry.

In the Executive Summary of The Northern Pulp Replacement Effluent Treatment Project report, Table E1.1.1, Northern Pulp anticipates NO SIGNIFICANT (NS) impact on each and every environmental and socio-economic metric, through every phase of the project, including accidents. This must be considered ludicrous conjecture.

One example from the plan, the construction of a 4 km trench, 9 m wide and 3 m deep, would most certainly result in a SIGNIFICANT impact on the ocean floor. Construction activities and resulting sediment would have significant negative effects within Caribou Harbour and beyond. Then the introduction of 60-90 million liters of treated effluent <u>each day</u> would certainly have an effect on marine habitat, lobster larvae, lobster and herring.

The Northumberland Strait waters source our “world famous” Nova Scotia lobster fisheries. Our north shore fishing community will be providing more educated, experienced input. But, in fact, the lobster fisheries of 3 maritime provinces share risk here. It is not reassuring to read the note in the NP report that “unlike the visual impact experienced today, it is *anticipated* (italics added) that the effluent plume will not be visible when it reaches the water’s surface” (Executive Summary). It is not the visual impact of the effluent which is the largest risk to the long term sustainability of the fishery. Further, there must be some doubt about whether a short term exposure test can predict the long term impact on this important fishery.

Nova Scotia boasts of its Northumberland Shore with the “warmest waters north of the Carolinas”. The site of effluent discharge would be into these waters and within sight of four islands, all of which are permanently or seasonally inhabited – Caribou Island, Caribou and Munroe Island Provincial Park, Pictou Island, and Prince Edward Island. Not only the commercial use, but the recreational use of effluent waters and the potential socio-economic impact on local residents and businesses gives pause.

In Section 2.1.1.1, pg 8 of the report, Northern Pulp notes that they have achieved 80-99% reduction within the mill of “mill-wide particulate emissions, odorous emissions, and boiler particulate emissions”, yet in spite of this, the residents of and visitors to Pictou (and within many kilometres of the town) still note skin, respiratory and sensory symptoms.

The Canadian Environmental Law Association (website) defines the precautionary principle in environmental decision-making to “denote a duty to prevent harm, when it is possible to do so, even when all the evidence is not in”; that is, even in the setting of simply, uncertainty, decisions should favour health and sustainability of the environment. Thus, the NP effluent pipeline project must be refused: this is especially so, since there exists an alternative in-mill, closed-loop effluent treatment option.

I believe that Pictou County can survive, and indeed thrive after a decision to deny the proposed effluent treatment plan, and could withstand a temporary (downtime for the conversion to closed-loop system) or even permanent closure of the mill.

Michelin, Pictou County plant, recently announced that they are to make 200 part-time jobs permanent and will hire 150 more (Chronicle Herald, October 23, 2018). People will be more likely to come and to stay - currently we have instances of folks leaving Pictou because of the blight of the mill on the landscape and on the senses. Visitor numbers to Pictou will be improved and local businesses will be able to reinvigorate. I also believe that the hardworking, innovative woodlot owners would also thrive when relieved of current constraints.

Certainly, a Federal Environmental Assessment of the proposed effluent plan is required, but not only the water testing, but also of the potential impact of a leak along the full length of the proposed 15.5 km pipeline.

Again, the larger issue to be addressed is how to better sustain the forestry industry in this province, to launch eco-friendly practices, with minimized impact on the environment, other industries (fishery, tourism and small businesses), and importantly, on the health and wellbeing of the residents of Nova Scotia.

With this effluent treatment pipeline proposal, Northern Pulp, a foreign-owned entity, has pitted the forestry industry against the regional fishery, local businesses and residents. In 2014, following the Ivany Report, a group in to continue the positive discussions and devised a vision for Pictou County: “In 2020, Pictou County will be healthy, united, thriving and bold.”

I support the Nova Scotia Government in upholding the January 31, 2020 date for closure of the Boat Harbour site, and encourage the immediate prioritization of working with the forestry industry to adopt sustainable practices with respect for environmental values and the health of Nova Scotians. Effluent into the Northumberland Strait via the proposed pipeline should not be part of that practice.

Now is the time for strong Government action, and for change.

, MSc MD
FRCPC(Internal Medicine) FRCPC (Radiation Oncology) rtd
Braeshore, NS

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 10:35:15 AM

Project: - Choose - Comments: My name is
I live in Caribou River approximately 20 minutes from the Town of Pictou. Our home overlooks the Northumberland Strait. We moved here from Halifax 15 years ago after falling in love with the area while coming here to visit friends who live on Caribou Island. We fell in love with the Town of Pictou, with the pristine, clear and warm waters of the Northumberland Strait and the people who live in Pictou County. From our home we can watch the lobster fishers, the herring fishers, the ferry to PEI and in late February we watch the seals giving birth to their pups and listen to their converstions with one another on the ice. In the summer we enjoy the many beaches found around Pictou County. When we moved here 15 years ago, the Town of Pictou was a bustling small Town with lovely shops on the main street. Over the years we have watched this change dramatically. Not being a business owner, I am sure that it was not good for business when there were days, with the wind in the wrong direction, that one could hardly breath when one got out of their vehicle due to the stench and â?ofogâ? of the discharge from Northern Pulp. It doesnâ?Tt take a scientific mind to figure out that tourists will not want to stay in a place where you can hardly breath. Northern Pulp was asked to fix this problem time and time again to no avail. Yes, they say they have improved the air quality in leaps and bounds, however I invite you to come to Pictou when the wind is blowing in on the Town. There is no difference. Then, of course, there is Boat Harbour. This environmental disaster has gone on for far too long. The people of Pictou Landing First Nations should not have to suffer with this any longer. And it is not just the First Nations people. There were many people who had cottages in Boat Harbour where they once swam, fished and enjoyed nature. Unfortunately, those cottages are no more as is the nature that surrounded them. Enough is enough. Now, Northern Pulp wants to pollute the waters of the Northumberland Strait. Northern Pulp does not have a very good track record as far as trust and being a â?ogood corporate neighbourâ? goes. They cannot guarantee that there will be no adverse affect to this pipe going into the Strait. Waters that are so clear that on a calm day it is like swimming in the Carribean are in danger as is the marine life that lives there. The waters of the Northumberland Strait are, as they say, â?othe warmest waters north of the Carolinasâ? . Now Northern Pulp wants to pump more warm fresh water into the Strait which will raise temperatures unnaturally. I have been swimming at Chance Harbour once which is not to far from Boat Harbour. The water is orange. I could not believe it. Why would tourists come here to swim in orange water. They say they are doing all they can to meet the Provincial and Federal Regulations. They said the same about the air quality. I am in no way a scientific person, however, I am a person very concerned about the environment and what we are doing to it. I know what I see and smell. I realize that this issue is very contentious here in Pictou County and has driven a wedge between a lot of people. I also donâ?Tt believe that Northern Pulp should be allowed to hold people hostage - â?oNo Pipe. No Millâ? . No one wants to see people loose their jobs in either sector. We just want Northern Pulp to do the right thing as the people of Pictou County have been asking them to do for the last 50 years. On behalf of myself, and my husband, I implore you not to allow Northern Pulp to put this pipe into the Northumberland Strait. Make them do what is right for all people of Pictou County. Thank you for taking the time to read this letter.
Name: Email: @yahoo.com Address:

: Privacy-Statement: agree x: 50 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 12:20:49 PM

Project: replacement_effluent_treatment_facility_project Comments: I think this needs a federal environmental assessment. If it is as safe as they claim then they should have no problem with this. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 84 y: 25

From: @ .me
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 2:16:15 PM

Project: replacement_effluent_treatment_facility_project Comments: The Pictou pulp mill has been both an important environmental problem considering the destruction of Boat Harbour and a major economic problem considering the enormous amount of public money that has been diverted into keeping the mill going for years and it is time that this stop. An environment assessment by either the provincial or federal authorities is not reassuring because the types of tests involved would only detect severe short-term affects of the effluent e.g. the number of fish which would die in 24 h. What about the effects of long term low levels of pollution? There is also the problem of the devastation that the mill is doing to forests in Nova Scotia. The Lehey report clearly indicates there is need for a revision of forestry practices, and in particular less clear cutting. In addition, conserving our forests, and allowing abused forests to recover, is extremely import at this point in time, as expanding living forests is the best way for Nova Scotia to contribute to reducing climate change by providing increased canopy covered lands to sequester of CO2. Certainly extending the use of Boat Harbour would be further insult to the indigenous peoples that have been so strongly affected by the mill. The environmental racism has gone on far too long. This is a very appropriate time to reconsider forestry practices and to reorganize the forestry industry. We need better practices, such as selection cutting where the canopy is retained, and focus on high end uses of harvested wood. Biomass burning, such as done at the Pictou mill is a particulat concern as it is a polluting as burning coal not to mention the removal of trees that could absorb CO2. The government needs to take on a leadership role there, rather than letting it all drag on. Name: Email: Address:

:

Privacy-Statement: agree x: 65 y: 25

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 3:34:23 PM

Project: replacement_effluent_treatment_facility_project Comments: I do not agree with the Environmental assessment done by the province. I think it should be a Federal Environmental Assessment.I also do not want to see the affluent going into our marine environment. Name: Email: @ns.sympatico.ca Address

Privacy-Statement: agree x: 58 y: 24

From: @seanova.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 23, 2019 4:55:21 PM

Project: replacement_effluent_treatment_facility_project Comments: I am writing with regards to the plan for the bleached kraft pulp mill in Pictou County, Nova Scotia to pump many 60-90 millions of litres of effluent into the Northumberland Strait on a daily basis. I have read the Replacement Effluent Treatment Facility Project Description and Appendices in their entirety and I have grave concerns. The issue I have chosen to address in this letter is that of toxic chemicals being released into the Northumberland Strait. Using the numbers presented in the Project Proposal and Appendices, I calculate a total of approximately half a tonne of Adsorbable Organic Halides AOX per day will be released into the Strait. Appendix E3 1 reports that the maximum AOX in the effluent is 7.8mg/L. If we are conservative and assume only 60 million litres of effluent are discharged per day this would equate to 468 kg of AOX per day into the Northumberland Strait. Below I outline why I recommend the proposal be rejected. Appendix I1-B, panel 9 2 roughly outlines the effluent composition and percentage removal of chlorinated compounds by the treatment facility. I use the word â?oroughlyâ? because the categories listed are very general organics, metals, chlorinated organics, etc and do not contain the actual chemical composition of each category. The mill has stated they cannot predict the chemical composition of the effluent because it is â?odetermined by the make-up of the wood being processed on any given day.â? 3 Paid advertisements by the mill emphasize the effluent will be treated, however, the new facility is expected to remove only 45-65 of the chlorinated compounds. Many of the chlorinated and non-chlorinated organic compounds produced during the pulp bleaching process are toxic and are not readily degraded. For example, the highly toxic polychlorinated dioxins and furans are reported below the detection threshold stated by the laboratory performing the tests, and it has been deemed no longer necessary to test for them. It should be noted that â?onot detectedâ? does not mean the substance is not present. They are known to be generated during the pulping process. Furthermore, many of these compounds bio-accumulate in fatty tissue, which means they are not cleared by an organism, but continue to accumulate and, as a result, the concentration is increased higher up the food chain. Given that the proposed treatment facility only removes about half of the organic chemicals that will be released into the Northumberland Strait, we need further investigation into the long-term health effects. It is important to note not all of the chemicals present in the effluent are tested or the chemical components of the effluent are fully understood. The following statement is from the Canadian Environmental Protection Act 4: â?oAlthough approximately 250 individual compounds have been characterized in bleachery effluents, they have been estimated to represent only 10 to 40 of the total low molecular weight materials present.â? I am not confident that we truly know the effect of the chemical mixture on biological systems. Some may argue the toxins are within the allowable limit or there are no established limits. Stantec consultants in Appendix E3 5 state â?oThere are no CCME or provincial guidelines for AOX for marine or freshwater environments.â? In Appendix I1-B, panel 23 2, the AOX is predicted to be below the World Bank Group Guidelines 6 within 2 metres of the diffuser. These guidelines should not be used to justify acceptable limits of AOX as the concentrations listed in the guidelines vary based on the technology used for pulp and paper. For example the limit of AOX for bleached kraft pulp mill is 0.25kg/ADt while the limit for sulfite pulp and paper is 0.005 kg/ADt 6. This implies the limits are not set based on the effect they have on health or environment, but rather on the concentrations produced by the methodology employed in the paper industry. If the concern were truly about AOX exposure, the limits of allowable amounts would be the same for all

processes. Based on this information I conclude it is not an acceptable set of guidelines to be used for establishing concentration limits of AOX in the effluent. The experiments used to determine the effect of stress toxins, temperature, salinity, pH, turbidity, etc. on an organism have come a long way since the early 1990â?Ts therefore an LC50 experiment should no longer be considered sufficient. Sub lethal exposure may still affect the physiology and gene expression of the fish and/or shellfish and this is something we need to understand. We know many of the halogenated organic compounds affect the reproductive and immune systems, and can lead to developmental disorders or cause cancer. In addition, gene expression experiments help gain a better understanding of the exposure effects on protein and enzyme production which gives us an idea of how the effluent will influence the function of biological processes. I request gene expression profiling experiments be performed on fish and shellfish that are exposed to the effluent at concentrations consistent with what will exit at the diffuser final effluent â?" NOT once it is diluted and compared to the same species that has not been exposed. In Appendix H, it is stated â?oTo address the concern, NPNS will commission toxicity testing to determine both potential acute and sublethal effects on immature stages of lobster and herring. Standardized toxicity testing protocols are not available for lobster and herring however, custom tests have been developed that can be completed using larval lobster and herring embryos. The tests will include Stage I-IV larval lobster and include a live-dead acute assessment of the various stages, as well as the assessment of sublethal effects on moulting time and growth. Herring tests on embryos would be similar in that they would assess acute toxicity to eggs, as well as the growth post-hatch for a number of days.â? These tests are not sufficient to assess long-term effects of toxic effluent exposure and do not examine multiple biological processes. Below is an excerpt from the Canadian Environmental Protection Act 4 â?oSome chlorinated organic compounds can be biologically degraded or transformed and transformation may lead to more persistent and bio accumulative compounds. Chloroveratroles, for example, transformation products of chloroguaiacols which are unique to bleached pulp mill effluents, are capable of accumulating in fish up to 25 000 times the concentration in water. Some other chlorinated organic compounds detected in biological tissues downstream of bleached pulp mills reflect repeated or long-term exposure rather than high bio accumulative potentials.â? And â?oLaboratory studies using individual chlorinated organic compounds that are commonly discharged from bleached pulp mills have demonstrated such chronic effects as deformities, and embryo and larval mortalities in fish. These chronic effects include significant irreversible factors which jeopardize the continuance of the species and the integrity of the ecosystem.â? My confidence in the proposal is further undermined by the following disclaimer from KSH consultants in Appendix C regarding the â?oPreliminary Engineering for Effluent Treatment Plant Replacementâ? â?oThis report and any or all associated estimates included herein are indicative only and should not be viewed as definitive. KSH does not guarantee the accuracy of such estimates and shall bear no responsibility for any reliance on such estimates by the authorized recipient. KSH is making no representation or warranty as to the contents of this report, including, without limitation, with regards to capacity, quality, production or any other eventual project outcome, and KSH hereby disclaims all warranties whatsoever, including, without limitation, any warranty of merchantability, quality, suitability, performance or fitness for a particular or intended purpose. Any representations and warranties provided by KSH to the recipient in connection with the proposed project shall be limited only to those set forth in a definitive agreement to be entered into between the parties.â? This statement implies we cannot take the numbers seriously and they are not to be held accountable if any of the assumptions are incorrect. Over the past year and a half I have seen the county divided. It is divided because the currency for the discussion is â?ojobsâ? . Politically, I understand why. However, I think it is incredibly short sighted on our part. We need to understand what the volume and composition of waste

will do to the local ecosystem and what will be the long reaching effects. Half a tonne of toxic AOX chemicals along with the rest of the substances in the effluent every day into the Northumberland Strait is unconscionable. I have added an appendix to this letter that contains several other points that came to mind while reading through the literature for the proposal. Please consider these points as well. Thank you for taking the time to read this letter and please consider that we could potentially be destroying the sensitive aquatic ecosystem of the Northumberland Strait and rendering it uninviting for aquatic species and human recreation if the current proposal is granted. We could also be poisoning and/or killing the fish and thereby poisoning ourselves. I beg you to ensure the proper and current experiments are performed before pulp effluent is pumped into the strait. It is my opinion that the limits of allowable toxins and effects of said toxins are not well established. Please copy me on the environmental assessment report once your office has made their decision. Sincerely, Retired scientist BSc, MSc, PhD organic chemistry, concerned citizen and resident of Pictou County. 1. Appendix E3 Stantec Receiving Water Study Effluent Treatment Plant Replacement p3.66 2. Appendix I1-B Project Launch Materials at Open Houses and Engagement Sessions 3. Appendix I4 Meeting of Fishers of Northumberland Strait Fishers Northern Pulp NPNS Re: Proposed Effluent Treatment Facility Replacement ETF February 8, 2018 section 2.3 4. Canadian Environmental Protection Act Priority Substances List Assessment Report No. 2 Effluents from Pulp Mills Using Bleaching 5. Appendix E3 Stantec Receiving Water Study Effluent Treatment Plant Replacement 3.3.2.1 Adsorbable Organic Halides 6. World Bank Group Guidelines
https://www.ifc.org/wps/wcm/connect/6f13e78048855398afb4ff6a6515bb18/Final2B-2BPulp2Band2BPaper2BMills.pdf?MOD=AJPERES 7.
https://vancouversun.com/business/local-business/nanaimo-pulp-mill-to-pay-135000-penalty
Appendix of additional questions/concerns: A. It will affect more than fish. See Appendix N in the Project proposal for rare, threatened or endangered flora and fauna. There are many listed within less than 5 km from the project site. B. Effluent composition is different if the mill is undergoing maintenance. Have levels of contaminants been taken into account during this scenario? I have not read anything regarding that in the proposal. C. One of the risks identified by the mill is that plastic from the MBBR moving bed biofilm reactor could end up in the receiving water. How is this addressed? D. Power outage caused Harmac mill in BC to pump untreated effluent into the ocean. 7 What would prevent that from happening here? E. If we assume the regulations are acceptable for environmental health, the allowable concentration or pH, salinity, temperature, etc. limit does not mean 2 metres, or 8 metres, or 100 metres from the diffuser. Allowable concentration means the effluent should be at or below the legislated concentration prior to exit from the diffuser. Dilution into the receiving water should not be used for justification. Name: Email: @seanova.com Address:

Privacy-Statement: agree x: 68 y: 18

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 8:45:08 AM

Project: replacement_effluent_treatment_facility_project Comments: Allow the extension to build a proper facility Name: Email: @hotmail.com Address:

: Privacy-Statement: agree x: 55 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 8:57:47 AM

Project: replacement_effluent_treatment_facility_project Comments: Piping the effluent from Northern Pulp into the strait is no solution at all. The plant claims that its crucial to Pictou County because it provides jobs, but it would ruin the livelihoods of all those fishers who take their catches from the strait. The pulp plant has been polluting our waters far too long. Perhaps if it closed down, it would make the area more attractive for enterprises that would bring new, more sustainable, less toxic industries to the area. Name: Email: @gmail.com Address:

Privacy-Statement:

agree x: 57 y: 23

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 1:07:23 PM

Project: replacement_effluent_treatment_facility_project Comments: Im very pleased with the E.A. It was very detailed and informative. Im very pleased with the Treatment Facility Design and with the addition of the oxygen delignification process, I think it will have no trouble at all exceeding any stringent regulations. Name: Email: @northernpulp.com Address:

Privacy-

Statement: agree x: 72 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 2:49:22 PM

Project: replacement_effluent_treatment_facility_project Comments: Absolutely NOT to go through with this poisonous project....There are to many people dying from this effluent. Just take a look at the stats of Pictou County and the brutal deaths it has caused....Every form of Cancer there is and its the cause, anyone with a head on there shoulder can see that...I thank God our Indigenous people have the Balls to stand up and No. They are the ones that are educating us with he true facts....I support them one hundred percent. There has to be another way rather than killing our people and fisheries and wild life...Listen to the people with head on there shoulders for Gods sake do the right thing and scrap this project come up with something else ....Dont hear this sort of issue for and other pulp mills in Canada now do You. Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 51 y: 23

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Nova Scotia Environment Feedback Form Submission
Date: February 24, 2019 3:08:06 PM

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name: email: @hotmail.com comments: in regards to the environmental problem the northern pulp is contributing and will continue to contribute with the new efficient pipe in the northern straight....If you have any idea of the horrible affects of this issue in our county...causing death. serious and life threatening disease killing wild life and not to mention the wiping out of our fishing industry. the fish that is caught and sold will be polluted and kill more people. Do the right thing and support the people who value life not money...there is away an other way to solve this issue all they need to do is do it. It is against the law to dump you garbage in the forest and need to be outlawed to dump effluent into the ocean. thank you for allowing me my thoughts toward this issue..and hope your office will stand behind the people who know what is really going on here Page Last Viewed: www.novascotia.ca/nse/contact.asp

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 4:14:48 PM

Project: replacement_effluent_treatment_facility_project Comments: We have been subjected to gross air and water pollution from Northern Pulp for over 50 years. We firmly believe it is time for the mill to close and boat harbor be cleaned up on schedule, closing January 2020. No pipe in the Northumberland Strait as this will only lead to more pollution and ongoing issues with our water and air. Name: Email: @hotmail.com Address: Municipality: Postal-Code: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 61 y: 23

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 4:39:45 PM

Project: replacement_effluent_treatment_facility_project Comments: Paper Excellence-Northern Pulp had 5 years to change their Effluent Treatment Facility. The N.S. Govt. should NOT PAY ANY MONEY to Fund the Cleaning of Boat Harbour, Paper Excellence is part of Asian Pulp Paper - one of the worst environmental offenders on our earth! Their plan to Run Effluent Pipe along 106 near Pictou Town is a Very Real Hazard to Polluting Pictou Towns Protected Wetlands thereby Pictou Towns Water Supply also Polluting our wells which affect Each Resident of over 3,200 Population within the Town of Pictou! Not Acceptable to Any Resident of Pictou and Caribou as well! As Our Water Is Vital to Preserve Maintain Life for All Human, Animal Marine Life we cannot have this perpetrator of our Water Environment continue to Ignore the Timely Hazard in their quest for Money! Jobs Are Important but Not at this expense of Killing everything within the perimenters of Paper Excellences Pulp Mill! Name: Email: @eastlink.ca Address:

Privacy-

Statement: agree x: 55 y: 20

From:	@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 24, 2019 6:21:09 PM

Project: replacement_effluent_treatment_facility_project Comments: I have worked both part-time and full-time in forestry and arboriculture for 10 years and continue to stay aware of the issues affecting the industry and its subsequent impact on the ecology of our province. It is very clear that this proposal requires an assessment from the Canadian Environmental Assessment Agency. This is due to the fact that the province of Nova Scotia has financial stake in this project moving forward with its contribution towards the investigation of potential proposals for the effluent pipe. The current assessment, with its 30 day window for the submission of pubic comment, is not an adequate period of time for the public to fully read and understand Northern Pulps 1700 page submission. Furthermore, Section 34 of the Environment Act states: a the location of the proposed undertaking and the nature and sensitivity of the surrounding area b the size, scope and complexity of the proposed undertaking c concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking d steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people da whether environmental baseline information submitted under subclause 91Abx for the undertaking is sufficient for predicting adverse effects or environmental effects related to the undertaking e potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitats f project schedules where applicable g planned or existing land use in the area of the undertaking h other undertakings in the area ha whether compliance with licences, certificates, permits, approvals or other documents of authorization required by law will mitigate the environmental effects i such other information as the Minister may require. I do not believe that the 30 day period allotted for the current assessment is adequate to fully consider all of these issues. Thank you. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 71 y: 17

From: @msn.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 6:26:12 PM

Project: replacement_effluent_treatment_facility_project Comments: I fully support Northern Pulp and their efforts to modernize their effluent treatment process. I believe the science shows that this is an environmentally sustainable project that will ensure that Northern Pulp will continue to operate for years to come. I am confident that the new effluent treatment facility will put Northern Pulp on par with the best bleached kraft mills in the country for effluent quality. Name: Email: @msn.com Address:

: Privacy-Statement: agree x: 40 y: 16

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 7:56:04 PM

Project: replacement_effluent_treatment_facility_project Comments: Adequate time needs to be given to Northern Pulp to complete all environmental studies. If this plant closes it will effect much of Nova Scotia. Name: Email: @eastlink.ca Address:

: Privacy-Statement: agree x: 67 y: 17

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 8:14:31 PM

Project: replacement_effluent_treatment_facility_project Comments: I would greatly appreciate a thorough federal environmental assessment of this project. Our forest industry can survive without a pulp Mill but our fishing industry cannot survive contaminated water. Please err on the side of caution and do the most complete evaluation possible. Name:
Email: @gmail.com Address:

: Privacy-

Statement: agree x: 34 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 24, 2019 8:14:34 PM

Project: replacement_effluent_treatment_facility_project Comments: I am a Child and Adolescent Psychiatrist in Nova Scotia, and live a drive from Pictou Landing First Nations and Boat Harbour. My Sub-Specialty training included studying and treating the effects of environmental toxins on the developing brain. There are many toxins which affect the brain, However I will focus on Methyl Mercury and Particulate MatterPM 2.5. My concerns are the unaccountable loss of several tons of mercury in the 1970â?Ts near PLFN. The peak was 5 tons of mercury in 1975 Canada Press 1977. This would be an estimated loss of 10-15 tons over a 10 year period Montreal Gazette archives. In my opinion, we are testing fate with this amount of Methyl Mercury in the ground. JIF Consulting has found 3 areas of mercury in the groundwater surrounding Pictou Landing. Methyl Mercury bio-accumulates in seafood. Humans who consume seafood with Methyl Mercury can develop Minamata disease. This is a devastating disease which first was encountered in Minamata Bay in Japan where humans developed this disorder after consumption of toxic seafood. There is no treatment for this disease. Pregnant mothers transfer this Methyl Mercury to the placenta to the developing fetus causing severe brain damage. In Canada, we have had Minamata disease diagnosed in Ontario, Grassy Narrows and White Dog First Nations communities. This developed after Dryden Pulp and Paper spilled 10 tons of mercury into their river. Pumping toxic effluent directly into the Northumberland Strait is not an acceptable alternative for all the above reasons. The effluent will not be toxin free no matter how treated and will bio-accumulate in bi-valves mussels, scallops, oysters and lobsters. Seafood will be contaminated. The archaic expression dilution is the solution to pollution is no longer acceptable. Humans are at risk! We have the most pristine cold waters and export seafood to a dollar value of 2.0 Billion Dollars in 2017. Infrastructure at Halifax Stanfield Airport has begun to increase with holding areas for lobster and 3-5 air cargo shipments to China per week, as well as to Seoul, Korea. Why would we want to put this at risk? With regards to air pollution, Northern Pulp emits 63 of all the PM2.5 in NS of all businessâ?Ts combined. WHO in 2013 declared PM2.5 carcinogenic to Humans . Once in the air it can stay in the air days to weeks and travel hundredâ?Ts to thousandâ?Ts of miles. The new precipitator installed on the recovery boiler addressâ?Ts the odour but not the PM2.5. The main boiler has no precipitator. We are concerned about our local lumber industry and how they would be forced to adapt if the Mill ceases to operate. The lumber Industry will change in the upcoming year when the new laws will be enacted regarding sustainable forestry practices. It will be a reshaping of the Lumber and Forestry Industry and they will need direction and support from the community and the Federal Government. It is never Wealth over Health, Itâ?Ts always Health over Wealth. This information has been exposed over and over again. 50 years of environmental racism is shameful and it is time to resolve this issue. Honour the Boat Harbour act. We need a Federal Assessment, not just a Provincial assessment. No more extensions. Peopleâ?Ts Health and High Quality standards of environmental protection should be our goal. We have to live with Industry. We donâ?Tt have to live with Industry that pollutes. Respectfully Submitted,

Name: Email: c @gmail.com

Address:

: Privacy-Statement: agree x: 63 y: 31

From:
To: Environment Assessment Web Account; ceaa.northernpulp.acee@ceaa-acee.gc.ca; CEAA.BoatHarbour.ACEE@canada.ca
Subject: Concerns around 4 Tonne of TSS PER DAY - Opposing the NP Waste Proposal
Date: February 25, 2019 8:44:26 AM

CEAA, NS EA

On pg 84 of the EA, the projected Total Suspended Solids is 48mg/L. If 85 Million Litres of Effluent is processed per day, that equates to around 4 Tonnes of TSS per day into the Strait. Even if that meets the 25 year old PPER, it still poses a major risk to the marine species in that area.

The EA states that with the proposed AST facility, that TSS will be higher than the old waste process. This us unacceptable.

Sincerely,

Table 5.6-1: Anticipated Daily Maximum Effluent Water Quality (reprinted from Stantec 2018, Table 3.2)

Parameter	Unit	Value
Adsorbable Organic Halides (AOX)	mg/L	7.8
Total Nitrogen (TN)	mg/L	6.0
Total Phosphorus (TP)	mg/L	1.5
Colour	TCU	750
Chemical Oxygen Demand (COD)	mg/L	725
Biochemical Oxygen Demand (BOD_5)	mg/L	48
Total Suspended Solids (TSS)	mg/L	48
Dissolved Oxygen (DO)	mg/L	>1.5
pH	-	7.0 to 8.5
Temperature	°C	25 (winter) 37 (summer)
Total Dissolved Solids (TDS) or Salinity	g/L	4

At 85,000,000 L = 4 Tonnes of Solids PER DAY

From:
To: Environment Assessment Web Account
Subject: Support of Approval Permit
Date: February 25, 2019 9:13:54 AM

Good Morning

I am writing a letter in support of an approval permit for a Class 1 Environmental Assessment for the replacement system for Boat Harbour submitted by Northern Pulp on January 31,2019. I believe the company has put many long hours into this assessment and has done a thorough job making sure all environmental standards have been met. I know that the Boat Harbour setup was not the way to go but back in 1967 environmental standards were not in place like they are today and technology in these areas has changed substantially in the last 50 years. The new owner of Northern Pulp has already done work to this mill over the years he has had ownership to reduce his environmental footprint with technologies such as the new precipitator which has reduced the emissions going into the atmosphere and is now willing to put the money into the new effluent treatment facility. This new facility will treat the effluent on site before ever leaving the mill eliminating the risk of another effluent leak from ever happening again.Northern Pulp has found the best existing technology today for Bleach Kraft Pulp Mills . The owner has also proposed an O2 delignification after the treatment plant is built which will reduce chemical usage along with water consumption reducing the amount of effluent. I believe that the Remediation of Boat Harbour has to happen for not just the First Nations people of Pictou Landing but for all the residence of Pictou Landing but I feel that the government has not given Northern Pulp enough time to complete the entire process for this to happen. At the beginning when the Premier gave the deadline of January 31, 2020 there were only 7 studies to apply for an EA but ended up being a total of 28. These studies take time and some of them can only be done in certain seasons. It has come out recently that the company that is to be in charge of the Remediation of Boat Harbour will not be able to start work on the expected date due to delays. I would like to ask you how it is fair that this company that had the same amount of time to get their ducks in a row is entitled to an extension but Northern Pulp who has taken on all these extra studies that kept coming up throughout this process is not entitled to an extension? Any project whether it be a new school, hospital or effluent treatment facility all have delays that are out of their control. Northern Pulp has had many obstacles whether it be the weather, having to find an alternate route for the pipeline right up to the blocking of their survey boat which I'm sure you have most likely seen on the news. I feel that it is only fair that you give the same exception to Northern Pulp as you are to the company in charge of the Remediation.
I have lived in Pictou County for my entire life (30 years) and feel that the closure of the pulp mill would be detrimental to the county and also the entire province. Throughout my life I have seen the impact that it has had on this county when places like Maritime Steel and Trenton Works had closed and the economy was in a better place than it is today.
I believe all the industries involved fisheries, forestries and the pulp mill can coexist. I believe that the EA brought forth by Northern Pulp will pass all environmental standards and that this County and Province will continue to prosper.

Respectfully

Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: northern pulp proposal for environmental assessment
Date: February 25, 2019 10:38:08 AM

I have read and noted the Registration Document dated Jan. 31, 2019 and to the attention of Ms. Helen Yeh, Environmental Assessment Officer. What follows are my comments on same and my views on the proposal to pump large volumes of pulp effluent into the Strait of Northumberland.

At pages 8 and 9 of this submission is found the following statement: "For its entire fifty year history the BHETF has discharged into the Northumberland Strait at the outlet of the Boat Harbour Estuary." My comments on this seeming justification for continuing a process rife with environmental negative consequences- Yes this is true, and what have been the impacts of that? 1. pollution of Pictou Harbour (see study of cancer development in mussels in cages at strategic locations in the said Harbour and in the areas immediate to the Harbour's mouth.) Second, this outfall is a black pitchy mess that has caused the closure of one of Nova Scotia's most popular beaches (Lighthouse Beach); it has also resulted in the closing of the swimming area for the Girl Guides Camp (MacLellan's Girl Guide Camp- east of the Boat Harbour outfall; those children have been bussed to Melmerby Beach just to be able to have their swim lessons). Lobster traps that had been set in the area of the outfall and to the east of the outfall have had to be moved as the bottom does not allow a habitat for the lobster to thrive in. The effects on A'se'k (the other room) or Boat Harbour are abundantly clear!

Next: Here is a glaring and serious flaw in Northern Pulp's submission; it cannot be minimized and must not be ignored. At Section 2.3, page 11 is this statement: "Due to the EA Registration submission timing, the study period did not facilitate full biological field assessments for the current proposed transmission pipeline corridor." And "Field studies for the marine environment have been hampered by both seasonal constraints... and by physical opposition and obstruction..."

To proceed with any project given this admission by the proponent is totally unacceptable and amounts to a rolling of the dice that cannot be endorsed at any level of meaningful analysis and assessment. For a company to submit this as part of its plan is simply an admission that it has not done its work robustly! Here is the quote from this EA submission that shows how slack and lacking in thoroughness this proposal is. "The existing environmental conditions and associated potential environmental effects of the project therefore have been defined based on EXISTING AVAILABLE INFORMATION {non-specified} and OTHER DESKTOP SOURCES." Are they kidding? They did some Google searches and that is robust, competent, scientific analysis and assessment? No, it is blatantly insufficient, and presumptuous in the extreme. The proponent has chosen to put money into advertisements and sponsored media content. It should have started in 2015 when the Boat Harbour Act became the law of the land and done its due diligence. For Northern Pulp to state that it feels that their superficial analysis is justified given what it frames as a "... practice (that) is consistent with federal and other provincial EA processes..." is ludicrous and irresponsible, especially given the magnitude and likely negative impacts to the fishery and to tourism that account for several billion dollars of economic activity every year. These interests have been consulted and their opposition to this pipe in the Strait is uniform and persistent. In a nutshell, the tourists operators and the fishermen will never support this proposal. As to the feelings of those who cottage and camp along the Strait, there feelings have been made clear in their attendance in very large numbers at numerous public awareness sessions. The provincial government has heard these voices and the Boat Harbour Act has addressed some of the concerns. The views of the ordinary citizens have been documented and a survey of these letters to the editor will show where the majority

of people come down on the proposal to pipe pulp effluent to Caribou Harbour and dispose of it there or anywhere in the Strait. Hopefully the Government of Nova Scotia has seen fit to assess this citizen commentary; it is relevant.

With regard to the fishery particularly, there are several points that need to be made. There is ample evidence to support the concern that there will be bioaccumulation of deleterious, toxic substances that will impact the development of lobster larvae and will also cause the lobster to move to more hospitable environments in which to feed and reproduce. Pulp effluent in the Fisheries Act and other documentation is clearly identified as "toxic". Further, Northern Pulp has never identified the constituents that are in this effluent; the company has refused to do so. How can any government department, be it federal or provincial, sanction any such effluent if the constituent elements and each of their concentrations is not clearly established? In terms of known toxic and even lethal substances, it is clear that dioxins and furans are in the liquid effluent in Boat Harbour. It is clear, and has been most recently established with a published study by six Dalhousie scientists, that there are at least three known carcinogens that leave the stacks at Northern Pulp. They are in the form of 1,3 butadiene, carbon tetra chloride and benzene. That study also stated that these three elements exceed the Environemtal Protection Agency standards for safe emission levels. The aforesaid study also indicated the inadequacy of monitoring of such emissions. In other words, it stated that the monitoring stations are improperly sited and there are too few of them. As of this writing, it is believed that the monitoring station in the Town of Pictou (the only one in the Town, is inactive). How can this be allowed to persist?

As to the siting of the marine outfall to allegedly "minimize potential impact to marine water quality...". How can this claim be made when the constituent elements of the effluent and the concentrations of each have not been established? A study done in the early 1990's, with the lead author being S,. A. Jones, indicated that the release of effluent stays in the water column that it is released in for many kilometres and is found in "measurable amounts" even at a distance of thirty-six kilometres. How then can the proposal from Northern Pulp claim, without any significant modelling, that ambient conditions will return to the norm within a few metres of the outfall? This claim arrived at through inadequate modelling does not jive with the study just referenced. The NP submission also states that it feels that a pipe in theStrait will be a visual improvement to the existing obvious visual effects of today. It should be remembered that it was advocates for the pulp mill who in 1965 were telling residents and First Nations that there would be nothing but clear water coming out of Boat Harbour. In the literature put out at the November, 2017 meeting sponsored by Northern Pulp at the Wellness Centre in Pictou County at pages two and three it showed several beakers with the one to the far right showing a clear beaker of what looks like water. Once again, this is what Northern Pulp is saying the effluent will look like when it exits the pipe. I found this tactic to be reminiscent of what was displayed to the public in the mid 1960's. And, of course, the illustration then was dishonest and lacked genuineness.

This submission by Northern Pulp also states that there will be a surfacing of the effluent. I am sure that the boaters and swimmers in PEI, Pictou Island, in Brule and Tatamagouche will be pleased to hear that there will be effluent on the surface of the waters of the Northumberland Strait. Even more significant than the surface visual effects will be what happens to the marine biota and flora. This proposal does nothing to convince me that any best practices have been followed in the sense of solid scientific research, modelling and assessment to ascertain the likely impacts on these. It is what cannot be seen from the surface and what will bioaccumulate that will be most devastating to marine species. When so many livelihoods in

sustainable industries could be so affected, why should such a gamble as the one being offered in this proposal be entertained? The federal government needs to intervene here and make its own determination as to the "significance of environmental effects of the project." The federal government also must assess whether or not the Department of Environment in Nova Scotia has duly consulted with First Nations people in the Maritime Provinces ,as to this proposal!

Dillon Consulting in this submission to the Nova Scotia Department of Environment suggests that First Nations have been one of the groups offering "valuable input and raised important questions", yet it is very clear that this input has not at all been reflected in the submission Dillon has made on behalf of the proponent. First Nations may have been asked for input, but they have not been MEANINGFULLY CONSULTED. There is a huge difference, and it is one that has implications for the involvement of the Federal Government of Canada.It must be noted that the relationship that has developed between Pictou Landing First Nation and Northern Pulp has not been harmonious in any sense.

The proposal to run a pipe along the roadside, within a right of way is fraught with numerous problems. Also, the pipe itself will be an ugly presentation for all to view- even those who disembark from the ferry in Caribou. Tourists avoid the area now by driving quickly through Pictou County to other more pristine destinations. This has been clearly articulated by numerous people in the tourist and retail sectors. The owner-operators of Pictou Lodge have been making this abundantly clear for many years.

The Municipality of Pictou County has voted to support a firm closure date for Boat Harbour. It also has to give due consideration as to whether it will permit the passage of this effluent pipe over Municipal lands and watersheds. This is also the case , and more particularly so, for the Town of Pictou which depends to a significant extent on well-water supplies that this proposed pipe will pass over.

There are so many problems with running the pipe withing the right of way of the highway that it would be exhaustive to mention them all, but here are three concerns: 1. The proposal states that "The pipe may also be installed withing a paved portion of highway 106 to avoid existing infrastructure or environmentally sensitive features." So, tractor trailers, buses, cars,motorcycles will be travelling alongside a pipe carrying effluent and the barriers between them will be a guardrail. Really!
2. It is proposed that a "boring method" will be used to send the pipe around the current and recently redesigned rotary in Pictou. Again, really? In an area that is just beginning to give the Town of Pictou some promising retail development? 3. As far as decommissioning of this pipe , the plan, if it can be called such, is to leave everything in the ground or under the water and to merely cap it off after it has been cleared of the effluent in it. Hey, no problems here, just let mother nature and the future taxpayers deal with it.

The legislature of Nova Scotia has passed a law that will be followed, as being law abiding is in the best interests of all of us. To suggest that we should break the law to convenience any party is not tenable.Therefore the Boat Harbour Act must be followed to the letter. Lastly, the company Northern Pulp/ Paper Excellence opted to take a stance on how to "negotiate" with all interested and concerned parties with respect to a new effluent treatment proposal. It now proposes to hold effluent at Abercrombie Point for no more than two days before it transports it into the Strait. This is not an improvement over the existing treatment. The proponent has not done diligent work with respect to appropriate modelling nor proper and complete assessment of the potential harmful effects of this proposal if it were to be implemented. It

used numerous excuses as to why such thoroughness was not possible. It did not point to its own hesitation to get at this from the time that the Boat Harbour Act was passed. That is on the company. The company chose brinkmanship as a negotiating ploy. Brinkmanship is not part of a negotiating process that is used until late stages when one party or another opts for desperate moves. This was not a good faith approach by the proponent, and it has led to the divisions of not just the local communities, but to communities more distant. The strategy has also had the effect of strongly uniting previously loosely - connected elements; for that we should be thankful since being united in a cause can help to level the playing field. That, in my view, is what has happened in this matter. The leanings of the majority is found in the proclamations and meetings and press relaeses offered by the various, but now united, entities which include but are not limited to the following: Pictou Landing First Nations and the other First Nations communities in the Maritimes; Friends of the Northumberland Strait; Clean the Mill; the Fishermen's associations from across the Maritimes; the government of Prince Edward Island; concerned citizens.

There is a determination among all of these elements to advocate for the workers at the mill in Abercrombie and to advocate for the independent contractors who provide the mill with product should a closure of the mill occur. It is this determination to advocate and secure best results possible for these workers and contractors that is on the record. It is also this commitment that may be the force to re- fuse relationships that have soured because of the effects of the proposal to handle pulp waste in the manner that this proposal advocates.

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Northern Pulp's Replacement Effluent Treatment Facility Project
Date: February 25, 2019 11:56:02 AM
Attachments: My letter to the Environment Minister.docx

Good Morning
I am including my letter to the Environment Minister on my interest in the Northern Pulp issue and the assessment that is taking place on this subject at this time.
King Regards,

Re: Request for Designation for CEAA Federal Assessment - Northern Pulp Effluent Treatment Facility

I am writing this letter in regards to Northern Pulp's Replacement Effluent Treatment Facility Project.

My name is and I have been a resident of , Nova Scotia for the past 37 years. I have also worked at the same Company for 35 years (Sobeys Inc). Previous to that I grew up in , Pictou County, Nova Scotia which is on the Sunrise Trail and not far from the coast. In the summer months we spend our time at our cottage in Caribou Island. We enjoy swimming and walking the beautiful shoreline collecting drift wood and beach glass. It is a beautiful spot rich in mussels, quahogs, clams and razor fish with beautiful clear waters. When these shellfish are in season we will go down and walk the beach to get a few for an enjoyable summertime treat.

At the Ferry Wharf in Caribou, Pictou not far from our cottage it is a busy time in the spring, summer and fall months. Fishermen are getting their traps/gear and boats ready to go fishing for the season. The fishing industry is an anchor industry for Nova Scotia and several rural communities have survived for years and many times have thrived in the past and will continue in the future. It is also the same spot where the Northumberland Ferry docks to pick up and drop of Tourists from Nova Scotia to Prince Edward Island daily. It is a place of clean water, clean air and bountiful fish.

My father was a fisherman for some years, he fished Lobster, Scallops and Herring and this livelihood is what supported our family. I now have two brothers that also fish for a living and have been doing so for years. It is in their blood and it is now what supports their family. I have cousins who also fish out of this area every year. And also had uncles who have since past but this was their source of income for which made families succeed and stay in Pictou County.

If this pipe goes into the Strait and pumps effluent into the water, it does not just affect the Northumberland Strait this is part of the Gulf of St. Lawrence, this is a shared body of water for our three Provinces and the rest of Canada. Wastewater temperature also affects receiving waters. When discharged in large quantities, it can raise the temperature anywhere from 28 degrees Celsius in the winter to 38 degrees in the summer which means no marine life will survive. In the Northumberland Strait waters marine life spawns, nurses and migrates here, how is that possible if they are exposed to chemicals and heat? We are talking about wastes from an industry and turn it into a form of effluent waste and then pump into pipes underground into the Strait. There are just too many variables, as it might not be recycled properly, or treated properly and unnoticed leaks can happen, it will have detrimental impact on the environment through air, water and soil pollution.

In this letter there are three things that I would like to address that are just some of the concerns that I have with this assessment:

Example #1: "In paragraph 9.2.4 at page 501, NP states as noted previously, the project has two main sources of emissions/discharges. These sources may result in potential chronic human exposure to project-associated chemicals:
"Chemicals present in treated effluent and in air emissions may pose a potential human health risk if there is significant exposure to the project-associated chemicals.

They are stating that it is a potential Human Health Risk. I am extremely concerned about the health of people living close to Northern Pulp. For decades air emissions from the mill have been a problem affecting resident's health and the main issue has been the cancer numbers in Pictou County and now they want to pump it into our water.
Pulp and Paper mills pollute our water, air and soil. There are about 500 Kraft mills, and many thousands of other types of pulp and paper mills, in the world. Primary concerns include the use of chlorine-based bleaches and resultant toxic emissions to air, water, and soil

Below is an article from the Globe in Mail in 2013 and then was once again updated in 2018. This article is stating the cancer rates in Pictou County back in 2013 with the effluent pumped to Boart Harbour. How high will those numbers go if the pipe goes into the water and effluent is released?
According to Statistics Canada, the Pictou area has the seventh highest rate of cancer per 100,000 residents of the country's 106 health regions. The area around Saint John, N.B., which also has a pulp mill, is the only region with a sizable population that has higher cancer rates than Pictou. *(Andreatta. David (2013) "In Nova Scotia town, residents fight local mill's pollution" Globe and Mail, 13 September).*

Example #2: "In paragraph 10.2.1 at page 521, NP states as noted below

During operation of the ETF, there is potential for release of chemicals used in the treatment process as well. Such a spill may contaminate soils and Groundwater and, through runoff, contaminate watercourses. Contaminants may adversely affect fish. And fish habitat and waterfowl. Groundwater contamination may adversely affect nearby water Supplies!

My concern with this section is the unsafe effect that can happen to the water supply, fish and marine life and human safety if there is an accidental release of dangerous material. We are talking lives and the rich eco-system that is being put at stake all for this company and their wealth, Northern Pulp had a recent leak in October 2018 although the Company did not think it was a huge deal because to them it was just a small one. It does not matter the size of the leak, it is the fact that it went unnoticed by the Company as it was reported by a couple out walking. There was another one at this plant 5 years ago. *(CBC News (2014) "*Northern Pulp mill shut down due to effluent leak" CBC, 10 June). Then in 2008, the underwater pipe broke and caused a lengthy shutdown of the mill. The Provincial taxpayers either loaned or gave the $15 million to make sure this would not happen again and then for it to happen so soon again is a huge concern. . I question the NP inspections and how many leaks are happening that the community is not aware off? And if a pipe is underground it will never be noticed!

Example #3: *"In paragraph 9.2.4 at page 501, NP states a*s noted below

As noted previously, the project has two main sources of emissions/discharges. These sources may result in potential chronic human exposure to project-associated chemicals: Chemicals present in treated effluent and in air emissions may pose a potential human health.
There are three major exposure routes through which chemicals present in environmental media can enter the body: Inhalation, ingestion and dermal (skin) absorption. This can happen from ingestion of soils, dusts, drinking water and garden produce, local country food items (e.g., fish, shellfish and hunting)

My concern with this paragraph is that any chemical flushed through a pipe to discharge 70-90 million litres of effluent from a bleached Kraft mill is unacceptable for this day and age. Mill waste water continues to wreak havoc on surrounding ecosystems. Common sense can tell someone if chemicals are flushed into a water area then the first to digest the chemicals are zooplankton, plankton and krill which are the main food source for larger marine life. Then the lobster, herring, crab and tuna will ingest these contaminates and then eventually humans eat the pullulated food supply. The fish get contaminated and so do the people who eat it, which can cause exorbitant health problems in the future for humans. So basically we should not eat the food in the ground or fish the marine life and be watchful of our drinking as there is a potential for human exposure. So how do we live what is left?

Based on the Northern Pulp's Treatment Project and the information that I provided, I feel that the marine life in the waters of the Northumberland Strait will cease to exist if this pipe goes through. As it is there is a deteriorating habitat for lobsters in the waters now and we need to get better control and come up with better data to sustain the management of our fishery resources. When this toxic waste harms one organism, it can end up destroying an entire food chain of aquatic life. Improperly disposed chemicals pollute marine life and kills sea mammals, corals and fish. And any organism that digests affected marine life can have adverse effects. Over 1 million seabirds and sea mammals are killed by pollution every year. People who live in places with high levels of air pollutants have a 20% higher risk of death from lung cancer. This pipe is not a project that we want passed! Fish and seafood are among Canada's largest exports of food products. Lobster, Atlantic salmon, snow crab and shrimp remains Canada's top species exported in terms of value, with over $2 billion worth in 2016. Aquaculture is the fastest growing food production activity in the world and a growing sector in Canada. Approximately 72,000 Canadians make their living from fishing and fishing related activities.

Overall I feel that we need more information before the Minister can make her decision. We need an in-depth investigation. After reading this assessment there is so much evidence to show the likelihood that it will cause adverse effects on the fishery and marine life. And it will cause effects on Humans by air and water pollution. I feel that the Minister needs to reject this proposal. We need to have a Federal Environmental Assessment completed on this treatment facility. This project is undergoing a shorter, 50-day provincial Class 1 assessment, which is unacceptable. It is outrageous that you can get a Federal assessment to do the cleanup at Boart Harbour when the damage is done after 50+ years. But you cannot get a Federal assessment when Northern Pulp wants to go and cause more of a threat to our environment. The government's past handling of effluent from this mill has resulted in one of the most contaminated sites in Canada, Boat Harbour. I want to see a strong, science based review of this project which will protect the present and future health of our Strait and the economy which depends on healthy waters.

My question to you Minister… Remember it only took one diseased steer to basically cripple the beef industry in Canada for 5 years. If this goes through there will be no fishery, can Canada live without that?

Thank for taking the time to read this.

Kind regards

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 25, 2019 5:18:01 PM

Project: replacement_effluent_treatment_facility_project Comments: Surely Northern Pulp and its predecessors have been give enough tax payer money, and pumped out more than enough poison! It is time to move on!! Name: Email: @yahoo.ca Address:

Privacy-Statement: agree x: 61 y: 23

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 25, 2019 8:53:29 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel Northern Pulp should be given more time on the effluent project. Many jobs are tied to Northern Pulp continuing to produce fiber/paper. The time allotted after studies were completed was very short for such a major project Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 55 y: 23

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Pipe
Date: February 25, 2019 11:06:42 PM

To Whom it may Concern,

I am writing on behalf of my family. My husband is a fisherman and we have 2 children. We all love to go fishing, go to the beach, go camping, go swimming, have fun & live life.

The idea of putting a pipe into the Northumberland Strait may jeopardize all of the above things that we as a family love to do.

It's just not all about the fishing industry but about tourism and everyday life that this will affect.

I'm sure when they opened the mill and proposed all there information that they did not for see Boat Harbour turning out the way it is or at least I hope they didn't!! You have to have answers you can not speculate that it is highly unlikely to harm the fisheries. If you can't say it won't then you shouldn't do it. There is too much at risk. I know there are people at the mill, the forestry industry, etc but there are also lots of people on the other side, if the pipe goes in and it ends up like Boat Harbour. Then what? We have residents, we have tourists, we have fishers and we have fish, that what, don't count?

If there is a minimal percentage that it could 25, 50, 100 years down the road, turn into a hazardous site like Boat Harbour then it's NO GOOD. We need guarantee there is going to be no affect!

I have family, relatives, friends & strangers close and afar, that deserve & NEED answers. So please do the proper Federal Assessment and get answers.

Some intresting points from section 9.2.4
"Chemicals present in treated effluent and in air emissions may pose a potential human health risk if there is significant exposure to the project-associated chemicals. As such, many of the chemicals present in treated effluent and in air emissions are considered to be candidate COPCs at this time."
"At this time, it is only possible to identify candidate COPCs that may be evaluated should a HHRA of the project be a regulatory requirement. This is due to the fact that chemical process engineering design work is continuing and there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential concentrations of substances present in the effluent). "

There's a lot more vague information in his proposal, this is just one part of the proposal that doesn't give me a 100% guarantee the quality of life I want for my children! It doesn't give me a 100% guarantee that the pipe will not affect my families livelihood!

Sent from my iPhone

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 12:37:08 AM

Project: replacement_effluent_treatment_facility_project Comments: The environment Tourism Fisheries cannot bear the damage that will be done to Nothumberland Strait. Northern pulp and its predecessors have done enough to pollute our shores. Please no Pipe Name:
Email: @hotmail.com Address:

Privacy-Statement: agree x: 79 y: 34

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 9:14:13 AM

Project: replacement_effluent_treatment_facility_project Comments: Although we live in NB we have property on Caribou Island and are very concerned about the proposal to dumpâ? treatedâ? ? water from Northern Pulp mill in the Strait. We have grandchildren who swim in the Strait as do we, and we are not anxious to have them in polluted water. We have many cousins who earn their living in the fishing industry and do not wish to see them lose their livelihood. There must be a much better solution. Please find it or close the mill. It is a much too expensive to destroy the environment and then try to cleanup after after all fish and life in the ocean has been killed. Nova Scotia is known for clean beaches and swimming, it is your tourism industry gone in this northern part of N.S. and PI Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 59 y: 20

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 11:42:06 AM

Project: replacement_effluent_treatment_facility_project Comments: This is a very comprehensive document and I think the project should go ahead as soon as possible. This company has put a lot of effort and expense into preparing this project and have been cut short of time by McNeils Boat Harbour Act. The mill will be put under a great deal of stress if a shut-down of more that 10 days occurs. A lot of damage will occur in that period of time and the mill may not recover. Please pass this accessment and allow the mill and all of the spin-off business to continue operations. I would not be against the continued use of Boat Harbour to facilitate this project to its completion. Sincerly, Name: Email: @hotmail.ca Address:

: Privacy-Statement: agree x: 59 y: 27

From:
To: Environment Assessment Web Account
Subject: Comments NPNS Replacement Effluent Treatment Proposal
Date: February 26, 2019 12:11:16 PM
Attachments: Comments NP Effluent Treatment Proposal.pdf

Please see attached document for comments.

Thank you,

To: Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

Fax: (902) 424-6925

Re: Northern Pulp Nova Scotia Effluent Treatment Project Proposal

Submitted by:

Dear Sir or Madam,

I respectfully submit the following comments on the Northern Pulp proposal for the replacement effluent treatment project (NP Proposal), as registered at your office on February 7, 2019. The proposal document is too voluminous to possibly comment on all of the sections that could be included here. Therefore, I have selected several issues that I feel I am able to reasonably comprehend and make valid comments on.

I hold a Bachelor of Science from Mount St. Vincent University, and a Master of Public Health from the University of Massachusetts, Amherst. In my academic work at both the undergraduate and graduate levels, I have had to read many research papers in various disciplines in order to fulfill coursework, including writing my own graduate thesis. Understanding the underlying challenges of collecting and analyzing data using statistical methodology, and the importance of appropriately communicating conclusions of studies has informed my comments below.

My responses to the NP Proposal document include the following issues:

- Lack of scientific and statistical basis for many conclusions
- Use of ecological models without validation via observed data
- Lack of current and accurate baseline data
- Vague descriptions of the final effluent composition and impacts of solids content of effluent
- Omission of thermal pollution and global warming issues from effluent
- Irrelevance of Section 9 regarding human health impacts

The first general comment that I wish to make about the NP Proposal is its lack of what is commonly referred to as '**scientific method**'. There is a burden of work that must be completed in scientific endeavor. The best description that I could readily find on the internet (my underscores):

1. Make an observation or observations.
2. Ask questions about the observations and gather information.
3. Form a hypothesis — a tentative description of what's been observed, and make predictions based on that hypothesis.
4. Test the hypothesis and predictions in an experiment that can be reproduced.
5. Analyze the data and draw conclusions; accept or reject the hypothesis or modify the hypothesis if necessary.
6. Reproduce the experiment until there are no discrepancies between observations and theory. "Replication of methods and results is my favorite step in the scientific method," Moshe Pritsker, a former post-doctoral researcher at Harvard Medical School and CEO of JoVE, told Live Science. "The reproducibility of published

experiments is the foundation of science. No reproducibility – no science."

https://www.livescience.com/20896-science-scientific-method.html

In the instant NP Proposal, data is derived from models created and operated in controlled environments. In the natural world, the number of variables that affect the validity of the data are either too numerous to list, or are simply unknown. Statistical confidence intervals of conclusions in this proposal are not stated, nor are any statistical analyses mentioned (See #5 above). All scientific and technical data must withstand statistical scrutiny. This is meant to address the probability that the data is replicable and applicable in the natural environment or larger population.

There is no mention in the NP Proposal of how the models utilized by Stantec were validated, yet numerous assumptions/conclusions regarding the performance parameters of the proposed project are presented. Studies have been published about the validity of utilizing **models in ecological studies**:

> "Because there are no generally agreed validation criteria for ecological models, the best that can be done at present is for the modeller to state explicitly what the validation criteria are and leave it to the user to judge if the criteria are adequate. The most common criteria at present are the "see how well the simulated data matches the observed data"…
> Rykiel, E.J., Jr. "Testing ecological models: the meaning of validation." *Ecological Modelling* 90 (1996) 229-244.

Validation criteria are not mentioned in the NP Proposal, based on my own reading. Stantec has included simulated data on many effluent and pipe parameters. However, observed data is not included. For instance, with respect to the receiving environment – the baseline (current) water quality data is *assumed* to be the same at the outfall location as a previously considered location. This is articulated in the following disclaimer found in Appendix E - Receiving Water Study p. 16:

> "No historical water quality data are available for Northumberland Strait around the CH-B location. Data from neighboring Pictou Road (Stantec 2017) located about 6 km southeast were used."

Two year old data from a location "about" 6 km southeast was utilized, and characterized as "...expected to be worse than off Caribou Point at CH-B..." **This is a significant flaw in the validity of conclusions about the risks inherent in this project. Scientific conclusions cannot be drawn from the modelling data, only hypotheses.**

This deficiency should be considered pursuant to Section 12 (da) of the Environmental Assessment Regulations.

Section 5.6.1 Replacement Effluent ETF Effluent Discharge

The NP Proposal provides projected *estimated* composition of effluent leaving the diffusers at Table 5.5-1. It is then purported that this effluent "...will meet ambient water quality (current background) at the edge of a standard mixing zone." This critical section of the proposal is lacking in detail and does not explain where the extraordinary volume of effluent matter that will be continually exiting the diffusers will go. A fundamental scientific law states:

> "**The law of conservation of matter** or principle of matter conservation states that the mass of an object or collection of objects never changes over time, no matter how the constituent parts rearrange themselves. The mass can neither be created nor destroyed."

https://www.nuclear-power.net/laws-of-conservation/law-ofconservation-of-matter/

There is one variation in the law of conservation of matter, which is the production of energy in radioactive materials. The basic law of conservation of mass/matter is well known and applies in the fields of chemistry, physics, fluid dynamics etc.

The NP Proposal does not adequately address where the effluent mass being delivered at the diffusers will end up once it enters the Northumberland Strait. Every molecule of effluent will remain in the strait/ocean waters unless vaporized into the atmosphere.

Table 5.6-1 Anticipated Daily Maximum Effluent Water Quality (Reprinted from Stantec 2018, Table 3.2)

1. The **total suspended solids** in the effluent are *estimated* to be 48 mg/L. Using the conservative approach, the mill will be sending 85,000,000 Liters of effluent to the Northumberland Strait every day. This is the equivalent of 4,080 kg/day, or 1,489,200 kg/year of "suspended solids" being dumped into the strait. It is further noted that these suspended solids will be comprised of an unknown proportion of floc – biological organic solids, including microbes. Whether floc, sediment, chemical or any other substance, this is an enormous volume of organic and inorganic solid mass entering the Northumberland Strait.

If the solids become diluted within an arbitrary "mixing zone", then the massive amount of solid organic and inorganic material will simply be present in a more dilute concentration.

Given that each year there will be 1,489,200 kg of suspended solids released, the consequences should be addressed by the proponent. This is a serious deficiency in the proposal.

This deficiency should be considered pursuant to Sections 12 (c), (d) and (e) of the Environmental Assessment Regulations.

2. The temperature of the effluent leaving the diffusers is *estimated* to be 25º C in the winter and 37º C in the summer. At Appendix E - Table 3.1 Background Water Quality (from Stantec 2017) at the location "about 6 km southeast", the average winter temperature is denoted as 0º C and average summer temperature as 17.6º C. Thus, the average **effluent to ambient temperature differences would be 25º C in the winter and 19.4º C in the summer.**

Thermal pollution is perhaps the most concerning aspect of this proposed project, in its **deleterious effects on organisms** and contribution to **global warming**. A short primer on thermal pollution:

- Cold water contains more oxygen than hot water so increases in temperature also decrease the oxygen-carrying capacity of water. In addition, raising the water temperature increases the decomposition rate of organic matter in water, which also depletes dissolved oxygen. These decreases in the oxygen content of the water occur at the same time that the metabolic rates of the aquatic organisms, which are dependent on a sufficient oxygen supply, are rising because of the increasing temperature.

- Ocean invertebrates, fish and marine reptiles are obligate poikilotherms - their body temperatures depend entirely on the surrounding water. Each species is adapted to a single range of temperatures and many pass through several different life stages, each with an individual range of tolerance. The ocean's vast populations of microbes, fungi and sea plants also rely on narrow temperature ranges for optimal growth.

- Thermal pollution often temporarily increases aquatic plant populations. Other life forms, including microbes and animals, move into these regions to exploit the higher oxygen levels, but when photosynthesis stops at night or upon the death of plants, dissolved oxygen levels plummet, leading to massive animal die-offs. Excess heat can also cause unnaturally large microbial blooms, which kill animals by depleting local oxygen or producing toxins.

- Unnatural warmth and cold can also delay and redirect migration, influence when and whether breeding occurs, and decrease survival of young in marine mammal, reptile and bird populations. Heat pollution that leads to an overabundance of organisms in a region can draw in excessive numbers of creatures that feed on them, while depletion of prey populations by heat stress forces their predators to encroach on regions outside their normal range. Both situations lead to unnatural competition between and within species.

- A sudden thermal shock can result in mass killings of fish, insects, plants or amphibians. Hotter water may prove favorable for some species while it could be lethal for other species. Small water temperature increases the level of activity while higher temperature decreases the level of activity. Many aquatic species are sensitive to small temperature changes such as one degree Celsius that can cause significant changes in organism metabolism and other adverse cellular biology effects.

  https://www.slideshare.net/meghamajoe/effect-of-thermal-pollution-on-marine-life

This aspect of the proposal should be considered pursuant to Sections 12 (c), (d) and (e) of the Environmental Assessment Regulations.

It is unclear whether this EA will consider the effluent contribution to **global warming**. The gradual warming of the receiving waters within and beyond the arbitrary "mixing zone" from hot/warm effluent is not discussed in the NP Proposal. There is a document on the Nova Scotia Environment website at the Environmental Assessment pages titled: "Guide to considering climate change in environmental assessments in Nova Scotia". According to this document, Global Warming considerations in the EA include:

"Operational processes and activities can include the project's energy sources and operational boundaries (Guide to Considering Climate Change in Project Development in Nova Scotia Section 2.2, Steps 1−A and 2−A);
• Anticipated emissions can include information on the processes contributing to GHGs (Section 2.2, Steps 1−A,2−B) and estimated GHG emissions (Section 2.2, Step 2−C);
• General layout and size can describe the loss of carbon sinks through extent of forest removal (Section 2.2, Step 1−B); and
• The project's location or setting can be used in relation to a project's climate change vulnerability."

https://novascotia.ca/nse/ea/docs/EA.Climate.Change.Guide.pdf

Table 2-1 Criteria for Assessing Significance of Impacts from Project Activities

Operational processes and boundaries include the piping of hot effluent into the marine environment. Thermal pollution and its contribution to global warming are not discussed in the NP Proposal. The contribution to global warming should NOT be glossed over in this assessment. The 1967 mill should not be pushed forward into our collective future without considering the timely and relevant issue of global warming vis-a-vis the thermal pollution that will result from the proposed project. **Thermal pollution from the effluent will cause a significant adverse residual environmental effect in its contribution to global warming.**

Section 8.1.3.1. Potential Environmental Effects

The following paragraph in its entirety is vague and without any scientific basis. This paragraph should be rewritten to provide clear and detailed information about potential harm from the emissions after the project:

> "Without mitigation, the project *could* interact with the atmospheric environment in the following ways...emissions from the combustion of such sludge in the power boiler during operation and maintenance *could* disperse from mill stacks to off-site receptors." (Registration Document at page 142)

The use of "estimates" of current emissions at Table 8.1-5 is inadequate. The use of "estimates" at Table 8.1-6 is therefore, also unacceptable. Note that the "estimated" values are then utilized as baseline in the modeling noted at page 146: "Ground-level concentrations (GLC's) of air contaminants were predicted for two modeling scenarios...".

The models utilize baseline "estimates" to inform the conclusions seen in **Table 8.1-7 Summary of residual environmental effects related to the atmospheric environment VEC** (page 147). Ultimately, the findings under Significance of Residual Effect are all deemed "not significant". The conclusions based upon estimates are not valid or scientific. The conclusions are based on conjecture.

Breathtaking in their brevity, and vague, sweeping conclusions, Sections 8.1.3.1 through 8.1.4 should be rewritten to include a scientific basis. The conclusions are based on hypothetical outcomes derived from models. There is simply no rigorous scientific study noted in the proposal to support the assumptions in Sections 8.1.3.1 – 8.1.4.

This deficiency should be considered pursuant to Sections 12 (c), (d) and (e) of the Environmental Assessment Regulations.

Section 9 Human Health Evaluation

As a public health professional, it is impossible to understand why a project of this magnitude and nature would not require a human health risk assessment (HHRA) in an EA.

Anecdotally, there have been long suffering health effects in the population in geographic proximity to the Abercrombie pulp mill. The mill emissions are copious and unpredictable as they flow in response to wind velocity and direction. The waters of Boat Harbour are toxic and therefore, the effluent leaving Boat Harbour and going into the Northumberland Strait cannot be innocuous to marine or human life.

Morbidity and mortality can be measured and analyzed in a healthcare system such as Nova Scotia's. Reportable disease is recorded and some data is published. However, rates of disease such as cancer in Nova Scotia are published at "zone level", which makes it impossible to discern an elevation of disease rates in small geographical locales, or clusters.

https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6208a1.htm

My public health practice has been outside of Nova Scotia and so I cannot speak to the reason why the province has failed to study disease rates in Pictou County. I find it unusual that over the long history of the mill's presence, this has not been undertaken. This work is the domain of epidemiologists who utilize data (such as from the Nova Scotia Cancer Registry) and determine if disease rates appear to be elevated and, whether high rates of disease might be associated with the mill emissions and effluent. To the best of my knowledge, this has never been undertaken.

In the absence of epidemiological studies, it is not possible to dismiss the effects of the mill on human health. Nor is it possible to confirm the effects without delving into epidemiological studies. Unfortunately, this EA is currently proceeding without requirement to review the project's potential future effects on human health. This follows the paucity of attention to health effects from mill emissions and effluent over the last 51 years. This is an unjust burden upon the people of Pictou County. In any case, the information in Section 9 has no application in this EA in the absence of any historical epidemiological data. Any future epidemiological study would obviously take many months or years.

If human health were deemed relevant to this undertaking, the matter should be considered pursuant to The Environment Act, Section 34 (1) (b).

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 1:01:48 PM

Project: replacement_effluent_treatment_facility_project Comments: xx Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 76 y: 18

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 1:24:25 PM

Project: replacement_effluent_treatment_facility_project Comments: I do not approve of pumping treated effluent into the Northumberland Strait. no proof that the effluent will not be harmful to the surrounding waters especially with the temperature it is being quoted at. A lot of items with should or should not as per their model. The first proposal shows what little forethought was given to the proposed route as charts were readily available with depths and shipwrecks clearly marked. Furthermore the presumption they could cross the town of Pictous watershed without requesting approvals shows how entitled they think they are The amount of monies spent on the first and subsequent plans have been mainly funded by the provincial government and with the time spent could have been used to find a real plan and a solution. This company has continually been above the emission levels with no regards for the people in the surrounding area. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 65 y: 26

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 5:04:37 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp effluent treatment facility as proposed February 2019. Volume of waste water effluent 82,500 cubic meters/day is 57,300 litres per minute, system maximum. 70,000 cubic meters/day is 48,600 litres per minute, the rate which is most commonly created during the normal operations which the plant manager reported to me in conversation. Please note: the volume of one cubic meter is 1000 Litres The Northern Pulp proposed average daily waste water is projected to be 62,000 cubic meters per day of effluent, which is a rate of 43,056 litres per minute and is also 717 Litres per second. The volume of liquid waste from the the Northern Pulp Mill is extremely high. The upper maximum waste effluent suggested by Northern Pulp Nova Scotia is a volume of 82,500 cubic meters of effluent, this is 954.8 Litres per second to enter the environment. The current effluent temperature from Mill production to the Boat Harbour Effluent Treatment Facility is at 40- 42 degrees Celsius. There is no known heat loss for the current pipeline although it is likely more than a kilometre in length. However, the flow rate and the polyethylene piping may prevent heat loss while the Mill is in steady state operations/production. A 1,000,000 L one million litre storage tank may have the capacity to store Northern Pulp liquid waste effluent for 17.4 minutes /- 1 minute when production generates 57,300 L/minute effluent per day. At 40,000 L/minute of NP liquid waste effluent, fills a 1,000,000 L storage tank within 25 minutes /- 1minute, assuming it was empty at before hand. An 11.4 km pipeline which is 36 inches inside diameter will contain 7,479 cubic meters of waste effluent, or approximately 7.5 million litres of effluent should a catasrophic pipe failure occur. This environmental risk is significant, given the communities have no experience with large effluent pipeline failure. The 7.5 million litres of effluent does not include headwater effluents that would continue to be pumped or gravity fed from the mill should the transmission pipeline fail. The proposed 12 million litre clarifiers have a maximum four hour capacity to treat the effluent. The current Boat Harbour Effluent System has approximately seven to ten days by comparison. The open clarifiers will pose a very significant occupational health risk to Northern Pulp Mill workers/employees. The daily exposure limit to hydrogen sulphide H2S is less than 1 part per million ppm. The three clarifiers will off-gas hydrogen sulphide from 5 to 50 ppm depending upon winds. Hydrogen sulphide toxicity is not well addressed given labour regulations. This one gas can be potentially deadly as 100 ppm H2S with be fatal within 30 seconds to adult humans. Clarifiers The primary stage clarifier may remove 2.3 grams of suspended solids per litre of waste water with an on-going rate of only 0.3 grams per litre clarification as stated. Turbulent flows by the 700 to 950 Litres/second inbound waste waters into the clarifiers will negatively impact settling, raking or screening actions of the on-going success in the clarifier systems. Clarifiers work best with a calm steady state fluid, where there is little turbulence and there are days for solids to fall from mechanical suspensions or have time to settle gradually due to differences in specific gravity. Little discussion is made of wood fibres and the inorganic composition of the effluent water waters. The process chemicals in a Kraft pulp digestion process are mainly and potentially all water soluble. Settling in the clarifier is difficult, to say the least. The waste wood fibres lost in the waste waters will float due to their specific gravity. The first stage clarifier does not describe any wood fibre retention or extraction, nor the capture of water soluble chemicals. The proposed clarifier is designed to capture only dense total solids which may or may not settle out in the very turbulent clarifier environment. Waste matter from the clarifiers will be diverted to a sludge tank and ultimately to the Power Boiler para 5.2.2.8. The

text as presented is misleading. It suggests: Pressed sludge/solids containing water will be combusted in the power boiler to produce heat. The text should state any water component of the waste sludge is totally released to the atmosphere along with the soluble contaminants. While the power boiler, produces stream and electricity, any moisture in the combustion chamber can only exit via the chimney and into the atmosphere of Pictou County. Should this same moisture contain soluble sulphites, sulphides and related process chemicals, these will all be made airborne by the combustion process. Please also note: The combustion/power boiler is the least equipped for pollution abatement. Marine Pollution at Caribou Harbour The Caribou Harbour opening suggested for the effluent diffuser is adjacent to Northumberland Ferry vessel route. This means the visitors to Nova Scotia or leaving the Province via the ferry service will be subjected to high concentrations of sulfur dioxide gases and related sulfur oxides arising from the effluent diffuser. The effluent water exiting the proposed diffuser apparatus with be toxic to marine life. With respect to ferry users, the effluent is fresh water, hot and very gasified. This will result in the effluent rising to the surface of the Northumberland Strait water immediately. The notion that these waters will mix uniformly by natural blending is misleading. The differences in temperature and specific gravity will cause the effluent to create a continuous rift pattern which will prevent wishful mixing/blending as suggested by Northern Pulp. The analogy is higher industrial chimneys from factories were thought to better diffuse airborne pollution. Scientists and engineers now know this does not occur in fact. The proposed position of the effluent diffuser is immediately upstream of the Caribou Provincial Park, the Pictou Lodge and across the harbour from the Pictou Landing First Nations lands. As the Northumberland Strait tides fall twice daily the Northern Pulp effluent will be mixing and flowing toward these locations. The smell of oxides of sulphur, sulphur dioxide, hydrogen sulphide and related kraft pulp wastes will greatly impact breaches, the nasty odour of the sulphur complexes will cause undue respiratory stress for humans and other mammals on, in or adjacent to the Northumberland Strait. Marine Habitat 717-949 litres of Northern Pulpâ?Ts liquid effluent will enter the Northumberland Strait per second. The Biological Oxygen Demand BOD, the pH and maybe physical attributes, will have been pretested by routine daily compliance measures. The BOD usually laboratory test requires at least an hour of lab time to perform the testing. Stopping production because of a failure of BOD testing will not happen due to the safely to the workers and the plant processes this plant must slowly be shut down which would fail the three hour available for the decision. Compliance issues will be next to impossible to evaluate as the waste water will be entering a saltwater environment, well below the surface waters. 717-949 litres of very hot water per second will be entering the Northumberland Strait. The huge temperature variation compared with receiving waters by some 25 to 35 degrees Celsius will be lethal to marine life. Northern Pulp Management suggest they expect this lethal impact to be spread over an area of 100 meters/any direction from each diffuser. However tidal action, thermal rifts and the specific gravity differences will cause the warmer waste waters to rise immediately, having a larger impact on fish and marine mammals. The inorganic waste chemicals from the NP Millâ?Ts operations, will impact benthic shellfish life. The nasty odours and the chemical/physical pollution will negatively impact tourism, recreational land use and the fisheries. Little work has been done to accurately quantify waste metals from the Millâ?Ts current operation. The quantities of iron, nickel, chromium, molybdenum and other ingredients within stainless steel and chromium plated steel roller surfaces have left an impact in Boat Harbour. Having sampled the embankment soils and having had a third party test laboratory analyze the soil samples, there was a noticeable trend within Boat Harbour. Inorganic heavy metals have occurred and entered into Boat Harbour since the Mill was built in 1967. These metal contaminants are likely from eroded stainless steel, worn pipes, worn roller surfaces, etc.. that 50 years of operations has lead to chronic heavy metal waste/pollution. Should Northern Pulp

and this kraft pulp process operate for another 25 years or more, the inorganic metals pollution needs to be addressed as part of current evaluation. The lead, tin, antimony, cadmium from bushing/metal bearings, chromium from hard electroplated chro mium rollers, chromium/nickel/iron/molybdenum from stainless steel piping, cadmium plated bolts and fasteners, all these metal suffer daily erosion, corrosion and cavitation which will impact the Northumberland Strait lobster fishery. The oxides of sulfur, the changes in salinity, water temperature, turbidity will impact fish habitat and the migration of fish stocks within the Strait. Northern Pulpâ?Ts Environmental History Paper Excellence and Northern Pulp Nova Scotia operated the kraft pulp mill without an electrostatic preceptor for more than a year without reporting its failure to the community or its regulator. Northern Pulpâ?Ts Power Boiler has failed emissions testing. The Northern Pulpâ?Ts Recovery Boiler failed emissions testing. Regardless of failed airborne pollution testing, the Mill operations continued until appropriate shutdowns could be scheduled well after directions/Ministerâ?Ts Orders were given to the Mill management. The proposed size of the first and second stage clarifiers and the â?oBAS technology may appear interesting to the environmental assessment decision makers. However, there is only a four hour residency of waste waters to remain in holding tank system. However with waste waters of 700 - 950 litres per second entering each of the first and second stage clarifiers, this flow rate will cause extreme turbulence. The magnitude of the waste water flow rate limits the capacity of the clarifiers. Furthermore the off-gasing of hydrogen sulphide from the clarifiers will create a process that is difficult to understand and control as well as potentially deadly to workers exposed to the open clarifiers. Sedimentation as described by the proposal within the clarifier system will not meet current standards. The recent Mill Management, while perhaps willing to invest in operator training, most likely will under resource this waste treatment system, as previously demonstrated. The waste treatment proposal only addresses the BOD/COD, pH attributes of the waste waters. The off-gasing from sulphites/sulphides/oxides of sulphur, wear metals, inorganic chemical iron, nickel, chromium, cadmium, sodium sulphide, sodium sulphates pollution, and the huge thermal pollution issues are not addressed by the proposed plan of action. The high density polyethylene or polypropylene piping system to transport the waste water effluent to the final marine site will effectively insulate the waste waters and prevent heat loss. The daily loss of 62,000,000 to 82,500,000 litres of hot water 35 to 40 degree Celsius into the environment is â?ocriminal. Conclusions: 1. The proposed effluent treatment system is under sized for the clarifiers and the current daily water volumes. 2. Once effluents have passed the clarifier system, there is little opportunity for subsequent remediation should BOD testing indicate an issue. BOD testing, requiring an hour to complete, provides only three hours to stop production of the mill. 3. Waste effluent at 35 degrees or more will enter the Northumberland Strait killing marine life. The projected waste path does not accurately address the thermal toxicity to marine life, the foul smelling oxides of sulphur by-products, chronic heavy metal contamination by the effluents. 4. The waste waters are out of visual sight of the Mill, its response teams and could have days of non-compliant waste disposal before regulatory processes would require immediate shutdown of the proposed waste treatment system. This would be at the expense of fishermen, marine life and a valuable coastal zone area for tourists, residents and endangered marine mammals. Lastly 5. An Industrial Approval should not be considered but the Province of Nova Scotia for the continuing operations of Northern Pulp Nova Scotia Limited the Mill until the Mill replaces the existing kraft caustic digestion technology and implements a closed loop water pulping process such that there is little or no waste management issue, no need to dump waste process chemicals and spent waters into the marine environment of Pictou County, the Pictou Landing First Nations or the Strait of Northumberland. Sincerely, Chemist Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 62 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 26, 2019 11:18:55 PM

Project: replacement_effluent_treatment_facility_project Comments: Shut down the Mill #NOPIPE 300 jobs at the mill compared to thousands of jobs by the fishermen/fisherwomen and the sport fishing industry. What will come out at the end of the pipe will be terrible and should never be allowed.Northern Pulp had enough time to fix issues and they never did. Boat Harbour will happen again if they allow the pipe! For those who want the pipe-Go check out Boat Harbour and Please Drink the water from there and report back if you can!!! Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 54 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 27, 2019 10:21:38 AM

Project: replacement_effluent_treatment_facility_project Comments: Replacing an old treatment system with one state of the art is a no brainer. Keeping jobs and wealth in the province. Not doing it is like walking away from your home or city because you will not take responsible protective action on the environment. Any subsidy the province commits always comes back in new dollars to the economy. Lets do it!! Name: Email: @hotmail.com Address:

Privacy-Statement:

agree x: 77 y: 38

From:	live.ca
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	February 27, 2019 11:20:39 AM

Project: replacement_effluent_treatment_facility_project Comments: As residents of Pictou County wed like to address the serious issue affecting the local area and the broader province of NS in regards to the proposed Effluent Treatment Facility project put forth by Northern Pulp We feel confident that NP has carefully prepared, planned, studied in depth material for the proposal and the tests that theyâ?Tve been undergoing the past five years to meet environmental regulations, requirements, and scrutiny set forth by the province of NS to move forward with construction. Today we all are concerned about the various effects on our environment and have become skeptical of false truths passed on throughout the years that has made us very guarded. We strongly believe with all the studies, tests, preparations that this company has done, and millions of dollars spent since purchasing the mill that their seriousness, commitment to the project, and willingness to continually improve on this mill since becoming owners shows their dedicatio n in making the future of this mill and its effluent outfall one of present dayâ?Ts highest in technology. A five year deadline was set forth by government for the closure of Boat Hbr and timeline for NP to complete everything necessary to pass an environmental assessment, in essence this may have seemed ample time to achieve all crossed Tâ?Ts and dotted Iâ?Ts but with all considered the company was met with challenges from government with continued added criteria and challenges of interference when trying to fulfil the necessary studies to gather that information. There are many who are not in favour of an extension to Boat Hbr, and we all agree that a clean-up is necessary, effluent has been treated this way for fifty years and facts tell us that some of the best catches for fishers over the years have not been affected, an extension may be necessary for NP to complete scientific crucial detail for the effluent project they propose for continued operation of NP, and I hop e government, local groups, and community give consideration into a short term extension if needed. Very concerning is the fact that there are individuals and groups locally non-local on a crusade to shut down NP permanently regardless of the outcome of scientific tests results. Itâ?Ts ironic to hear comments coming from the government of PEI regarding our effluent when facts tell us that over 90 of nitrates in our strait comes from that province and as well the outfall from other industry waste water from towns travel through our rivers including Pictouâ?Ts to the Northumberland Strait. Our communities, neighbours, families, etc. have become divided in conflict due to lack of leadership within our boundaries of Pic.Co. N.S., political parties blaming each other, or anyone, when it was they all political parties who voted for a deadline, instead of the blame game they should be coming together for viable solutions resolution. There is a real concern for the many jobs in PC, rural NS, the entire province, and the more than 500 retirees of the pulp mill whose benefits and pensions may be impacted and disheartening to think about the many young families presently employed by NP and forestry who would undoubtedly have to leave our county and province in search of employment elsewhere to support their families and further jeopardize an already declining population and decreasing property value of land and homes in our county as well as the negative effect on business locally and provincially. Respectfully sincerely,

Name: Email: @live.ca Address

Privacy-Statement: agree x: 62 y: 17

From:
To: Environment Assessment Web Account; Friends of the Northumberland Strait
Subject: Northern Pulp"s EA of New ETF and Pipe
Date: February 27, 2019 12:30:44 PM
Attachments: "s letter.docx

24 Feb 19

Dear Environment Minister Margaret Miller,

I am writing to you about Northern Pulp's pipe that they want to build. I am nine years old from Central Caribou, NS. Please do not dismiss my letter because of my age. I have grown up on the beaches of Caribou and my cottage on Pictou Island. I have fished lobster with my grandfather and father every spring since I was four. My Great-grandfather, grandfather and father have all fished the same Pictou Island grounds that I would like to fish someday. Kids like Greta Thunberg are making grownups take climate change serious, if she can do that maybe I can do the same with this pipe idea, because it is serious, seriously bad.

I am asking you to not allow Northern Pulp to put their pipe in our ocean. It will make all the marine life swim away. People around the world are making changes and working to stop pollution, why would we allow this to happen to our beautiful beaches, to the animals and fish that live in the Northumberland Strait. We need to think forward not backwards.

In 4H I am doing a project on Sustainable Fishing Practices in Nova Scotia. While doing my project I have found lots of examples of fishermen, scientists and First Nations working together and coming up with ideas so there are still fish in the ocean in the future. Destroying their marine habitat with brown, hot, smelly water is not sustainable.

When I was at marine biology camp we did an experiment with oil on a feather and used Dawn soap to try and get it off like in the commercials. It was hard to get any of the oil off and in the end we weren't able to get it all. We were learning about a spill, an accident, this pipe will be pumping an unimaginable amount of pollution on purpose everyday into the ocean. This experiment also made me think about the Dawn commercial, using hurt ducks to sell their soap and it made me mad. I have to listen to Northern Pulp commercials everyday telling me how great they are, but just because it is in a commercial does not make it true.

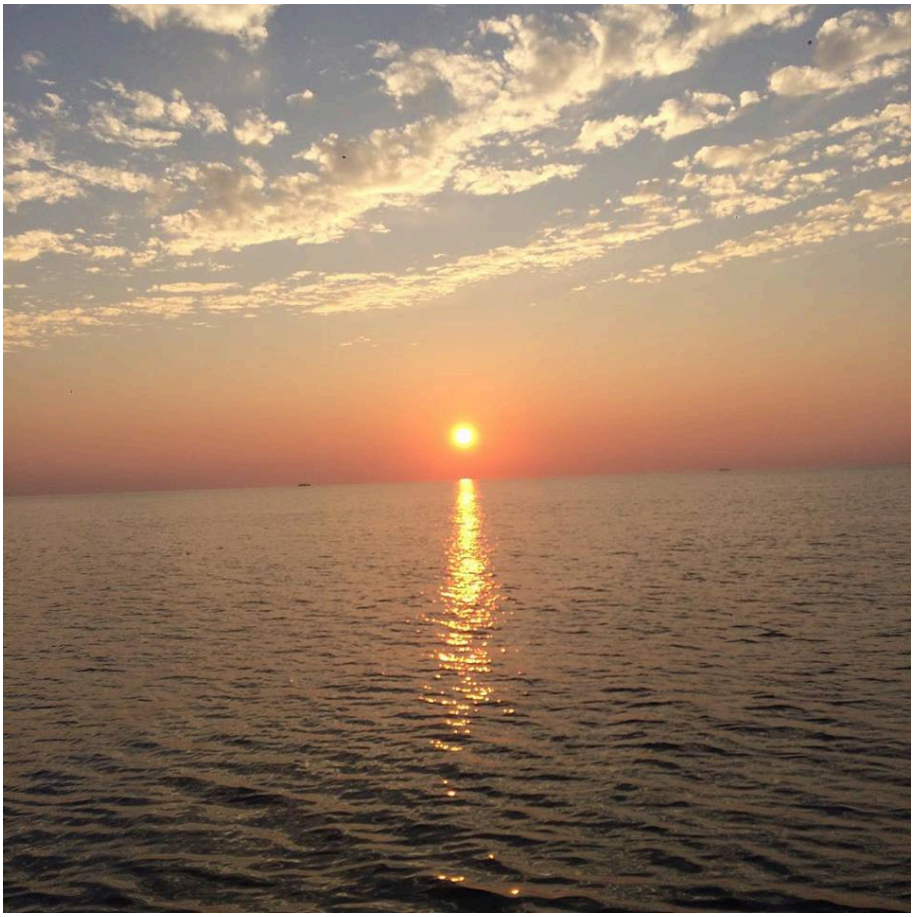
In school we talk about not littering, reduce, reuse and recycle. We learn about pollution and what we can do to help the Earth, but we are not allowed to talk about Northern Pulp even though some days when the wind is blowing the smog toward our school we have to play inside because the air hurts to breathe and it smells worse than dog farts. If you allow them to build their new system it will be burning sludge on top of what they burn now, it will be worse.

If you have ever played on a beach, ate seafood, enjoyed your day on a boat I want you to think about that when you make your decision, think about that and think about a nine year old in Caribou NS staring out at a new Boat Harbour.

Thank you for reading my letter,

Central Caribou NS

Don’t let this:



Become this:

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 27, 2019 3:26:01 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe that the installation of the effluent pipe will not be detrimental to the fishing industry. This system has been proven to work in other parts of the world with great success! I support this projec! Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 81 y: 10

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 28, 2019 3:51:15 AM

Project: replacement_effluent_treatment_facility_project Comments: I was born in Pictou and left in 1994, but still visit several times every year. I have spent many summers growing up on our Northumberland Strait beaches and lots of time onboard a fishing boat hauling in our lucrative lobster, scallop and herring catches as well as snow crab and tuna further down the shores. It is bad enough with the air pollution this pulp mill emits, with its faulty and outdated equipment, but now they want to continue to pollute our waters, so my focus will be on this aspect. There is a certain beauty out on the open water of our Northumberland Strait, which cannot be underestimated as to how long that could quickly disappear with such a waste proposal put forth by Northern Pulp. I am well informed on Northern Pulp and its predecessorsâ?T operations at Abercrombie Point, but more importantly Boat Harbor. The deceit which has taken place for over 50 years by our own government and the many pulp mill owners including NP, needs to come to a halt in January 2020. The Pictou and surrounding communities, especially Pictou Landing First Nation, need time to heal and recover from this worst case of environmental racism in Canadian history. To even consider putting a fresh water toxic effluent pipe from an outdated, broken down pulp mill, at the mouth of Caribou Harbor, which would run over water-sheds for drinking water to get there, and then into salt-water fishing / spawning grounds makes no sense at all in this day and age. I will not forget to mention this area is adjacent to Caribou - Munroeâ?Ts Island Provincial Beach Park, which locals and tourists visit on a regular basis, our very own historic Pictou Lodge and Waterside Beach. Also add our beautiful Pictou waterfront in the mix, and I just do not see any logic with wanting to jeopardize parts of Canadaâ?Ts Ocean Playground in favor of a foreign entity who has no real interest in long-term investment for our Province. If they did, there would have been other options available over the years to either change their pulp process or close the effluent loop, which we all know they can! It will be costly, but is there really a price on peopleâ?Ts health a nd lives with the way this pulp mill is running now?? To not do it, or provide a more environmentally friendly option, shows their level of commitment because from my understanding the only reason seems to be the almighty dollar! And that is their profit loss! Who needs bleached toilet paper and kleenex tissues nowadays when we know what is coming from this type of pulp-mill effluent process and into our air / waters? The further concerns I have are that Northern Pulp cannot even say what this discharge of so-called treated effluent will contain. What is the chemical composition and how much solids go with this daily discharge?? How can they not be 100 certain on this now but expect us to approve of their weak proposal to discharge it?? Are we seriously thinking pumping up to 60-90 million liters of heated fresh water into a salt-water environment will not do irreparable harm to our fisheries and aquatic lifestyle?? Where is the 1 ton of expected solids going to go, let alone the plume of effluent in our waterway? Dilution is simply not the solution to pollution nowadays. It is a known fact already that our oceans and waters are warming up at an alarming rate, and it is affecting marine life, so why does our Province want to contribute to what will be an ongoing daily activity?? Also, this is not new state of the art technology, regardless of what Northern Pulp wants to say. How this proposal went for Federal reviews already, but not this time around, further baffles me. What has changed from the last time this proposal was rejected due to suspected harm to our very important fishing industry, as well the environmental damage to our waters and coastline we have already witnessed and need to clean up now at the taxpayers expense? Furthermore, and it also came from your own dept, and regardless of what NP says again, this toxic effluent has NOT been pumped into the

Northumberland Strait for over 50 years! It is not heated fresh water, with solids going directly into OUR Strait. It has time to settle and cool in the Boat Harbour lagoons, before being released into the Strait. There is a dead zone around this discharge pipe as well, where the receiving waters look like Root Beer. So maybe we want to visit Boat Harbor once more in order to see what our tourists travelling on the Northumberland Ferries just might end up seeing. Surely they will want to get right off the ferry and go down and buy some lobsters off our local fishing boats, which I have seen so many do, and then continue their journey to Caribou Beach or Pictou Lodge and jump in the waterâ?¦â?¦Sorry for the sarcasm but it is a very realistic possibility our Strait will look like Boat Harbor and I would hate to see the outcome once it does . In closing, Boat Harbor needs to shut down in January 2020, and if still required this effluent proposal should go to go to a Federal Assessment, where our own Fisheries Dept. and scientists etc. can assess it instead of NPâ?Ts paid scientists. Thanks for your time in this very important matter to our communities, but more importantly our environment and the future of our children / grandchildren. Name: Email: @hotmail.com Address:
Postal-Code: NS Phone: Privacy-Statement: agree x: 67 y: 27

From:
To: Environment Assessment Web Account
Subject: Response comments to Northern Pulp EA Registration document
Date: February 28, 2019 1:11:31 PM
Attachments: Northern Pulp response comments.pdf

Hello,

Attached please find my letter containing thoughts and comments to this recent application for assessment approval by Northern Pulp Nova Scotia Corporation.
I believe in the interest of saving and conserving on paper product use, e-mailing the document would be a preferred method of communication.

Thank you very much for your favourable consideration in this regard,

February 28, 2019

Dear esteemed protectors of Nova Scotia,

This Northern Pulp Nova Scotia (NPNS) Environmental Assessment Registration Document totals 1698 pages, including those in the 14 Appendices. The public has a minimal 30 day window of opportunity to read, research and respond to this overwhelmingly-lengthy report. To recognize that the provincial taxes I trustingly pay are used to grant Northern Pulp funds, from the sweat of my labour, to use and abuse in this manner, is extremely disheartening. **Please invest my money in providing exemplary health care services for all Nova Scotia residents instead.**

NPNS's prepared EA report is guilty of using repetitive jargon as a red herring to cover up hypocrisy throughout. That is interpreted to be an intentionally intimidating waste of time - mine and yours! Pertinent information stated well the first time would be adequately convincing. What is not being said, deceitfully hidden within this vast maze of hedged wording, is factually the most relevant and potentially frightening.

When that many words are deemed necessary to describe a project, common sense would dictate it is nothing more than an elaborate fast talking scheme to sell an idea they also know is terrible. If this project had actual feasibility and merit, these words would not have to work so hard to sell it.

What experience credentials does this company actually have for a project construction of this magnitude? This mill's parent company usually takes over existing mills already in operation do they not? What they are proposing will waste a colossal amount of money if attempts fail. It will take at least 3 to 4 years, if not 5 or 6 years (given their procrastination tendencies) to complete during the weather-dependant working months offered by our Maritime climate.

Have they addressed the risk for project interference with the Bell Aliant fibre optic telecommunications submarine cable running from Caribou to Wood Islands, PEI? Telecommunications is a lucrative industry for Nova Scotia.

Northumberland Strait waters are relatively shallow depths. Is there adequate volume to use this disposal at sea method? Disposal at sea is prohibited without a permit issued by the Environment and Climate Change Canada (ECCC) Disposal at Sea Program under the Canadian Environmental Protection Act, 1999 (CEPA). Pulp and paper effluent wastewater is not listed in the applicable substances list on Schedule 5 of CEPA for eligible consideration.Without appropriate depth, would effluent waste debris of significant proportions continually rise to the water surface, washing inland with each rising tide and winter ice?

- Nova Scotia, Canada's Ocean Playground, is surrounded by more than 7,500 kms of ocean coastline. Anywhere in the province you are never more than 56 kms or an hour's drive from ocean access.

- Promoting environmental protection from pollution for these coastal water resources is crucial as sea levels steadily rise each year.

- Compromising the vulnerable integrity of Northumberland Strait waters and coastline with pulp and paper mill effluent wastewater containing unspecified chemicals of potential concern (COPCs) would prove to be fateful.

I've selected a couple of section details to comment on. I hope these will serve to convey my grave concerns about this entire matter. Also included is an article researched from the Pulp and Paper Canada Newsletter website:

Table 1.1-1: List of PIDs Involved in the Proposed Project

- Federal agency approval will be necessary for use of the four outlined properties belonging to Her Majesty the Queen (Canada).

- Risk of jeopardizing an entire marine environment in the Northumberland Strait will warrant conscientious federal consideration under the CEPA.

- Basin Head on the eastern end of PEI is a federal Marine Protected Area (MPA). It is highly plausible to expect large volumes of industrial contaminants, with COPC characteristics, released daily from adjacent NS shorelines will affect the unique ecosystem of that MPA.

Section 9.0 Human Health Evaluation

Preface

[paragraph 2]...Health Canada clearly communicated their position that a human health risk assessment (HHRA) of the project would need to be considered

NPNS states an HHRA is not needed unless specified as a condition once approval has been signed. Statistics are quoted from an HHRA prepared for a pulp mill proposal located in Tasmania on the other side of the equator? It bears noting, that mill never received approval to operate due to environmental concerns. There are bound to be significant differences between health challenges faced in that Eastern Hemisphere country than we experience here in the Northern Hemisphere. For instance, Tasmania claims to have the cleanest air in the world. Not exactly something Pictou and surrounding counties can boast with ongoing problematic putrid emissions from this aged pulp mill.

I believe NPNS shows serious contempt for all public health and well-being, not only of local, provincial or even federal consumers but that of every international seafood consumer as well. Potential for industrial activities to also impact global health warrants mandatory federal health agency involvement. Popular Nova Scotia seafood is a multi-billion dollar commercial export industry. But do you recall how one mad cow incident in Western Canada shut down all international borders for Canadian beef exports? One contaminated lobster from Nova Scotia could very well cause an international crash for all Nova Scotia provincial seafood markets - not just those located in Pictou County.

9.1 Introduction and Background

[paragraph 3] *At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty* ***until the project is operational****.*

9.1.1 Canada Health Consultation

[paragraph 1; bullet ix] *Including a reasonably well defined characterization of likely effluent chemistry that represents a conservative prediction of the chemicals that may be present in effluent discharge.*

[paragraph 3] *With respect to item ix above, there remains uncertainty at this time regarding the specific chemical parameters that will be present in the project's treated effluent (and their concentrations).*

9.2.4.2 Identification of Candidate COPCs in Treated Mill Effluent

[paragraph 3] *Due to uncertainty regarding effluent composition and approximate concentrations of substances present in the future treated effluent (which will not be verified* ***until the project is operational****)*

Evident throughout this entire document, the repetitive phrase, **"*until the project is operational*"** reads similar to a blackmail extortion attempt.....NPNS is essentially saying, "sign over approval for us to operate before we will release the identity of the chemicals that will be present." They are literally holding human health hostage!

It is disappointing not to see compiled data of accurate chemical identification from Northern Pulp scientists and chemists that presumably would be employed on site and responsible for daily monitoring of this effluent treatment system. Working with toxic substances used in this pulping process, they should be able to knowledgeably provide the characteristics for these COPCs. Why outsource that necessary information from other mills and outside agencies? How can they claim uncertainty about something they've certainly been creating and using for years?

Section 14.0 Assessment Summary and Conclusion

[paragraph 2] *The continued operation of the NPNS mill is essential to meet global market demands.....*

A quick Google search of pulp and paper mills, just in Canada alone, indicates a total of at least 30 mills. Social sourcing for renewable sustainable products is trending for conscientious consumers concerned about the devastating environmental impacts these mills create. There will be better, more earth-friendly products sourced, produced and manufactured in the very near future. A smart investor would be encouraged to give serious consideration to those long-range plans rather than continuing to provide huge financial crutches for this aged mill to keep limping along on.

If the global market has the high demand they claim, why is NP not able to generate enough revenue to support their own projects? Perhaps there is already too much competition within this sector of the business market?

https://www.pulpandpapercanada.com/news/feds-provide-update-on-forthcoming-pulp-and-paper-effluent-regulations-1100001557 **{*Pulp and Paper Canada, February 4, 2019*}** The federal government has delivered an update on the new pollution regulations it is developing for pulp and paper mills.

The new regulations would set more stringent standards on the level of contaminants allowed in pulp mill wastewater. The effluent makeup has changed with the introduction of new technologies, officials say.

The Northern Pulp mill would be subject to these new regulations if it is to meet the Nova Scotia government's January 2020 deadline to move its effluent drainage pipeline off the Pictou Landing First Nations reserve.

The second round of consultations for the new pulp and paper mill regulations will not occur until early 2020. ***{by PPC staff}***

Questions arising from the afore-mentioned EA sections and the Pulp and Paper Canada article:

- Does NPNS have ulterior motive for attempting to fast track this project in advance of new Canadian pollution regulations coming into effect?
- Is it possible NPNS will qualify to claim exemption from these new regulations if the construction process receives conditional approval and begins prior to these regulations coming into effect?
- Is your Department confident any effluent treatment system financially invested in now will have the capabilities to handle these future stringent federal standards?
- Or will N.S. taxpayer funds be drained yet again for costly future upgrades to technology installed now that does not meet those revised standards?
- Do these new technologies referred to actually require more caustic chemical compounds which affect the effluent makeup?
- In this EA, consultants frequently weave the phrase "uncertainty regarding effluent chemistry characteristics" throughout the daunting web of word entanglements. Would that expressed lack of conclusive information by a company who has been in this industry for so long be cause for questionable concern within your department?
- Is it deemed professionally acceptable in the pulp and paper industry to withhold revealing accurate effluent chemistry characteristics to environment government officials? Would that be deemed acceptable practice by N.S. environmental laws and regulations?
- Is it conceivable that NPNS is deliberately stalling or withholding facts on correctly identifying these effluent chemical characteristics in order to be able to claim compliance - only after they know what the new acceptable Canadian standards are going to be? Deemed a highly suspicious and contentious practice.
- Would common sense and logic dictate that astute financial investors, like the Nova Scotia government, adopt a practical approach of first determining what the pollution limitation guidelines are going to be before sinking further taxpayer monies into an environmentally sensitive project of this magnitude?

- How long must we, the taxpayers, be expected to keep throwing good money after bad into this aged pulp and paper mill that long ago ceased to be an environmentally-conscious asset by Canadian federal standards? **Again, I ask that my taxes be used to provide exemplary health care services for all Nova Scotia residents instead**. The pulp and paper industry is a highly competitive market - human health care should not be!
- How many mill jobs will actually be phased out and eliminated after being replaced by upgraded modern technology?

At the expense of many, I believe, NPNS is seeking permission to wash away any and all industrial waste woes to sea solely for their own corporate economic convenience and advancement.

I fear this metaphorical Pandora's Box pipeline carrying effluent wastewater will unleash residual effects into the Northumberland Strait that can never be reined back in. Irreparable and irreversible damage will wreak havoc in Canadian waters. Hope was the only remaining symbolism left in Pandora's box before it closed. Thus, it is my fervent hope lessons learned from using Boat Harbour for effluent treatment and the subsequent catastrophic effects will not be in vain when that facility is shut down on January 31, 2020.

In closing, I offer this trademark quote printed in each issue of SALTSCAPES magazine:
"Some would make us just names on a list. But we are people in a place - and resist."

Respectfully submitted,

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: February 28, 2019 9:34:38 PM

Project: replacement_effluent_treatment_facility_project Comments: We as residents of Pictou County, living in New Glasgow and owning property along the Northumberland Strait, have the following concerns re the proposed Northern Pulp waste solution for its effluent that currently goes into Boat Harbour. Pumping the effluent into the Northumberland Strait is an environmental time bomb with no possible method of containment or cleanup. We need to have buy in from N,S. , PEI, N.B. and Quebec, as the waters of the Northumberland Strait and the Gulf of Saint Lawrence affect us all. The fishermen of all of these provinces will be affected if there is a consumer backlash against fish being marketed from polluted waters. This industry is worth millions of dollars and is a federal responsibility. The fact that our Native nations are affected, as well as the fisheries and many provinces, should make the case that this situation calls for a full federal government environmental assessment. Tourism will be further affected as we already have seen the impact on the town of Pictou with the existing smell from the Northern Pulp plant with the impact of the discharge location near the Caribou Ferry Terminal connecting us with Prince Edward Island. This terminal is a major tourism entry point into our county of Pictou. Who will be excited to go into the waters to swim, kayak,etc around this area when they know that possibly there could be pollution from a pulp mill in the water? This proposal will affect tourism. The visibility of such a pipe along the Pictou causeway or anywhere along the Trans Canada Highway connector to the Caribou Ferry Terminal will be a clear negative to our tourism image. Our tourism industry is worth millions of dollars. There is no guarantee that a waste pipe going alongside the Pictou Causeway will not be punctured at some point due to a car or transport truck leaving the road. If punctured, Pictou Harbour will be affected and there is no containment possibility. Other points that are of concern to us from the Northern Pulp proposal are as follows: The waste proposal poses major risk to harming marine life , marine habitat, species at risk/endangered/threatened that include migratory and marine birds, fish, vegetation, reptiles etc. The proposal goes through the Pictou town and Caribou water supply. A provincial park and a nature preserve are within the effluent pipe footprint Meeting Pulp and Paper Effluent Regulations PPER doesnâ?Tt prevent harm to marine life or marine habitat per Environment Canada. The chemical characteristics of the proposed effluent is â?ounknownâ? to Northern Pulp. The proposal shows the plan to burn the toxic sludge in the power boiler. Air emissions are an issue today and health issues are already known to be above provincial averages today in Pictou County. The proposed spill basin on the plant site is planned to only hold 35 million litres of untreated effluent which is only 10-12 hrs of plant operation before it goes into the downstream system. If a malfunction happens where does the excess go? The proposal also lists temporary and permanent closures for fishermen around the outflow area and to create a no anchor zone. The proposed O2 delignification system is not laid out regarding how or when it will be constructed or maintained. It is listed in the appendix of the proposal as a â?ofuture upgradeâ? . This should have to be defined now and not in the future. The Waste proposal will be pumping effluent into the ocean after only processing it for 8 hours as opposed to the current waste system that takes about 30 days to process and reach the Strait. The Nova Scotia provincial government has many conflicts of interest going back decades between itself and the mill and should not be involved in the environmental assessment and the approval/rejection of a Boat Harbour Effluent Treatment Replacement Solution. We would like all of these points to be considered and strongly suggest that a Federal Environmental Assessment is necessary. Name: Email: @hotmail.com Address:

Privacy-

Statement: agree x: 39 y: 21

Dear Minister of Environment

I am writing this letter concerning the Northern Pulp Environmental Assessment on replacing the effluent pipe . My name is , I'm a fourth generation commercial fishermen and have owned my own fishing enterprise since 10 years .I strongly object to this project , the release of up to 90 million liters of effluent into any body of water is un-acceptable! The chemicals and the freshwater being released into salt water will cause adverse effects on the marine environment an on all fish stocks in the area that can Not be mitigated

In closing I urge you to REJECT this project !!!

From: @ledwidgelumber.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 10:01:36 AM

Project: replacement_effluent_treatment_facility_project Comments: I support this project as I feel the quantity and quality of studies done proves the validity of the science that this project is environmentally sound. There is no valid scientific reason it should not be approved. Name: Email: @ledwidgelumber.com Address:

:

Privacy-Statement: agree x: 55 y: 18

From: @ledwidgelumber.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 10:59:35 AM

Project: replacement_effluent_treatment_facility_project Comments: I support the Northern Pulp project and believe the science proves the validity of it. Name: Email: @ledwidgelumber.com Address:

: Privacy-Statement: agree

x: 39 y: 25

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 11:08:15 AM

Project: replacement_effluent_treatment_facility_project Comments: I support this project proposed by Northern Pulp. Name: Email: Address:

Privacy-Statement: agree x: 52 y: 31

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 11:32:51 AM

Project: replacement_effluent_treatment_facility_project Comments: I support this project as proposed by Northern Pulp Name: Email: @hotmail.com Address: Municipality:

Privacy-Statement: agree x: 68 y: 17

N.S. ENVIRONMENT
ENVIRONMENT
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MAR 0 1 2019
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@ns.sympatico.ca

February 23rd, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O.Box 442
Halifax, N.S.
B3J 2P8

Dear Sirs;

Re: **Northern Pulp Replacement Effluent Treatment Facility Project**

I have read through the project documents and have the following concerns:

In section 8 I have concerns about floatation of the underwater pipe if the slope is not uniform. I do raise serious concerns about how to detect leakage on the underwater portion of the pipe. Once the pipe is in service, nothing short of plugging the diffusers would allow any testing for leaks from the underwater based part. There is also no real ability to sample at the diffusers to get a real effluent test. Sampling in the Northumberland Strait would leave all kinds of room for argument about the effluent albeit from the plant. One item on the land based part of the pipe that really disturbs me is air release valves on the high points. These would be likely something like 4 inch openings and such valves do stick open occasionally. When that happens, then the drain point often goes unnoticed in a ditch or field for some time. If such a drain happens to be in the Pictou Water Supply area, then the situation could be serious.

In section 10.0 there is a statement that HDPE is not susceptible to thermal expansion like steel pipe. THAT IS FALSE. For example, on a 10 degree Fahrenheit temperature change, the 4.1 km section underwater would change 11 feet in length. The seasonal seawater change is more than that. Therefore, expansion does need attention. Repairing a leak in a 3 foot diameter pipe on land is a significant exercise. Repairing a leak underwater, after a difficult job of finding the leak, is even more significant.

Section 12.3.9.3 says that the plume from the diffuser will reach the surface but will not be visible. That statement is questionable.

Appendix J1 Part 2 on testing for urchins in Boat Harbour makes me wonder. Boat Harbour is presently fresh water or effluent but not salt water. How can it be salt water at this time?

The documents seem to tell me that the intention is to keep the Mill operating as a bleached kraft pulp mill. This is my greatest concern. The appetite for wood has resulted in the depletion of

supply within a 200 km radius. The process itself requires about 2 cords of wood to make a ton of pulp. Having been around when the Scott mill was built and seen the forests of the day, I am appalled with what has grown since the first clear cuts were made for supply. Too much fir has come back and it is now reaching the end of its life cycle without becoming really useful because it has never been thinned to allow it to grow. Dead fir does not make good pulp. Maybe right now with the dollar at a 25% premium for sales trucking long distances makes sense but if the dollar is par, things will be different even with lumber that is cut in trying to get chips from the slabs. Maybe if the pulp were made into paper on site, then the added value would justify the new treatment but the present system is doubtful.

Before Northern Pulp or the people of Nova Scotia spend as much or more on a treatment plant as Northern paid for the mill in the first place, we should all consider whether or not to continue or to abandon. Just the power required for treatment, whether in Boat Harbour or in the new treatment system would pay the wages of quite a number of people. Considering the fact that we have to pay for the Boat Harbour cleanup anyway and considering that we share in expenses and not profits from the mill, it is time to cut our losses. Too many vibrant communities have been ruined already. I will name Parrsboro, Advocate, Mooseland, and White Rock just to name a few.

Further to this, the reports submitted do not include a good cost accounting of the operation. Too much of the input is for transportation of raw material and a lot is for transportation of the finished material. Not enough is spent on restoration of the lands, company owned, crown land and private land that have been harvested. There are too many costs unknown to us all, kept secret by both company and government. On that basis alone, it is good time to quit. Give our young people a clear slate to figure out. And hopefully one where they can share the profits.

I would strongly recommend that the mill itself cease to operate, at least as a kraft mill.

Thank you

Honorable Margaret Miller
Minister of Environment,
Government of Nova Scotia

Environmental Assessment Branch
Nova Scotia Environment
PO Box 442 Halifax, NS
B3J 2P8

February 25, 2019

Re: Replacement Effluent Treatment Facility Project-Northern Pulp, NS Corp.

Madam,

We are writing as present Pictou residents and former home owners in the Carbou Island area of Nova Scotia, very near the site of Northern Pulp's proposed discharge of its effluent material. We are active residents who enjoy fully the environmental life of this part of Northern Nova Scotia from the recreational persuits of walking, biking, swimming, sailing and kayaking on and around Pictou Harbour and the Caribou Harbour areas, to the pride we have in the area as a viable environment in which we can continue to thrive and in which other generations will buy and build homes, settle and raise children and continue to enjoy the wonderful and close communiity that has been built here over the years. We feel strongly as members of this great county that the proposal put forward by Northern Pulp is flawed in a number of ways and should not be considered as a way forward for this mill. This pipe proposal should be denied as it has the potential to "...damage or change the environment in a manner that negatively affects aspects of human (and marine) health".

We have long lived with the air pollution caused by the mill over that past 50 plus years and felt this was a very high cost for the economic life of the community, as said air quality has been thought by some studies to cause many of the lung, heart and other health issues of those in this county. In recent years we have looked with horror at the conditions at Boat Harbour, its affect on wildlife and on the indigenous peoples of Pictou Landing First Nation. We have been very gratified to learn that there will be restoration there for the land and waterways with the clean-up porposed to begin next January. The air pollution continues....

In the Executive Summary of the proposal, Northern Pulp suggests that there will be "no significant" affects of the effluent from the pipe on Fish, Fish Habitat, Flora, Sediment Quality or on the Social and Economic Environment in and around Caribou Harbour and

the Northumberland Strait. It is hard to beleive that they could proport this without any understanding of how much of the solids, how much silt, what smell, what measure of 'plume' or what temperature of water will be issued from the end of the pipe on any given day and what effects each will have. Water temperature and effluent will affect the fish/lobster/oyster/ life of the immediate water area and the fishing industry as a whole, including licences for shell fish just off shore. The changes in water color, and the sight and smell of waste will affect land and property values, even passenger service on the Norhtumberland Ferry during the summer months has the potential to be affected. The water pollution affecting fish and wildlife habitat, especially migrating birds such as heron and small shore birds and the seal population living close to Caribou Island and Pictou Island a good deal of the year is vast. The human recreational and tourism costs of loss of swimming, boating and recreation in the area including many parks and public beaches could reach millions of dollars of revenue to the community just by the fact that tourists would know that the effluent is being relased into the area. With solid and or silt effluent the very currents may be changed by this accumulating effluent on the Harbour bottom.

Tens of thousands of litres of effluent will be flushed into Caribou Harbour and the Northumberland Strait daily without an affective monitoring system applicable to either land or water useage. This company has yet to develop any monitoring system that speaks to long term assessment and when Northern Pulp says that it will have a sytem in place to "adapt long term to changing conditions" we are skeptical, as we have seen what the mill has done over the years in Boat Harbour. We are concerned as well about the life of the pipe itself overland or in some places a few feet underground as it follows the #106 to the sea and how this may affect our land masses, transportation and most importantly our Pictou Watershed.

The proposal of a "new" program on the mill site for dealing with solids does not sit well with us as we wonder how they will be handled in the short and long term. Will burning some of the remaining solids add to the air pollution we are now exposed to daily? Will they end up in the effluent as sludge and further pollute the waterways in Caribou Harbour? Will they be buried and how will that affect the health of indiviuals who live in the area and work on site? The trust is thin on this issue as you can imagine.

Therefore, for these reasons we oppose the Pipline Proposal and suggest a more extensive study to ameliorate the concerns we and many others in the area have about this proposal. We beleive strongly that a Full Environmental Assessment is necessary for the continued health and safety of the environment in Pictou County.

We thank you for your time and attention to our concerns as citizens of Nova Scotia.

We would appreciate an acknowlegement of this letter,

Most sincerelv.

Pictou, Nova Scotia

From:
To: Environment Assessment Web Account
Subject: Northern Pulps EA for the treatment facility
Date: March 1, 2019 4:37:04 PM

I would like to see this project move ahead as quickly as possible.

Sent from my iPad

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 5:00:03 PM

Project: replacement_effluent_treatment_facility_project Comments: As a resident of Pictou County, a woodlot owner, a professional engineer, and a person familiar with the technology behind the proposed treatment facility, I would really hope that reason and sound scientific analysis prevails over emotion. The proposed facility is not a threat to the environment or to the fishery. It is time for local politicians and residents to stand together and do the right thing. Baseless emotional arguments unchallenged have the potential to devastate the Pictou County economy. Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 51 y: 28

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 1, 2019 7:36:02 PM

Project: replacement_effluent_treatment_facility_project Comments: I feel the project should go forward if the science says there will be no adverse effects of the discharge line. There should be an extension given for the use of Boat Harbour. The way I look at it is why shut the forestry sector down when the present owners of Northern Pulp are committed to the project. If the effluent line cannot go where the assessment wants it to go there should be an extension granted until a discharge place is found. It would be foolish to shut down the forestry sector. This project is a massive undertaking and if the government was doing it, it would take way more than 5 years to complete. Actually Northern Pulp and the government took the first year plus just to hammer out the industrial approval that Northern Pulp could operate under. Has there been any effects elsewhere where discharge lines enter waterways. Will all Federal and Provincial Regulations be met. Why am I so concerned:1 I have and still am working in the forest industry for 30 years:2 My brother has and still is working in the forest industry for 35 years:3 My father worked and actually still does part time for 40 years:4 Many friends and other relatives work in both the forestry and fishing sectors:5 We raised and are raising our families here and dont want to leave:6 We work full time and pay taxes to support the social system. This must be based on science not Fear mongering and Here say and Northern Pulp must be given the chance to proceed with this project without any interference of any partiesfishermen Blockading this just puts projects behind. My final note is that if Northern Pulp closes the Nova Scotia economy with be devastated. Many people will move away. This isnt just the workers in the sector. This means families as well. I just hope everyone will work together for the better of Nova Scotia. Thank You. Name: Email: Address:

Privacy-Statement: agree x: 42 y: 22

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 8:54:43 PM

Project: replacement_effluent_treatment_facility_project Comments: This treatment facility is the same as the most modern facility used at many mills in both Canada and the USA. Diffusing the treatment wastewater this is more correct then affluent as once chemicals are removed there are only the mineral residues from wood which occur naturally left into the massive water body of the Northumland Strait and the current flow there will disperse the wastewater and dilute it and make the effect marginalized almost immediately. This is a good system and proven treatment facility and pipeline method that should be approved by Department of Environment. Class 1 EA is appropriate as this is a replacement of an existing system in an existing facility. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 79 y: 31

From: @dal.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 9:24:24 PM

Project: replacement_effluent_treatment_facility_project Comments: This project must be approved. This needs to happen for the sustainment of rural life in Nova Scotia. The NIMBY effect in NS is decimating rural life and eliminating resource jobs that provide quality pay and a good standard of living. The products that you use everyday are either farmed or come from the ground. Why do Canadians feel that we are so privileged that we donâ?Tt require the resource industries that supply us with everyday items? That just leads to a shift in resource extraction to poorer countries with less than adequate environmental and safety standards that are truly putting people at risk. Canada has some of the highest environmental standards in the world. We should be proud of our resource industries, not trying to end it. Name:
Email: @dal.ca Address:
: Privacy-
Statement: agree x: 70 y: 27

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 1, 2019 10:02:21 PM

Project: replacement_effluent_treatment_facility_project Comments: In favour of the plant Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 63 y: 17

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 3, 2019 12:03:46 PM

Project: replacement_effluent_treatment_facility_project Comments: From all the information I have read on the subject and the years I have spent living in the Pictou County area.I feel that the proposed pipe would do the beautiful Northumberland Strait life long damage to marine life and the total environment.I appose this pipe. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 43 y: 16

From: @dal.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 3, 2019 4:21:58 PM

Project: replacement_effluent_treatment_facility_project Comments: I am a first year student at Dalhousie University. I have lived in Pictou, Nova Scotia my entire life. I am writing to explain why there should be an expansion for the effluent treatment plan for Northern Pulp. My dad is a dedicated employee at Northern Pulp and he has worked there for the past ten years. His job at Northern Pulp was and still is our primary income within our household. A large amount of funding for my university program and living has come from my fathers income. My first year of university costed our family over . It scares me to hear that Northern Pulp could possibly be shutting down in the following year as it would leave me without funding. I know that I am not the only student going through this possibly devastating news because there are many students within the county that are experiencing the same issue. Not only does my father work at Northern Pulp, but my uncle has worked in the forestry industry for 35 years. My grandfather has also worked in the forestry industry but for over 45 years. As a student who was planning to graduate and move back home to work, I am extremely scared of what is going to become of Nova Scotia, especially Pictou County. It is from my understanding that if Northern Pulp closes in the upcoming year, it will cause a domino effect in all other forestry jobs within Nova Scotia. Northern Pulp closing means that there will be no jobs for not only mill workers, but also little to no jobs for the truck drivers transporting wood/chips and workers initially cutting the wood in saw mills. If this large group of people is no longer having this primary income to spend, then there will be less money to spend on local businesses. I know for a fact that Northern Pulp employees spend a great chunk of their paycheck on goods in local businesses. It is very possible that some of these local businesses would close as well as a result of Northern Pulp closing. Since there are very little good paying jobs in Pictou County, this will force people to m ove elsewhere to find work. From what I have heard, Northern Pulp employees would like to move out west to find a good enough pay job if Northern Pulp closes. I am one of twelve students in my first year of at Dalhousie University. It is a demanding program, but I honestly love who I am becoming. It is from my understanding that are in high demand right now as there is a greater population that is aging as I write this. As I sit in the classroom, I start to wonder what my hometown will be like when I graduate. If my community becomes a ghost town, will I want to come home to work? And if I do want to come home to work, will there still be a job for me here? If people and their families are moving away to find work, that means there will be a smaller population of people for me as a health care professional to treat. Therefore, less will be hired to work. I strongly believe that the project should go forward if the science reveals that there will be no adverse effects due to the discharge line. If the effluent line cannot go where the assessment wants it to go, there should be an extension granted until a discharge place is found. The present owners of Northern Pulp are committed to the project. I just wish that everyone could work together and find a solution that is best for everyone. At this point in time, the best way for everyone to work together would be extending the deadline. In conclusion, Northern Pulp closing its doors would truly be devastating for everyone in Nova Scotia, including myself. So many families will be forced to move elsewhere in the country to find a good source of income. I honestly donâ?Tt know how I will be paying my way through university next year if dad loses his job. This cares me every time I think about it. Some people may say â?oOh but you did/will receive scholarships to pay your way throughâ? . The scholarships that I received at my high school graduation did not even pay for half of my cost to go to school this

year. Thank you for reading. Name: Email: @dal.ca Address:

Privacy-

Statement: agree x: 67 y: 26

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Treatment Proposal
Date: March 3, 2019 5:58:58 PM

Dear Honorable Minister,
I am writing to support the request from fishermen's organizations from Nova Scotia, New Brunswick, Prince Edward Island and Pictou Landing First Nations to have Northern Pulp's Effluent Treatment Project designated a project for a Federal Environmental Assessment under Section 14 of the Canadian Environment Assessment Act (CEAA) 2012.
I have been a life long resident of Pictou County and have lived in the town of Pictou for the past 40 years. I taught school for many years and raised a family in the town of Pictou. I have been following closely the media coverage of the Northern Pulp situation.
I fully support the fishermen of Nova Scotia, New Brunswick, Prince Edward Island, and the Pictou Landing First Nations residents. I am concerned about the impact the proposed effluent pipe will have on fish and fish habitats in the Northumberland Strait. I feel a full Environmental Class 2 Assessment is needed to fully address the concerns of the fishermen, the Pictou Landing First Nations residents and the citizens of Pictou County.
My family has had close ties to the Northumberland Strait spending our summers enjoying the warm waters and beautiful beaches. What will happen if this proposed pipe ruins the waters and in doing so ruins our very lucrative fisheries and tourism industries that rely on the Northumberland Strait?
As a resident of Pictou I am concerned about the proposed pipe extending through our watershed area. I have the following questions:
What will happen when this pipe leaks?
What contingency plan will be put in place for the eventuality of a leak?
What effect will a leak have on our health?
What monitoring system will be put into place to detect a leak? Past effluent leaks from the Northern Pulp Mill to Boat Harbour have been detected by local residents. That is unacceptable.
My lives within a kilometre of this proposed pipe and she uses a well. How will her water supply be effected when there is a leak?
I ask that you recommend a Federal Environmental Class 2 Assessment be completed regarding this proposed effluent pipe plan.
Thank you for your time and consideration of this issue.
Yours truly,

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 3, 2019 6:00:46 PM

Project: replacement_effluent_treatment_facility_project Comments: As a woodlot owner and employer of over 100 people in NS. I am very concerned that our governments may take a hard line with Northern Pulp to appease many who have no direct or indirect involvement with this issue at the expense of our tax dollars and the long-term success of our lumber industry in the province. There is NO CONDITION upon which it is acceptable to force closure in favor of granting additional time for resolution without harm to the industry. I like many are in favor of a balanced environmentally, financially and socially acceptable resolutions if possible in the long-term. Name: Email: Address:

: Privacy-Statement: agree x: 64 y: 27

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 3, 2019 7:03:18 PM

Project: replacement_effluent_treatment_facility_project Comments: I do not agree with the effluent pipeline discharging into the Norththumberland Strait! An on-land solution is required. Name: Email: @hotmail.ca Address:

Privacy-Statement: agree x: 61 y: 22

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent pipe
Date: March 3, 2019 8:37:04 PM

I am writing to support the request from fishermen's organizations from NS, NB, PEI, and Pictou landing First Nations to have Northern Pulp effluent treatment project designated a project for federal environmental assessment under section 14 of the Canadian environmental assessment act. (CEAA) 2012.
I am a lifelong resident of the town of Pictou. A great deal of my summer days as a kid were spent enjoying the waters and beaches of the Northumberland Strait and as an adult I spent many summers sailing those beautiful waters. I've eaten clams, oysters, smelts, mackerel, and lobsters from the Northumberland strait. Now all that and much more is threatened with the proposed effluent pipe from Northern Pulp. I would like to know:
1) What chemicals are in the effluent?
2) What affect will these chemicals have both in the long and short term on the fish stocks in the strait?
3) Pictou's domestic water is supplied by numerous deep wells through which the proposed effluent pipe will pass. What steps are being proposed to protect this water supply?
4) What affect will mill effluent in the strait have on tourism?
5) Who is going to monitor the affects of a pipe and how will it be monitored?
6) With so much at stake and with so much distrust created over the years with this mill, it should be apparent that nothing less than a federal assessment is needed. Why is it not being recommended?
It is for questions like those I have asked above that I feel a class 2 federal environmental assessment.

Thank you for your time.

0
@eastlink.ca

From: @me.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 3, 2019 9:47:20 PM

Project: replacement_effluent_treatment_facility_project Comments: The scope of this project requires a federal environmental assessment, and at the very least, a class 2 assessment. A class 1 assessment is insufficient and would be a failure to our First Nations community, the environment, maritime tourism, maritime fishermen, and other businesses affected by the many negative spinoffs. Please do not move forward without adequate due diligence. Name: Email: @me.com Address:

Privacy-

Statement: agree x: 82 y: 35

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 1:50:30 AM

Project: replacement_effluent_treatment_facility_project Comments: I am against this project for the following reasons. It is not an improvement on the existing system which will cost millions to remediate Boat Harbour Dilution is not a solution Any level of effluent is too much to be discharged into the Straight The effluent contains heavy metals and other pollutants if it will damage the mill as stated it will damage the ocean The only reason that this system has been chosen over other more advanced systems is that it keeps the mill profitable Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 76 y: 9

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 6:13:03 AM

Project: replacement_effluent_treatment_facility_project Comments: This is not environmentallying wise and should never allowed to occur. Name: Email: @gmail.com Address:

: Privacy-

Statement: agree x: 49 y: 18

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 7:05:55 AM

Project: replacement_effluent_treatment_facility_project Comments: We need Northern to continue operating to protect our integrated forestry industry. We should extend the operating license to accommodate a full and complete environmental assessment and then implement the new affluent distribution system if it is approved. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x:

81 y: 17

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 7:46:10 AM

Project: replacement_effluent_treatment_facility_project Comments: When there is a on shore breeze Chance Harbour, you can go into the water, up to your knees and not see your feet, no swimming for the kids when the water is this dirty. 30 years Name: Email: @eastlink.ca Address:

: Privacy-

Statement: agree x: 50 y: 26

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 8:15:00 AM

Project: replacement_effluent_treatment_facility_project Comments: Comments to Northern Pulpâ?Ts Environmental Assessment for the Replacement Effluent Treatment Facility Project My name is and I am the current owner of property in Chance Harbour held in our family for over a century. The property borders the Northumberland Strait a few east of MacKenzie Head and approximately meters from the mouth of Boat Harbour as the crow flies. I am years old and I am quite familiar with the impact Boat Harbour has on our shore line prior to and after the effluent treatment facility EFT was installed. I also see the results of improvements made to the EFT over the past 50 years. Even though the aesthetics of the shoreline in front of my property may improve, there are more important environmental issues at stake. I welcome the closure of Boat Harbour as an ETF however, I have concerns about the rush to approve and implement a new ETF. The environmental assessment EA should not be concerned with the deadline of the Boat Harbour Act, but a thorough review of the data and a reasonable time line for testing should be done. N o, I am not agreeing to, nor supporting an extension to the closure of the Boat Harbour EFT. The impact to the mill of a premature closure should be dealt with separately. First, come up with a best case replacement EFT. EA Class I Inadequate There is far too much data to review and too much incomplete information to pass the EA in a 30 day period. Monitoring: The EA does not detail the monitoring of the new system. A detail of inspections by people and electronic devices should be provided. Will monitoring be continuous 24/7, or longer periods of time? How will the portion of pipe imbedded in the Strait be monitored? Based on the last two pipe breaks, the current methods of detecting and preventative maintenance are inadequate. Current air monitoring is minimal and that tells me Northern Pulp will continue minimal reporting. Total Suspended Solids TSS: During an open house hosted by Northern Pulp, Hugh MacDougal, NP Engineer, explained to me and my wife the new activated sludge treatment AST process. Part of the process that jumped out was TSS emptying into the strait would increase. an environmental lawyer, found evidence of increased TSS in an e-mail from a NP technical manager to Dillon Consulting. received the e-mail through an FOI request. Testing: There are several areas in the EA where the writer states further study is recommended. For the sake of brevity, I will mention one. The conclusion in Appendix R, A Summary of Scientific Literature Related to the Effects of BKME on American Lobster recommends further study. The conclusion is on page 51 of Appendix R. When asked about the chemical composition of the effluent at discharge point, no information was available. Ice scouring was briefly discussed in the report, but there was no mention of mock diffusers being installed. I would think a test over several winters would be required to see the diffusers avoid being damaged by ice scouring. Conclusion: The Province should hand over the EA to federal government to do the review. The Province, as a lender and lease holder of wood lands, is too close to NP creating an apparent conflict of interest. Concerned Citizen New Glasgow, NS Name: Email: @bellaliant.net Address

Privacy-Statement: agree x: 58 y: 18

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 9:37:54 AM

Project: replacement_effluent_treatment_facility_project Comments: I absolutely support the replacement effluent treatment facility project proposed by Northern Pulp. Given the amount of time they had, they have done really well in researching and planning for his project. They have put a lot of effort in gathering scientific evidence that there will be little to no negative impact in the Northumberland Strait. They have, in my opinion, jumped through more hoops and than other industries in Nova Scotia to educate the public. The proposed system is not bran new technology. It has been used by other mills around the world and in Canada and has proven to be great. My kids and I swim in the Northumberland Strait, we live in Abercrombie so I take the environmental concerns very seriously and I confidently support and believe in Northern Pulps effluent treatment facility project and absolutely think the project should be approved asap. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 74 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 10:20:10 AM

Project: replacement_effluent_treatment_facility_project Comments: Since the 1970s, Environment Canada has established Pulp and Paper Mill Effluent RegulationsPPER that would surely be applied to the proposed Northern Pulp pipeline installation. However, the local impact of effluent discharges on seafloor communities has probably not been addressed as yet, or has the regional dispersal pattern tidal of effluent discharges in relation to toxic effects on a range of planktonic and benthic marine species? I would presume that these issues would be addressed in a federal environmental impact statement EIS? Name: , Email: @gmail.com Address:

Privacy-Statement: agree x: 58 y: 22

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 10:41:58 AM

Project: replacement_effluent_treatment_facility_project Comments: Am I bias? I try not to be. I work at the mill and I feel like my livelihood will be jeopardized if Northern Pulp closes. I have always tried to look at each side of the story when it comes to environmental issues. As we know it. The Maritimes have made their wealth off industryâ?¦. And it seems each time when industry leaves the public and government think that tourism will boom but I have yet to see that happen in places that are ghost towns now. I feel we need to look at the overall problem. The public has seen what has happened to the mill in the past and they bring those past experiences with them and they arenâ?Tt positive. In order to move forward we need to put the past behind us and live for the future. What future is here in Nova Scotia? Nova Scotia has an abundance of renewable resources. Tress being one of them. We have a seedling department in Debert that we have seasonal workers plant trees in the summer. I know it does take time for the trees to get to be at the state that we harvest them â?" but itâ?Ts not like we donâ?Tt think about replanting. I know if the Mill closes I will more than likely venture out west to find better work. That includes my partner as well. Everything will be affect in my life. If the industry isnâ?Tt here it will just go elsewhere and it will be a loss to the Maritimes. Keep people working in the Maritimes! Name: Email: @hotmail.com Address:

Privacy-

Statement: agree x: 45 y: 31

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 4, 2019 11:23:53 AM

As a woodlot owner I support Northern Pulp.

Sent from my iPhone

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 11:28:39 AM

Project: replacement_effluent_treatment_facility_project Comments: Good morning I have been a commercial fisherman in Northumberland Strait since 1981 when I first bought my fishing gear.the proposed pipe from Northern pulp is of great concern to me as the discharge Will be located and a very good lobster fishing area and Right Beside one of the last large Herring Spawning grounds in the area. Northern as stated that theyâ?Tre Discharge will be in the Deepwater but a couple hundred feet on either side you will be into 25 feet or less this is a very small channel it runs Past Caribou harbour at the Norwest end of this channel the affluent will discharge in to the main lobster fishing area in the rising tide and then fall back over the area where about 25 of the boats out of Caribou Harbour Fish . And then just east of the pipes discharge is a Large scallop bed this I believe will have a Drastic effect on our fishery. In the area of the discharge and a larger area as Water between the discharge and Pictou Island has an average dep th of 30 feet and not a big tide to carry stuff away Name: Email: @gmail.com Address:

: Privacy-Statement: agree x:

54 y: 21

From:
To: Environment Assessment Web Account
Subject: response to Northern Pump dumping effluent into the Northumberland Strait
Date: March 4, 2019 11:53:44 AM

My purpose for writing to you is over my concern for the place I still consider home – New Glasgow.

I am writing in relation to Norther Pulp's Replacement Effluent Treatment Facility Project. I am for a full blown national external environmental assessment that will not be a conflict of interest.

I am very informed about the mill...have read everything I think there is to read and spend the first hour of every day reading the websites on it. I am very sad to see the issue of a pipe tear the community of Pictou County apart.

I am very sensitive to the arguments on both sides.

- Hundred (into the thousands) of people making their living in the forestry, trucking, etc.
- The cost of healthcare due to high cancer rates in Pictou county, the billion dollar cost to tax payers to clean up the chemical mess at boat harbour, the affect on tourism and the fishing industry, the cost of all the donations the government gives to the mill to keep those 250 jobs (and spin offs), the fresh water cost, the clear cutting, the chemical spraying, the corruptness, deception and lies from all governments.

I am strongly against Northern Pulp, putting a pipe into the strait and continually not meeting industry environmental standards and regulations.

I believe this foreign company can afford to meet industry standards but enjoys getting away with abusing the citizens and government because they can... fear and threats have worked well for them for years. I am not against the mill but am against the abuse the native Canadians, the environment and citizens of Pictou County. I don't think the owners of Northern pulp care about the environment or the health of Pictou County residents. Yet they are making the profits that they could invest in these things.

I grew up a cottage on the Northumberland strait cottage and watched the water continually grow browner and smellier each year. We can't continue to accept the assault on the environment at any cost. I understand jobs are important!! But if a study were conducted and the cost of the donated land, water, causeway, health costs, clean up, loans, donations made compared to the cost of jobs.... I wonder which would come out on top... minus the assault on the water, forest, air and water pollution. It is very complex.

More people would invest and start businesses, more doctors, retired people, professionals, artists and trades people would come, stay longer or move back, and Tourism and property sales and prices would increase, if people were not afraid to breathe, eat the fish, and swim in Pictou County.

I still live in Pictou county 2 months a year - but I pay property taxes and expenses (12 months a year), insurance, hydro, boat storage, and grass cutting/snow plowing, twelve months a year. I have purchase property, hired an architect, contractor, plumbers, electricians, bought boats, cars, a, put on a new roof

month, replaced a deck, heating system, bought gym memberships, paid boat mechanics and boat storage, groceries, gas, have an account at home depot.

The vision for the future has be in line with a knowledge based economy. The economy in Pictou County appears pretty bleak. The front street of Pictou and New Glasgow, the malls, and restaurants appear empty, houses are for sale everywhere, the population is not growing, - it doesn't seem like the mill is saving the community. The status quo has not and is not working. The citizens of Pictou County deserve better. Nothing is worth breathing chemicals, swimming in brown water and gooey foam when the breeze is onshore, water with mercury and other chemical and eating fish from this water. I want to raise awareness and be part of the solution to bring the place I still call 'home' back to life.

I recently wrote a letter to the environment minister voicing concerns over the rush to get the assessment conducted on NP proposal to pour the effluent directly into the strait. It took his office more than 30 days to send me a form letter, which didn't even answer my questions. If they can't answer emails in 30 days how can we expect them to do an environment review in 30 day!

My question is, why the rush? It appears biased. If we all want the best for our town lets take our time and do the right thing long term. I know this can't be easy. But please do not cave to NP threats. Their concern is profits for their foreign company not the health and welfare of New Glasgow citizens or the environment in Pictou county. What is the worst thing that could happen if they take an additional 30-60 days to access the proposal? The facts will emerge and the plant could close? Perhaps then NP would invest in their company and finally meet industry expectations. Do we not have the vision and foresight to deal with this scenario? I can think of several alternatives as I am certain you can too.

Please recommend an extended review so decision are based on knowledge and not emotion. Take the time required for such a serious decision. Develop mechanisms to keep the young people in New Glasgow, strategies to grow the population (which hasn't grown since NP arrived), and stop New Glasgow from receiving consistent negative press as one of the worst Canadian communities to live. Please make a decision based on information and facts and to keep more people from leaving and more of us coming back.

I look forward to seeing you soon in New Glasgow.

email: @um.edu.mt

University of Ottawa

uottawa.ca

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 11:57:34 AM

Project: replacement_effluent_treatment_facility_project Comments: Feel that Northern Pulp should be granted an extension on Boat Harbour in order to have their effluent line installed. The loss of jobs this mill provides directly and indirectly would certainly be felt across a good part of the province. Pictou Co.can not afford to lose the large financial contribution the mill puts in to the local economy. However it is important that the pipe is installed meeting or exceeding the environmental standards that are imposed on them. I believe there is a solution that everyone can benefit from if done correctly. Name: Email: @ns.sympatico.ca Address

Privacy-Statement:

agree x: 72 y: 30

From:
To: Environment Assessment Web Account
Subject: Northern Pulp EA Response Letter
Date: March 4, 2019 12:16:00 PM

Department of Environment,

I am writing in regards to Northern Pulp's new effluent treatment facility and 15.5 km pipe proposed to discharge up to 85 million litres of treated effluent and four tonnes of suspended solids every day into the Northumberland Strait. I would like to address losing the Marine Stewardship Council (MSC) blue seal, the fact that the quality of the treated effluent will actually be worse and Appendix R Bleached Kraft Mill Effluent (BKME) effects on lobster.

I am a third generation fishermen, my grandfather and father both fished the Northumberland Strait. Fishing has changed a lot since my grandfather started, we regulate the size of our lobsters, put in escapes, use dissolving string, reduced the amount of traps we fish just to name a few of the sustainable fishing practices we use. Lobster from the Bay of Fundy, Scotian Shelf and Southern Gulf of St. Lawrence have the prestigious Marine Stewardship Council blue seal since May 2015. This is an international stamp of environmental sustainability. It opens up international markets that require third party certification. This is hard to achieve and easily lost. MSC are watching this Northern Pulp proposal very closely to see the outcome. If that certification is lost it will greatly affect the sale of lobsters from all three provinces which ship to the US, Europe and Asia. More than 3000 people make a living on the Northumberland Strait, 18,000 people are working in the fishing industry in Nova Scotia. Seafood exports is a $2 billion industry for Nova Scotia, if the blue seal of MSC is lost that number will go down significantly, this is a serious threat to the Canadian fishing industry(Dept Fisheries, Gov't of NS, NS Exports).

The Nova Scotia provincial government and Northern Pulp have both been spreading the misinformation that their treated effluent has been going out into the Strait for 50 years therefore there is nothing to worry about. This is not true, I have witnessed it firsthand. My first year rock crab fishing I put my crab cones along the mouth of Pictou Harbour. As I fished up from Lighthouse Beach the smell became unbearable and the cone came up filled with black silt and no crab, I moved the cone away from the area and found out that was close to the Boat Harbour outfall. What I have come to learn in the past year is the way Boat Harbour treatment facility works is the treatment is completed at point C, but just because this is the end of the Boat Harbour Effluent Treatment Facility (BHETF) does not mean that is has finished treatment. It there releases into the lagoon where the water sits for 20-30 days, cooling and settling solids, then through a dam as the water levels get high and with the tide release into the Strait at Point D (Boat Harbour Map attached). It then flows back and forth within a box tide along the shore between MacKenzie Point and the end of Lighthouse Beach (Tidal Flushing of Pictou Harbour and Pictou Road, Fisheries Research Board of Canada Technical report no. 146, 1969). This is much different from the new proposed system where it will be treated for hours instead of 20-30 days, the temperature will be 25oC in the winter and 37oC in the summer (NP proposal Table 5.2-1) and relentlessly pumping out onto fishing grounds. The treated effluent quality at point C is the same quality it will be when pumped into the Strait. Both meet regulations, these regulations are not stringent enough to prevent harm, the mill is meeting regulations but their Environmental Effects Monitoring (EEM) shows Northern Pulp is doing harm to fish habitat and the only thing being done about it is every three years Environment Canada gives them recommendations (PEI Legislative Assembly Feb 1st 2019). Through a FOIPOP it was found that Northern Pulp's technical manager agrees that the effluent will actually be worse coming out of the new pipe that what is coming out of Boat Harbour now. (Email dated Nov 2017 Technical Manager Northern

Pulp, FOIPOP) What is in the treated effluent that will be pumped onto our fishing grounds? It is not in the environmental assessment which states that the chemistry characteristics will not be known until the project is operational. This is a huge gap in the proposal, we do know that it contains dioxins, furans and heavy metals. Shellfish, such as scallops which I also commercially fish, absorb dioxin and furans at 25,000–50,000 times the concentration in the water. Cumulative effects would cause deformities, and embryo larval mortalities in fish, chronic effects include significant irreversible factors which jeopardize the continuance of the species and the integrity of the ecosystem (Environment Canada, 1991). Further to accumulative effects on marine life the FOIPOP done by had a letter from the Dept of Environment stating that Northern Pulp should have a study on accumulative effects of BKME on marine life, this was not completed, another gap in the EA.

After reading Appendix R of the EA I fail to see how this can even be called a study, if Stantec can run the study saying everything will meet background by 2 to 5 meters and Stantec is also in charge of running the lobster study which says because it meets background by 5 meters lobsters will not be affected. There needs to be independent third party studies done on both the plume and the effect on lobsters. Harvesters have history with Stantec (Confederation Bridge) and they have a history of not agreeing with their reports. The receiving water study is just a prediction, it is not factual therefore the results of Appendix R are not fact they are just a prediction based on a prediction, not very comforting to a $2 billion a year industry.

The devastating effect this could have on the commercial fishing industry cannot be overstated. The construction alone of the pipe has the potential to greatly harm the fishing industry, the frequency of daily pumping 85 million litres of hot treated effluent and four tonnes of suspended solids would cause uninhabitable conditions for marine life. As for reversibility, we need to look no further than Boat Harbour Remediation Project. This will take millions of taxpayer dollars and years to restore and that is a contained area. There will not be a remediation project large enough for the Strait, it will never recover if this proposal is approved. Therefore I ask that you reject this proposal, if you can not reject I ask that an Environment Assessment Report be completed, there is too much at risk.

Thank you Minister,

Google Satellite View
of Boat Harbour Area

Boat Harbour
Settling Ponds
Pipeline of waste water
1
2
3
4
Aeration Stabilization Pond

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 12:43:04 PM

Project: replacement_effluent_treatment_facility_project Comments: This project can not go ahead, the proposed pipe line will destroy our strait. Itâ?Ts not a job vs job situation, itâ?Ts abojt the environment. Even if it was about jobs, there would be far more jobs lost in the fishing and tourism industry. This affects 3 provinces and all 3 depend on clean water to fish and attract tourists. Nova Scotia is Canadaâ?Ts ocean playground, this pipe will ruin everything Nova Scotia is known for. People already avoid swimming in Pictou and Lyons brook because the mill has contaminated those waters even will the smaller amount of effluent going in. Northern pulp constantly says the effluent is treated but will not disclose what is actually in it. The millions of litres of effluent will be too warm for any salt water marine species to survive, marine life is very sensitive to change and this would be a sudden change. It will be a larger version of boat Harbour. If the mill wants to continue, I believe, along with many others, that we shou ld switch to hemp products. Itâ?Ts more environmentally friendly, grows faster and produces more products. Weâ?Tve got to start thinking about the environment more and less about money, with time money will come but the environment is already on the verge of being destroyed. Name: Email: @hotmail.ca Address: : Privacy-Statement: agree x: 77 y: 27

From: @forestns.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 12:49:27 PM

Project: replacement_effluent_treatment_facility_project Comments: I write today on behalf of ForestNS in support of the Northern Pulp ETF replacement project. This project is vital to the continued operations of Northern Pulp and therefore the future of a tightly integrated forest industry here in Nova Scotia. From landowners to harvesting and trucking contractors, sawmillers to the thousands of Nova Scotians that work in and with our sector every day - this project is very important. Having reviewed the EA submission within my laymans capabilities on such an in-depth submission, I have every confidence in the expertise at Northern Pulp and the engineers, consultants and experts they have worked with to develop this project, along with the regulatory and oversight expertise of ENS to ensure the operation and compliance of a new ETF. It is my belief that this project should proceed as early as possible to ensure Northern Pulps future in a strong forest sector in our province. Name: Email: @forestns.ca Address:

: Privacy-Statement: agree x: 77 y: 18

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s Proposed Effluent Pipe into Caribou Harbour
Date: March 4, 2019 1:08:41 PM
Attachments: Submission to Northern Pulp Environmental Assessement re Rock Crab.pdf

March 4, 2019

Re: Northern Pulp Replacement Effluent Treatment Facility Environmental Assessment

My name is . I have been a fisherman for years. I fish in and around the area of Caribou Harbour and have great concern over the possibility of an effluent pipe in this area.

Caribou Harbour is one of the largest rock crab nurseries in the Eastern Gulf. It contains millions of female and juvenile crab. I have fished rock crab for several years. I fish Hillsborough, PEI and from Wallace Harbour to Caribou Harbour in Nova Scotia. Female crab can be found in all the bays and inlets, but for some reason Caribou Harbour holds a far greater number of female and juvenile crab than all the other areas.

The survival of the lobster industry in this end of the Strait depends on the health of this rock crab nursery. Crab is the main food supply for lobster.

I am concerned about the potential impact of a pipe carrying and **continuously discharging up to 3 million litres an hour** of effluent through three diffusers, and the potential that this will produce noise and/or vibration that would disturb marine life.

I would like to draw the Minister's attention to the potential impact of noise and/or vibration from the diffusers on the marine species in Caribou Harbour and surrounding area. This issue has not been addressed in Northern Pulp's submission. I believe this issue must be fully addressed before any approval is given. Noise and vibration can carry long distances under water and change conditions which make a habitat favourable for many species.

I also believe that Northern Pulp's plan to excavate a trench through the centre of this very special eco-system may disrupt the fishery in this area.

The DFO description of Scallop Buffer Zone 21, 22 and 24, which runs 1 nautical mile from the nearest point of land and includes the entire proposed pipeline and outfall, states that the ecological components of interest protected by the buffer zone are" juvenile American lobster and habitat that is important to biodiversity" and states "specifically American lobster nursery habitat is important for the life-cycle of the species."

The description also states, "No other human activities that take place in this area are incompatible with the conservation of the ecological components of interest" and that "These closures offer protection to other important species and habitats in the southern Gulf of St. Lawrence." As an example, DFO refers to SFA 22 containing "rock crab (an important pr ey for several species and a commercial species." http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/sfa-zpp-eng.html

Caribou Harbour is home to the largest commercial fishing fleet in the Northumberland Strait. The strong lobster catches in this area are the result of the continuous food supply from the rock crab nursery. The potential destruction of this crab habitat will have devastating consequences on the lobster industry in this area. No studies have been done on the possible effect noise and/or vibration from this effluent pipe could have on local marine life. When foreign material is dumped into the environment, it will have an effect. Sometimes it takes years to realize how big that effect will be and then it is too late to fix it. Northern Pulp needs do something environmentally friendly, not something that is economically beneficial to themselves.

Sincerely,

hotmail.com

From: @mcdlaw.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 1:25:06 PM

Project: replacement_effluent_treatment_facility_project Comments: Dear Sir or Madam and Ministers: Please be advised we represent the Harbour Authority of Caribou hereafter the â?oAuthorityâ?, Pictou County, Nova Scotia. Located at the mouth of Caribou Harbour the Authority operates the busiest fishing port in Northern Nova Scotia. It is the hub of fishing activity from April to early December each fishing season. It is accessed via the106 branch of the Trans-Canada Highway and is adjacent to the Northumberland Ferries terminal. The facility managed by the Authority is the â?~heartâ?T of the commercial fishing industry in northern mainland Nova Scotia. The Authority has retained our firm to express its grave concerns regarding Northern Pulpâ?Ts proposed new treatment facility, which includes an effluent pipe to discharge an estimated minimum of 62 million liters per day, into the mouth of Caribou Harbour. The Authorityâ?Ts position is that the Northern Pulpâ?Ts proposal fails to adequately address and in some cases completely fails to address various environmental and navigational concerns which could cause both short and long term harm to the facilities managed by the authority as well as its patrons. Of major concern is that Northern Pulpâ?Ts associated effluent will be harmful to the receiving waters of the Northumberland Strait and its marine life habitat. Northern Pulp is considered to be among the 70 of Canadian mills whose effluent has been proven harmful to the receiving waters into which it discharges. I will outline herein several of the Authorityâ?Ts major concerns with Northern Pulpâ?Ts current proposal. 1. Northern Pulpâ?Ts current proposal section 8.11.2.4 confirms that there has been no testing completed with respect to the water composition of Caribou Harbour. Instead Pictou Harbour was used as a proxy for Caribou Harbour with respect to water quality. There is no explanation as to why water quality data for Caribou Harbour was â?ounavailableâ?. The Authority views such an assumption on water composition as entirely inadequate. There are major distinctions between the two harbours which makes such an assumption tenuous at best. Pictou Harbour has been exposed to sewage from the Town of Pictou and other municipalities for over 200 years. In addition industrial waste from a ship yard, pulp mill, power plant, tire plant and many other businesses has been discharged into Pictou Harbour for over a century. Pictou Harbour also has three major feeding tributaries and Caribou Harbour only has one much smaller tributary. Caribou Harbourâ?Ts water chemistry is potentially drastica lly different in comparison to Pictou Harbour. In the Authorityâ?Ts opinion the assumption and lack of data falls far short of federal and provincial regulatory requirements under legislation such as the Pulp and Paper Effluent Regulations PPER, the Fisheries Act, the Disposal at Sea Regulations under the Canadian Environmental Protection Act, 1999 CEPA, and DFOâ?Ts Measures to Avoid Causing Harm to Fish and Fish Habitat DFO 2014. The Authority submits that this lack of data and other aspects of Northern Pulpâ?Ts environmental assessment indicate a â?~rushed jobâ?T and which lacks substance. 2. The Northern Pulp proposal relies on a receiving water study prepared by Stantec. This study indicates that there will be minimal flow of effluent discharge into Caribou Harbour. The Authorityâ?Ts position is that the methodology used to make this erroneous determination is subpar and inadequate. A significant volume of water from the discharge location flows into Caribou Harbour on a rising tide. The patrons of the Authority will attest to the â?oallusionâ? of a rising tide at the proposed discharge point going mainly northwest, when this in fact, is false. 3. Section 6.5 of Northern Pulpâ?Ts proposal suggests that fishermen have offered â?ono input to the outfall locationâ?. The Authority has been advised by its fisherman patrons that this is a false statement and that Northern Pulpâ?Ts representatives were informed the entire area outlined

and presented to the fishermen of Caribou Harbour, including the pipe route and outfall, is fished at one point or another throughout the year. 4. The Authority is very concerned that its patrons both commercial and recreational will have their navigational abilities under Navigational Protection Act restricted. This has simply not been addressed adequately in Northern Pulpâ?Ts proposal. As previously noted herein the patrons of the Authority, in particular seventy 70 plus commercial fishermen, navigate directly across the path of the proposed pipe route in Caribou Harbour, on a daily basis, during regular fishing seasons of lobster, crab, herring and scallop seasons spanning April through November. Fishermen fishing north, northwest and west of the mouth of Caribou Harbour exit the marked channel between the third and fourth red buoys depending on destination daily â?" saving individual fishermen hundreds of miles of travel and reducing fuel consumption and reducing emissions. There appears to be a general lack of attention paid to these concerns. The Authorityâ?Ts position is that all navigation concerns must be a ddressed satisfactorily prior to any approval and not be left to be â?ofigured out laterâ?. 5. The general consensus among the local fishermen and supported by the Authority is that proposed construction highlighted on page 14, in appendix F of the proposal will be insufficient to prevent ice damage. The Authorityâ?Ts experience is that a winter storm from the northeast shifts ice dramatically at mouth of Caribou Harbour. The ice piles up in the shallow water along the proposed pipe route, near the mouth of the harbour in excess of 5 meters. The silt and sand in this area is a â?~moving barâ?T and the Authority does not believe that two 2 meters of pipe cover on this soft bottom is sufficient. A proper assessment would have to monitor the conditions of the ice over more than one winter season. As well an in-depth survey will be required as the density and hardness of the bottom varies dramatically, which will no doubt require further study to prevent pipe fatigue and stress cracking. 6. The dredging of Caribou Harbour in 2007, along the passenger ferry channel, required a Federal Assessment, as did the 2015 upgrading of PEI-New Brunswick Cable Interconnection Upgrade Project. Given that Northern Pulp proposes the dredging and installation of equipment in the same body of water the Authorityâ?Ts position is that this project contains all the criteria for a Federal Environmental Assessment as did the previous mentioned projects, as it pertains to section 67 of the CEAA 2012 Act. Section 67 of CEAA 2012 sets the framework for the environmental assessment of projects being carried out on federal land that are not considered designated projects and for which a full environmental impact assessment under the Regulations Designating Physical Activities is not required. As the seabed of the Northumberland Strait is federal crown land it is subject to requirements under section 67 of CEAA. Section 67 states as follows: â?¦..an authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless: a The authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects or b The authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 693.â?T Based on the above the Authorityâ?Ts position is that this project is subject to review by a federal authority in order to determine whether the carrying out of the project will cause significant adverse effects on the surrounding environment, or if any potential significant adverse effects are justifiable. The Authority requests that Northern Pulpâ?Ts Effluent Treatment Project be designated a project for Federal Environmental Assessment under Section 14 of the Canadian Environmental Assessment Act CEAA 2012. Please accept the Authorityâ?Ts legitimate concerns and address this crucial matter appropriately. Yours truly,

cc Client Name: Client: Harbour Authority of Caribou,
Email: @mcdlaw.ca Address:
Municipality:
Privacy-Statement: agree x: 53 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 1:31:32 PM

Project: replacement_effluent_treatment_facility_project Comments: I strongly recommend that the replacement effluent treatment facility project be approved by the Nova Scotia Department of Environment.In the Executive Summary there is no significant residual environmental effect predicted. The summary states that under worse case conditions water Quality at the end of the mixing zone for the three port diffuser will reach ambient conditions within less than two meters from the diffuser in terms of total nitrogen,total phosphorous,total suspended solids,dissolved oxygen,ph and salinity.Colour will return to baseline conditions within five meters of the diffuser.Temperature will be within 0.1 degrees Celsius of background at the end of the 100 meter mixing zone The summary states the wastewater treatment facility projects the effect on the environment during all phases is rated as not significant. I strongly recommend that your decision will be to approve this project.I believe your decision should be based on the science presented in this environmental assessment registration document.It should not be based on the unsubstantiated arguments of fear. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 63 y: 15

From: (HorizonNB)
To: Environment Assessment Web Account
Subject: Northern Pulp's Replacement Effluent Treatment Facility Project
Date: March 4, 2019 2:02:38 PM

Dear Honourable Margaret Miller,

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project.

I recently completed my Ph.D. in Clinical Psychology and am currently practicing as a Resident in Psychology in New Brunswick, with plans to return to Nova Scotia. I grew up just outside of Pictou in the community of Braeshore, where I spent summer months exploring the surrounding beaches and swimming in the Northumberland Strait. The Effluent Treatment Facility Project is of great personal significance because my husband and I recently purchased waterfront property in Braeshore.

The allocated one-month time period is insufficient for me to comprehensively read and critically analyze the 600+ page document prepared by Dillon Consulting for Northern Pulp. However, in my review thus far, one summary section of the report caught my attention. In Appendix E3 the conclusions section states the following:

"Among the four potential outfall locations discussed in this study for the discharge of the effluent, the Alt-D outfall location provides the smallest potential long-term cumulative effects on the fishery and socio-economic environments, and therefore is considered the better outfall location for the discharge of the treated wastewater from the mill."

This statement indicates that there is potential for long-term, negative effects of the proposed outfall location. I would suggest that it is not acceptable to select this option simply because it provides the "smallest" risk of four options presented by Northern Pulp. Are we limited to these options? I would like to see more comprehensive information regarding the feasibility of a treatment facility that is contained on site and has no discharge pipe into the Northumberland Strait.

Sincerely,

Dr. Everett Chalmers Hospital
Horizon Health Network

From:
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 3:20:16 PM

Project: replacement_effluent_treatment_facility_project Comments: Dear Minister of Environment I have a trucking business that employs 40 employees and depend on Northern Pulp to keep every one receiving a pay cheque so they can buy grocerys and make house payments, car payments and all the other expenditures that go with every day living. I ask that you ignore all the fake news that is going around and make your assessment on Science and the fact that the effluent has gone into the Strait for the last 52 years and there has not been a fish kill in its history. We know that there are fish living in Boat Harbour now so with the new Wastewater Treatment Facility and where it is proposed to go will ensure a very acceptable Environment. Name: Email

Privacy-Statement: agree x: 58 y: 19

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s new ETF
Date: March 4, 2019 3:44:09 PM

Minister Margaret Miller
Dept of Environment

I am writing today in regard to Northern Pulp's replacement Effluent Treatment Facility.

As a wife and mother, i have grave concerns regarding their plan to place a pipe into the Northumberland Strait.

1. Air Pollution:

In 2003, my husband and I built a new home in Three Brooks, maybe 8 km from the Town of Pictou and 5 km from the Caribou Ferry Terminal where this proposed pipe will enter the Strait.
Shortly after moving into our new home in 2003, our son He had zero issues prior to the move.

"In 2012, Northern Pulp reported to NPRI the release of 1,011 tonnes of fine particulate matter into the atmosphere. Remember, this is the deadliest kind of particulate, the kind that can get lodged in your lungs forever. One industry insider noted it was like having 37 Irving mills worth of fine particulates. In fact, NPRI data shows that in 2012 Northern Pulp was the highest emitter in Canada of seven substances, including Total Reduced Sulphur (TRS), Total Particulate Matter, PM10 and PM2.5. [1]
Stack tests from November 2013 showed the mill was producing emissions 78 per cent above what was allowed. " (https://www.halifaxexaminer.ca/province-house/dirty-dealing-3/#Living%20Downwind%20Dangerous)

Now, under their new effluent treatment facility, their plan is to burn the activated sludge in their power boiler . I fear this will only increase their emissions and based on their past history, i have zero faith they will keep it within regulatory limits.
After reviewing their new Environmental Assessment submitted to the Province of NS, it appears they won't even have an air monitoring station in the Town of Pictou which is directly across the water from the mill. This is unacceptable !

Why doesn't Northern Pulp have to have "Continuous Emissions Monitoring" CEM on all of their stacks like other mills in Canada are required to do with live streaming to a website for everyone to see exactly what chemical compounds are being released and whether or not they are surpassing the risk thresholds?

2) Water Pollution / Economic Impact

My husband is a self employed commercial fisherman in the Northumberland Strait. His fishing grounds are in the immediate area of where the outfall of this pipe will be located.
We are hearing there will be a 'no fish zone' of 3 square km around the outfall of the pipe.
So, essentially, my husband and his gear will be displaced as a result. So, is he supposed to move to another location on top of other fishers?
As a family we have invested hundreds of thousands of dollars into this business. If a pipe is permitted to dump millions of litres of effluent per day into the Northumberland Strait, fisherman in all 3 Provinces will suffer financial impact.
As soon as the effluent starts pumping in, I suspect they will lose certification as Atlantic Canadian lobster is certified to be coming from clean, pollution free waters. The loss of this certification will impact markets globally and the prices will no doubt drop. Considering Seafood is one of our biggest exports in the Province of NS, worth over a billion dollars, is it worth the risk? Will there be a compensation package to all fishermen in the Strait ?

In the Environmental Assessment document from Northern Pulp, Table E. 1. 1-1 shows the Summary of the Significance of Project Related Residual Environmental Effects relating to fish and fish habitat.
In every possible category, Northern Pulp shows "NS" which means " No Significant Residual Environmental Effect". WOW ! What are the chances of that ?

In every single category they predict "No Significant Residual Effect" ;
how convenient ! Dumping up to 70 million litres of effluent into the ocean, 24 hours per day, 7 days per week, 365 days per year….. Non stop. Common sense would tell you that HAS to have some residual impact ! To my knowledge, Northern Pulp have NOT studied what the effects effluent will have on Lobster Larvae or Herring eggs or Juvenile Rock Crab; let alone Tuna, Porpoises, or Whales.
In fact, they state in the Environmental Assessment document that they don't know for sure what composition the effluent will be. They "anticipate" it will meet federal guidelines.
And if it doesn't ? Does the Strait become the next Boat Harbour ? How do you clean up an ocean where its not contained ?

All the regulations put in place in the past year to try to save the North Atlantic Right Whales in the Gulf of St. Lawrence, yet allowing Northern Pulp's plan will mean they will swim through toxic waste water flushed into the Strait. What long term effects will this have on them? Will it kill the majority of plankton they eat? Will it impact their already low reproduction rates ?
The World is watching after so many of these whales died in US and Canadian waters in the past few years. Will the World approve of Canadian authorities allowing them to be poisoned?

Northern Pulp have stated they are confident they can meet the federal pulp and paper regulations. Supposedly all they have to do is pass the acute lethality test where they put effluent into a bucket with some trout. If more than half survive after so many hours , it passes.
It concerns me that our federal regulations have not been updated in over 20 years.
As well, Northern Pulp's plan is not to dump into a fresh-water River , they are wanting to dump into an ocean; so why wouldn't the test be in relation to species in the ocean like lobster larvae , herring eggs, plankton, etc.

Minister Miller, I urge you to reject this proposal Or at the very least send it for a Federal assessmen
Recently it was announced that Boat Harbour Remediation will require a federal assessment. This company helped pollute Boat Harbour . So, in turn, it should require a federal assessment to dump that toxic waste into the Strait.

- Impact on 3 Provinces
- Financial impacts on 1000's of independent business owners
- Impact on Species at Risk in the Strait
- Impact to First Nations who fish there as well
- Same plan was denied by the Feds twice before
- Proponent has completed NO science of the impacts to fish and fish habitat
- did NOT hold any public information sessions after they changed their planned route from Pictou Harbour to Caribou Harbour
- Province of NS cannot conduct this Environmental Assessment without bias as they are also financing the project and have an enormous conflict of interest considering the Indemnity Agreement signed with this company

From:
To: Environment Assessment Web Account
Subject: Replacement Effluent Treatment Facility - EA
Date: March 4, 2019 3:56:29 PM

Dear Minister,

Please accept this communication in response to Northern Pulp's Environmental Assessment for the Replacement Effluent Treatment Facility Project. My name is . I am the General Manager of the Pictou Lodge Beach Resort, President of Destination Eastern and Northumberland Shores, Board of Directors Tourism Industry of Nova Scotia, and Chair of the Nova Scotia Tourism Human Resource Council.

I have many concerns about Northern Pulp's Environmental Assessment, but will focus my communication on the following points:

1 - Effect on Tourism and the socio-economic impact.
2 - Issues in Engagement

1 - The socio-economic impact and the effect on tourism

As per the Nova Scotia Environment Act, Purpose of Act, section A:

The purpose of this Act is to support and promote the protection, enhancement and prudent use of the environment while recognizing the following goals: (a) maintaining environmental protection as essential to the integrity of ecosystems, human health and the socio-economic well-being of society;

In the EA submission section 8.14.4.2 it is stated:

The daily operation and regular maintenance of the project is not anticipated to impact the socio economic environment.
AND
No impact to community use of recreational areas is anticipated from the operation of the outfall. Additionally, odour prevention was a basic design criteria used in the development of each stage of the ETF process. Through employing a process that has, for example, continuous sludge removal, subsurface air injectors, and indirect effluent cooling, odour is controlled during the treatment process. No impact to community is anticipated from odour during the operation of the ETF.

My concerns here are two fold:

1 - Risk of impact to waters

I am concerned with the lack of studies around the economic impact this project could have on the tourism industry. Tourism produced 2.8 billion dollars in revenues in Nova Scotia in 2018. Northumberland Shore area typically makes up 8% of this total. The Pictou Lodge Beach Resort (built in 1924) is located about 5km down the strait from the proposed outfall area. The resort has been built to a 2.8 million dollar business that employs 70 people. According to the 2017 NS Tourism Visitor Exit Survey, the top reasons pleasure tourists visit Nova Scotia are “Coastal Sightseeing - 47%” and “Visit a Beach - 49%”. Lobster remains an important part of the visitors experience as well. 45% of pleasure visitors to the province in 2017 ate lobster while here.

From a destination marketing perspective, the Northumberland Shore has always lead with the beaches in our area. Northumberland Strait’s unique selling point is that our beach waters are swimmable reaching as high as 25 degrees Celsius.

The impact of dumping millions of litres of effluent into the Strait will be harmful to our branding efforts and will have a negative impact on tourism businesses in the area. We are a destination that primarily sells warm swimmable waters and fresh local seafood. Nova Scotia is traditionally known as Canada’s Ocean Playground. The impact of this pollution could affect Nova Scotia’s tourism brand as a whole. It could also have negative impacts on the lobster brand for Northumberland Strait and Nova Scotia in general.

The lack of a study around economic impact and tourism impact for the Northumberland Shore and Nova Scotia is a major concern. This is cause enough for the Minister of Environment to order an environmental assessment report for the new treatment plant and subsequent effluent outfall. This report needs to include a socio-economic impact study on the tourism industry.

2 - Air quality issues.

In section 8.1.2.2 the EA claims that odours are impossible to address as the new odour coming from new treatment plant will not be known until such time as the plant starts to operate. Until the new chemicals and compounds are combined. It also states that this issue is subjective and will quite possibly not be worse than current.
It also states that “Because the perception of odour and its effects are subjective and relative to an individual’s perceptions, limits, and tolerances, it is more frequently treated as a nuisance issue”.

The current state of air quality and odours produced from the plant have had a negative

socio-economic impact on the community. In my tourism operation we have lost long term guests who had to leave because of poor air quality. We have lost potential group bookings and weddings because of the air quality on the day of planning visits and tours. The local town has lost residents and potential investors because of the air quality. There is no current study on what the economic impact the poor air quality and odour produced by mill has had on tourism industry and economic development in the community over the last 50 years. This is of concern to me.

I would argue it is more than a “nuisance issue” when air quality and odours are recorded and publicly displayed on trip planning sites such as TripAdvisor. This has a real impact on potential travel and booking decisions. For example:

Lovely spot - except for the smell
Review of **Pictou Lodge Beachfront Resort**

Reviewed October 12, 2015

We only stated for a brief overnight visit and didn't get to fully appreciate this resort. Desk staff very pleasant and helpful, supper in the pub area delicious with the server going out of her way to make us comfortable. Room clean with usual facilities you would expect. However, there is a continuous smell in the air which at first we thought was sewage, but were told it is the emissions of the local pulp mill. This is disappointing as the location and facilities at this resort are lovely and it is very convenient for catching the ferry to Prince Edward Island (10 mins to the terminal). My mother and I were very relieved that we did not have to stay for longer and if we had booked for longer would have probably checked out and found someone else. I am sorry for the poor review as the problems are largely outside the control of the owners, but hope this will help their cause in trying to get the Mill to clean up its act.
Date of stay: October 2015

In addition to the current air issues, the new treatment plant will include the combustion of sludge generated in the replacement ETF for energy recovery. Emissions from the combustion of sludge in the power boiler during operation and maintenance is to be dispersed from mill stacks. A socio-economic study into what the impact of the poor air quality will have on local businesses and residents needs to be done before construction of the new treatment plant begins. As a local business operator and resident I insist the Minister of Environment order a environmental assessment report.

2 - Lack of Public Consultation

Under the section 6.0 Public Engagement I take issue with the following points:

6.2.5 - Engagement with Government.

At no time was the Provincial Department of Business, Tourism Nova Scotia, or the Minister of the Department mentioned here. The potential impact on the tourism industry is the same as the forestry and fisheries industries. On several occasions I had written to the Minister with my concerns on the impact of tourism. An environmental assessment report needs to be done with the inclusion of the Department of Business and Tourism Nova Scotia.

6.3.2 - Engagement Sessions

The public consultations that I attended did not have any information in regards to an outfall in the Caribou wharf region. All discussions and diagrams we were presented had the outfall in the Pictou harbour region.
The Caribou wharf area is the 3rd highest entry point for Nova Scotia. It is an entry point for 475,000+ visitors to Nova Scotia annually on the ferry service between Caribou / Wood Island. I would have presented a much different scenarios of questions to the public sessions if this location would have been identified. Although it is the same approximate distance from our public beach, the potential impact on tourism to Nova Scotia would be 10 fold if there were discoloration, odour, or any other visible issues at this new outfall point. What is perceived as a nuisance could have real socio-economic impact. An environmental assessment report and new public consultations need to happen before construction can begin on the new treatment plant.

6.4.1 - Engagement Activities

There were no invitations sent to any tourism representatives during this session. Tourism operators were never identified as stakeholders in this EA process. An industry that produces revenues of 2.8 billion dollars provincially and 224 million locally was not seen as a “stakeholder”. This complete absence of an industry that would be affected by the new project who were not properly engaged in the EA process is reason enough for the Minister to order an environmental assessment report.

In conclusion, the hefty treatment replacement facility project document submitted by Northern Pulp did not address a key part of Nova Scotia’s Environmental Act, “the socio-economic well-being of society”. It did not address a key stakeholder in the process. I would ask the Minister to order an environmental assessment report for these reasons.

Pictou Lodge Beach Resort

www.pictoulodge.com
www.youtube.com/pictouvacation

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s new ETF
Date: March 4, 2019 4:02:20 PM

Minister of Environment
Province of NS

March 4/19

I am writing you about Northern Pulp in Abercrombie , NS and their plans to put a pipe in the Northumberland Strait.

My dad is a fisherman out of Caribou Harbour. He fishes lobster, rock crab, herring and scallops. I go fishing with him sometimes and look forward to doing that when I am older.

Someday I might want to do that for a living .

Boat Harbour is one of Nova Scotia's worst environmental sites. Now, Northern Pulp wants to pump that waste into the Strait via Caribou Harbour; right where my Dad fishes.

I am scared this will kill all the fish. What will he do then?

Also, I heard on the radio today that what will come out of this new pipe into the Strait will actually be worse than what currently flows out of Boat Harbour into the Strait.

Here is the link to the CBC radio show :

https://www.cbc.ca/listen/shows/information-morning-ns/segment/15672343?fbclid=IwAR0jKWPZfrIYOx1s-N8pQsddtWS6jY8FdaE13dS5oZqwHocqdg9GPkhYClg

I am worried this will poison the fish and lobster and crab. Will everyone still be able to eat it?

On pg 84 of the EA, the projected Total Suspended Solids is 48mg/L. If 85 Million Litres of Effluent is processed per day, that equates to around 4 Tonnes of TSS per day into the Strait!

The EA states that with the proposed AST facility, that TSS will be higher than the old waste process.

How can 4 tonnes of Total Suspended Solids NOT harm the Northumberland Strait every day

.

I hope you reject this environmental assessment application and do what is right for the Province o f NS

thank you

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 4:06:44 PM

Project: replacement_effluent_treatment_facility_project Comments: Lets Do The Math: Everyone wants better health care, better access to mental heath care, all 100 series highways twinned as well an overall better maintained road system, a better education system, help for the homeless, an end to poverty, and the list goes on and on. So how do we fix these problems? Well it comes down to government expenditures doesnt it? We are a poor province and are in debt up to our ears, so the province cannot afford to do any better than they are doing now. Without sustainable economic growth and a growing taxpayer base, how can we expect the government to address these issues adequately? So the solution is simple, Nova Scotia needs more taxpayers. We have heard for decades that â?obusiness is the backbone of a good economyâ? . Well this is where the rubber meets the road. The citizens and government must support new industries and foster the growth of present industries. This is not rocket science. The world views Nova Scotia as a non-business friendly province, especially in the resources industries. I started my own business from scratch almost forty years ago in the forestry industry. It is a small business, but we employ between 15 and 18 full time, seasonal employees, some of whom have been with us for over thirty years. For most, we are their only source of employment. I can say without hesitation that Paper Excellence, the owner of Northern Pulp, is unquestionably the best company we have done work for in all of those years. They far exceed the amount of money they are required, by legislation, to put back into privately owned woodlots on an annual basis. Their budget for follow up treatments, such as planting and thinning, are consistent and reliable every year. This allows a small business such as mine to retain an experienced labour force. They are a globally known company, particularly for being efficiently run and environmentally friendly. Northern Pulp leaving our province would have two monumental negative effects: 1 the forest industry would be near collapse-- this far exceeds the immediate 300 jobs related to the mill itself. Its closure will result in thousands of lost jobs as there are numerous companies who rely up them for a significant portion of their revenue. To think that their is a plan B that will overcome this lose is simply absurd 2With our already tarnished image around the world as being anti-industry, and wilfully booting out such a globally well regarded company as Paper Excellence, this will serve as just another nail in the coffin for our province. If weâ?Tre willing to sacrifice a company which is vehemently working to re-establish its image and develop a forward-thinking environmental plan, what possible expectations can we have for future industries to consider our province as â?~open to businessâ?T? To quote General Colin Powell, former U.S. Secretary of State Great leaders are almost always great simplifiers, who can cut through argument, debate and doubt to offer a solution everybody can understand. Come on government and opposition, where is the leadership? Name: Email: @eastlink.ca Address:

: Privacy-

Statement: agree x: 64 y: 24

From: @mail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 4:33:07 PM

Project: replacement_effluent_treatment_facility_project Comments: 4 Mar 2019 Nova Scotia Department of Environment, I am writing in regards to Northern Pulpâ?Ts new effluent treatment facility and 15.5 km pipe proposed to discharge up to 85 million litres of treated effluent and four tonnes of suspended solids daily into the Northumberland Strait. I am a resident of Central Caribou, where this pipe is proposed to run through, I have walked the coast of Caribou Harbour almost daily with my children for 12 years. I have several concerns about effluent and suspended solids where my children, dog and I swim. What will happen to the clam and oyster beds that live in the mud of Caribou Harbour, Northern Pulpâ?Ts open house information is not matching what is in the EA, the treated effluent leaving the aeration basins of Boat Harbour is meeting Pulp and Paper Effluent Regulations and causing harm but nothing can be done to remediate this other than some recommendations. Caribou Harbour is not a large body of water, the tide will bring effluent and suspended solids into the harbour. The EA and receiving water study state that the effluent will not come into Caribou Harbour, I fail to see how this is possible as the end of the pipe is right outside the mouth. Figure 8.12-1 page 363 of the EA is a still photo of the bottom of Caribou Harbour and states that it is devoid of microflora and microfauna. I can tell you that it is most certainly not void of life perhaps, because one still shot of a sand bar cannot show the huge oyster and clam beds present in Caribou Harbour, we have to wear swim shoes in the water there are so many you cannot walk without them. Oysters and clams are filter feeders and will be the first affected by this pipe. The mitigation measures for socio-economic issues is to take our concerns to the NSE Dept in Granton and Northern Pulp Community Liaison Committee will continue to facilitate two-way communication and advise to Northern Pulp. It is well known that the Community Liaison Committee meets in secret and the membership is hidden from the public. It also states that a communications and compensation plan will be available for the commercial fishermen, this is the first mention that there will be any effect of the effluent 2-5 meters past the outfall. If there needs to be a compensation package due to regular operation of the ETF how can the significance of the residual effects be: not significant or averse as stated in Table 8.14-2 pages 444-445. I attended all of Northern Pulps open houses, these were held for the Pictou Harbour outfall, they did not have any information sessions on the Caribou outfall. The information I received stated that there would be one tonne of suspended solids being pumped out daily, after reading the EA and calculating 48 mg/L by 85 million litres that would mean there are 4 tonnes of suspended solids daily going through the pipe. The ferry channel already needs to be dredged due to sand build up in the channel, how often would it need to be dredged if four tonnes of solids would be pumped into it daily, also I have not seen anywhere in the EA how routine dredging would affect the pipe. At the information open houses they had pictures of treated effluent from 1970, 1990, 2017 and finally a predicted photo of 2020. The last picture showed that the effluent was clear and this is how it would look in the new system History Effluent Quality picture Open House Panel 14, link below. This is not h ow it will look coming out of the pipe. There are pictures and video of what the effluent looks like leaving Boat Harbour now it is dark brown, however that is better than what it will look like coming out of the pipe because the new system does not replace the Boat Harbour Lagoon. It is only replacing the settling basins and aeration basins, what the water will look like leaving the pipe is what the water looks like now leaving the aeration basins. This is meeting regulations, and will continue to meet regulations in the new system. That does not mean it will not cause harm to fish, shellfish, marine plants, marine animals, birds as

well as their habitat. When Environment and Climate Change Canada Pulp and Paper Effluent Regulations PPER came to meet with the PEI Legislative assembly Feb 1st, 2019 see link below for transcripts they stated that Northern Pulp is one of the 70 of pulp mills that are causing harm even though they are meeting regulations. The Environmental Effects Monitoring EEM shows they are harming fish habitat while meeting regulations. The only corrective action taken after harmful effects are found by the effluent is Pulp and Paper regulators make recommendations for them to implement for the next three years, whether or not these changes are made or work isnâ?Tt checked until the next three year period of the EEM, and if they are still harming fish habitat there would just be more recommendations to them. So just like when Pictou Landing First Nation told Environment Canada that the mill was killing all the fish 50 years ago, there is still nothing living in Boat Harbour and the mill is meeting regulations. Would the same not happen to the Northumberland Strait? Everyone could complain that there is nothing living around Caribou but the mill is meeting regulations so the only thing that can be done is recommend changes every three years. The Strait is a unique ecosystem that must be protected. We are known for our swimmable beautiful beaches, our pristine waters that produce a sustainable seafood industry renowned around the world. If this is approved there will be no turning back, the Pulp and Paper regulations do not protect us or the Strait, if this decision is based on whether or not the EA can pass PPER then the Strait will become the next Boat Harbour, because it is the same regulations that they are passing now. Northern Pulp has made no effort to meet with the communities of Pictou and Central Caribou before and after the pipe location changed and the information that was provided by the meetings in New Glasgow are not even close to the information that is now in the EA. For these reasons I ask you Minister to reject this proposal. Thank you Central Caribou, Nova Scotia http://www.assembly.pe.ca/sittings/2018fall/transcripts/17_2019-01-02-transcript.pdf http://www.paperexcellence.com/copy-of-faq click on tab for project launch open house materials if link below does not work https://drive.google.com/file/d/14OWv3oA8C1E1ys4hxFCBCq4IcRkpkJq5/view Name: Email: @mail.com Address:

Privacy-Statement: agree x: 66 y: 23

From:
To: Environment Assessment Web Account
Subject: Response to Northern Pulp pipeline proposal
Date: March 4, 2019 5:49:58 PM

Dear Margaret Miller , NS Environment Minister,

I am writing to express two concerns I have with regard to Northern Pulp's Replacement Effluent Treatment Facility Project.
I am a retired teacher, father of two, and have been a resident of Braeshore, Pictou County for 39 years. I have lived in a shorefront home for the past 14 years and water related activities are a very important part of my life.

My first concern relates to the yellow signs that appeared all along our shore a number of years ago warning us not to eat the shellfish.

When these signs went up it made me worry about the quality of our water. Why can't we safely consume shellfish?

I learned that according to Fisheries and Oceans Canada, Pictou Harbour is in a prohibited area because of contamination from waste from the following:

- failing residential wastewater systems
- municipal wastewater treatment system
- runoff from land, like in the case of agricultural activities
- industrial facilities discharging into the environment

Some steps have been taken to help this situation. The town of Pictou has installed a sewage treatment facility. County residents have their own septic systems that must meet strict guidelines relating to proximity to water. I doubt that agricultural run off is now not as significant as there are now many more homes and cottages along the shore than there are farms.

That leaves Northern Pulp. Its new pipe will dump 60 to 90 million litres of effluent per day into Caribou Harbour, which also is in a prohibited shellfish area. It seems that while municipalities and property owners are working to improve water quality, Northern Pulp is only making our water worse. Will we ever have a time in the future when the yellow signs won't be needed?

My second concern relates to recreational sea bass fishing. This is an activity I enjoy very much from my shoreline and I fear that with continued effluent entering our water that this activity may go the way of shellfish harvesting.

I suggest that more research needs to be done to ensure the safety of ours waters.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: Comments to Environmental Assessment"Northern Pulp Wastewater Treatment Project"
Date: March 4, 2019 9:20:05 PM
Attachments: EA submission.docx

To: Hon. Margaret Miller, Minister of Environment for Nova Scotia

Thankyou for the opportunity to provide comment regarding the EA presented by Northern Pulp with respect to the Northern Pulp Wastewater Treatment Project. Can you please see the enclosed letter dated March 04,2019 reference to Northern Pulp Wastewater Treatment Project from myself and register it with the EA documents as public comment.

With Appreciation.....

To: Honorable Margaret Miller, Minister of Environment for Nova Scotia

Date: March 04, 2019

From:

RE: Comments to Environmental Assessment "Northern Pulp Wastewater Treatment Project"

I have read large portions of the "Northern Pulp Wastewater Treatment Project EA and would appreciate your consideration of four points which I have identified. I live in the small community of Toney River and although retired now, worked with Michelin Tires Canada for most of my working career. I had worked with Scott Maritimes Paper and am also a woodlot owner.

1. I live in an area which is a strong fishing community. We continually hear local concerns regarding this project and comments are most often presented with no facts. Example…."the effluent will be poison to everything", "in today's world, we do not need to put effluent in the ocean water", etc. It is essential that The Ministry deal clearly with facts and science. The EA has presented extensive facts and it is correct and good to question for detail and understanding. There should be questions and a need for further description however always with a focus on the facts. Our efforts to achieve environmental improvements must be based on clear true facts of science and history.
2. The EA has proposed detailed design and construction of an effluent treatment system described as Moving Bed Biofilm Reactor (MBBR) BAS and has identified comparison Kraft mills in Germany and Sweden where the technology is used….section 4.2.1. To provide factual performance results of this technology, data collection from these mills should be provided identifying effluent volumes, chemical quality, color and temperature. Note section 5.2.2.9 which describes the anticipated effluent quality of the NP project. The results of technical "best practices" should be well identified in order to provide confidence in the engineered project.
3. I have not been able to identify clearly in the EA, a multiyear past history of the effluent quality from the Boat harbor facility to the Northumberland Straight with respect to quantity, chemical qualities, color and temperature. Note again section 5.2.2.9 the anticipated effluent quality for the new NP project. I would suggest that we should be making a clear comparison between the "before" and the "after" for this project with respect to each of the effluent parameters. This study of the past effluent entry to the Straight should also be compared with the health and catch rate of lobsters in an area of several kilometers from the Boat Harbour outfall. Twenty to thirty years of data regarding this would be benefit in understanding our current situation and

predictability of the future. Lobsters should be somewhat representative of the ocean health as they are bottom feeders of other ocean life and not plant life. As the resource is so important, extensive data should be available.

4. One area of this development is the installation of 4.1 KM of buried undersea piping and diffuser assembly. Section 8.12.3.3 of the EA deals with construction of this piping and the disturbances with a resulting influence on sea life. Can I suggest that a comparison could be made to the Confederation Bridge project from New Brunswick to PEI. Although the NP project is much smaller and in a more confined water area, historic information of physical changes and lobster catch rates in areas around the Confederation Bridge could improve the understanding of any negative consequences from this part of the NP project. I would suggest that the effluent pipeline route option Section 4.2.4….to the Pictou Landing / Boat Harbour area and underwater a distance into the Northumberland Straight should have had greater consideration and priority. The Caribou Harbour area is a very busy location with the largest fishing boat concentration on the Northumberland Straight, the PEI to Nova Scotia ferry location and a very busy tourist accommodation area.
5. Closing……

   I would ask you to consider my noted points and call for some further study and documentation to best clarify the construction, results and influences of the project. This can lead to better managing any potential risks of the Northern Pulp Wastewater Treatment Project. Our Province has a very high rural population and that follows to be a region where reliance on natural resources is very high and important. The forest industry and Northern Pulp are very important to the economy of the entire Province, and every effort must be made to safeguard this contribution to the economy. A detailed understanding of all the science and facts associated with this project is of upmost importance to well inform the public and ensure that wise decisions are made.

   Changes in our Provincial forest policy as regards to the use of low grade wood fiber deserve long term planning and must not be any part of this project consideration.

   Can I please suggest that further information to the EA be developed per the above items 1,2,3, and 4
   Thanking you……

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 4, 2019 9:46:02 PM

Project: replacement_effluent_treatment_facility_project Comments: I am writing to express my concerns around the proposed Effluent Treatment Facility that Northern Pulp is planning and the placing of out flow pipes into the Northumberland Strait. Having had cottages on the Strait for most of my life and frequenting the local beaches with my children and grandchildren, I am greatly concerned with the damage the treated effluent will cause to the waters we swim in , beaches we play on and fish we consume. I believe that a Federal Assessment would be more stringent and have little doubt the results would show a truer picture of any risk to our environment. I only want to ensure that the ecosystems in the Northumberland Strait and those that live by it and work on it are protected. We do not need to rush into a situation that could ruin the fragile ecosystem that borders on three provinces, itâ? Ts breeding grounds and the local fishing and tourism industries. Northern Pulp will be dumping approximately 85 million litres of effluent da ily and they have noted on Page 2 of their EA that the contents of the effluent will not be known until the system is operational so they have not released the chemical make up in their EA. As a citizen of the affected area, I request the Provincial Government do their due diligence, ensuring we know exactly what is going to be pumped into our waters and the effects it will cause on the ecosystem. The Mill has been poisoning our air and water for the last 50 years, we must be sure this is not the case in the future, therefore we need a Federal Assessment to ensure our environment and our children will no longer be negatively affected by the mill. Thank you for your time. Sincerely,

Resident of Pictou, NS Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 56 y: 23

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Replacement Effluent Treatment Facility Project
Date: March 4, 2019 11:45:06 PM

Dear Minister of the Environment for NS, Margaret Miller,

I am writing to request that an Environmental-Assessment Report be undertaken with regard to the above-named project.

I have lived my entire life, with the exception of my time at Dalhousie University in Halifax, along the shores of the Northumberland Strait in Pictou County. I can look out across the Strait and see the shores of Prince Edward Island and I am very aware that it is not only the people of Nova Scotia who will be affected by this project.

I have attempted to read through the voluminous quantity of documents presented by Northern Pulp to your department, and I find that a number of things concern me

1. In Table E.1.1-1, Summary of the Significance of Project-Related Residual Environmental Effects, page xxxiv, it is **predicted** that the project, during all phases, will have no significant effect on any component of the environment. However, no where is it stated exactly what will be the composition of this effluent that they propose to continually pump into the Strait, day in and day out .... until something goes terribly wrong. And that may not take long, given that there has been no study done to determine the potential impact of this effluent of unknown composition on lobster larvae. This deluge of materials and chemicals **cannot and will not** simply "disappear" with no adverse effects. Indeed, it is entirely possible, perhaps even probable, that this action will cause significant adverse effects to environmental health, to human health and to the economic health specifically of the fishing and tourism industries, and also to other individuals and businesses whose livelihoods depend on the well-being of these major industries.
2. There has been **no public consultation** on the proposed route of their 15.5 km pipeline along Highway 106, entering the marine environment near the Ferry Terminal at Caribou and proceeding out into Caribou Harbour where the effluent (of unknown composition) will be discharged into the **prime fishing grounds** of the Northumberland Strait. This is madness! It would truly be reckless to take such a risk adjacent to any fishing harbour, let alone the largest fishing harbour on the Nova Scotia side of the Strait, without consultation and further study.
3. The concluding paragraph of Section 14, page 588 states "Overall, based on the results of this EA Registration, it is concluded that, with planned mitigation and the implementation of best practices to avoid or minimize adverse environmental effects, the residual environmental effects of the project, including the effects of accidents, malfunctions and unplanned events as well as cumulative environmental effects, during all phases are rated not significant." Is this a logical conclusion considering that it is stated no field work was conducted with regards to Harbour Physical Environment, Water Quality and Sediment Quality (Section 8.11) nor with regards to Marine Fish and Fish Habitat (Section 8.12)? My second question is: Not significant to whom? Perhaps not to the owners of Northern Pulp. They don't need to care about the

marine environment in Atlantic Canada. They don't need to care about the well-being of those who live along the Northumberland Strait. They don't need to care about the livelihoods of those who work in the fisheries or in tourism. They don't even need to care about the forestry workers in this area. They can simply continue to live their lives far from here, no matter what happens with their predictions and assumptions.

For these reasons, I believe it is important that this project be the subject of the more in-depth analysis and investigation of an Environmental-Assessment Report.
May God give you wisdom in this matter.
Sincerely,

Sent from Mail for Windows 10

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 9:37:06 AM

Project: replacement_effluent_treatment_facility_project Comments: I support this Project.
Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 81 y: 19

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 10:00:44 AM

Project: replacement_effluent_treatment_facility_project Comments: Having no regard for our environment, and never have, NP has proposed a replacement Pipe plan to release untreated effluent directly into the Strait. This is a terrible plan. How is it okay to dump it anywhere for that matter? Who, in their right mind, could possibly think otherwise? The continued damage our Nova Scotian Government permits to happen to our environment in the name of jobs is outrageous! My mind is boggled at the sheer stupidity of it all. Putting Our Oceans Habitat, its ecosystems, at risk is putting Humanity at risk, in my view, and a crime. Of course were not the only polluter in Canada, or the world, but doing something because everyone else does it doesnt make it right or solve the problem Our World faces. Lets be better than that Nova Scotia. Name: Email: gmail.com Address:

Privacy-Statement: agree x: 74 y: 31

From:
To: Environment Assessment Web Account
Subject: NP and the environment
Date: March 5, 2019 10:18:33 AM

I spent my summers on the pristine Northumberland Strait. My grandfather had built our cottage in 1929. My mother grew up there. I and my five siblings grew up there, as did my children and my 10 nieces and nephews.
I was seven when “the smell of money” would blow over and ruin our days. Our water turned brown and reeked. Dead fish would turn up on the beach. President of Scott Paper, was our neighbour at Chance Harbour and he would occasionally take samples of the water and have it tested: nope! That’s not Scott !
Well now we know it was. Jobs were too important at the time. And indeed at least for the terrible insidious poison they were shipping our way at least they employed about a thousand locals. You kind of felt like at least Scott cared a bit about us and our environment...
NP doesn’t care.
NP employs a couple of hundred (I know there is spin off in he woodlands and Halifax but that is not enough to justify poisoning the locals of Pictou County, our air and water, our fisheries and tourism).
NP sends all there profits to Indonesia.
NP is not willing to invest in Pictou County and when they finally have to invest - they will choose to close and leave NS and its taxpayers with a huge cleanup bill.
.
Save our fisheries.
Save our water.
Save our air.
Save our people.
Save ourselves some pain and insist now on a proper EA

Sent from my iPhone

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 10:34:48 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe that this should be allowed to proceed, please approve this EA. Name: Email: @gmail.com Address:

Privacy-Statement: agree

x: 88 y: 13

From: @GMAIL.COM
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 10:35:12 AM

Project: replacement_effluent_treatment_facility_project Comments: I BELIEVE THAT THE PROVINICAL GOVERNMENT IS CAPABLE OF OVERSEEING THAT THE ENVIRONMENT IS PROTECTED WHILE ALLOWING FOR INDUSTRY TO CONTINUE. PLEASE APPROVE THIS EA Name: Email: @GMAIL.COM Address:

Privacy-

Statement: agree x: 91 y: 9

From:
To: Environment Assessment Web Account
Subject: Northern Pulp E.A
Date: March 5, 2019 10:39:21 AM

Why should Northern Pulp be allowed to send their effluent treated or not treated directly into the Northumberland Strait?

1. Pipeing effluent into a most lucrative fishing grounds on the North Shore of Nova Scotia, too much risk.
2. Proposed pipe outlet being in marine navigation waters, jurisdiction Federal Government.
3. Climate change and pollution. We cannot afford anymore risk. Improve risk assessment Government Red Tape is required when Canadians health and wellbeing are at risk. Improve risk-based compliance.
4. The government needs to strengthen regulations to ensure transparency, predictability and accountability.
5. This decision is not about jobs vs. jobs it's about industry vs. an entire eco system. Too much risk.
6. We cannot afford to be making future investments in an industry that is decimating our forests. Too much risk.

WEARWELL GARMENTS LIMITED

126 Acadia Avenue, Stellarton, NS, B0K 1S0
Toll Free: 800-565-1188
Main: 902-752-4190
Fax: 902-752-4328

SOLUTIONS THAT LAST!

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 10:46:33 AM

Project: replacement_effluent_treatment_facility_project Comments: Dear Ms. Miller, I have worked at Northern Pulp for six years as of yesterday. This month also marks my 25th year in the Pulp Paper industry. I understand very well the importance of this industry to our provincial economy. In my six years at Northern Pulp, I have seen many positive changes in terms of emissions and our environmental footprint. The Mills owners have spent large amounts of money to improve the operation and a reduction in emissions is clearly evident. Northern Pulp has treated me well the past six years. I get to work relatively close to home and I get to work in a professional environment with other well educated individuals. Northern Pulp has allowed me to continuously improve myself through training opportunities. This allows me to improve and maintain the professional designation that I hold. The other Pulp Paper mill that I worked at constructed a new effluent treatment center in the mid-1990s. That was seen as an expansion to the mill and an improvement for all concerned. It amazes me daily that the ETC proposed for Northern Pulp isnt seen the same way. There is no reason why the forest and fishing industries cant co-exist. They have in this community for over 50 years. Now with 2019 technology for effluent treatment, it will be better than ever. People should listen to the science and not the uninformed opinions of a few. The science will prove that this is a worthwhile project for not only today but also in the future. I look forward to the remediation of Boat Harbour. Hopefully decisions made in 2019 are far better thought out compared to decisions made in the late-1960s. I also look forward to continuing my career at Northern Pulp. I look forward to providing my daughter with a good standard of living and opportunities for her today and in her future. I hope to do this in a province that respects the environment and values industry in a variety of forms. Im confident that all can co-exist. Respectfully yours, Name:
Email: @northernpulp.com Address:

Privacy-Statement: agree x: 51 y: 22

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Proposal Environmental Impact
Date: March 5, 2019 10:50:13 AM

Re: Northern Pulp Proposal,

Dear Sir/Madam,

We live directly across the Strait in Little Sands, PEI from where the proposed pipe is planned and view the smoke stacks of Northern Pulp. We already have them polluting our air and now the want to further pollute the ocean waters.

The health impacts experienced from those living across from Northern Pulp are most concerning. People of all ages are experiencing rates of cancers and disease that appear to be far higher than averages. Why? The only source of known pollution in this area is Northern Pulp. Pollutants from the stacks are put high into the air and come down in areas miles from the pollution source. Now there is a plan to direct waste discharge 4k into the Strait towards PEI.

We are calling for a full health impact study to be performed to find out why so many cancers and diseases are being experienced by people living in our area.

This plant has a documented history of polluting which brought about the questionable plan to dump their waste into the Strait. Should we trust them or their studies? Using the threat of closing and job loses to in order to justify their actions which are having such a profound negative impact upon so many people. Surely there exists a better way.

If the effluent does not contain pollutants or carcinogens then:

Why are is it not being discharged at the shore by Pictou?

Why is it being piped 4 Km from shore?

This strait is not isolated and will cause environmental damage far beyond our region as it connects to the oceans of the world.

Please have the vision to see the serious consequences of allowing this to go forward and do the right thing by rejecting their application.

Sincerely,

,

Little Sands, PEI

From: @dal.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 11:44:32 AM

Project: replacement_effluent_treatment_facility_project Comments: I would like to see a more thorough investigation of the environmental impact of this project than what the NS government currently plans to do. Northern Pulp has a history of erratic adherence to regulations and regulation guidelines and delay in notification of the public of problems. Equipment can fail, pipelines can break. What happens if equipment failure results in contaminated effluent - who is monitoring, how long will it take to find out there is a problem, and will the consequence be immediate shutdown of the mill until there is a remedy? What is the cumulative effect of long-term deposit of heated effluent into the Strait? I also commend the Premier of this province for holding firm on no extension. If this issue was truly a threat to their business, I believe that Northern Pulp would have made it a priority and funded the necessary resources to get a plan together within the legislated time frame. That they havent and are asking for an extension suggests to me that they thought they could use the politics of job loss to get an extension. I also believe that they do get an extension, they will be back in a years time with other excuses for why they need an additional extension. Name:
Email: @dal.ca Address:
: Privacy-Statement:
agree x: 53 y: 18

From:
To: Environment Assessment Web Account
Subject: No pipe please
Date: March 5, 2019 11:46:31 AM

Under no circumstances can I agree to an extension of the use of the Boat Harbour facility or a pipe directed into the Northumberland Strait. Polluters need to be responsible for the damage they cause not the tax payers.
Let’s get this right in 2020. Enough harm has already been done.

Owner/Principal - xOff Properties

Sent from my iPad

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 1:30:54 PM

Project: replacement_effluent_treatment_facility_project Comments: To: Minister of the Environment, I will firstly start with an article, below, from the Chronicle Herald which summarizes nicely my feelings on this whole affair. I do believe that the time for the Mill to close has come, I have lived in Pictou County all my life and enough is enough. This Mill in its many forms has been subsidized too much for over 50 years and the pollution, to the water and the air, has caused far too much damage to even estimate to human health, recreation on the waterbrown sludge for years stretching for many miles down the shore, to tourism in general and, in particular, to the town of Pictou, the constant foul smell in the air, damage to the Fisheries, etc. Cut our mill lossesChronicle Herald, Voice of the People, Feb.23, 2019 Thank you to Jim Vibert for his Feb. 20 column on Plan B for the Northern Pulp mill. I really think itâ?Ts time to return Pictou to a pristine tourist destination, and allow the fishers to keep earning a living without more problems threatening their fishing grounds. This is also our food supply. Certainly, if the mill is to remain open, an in-depth and unbiased assessment of the effluent is essential, and promises to the Pictou Landing First Nations community must be honoured. A solution is for the mill workers to be compensated with three yearsâ?T salary or expected wages, and be provided with career counselling. The foresters should be provided with an appropriate lump sum to help them return to responsible forestry management and environmental considerations. This would be a mere drop in the bucket compared to what the province has spent on the mill so far, and what itâ?Ts likely to cost us in the future.

Antigonish I am of the learned opinion that a Class 1 does not cut it, the Registration Document for this is certainly lenghty but it is insufficient to learn the truth and prove once and for all that the Mill will not cause further environmental problems. Your job is to protect the whole environment and a Class 2 assessment needs to be done period!! Please keep the politics out of your decision and do your job, not what is best for politics. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 55 y: 16

From:
To: Environment Assessment Web Account
Subject: Replacement Effluent Treatment Facility Project
Date: March 5, 2019 2:42:36 PM
Attachments: Response to Northern Pulp.docx

Please see my response to the proposed assessment as requested by you.
Thanks for consideration of my response, as attached.

--

Response to Northern Pulp's Application for an Environmental Assessment

March 5, 2019

To: Minister of the Environment,

I will firstly start with an article, below, from the Chronicle Herald which summarizes nicely my feelings on this whole affair. I do believe that the time for the Mill to close has come, I have lived in Pictou County all my life and enough is enough. This Mill in its many forms has been subsidized too much for over 50 years and the pollution, to the water and the air, has caused far too much damage to even estimate to human health, recreation on the water (brown sludge for years stretching for many miles down the shore), to tourism in general and, in particular, to the town of Pictou, the constant foul smell in the air, damage to the Fisheries, etc.

"**Cut our mill losses** (Chronicle Herald, Voice of the People, Feb.23, 2019)

Thank you to Jim Vibert for his Feb. 20 column on Plan B for the Northern Pulp mill. I really think it's time to return Pictou to a pristine tourist destination, and allow the fishers to keep earning a living without more problems threatening their fishing grounds. This is also our food supply.

Certainly, if the mill is to remain open, an in-depth and unbiased assessment of the effluent is essential, and promises to the Pictou Landing First Nations community must be honored. A solution is for the mill workers to be compensated with three years' salary or expected wages, and be provided with career counseling. The foresters should be provided with an appropriate lump sum to help them return to responsible forestry management and environmental considerations.

This would be a mere drop in the bucket compared to what the province has spent on the mill so far, and what it's likely to cost us in the future.

Jean Harrison, Antigonish"

I am of the learned opinion that a Class 1 does not cut it, the Registration Document for this is certainly lengthy but it is insufficient to learn the truth and prove once and for all that the Mill will not cause further environmental problems. Your job is to protect the whole environment and a Class 2 assessment needs to be done period!! Please keep the politics out of your decision and do your job, not what is best for politics.

From: @live.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 2:54:02 PM

Project: replacement_effluent_treatment_facility_project Comments: I strongly feel that Northern Pulp are doing their due diligence in providing a new world class treatment facility. Their science is tested and proven. If their design meets standards and specs, they should be allowed to proceed and more time be given to build the right solution. Fish stocks in the Northumberland Strait have been excellent over the past 50 years. With the new system, the effluent will be treated much better than in the past and hence a huge improvement from what we have today! Name: Email: @live.com Address:

Privacy-Statement: agree x: 41 y: 17

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 3:42:28 PM

Project: replacement_effluent_treatment_facility_project Comments: EA Submission2nd March 4,2019 Additional Info from Stantec Chart 5.6-1 and more observations. Page 8

Further to my comments submitted by email on February 13, 2019, solids dispersed into Northumberland Strait were described as minimum 1000 Kg on page 4, last paragraph. Actual maximum values of 4 Tonnes of Solids per day have been calculated based on Stantecâ?Ts Table 5.6-1 regarding discharged solids. TSS of 48 mg/liter equates to a probable maximum of 4 Tonnes. This large amount of solid material was never put into the ocean by the old Boat Harbour System indicating the new AST will be much worse for the environment. This amount is absolutely unacceptable, yet the antiquated Canada PPER regulation for TSS is 11,500 kilograms/dayfact supplied by Bruce Chapman of NP. This TSS Regulation MUST be updated and can never be one size fits all. It must be tailored to the receiving water to permit any safety to our marine life. The Northumberland Strait is described unscientifically, yet accurately by PEI MLA Colin La Vie as being like an old washing machine sloshing that highly tainted fresh water effluent back and forth with the tides, over the Lobster and Herring Beds and not sufficiently flowing out to ocean. A more scientific approach is this warning: Hypoxic or anoxic conditions can develop when oxygen is consumed by decomposing organic matter. If currents are weak and the organic matter is not being flushed from the area, these conditions may generate potentially toxic reduced compounds such as methane, ammonia and hydrogen sulphide Pearson and Rosenberg, 1978 Human Health Evaluation: There is none in a Class One Assessment. The Minister could order one but this would prolong the timing of the process which NS Environment does not appear to want. County residents have long decried the lack of health monitoring yet statistics seem to bear out there are increased serious health issues occurring. I can only hope that enough public comments on Health might be generated in this Environmental Assessment Forum to allow for the possibility of including human health considerations. My final comment is on the most disappointing action not taken by Northern Pulp. A Lobster Study! To gather info to understand and help protect the Lobster Fishery from that effluent, which will carry an enormous organic load. A Lobster Study was promised to be undertaken. PEI Legislature Committee 16 Feb 2018. Their testimony revealed Lobster Studies were on their immediate radar and would be carried out. NPâ?Ts agent, Dillon was looking after securing Scientists for expert advice. Those studies were never carried out or perhaps no experts could be secured who felt there was no danger? Trust broken! Again, Thank You. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 56 y: 18

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 4:36:36 PM

Project: replacement_effluent_treatment_facility_project Comments: I am fully in support of replacing Boat Harbour with the newly proposed Effluent Treatment System. We need this to keep forestry in Nova Scotia as it would be a vital asset. Northern Pulp should be given the opportunity to be given an extension. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 17 y: 14

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 4:37:06 PM

Project: replacement_effluent_treatment_facility_project Comments: I am fully in support of replacing Boat Harbour with the newly proposed Effluent Treatment System. We need this to keep forestry in Nova Scotia as it would be a vital asset. Northern Pulp should be given the opportunity to be given an extension. Name: Email: @gmail.com Address: : Privacy-Statement: agree x: 50 y: 20

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 4:39:04 PM

Project: replacement_effluent_treatment_facility_project Comments: I am fully in support of replacing Boat Harbour with the newly proposed Effluent Treatment System. We need this to keep forestry in Nova Scotia as it would be a vital asset. Northern Pulp should be given the opportunity to be given an extension. Name: Email: @hotmail.com Address: Municipality:

Privacy-Statement: agree x: 74 y: 20

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 4:54:38 PM

Project: replacement_effluent_treatment_facility_project Comments: I support the NP replacement effluent treatment facility project and I support an extension to the timeline to allow a thorough and successful completion of the project. Name: Email: @hotmail.com Address:

: Privacy-Statement: agree

x: 56 y: 16

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 8:07:05 PM

Project: replacement_effluent_treatment_facility_project Comments: I want to start this comment by stating that I wish to remain anonymous and my views do not represent that of my employers. My relation to this project is I am a homeowner that will be within the 500m distance from the pipeline and I am a professional engineer who works in the water and wastewater industry. I have had concerns since the initial consultation that is referenced within this report section 6.4.1. At this time, the consultants did not conduct themselves appropriately nor did they do their appropriate homework. Statements from their public sessions can be paraphrased as Pictou still dumps their sewage into the harbour and the treated effluent of a municipal wastewater plant is similar to that of industrial plants. The first statement was/is untrue and the second statement has several implications to me. Municipal wastewater is treating organic waste in some rare instances more than this. Industrial wastewater contains several other elements including inorganics such as heavy metals. If the belief that industrial wastewater is the same as municipal, why not set the limits the same. Those can be found in the Atlantic Canada Wastewater Guidelines Manual and are almost half 25 mg/L of the 48 mg/L BOD and TSS requirements listed in section 5.2.2.9. I will give the consultant credit however. They did mention the Caribou watershed and the Source Water Protection Plan, but they did not seem to engage stakeholders the way they should have. Nova Scotia Environment is part of the Source Water Protection Committed and helped develop several key components to the communication plan with the help of Hydrogeologist consultation. If the consultant truly wanted to gain full public input, reviewing the Source Water Protection Plan would have guided them to first talk to the Committee. This would have helped them identify additional water sources that are being currently developed northern section of the watershed, and it would have helped guide who to contact. Additionally, the Watershed identified within the report is actually considered Zone 2 of a three-zone watershed area that was defined by a hydrogeologist. Zone 3, not shown in the report, is a much large area that shows surface water zones that impact the watershed. This is r elevant for both private and municipal water sources as groundwater sources that are impacted by surface water, typically defined as GUDI, can be impacted by activities in surface water. The idea is, if the surface water becomes contaminated, there is risk for nearby GUDI sources to become tainted as well. Furthermore, the delineation of 500 meters used in the consultant report is the minimum value that is recommended in the Source Water Protection Plan. The recommended distance is 650 meters. Finally, as both a private well/land owner and someone who works in the water/wastewater industry, I have concern with how quickly the consultants dismiss risks as non-significant or NS. If there is a chance that the pipeline could break and devastate water sources and the environment, thereby creating a non-reversible condition, with only partial promise that the effluent will not harm the environment it is not ANTICIPATED that the effluent plume will not be visible when it reaches the water surface, this is more than non-significant for those who could be impacted. The report states that effluent will meet PPER requirements, but this does not give me confidence when I drink water based on the Guidelines for Canadian Drinking Water Quality GCDWQ. I would like to conclude with, I do not fully agree that EAA 2012 should not apply as section 41a states to protect components of the environment... from significant adverse environmental effect caused by design project. Several significant adverse environmental effects have been observed in the past. Therefore, hedging risk management on operational inspection and maintenance does not instill confidence in me that things will be different this time. If this means the mill has to close, I would prefer to have a

short-term partially depressed economy than a permanent loss of water, environmental damage and property that has zero value. Name: anonymous Email: @gmail.com Address:

: Privacy-Statement: agree x: 102 y: 21

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Class I Environmental Assessment - Replacement Effluent Treatment Facility Project
Date: March 5, 2019 8:37:53 PM

To Whom It May Concern,

I am writing this message to try and convene to you my concern regarding the proposed replacement effluent treatment plan Northern Pulp has presented. The mill has tainted the Northumberland Strait and Nova Scotia forests for over 50 years. The conversion of forest to disease and fire prone mono cultures (so called fiber farms) has been hard enough to swallow. Trees are resilient however and given enough time tend to reclaim the ground and return to a forest. The Strait and it's rivers, beaches, estuaries, etc. may not be able to recover as well if at all. Why risk so much for an industry that has hardly been a champion of the environment? They seem uninterested in exploring any other option than their pipe.

I don't want to see the end of the forestry industry. Surely there are other options for the province's woodlands than just pulp wood. The closure of a pulp and paper mill is nothing new. What have other areas that lost mills done with their trees? I can't imagine they were left to die in the woods. Wouldn't the government of Nova Scotia serve it's voters by encouraging a change in that industry through education, grants, etc?

The Northumberland Strait is a beautiful and important part of three provinces. The culture and economy of the land that it touches depends on it being healthy. Demand the federal government update the pulp and paper industry standards. Demand a federal environmental assessment. Demand Northern Pulp find an alternative solution.

Please stand up for the Strait, all it's provinces and the people that enjoy it.

Sincerely,

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 5, 2019 9:46:54 PM

Project: replacement_effluent_treatment_facility_project Comments: Dillon Consulting on behalf of Northern Pulp has stated that there is â?oNo Significant Residual Environmental Effect Predicted.â? That proclamation is dishonest in more ways than one. There is no way to predict leaks, spills, equipment failure, malfunctions, or other accidents, natural or man-made. The waste proposal poses major risk to harming marine life , marine habitat, species at risk/endangered/threatened that include migratory and marine birds, fish, vegetation, reptiles etc. The proposal goes through the Pictou town and Caribou water supply. Two provincial parks and two nature preserves are within the effluent pipe footprint. If they are contaminated, then what was the point of preservation??? This cannot be allowed to happen. Meeting PPER doesnâ?Tt prevent harm to marine life or marine habitat per Environment Canada. The characteristics of the proposed effluent is â?ounknownâ? to Northern Pulp. This is unacceptable. We want clean air and water and healthier forests. We want to protect our marine life. We want our children and grandchildren to be safe from this environmental time-bomb. We want our communities to thrive without having to worry about how lethal the effluent might be. Name: Email: @yahoo.ca Address:

Privacy-Statement: agree x: 57 y: 26

From:
To: Environment Assessment Web Account
Subject: Northern Pulp's Replacement Effluent Treatment Facility Project
Date: March 6, 2019 8:59:22 AM
Attachments: NPEA.docx

Please find attached by response to Northern Pulp's Replacement Effluent Treatment Facility Project.
I would appreciate an email indicating you have received my comments.
thank you.

March 6, 2019

Dear Margaret Miller, Minister of Environment,

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project.

I have been a long time resident of Braeshore and taught high school biology in the town of Pictou for 32 years. I feel strongly that we need to protect our environment and be very cautious about any human activities that may threaten it.

I would like to comment on two concerns I have with the proposed effluent treatment project. My first concern is for marine mammals and turtles and secondly I would like to see results from studies on the effect of the effluent on lobsters included in the report.

Marine Mammals and Turtles

On page 398 of the report, Table 8.13-1 lists marine mammal species known to occur in the Northumberland Strait. I have personally seen a Fin Whale and Harbour Porpoises and see that they are listed in the table under the category of special concern. Later in the report on page 570, section 12.3.9.1 it states *"it is anticipated that potential residual environmental effects of the project on marine mammals, sea turtles and marine birds may occur during the construction and installation of the pipeline, and during pipeline operation and maintenance activities."* This is very concerning. I
Also, I have sighted what I am fairly certain was a **Kemp's Ridley sea turtle** on the beach near our house. Unfortunately, I do not have a photograph of the turtle but I did report it to the Canadian Sea Turtle Network in 2015. A few months after my sighting another Kemp's Ridley was found in Hall's Harbour Nova Scotia and reported on CBC News · Posted: Nov 11, 2015. After seeing news images of the turtle I am more confident in my identification of the type. According to the Nature Conservancy of Canada the Kemp's Ridley is categorized as critically endangered and is considered the most endangered species of sea turtle in the world.
We must do everything possible to protect these vulnerable species.

Lobster Research

A second concern I have about the report is that I do not see any data on the possible damaging effects that the effluent might have on lobsters.
A personal experience I have with lobster research relates to a project done by one of my Advanced Biology 12 students. She was using Stage 4 lobster larvae in her project and unfortunately most of the larvae died when the temperature in the tank inadvertently increased over one weekend.
A quick literature search shows that there have been a number of research studies relating to various stages of lobster development and the factors affecting them.

The following is from the study titled Declining fecundity and factors affecting embryo quality in the American lobster (Homarus americanus) from the Bay of Fundy
Canadian Journal of Fisheries and Aquatic Sciences 72(3):1-12 · October 2014

"By far the largest change we observed across years was the steady and significant decline in fecundity, with an 8%–10% decline from year to year and an overall decrease of 31% from 2008 to 2013 (Fig. 3). Fecundity is influenced by multiple factors (see above) but ***temperature is likely one of the most important.*** *Laboratory experiments have shown that female lobsters require periods of low temperature (<5–8 °C) for ovarian development; if it is warmer, females will begin to transfer energy to molting and reduce spawning effort "*

Citation N. Koopman, Heather & J. Westgate, Andrew & Siders, Zachary. (2014). Declining fecundity and factors affecting embryo quality in the American lobster (Homarus americanus) from the Bay of Fundy. Canadian Journal of Fisheries and Aquatic Sciences. 72. 1-12. 10.1139/cjfas-2014-0277.

The effluent discharged into the proposed outfall area will range between 25 and 35 degrees Celsius. The study above indicates that climate change is already threatening the fertility of lobster, therefore, it does not seem advisable to release in excess of sixty million litres of warm liquid per day into a lobster breeding area.

This report, prepared by Dillon Consulting, indicates in appendix E3, section 3.3.2.10 that *"at 100 m the effluent plume temperature is* ***0.2 °C*** *above background" but later in the report on page 563 the statement is "Water temperature is anticipated to meet compliance for applicable federal water quality guidelines within approximately 2 m of the diffuser and be within* ***0.1 °C*** *of background at the end of the 100-m mixing zone."*

This inconsistency seems to indicate that they are not really sure what the thermal effect will be. I would like to err on the side of caution and have the thermal effect on lobsters more carefully considered.

In conclusion, I feel that the Northern Pulp's Replacement Effluent Treatment Facility Project, as presented, poses too many risks to species that inhabit our waters and should be rejected.

Sincerely,

From: @xplornet.com
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 6, 2019 9:03:14 AM

This place is a disaster. The information being given out is not the same as what is discussed in house.

Factors are missing in large proportions. There is NO WAY this effluent should be set free in Northumberland Strait. NS has a large business in seafood export, much larger than NP's and much more sustainable too, providing it is NOT damaged by chemicals being allowed to flow into the Strait.

This Pipe is NOT the answer to this problem and should NOT be allowed.

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 9:20:15 AM

Project: replacement_effluent_treatment_facility_project Comments: Its mind blowing to believe that in 2019 this type of pollution should be allowed to continue. I am sorry for the forestry workers that would be effected, but Northern Pulp has been a disaster for this province and I hope the Premier stand firm with his 1 year deadline. Northern Pulp is also responsible for massive deforestation across Nova Scotia, which makes the forestry industry unsustainable for the long term. Now along with putting our old growth forests at risk, they want to target our fishery in the Northumberland Straight. It is time for Northern Pulp to shut down. I believe the job losses of 12,000 are overstated and I have also heard rumors that there are other pulp companies in waiting to take over the mill if Northern Pulp should leave. Northern Pulp has no respect for Nova Scotia or the people that live in this province. Its time for Northern Pulp to shut down and go away! Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 60 y: 22

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Pipe concerns
Date: March 6, 2019 9:36:54 AM

I am sending along my objection to Northern Pulp's pipe proposal. I understand they submitted a class 1 EA. A project of this size and footprint on the environment, health of our ecosystems and people needs a more rigorous review. A Class II assessment is needed to ensure the effluent will not have long lasting effects to fisheries, marine life, environment and health of people. It is very alarming that Northern Pulp did not release the contents of the effluent to the public. The fact that documents obtained from freedom of information act suggest the content be disclosed but they choose to omit it from the submitted EA is very concerning. Why are they hiding it? Boat Harbour is a dead zone! It qualified for a Class II EA. How is this pipe proposal any different and less hazardous? The content going from the pipe into the projected landing zone of the Atlantic Ocean will be as bad or worse then what is being dumped today. This was confirmed by NP Technical Manager in his CBC interview. It is asinine to think that this pulp waste is acceptable to be dumped in the pristine Atlantic Ocean. Current standards for pulp and paper are out dated. Northern Pulp suggested they are meeting those standards. Are 25 year old standards acceptable when there is so much risk involved? Absolutely not! Tests done on fresh water Rainbow trout do not reflect the standards needed to PROVE this effluent is safe. Many of the marine life species that exist in this ocean today are salt water species that have reproduction life cycles around controlled consistent water temperature. Dumping this effluent into the breeding grounds of these species is a disaster waiting to happen. Mercury!! that NP did not include in their EA is present in effluent. Not only will it impact the marine life it will impact and cause harm to those who consume it.. Humans, other fish species, mammals, etc. I also am concerned with the pipe breaking. The unknown chemicals in the effluent now can reach town water supplies adding further risk to public health. The make up of the effluent leaching into the ocean today can already be realized on our shore lines. Look at PLFN and Sinclair beach.. a dark brown foam makes up the shore line. How can we let our children go near the water, swim, and enjoy the coast line if we now have Northern Pulp dumping this toxic pulp waste in the ocean. Everything about this toxic Pipe proposal is concerning. At a very minimum a Class II EA assessment is needed. This is 2019. Polluting our waterways and jeopardizing peoples health is now taken serious and can no longer happen.

thank vou.

From: @HOTMAIL.COM
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 11:08:09 AM

Project: replacement_effluent_treatment_facility_project Comments: HI ,I AM A WELDER AND HAVE BEEN GOING IN AND OUT OF THE MILL FOR THE PAST 20 YRS ,IT IS A GREAT PLACE TO WORK AND THE PEOPLE ARE FANTASTIC ,I DONT KNOW WHAT PEOPLE ARE THINKING ,WHEN THEY SAY CLOSE THE MILL ,DO THEY REALISE THAT WILL BE DIVISTATING FOR THE ECONAMY ,ITS A UNFORTUNATE SITUATION ,BUT WE HAVE TO WORK TOGETHER ,THERE WILL BE A LOT OF PEOPLE OUT OF JOBS ,FOREST WORKERS ,TRUCK DRIVERS AND IT GOES ON .I AM LOOKING FOREWARD TO GOING TO THE SHUT DOWN THIS FALL.AGAIN I SAY JUST STOP AND THINK ABOUT IT Name:
Email: @HOTMAIL.COM Address:

: Privacy-Statement: agree x: 58 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 11:08:16 AM

Project: replacement_effluent_treatment_facility_project Comments: There are so many reasons *not* to approve Northern Pulps planned Replacement Effluent Treatment Facility. Let me list them in point form: ** There is absolutely no guarantee that this system will actually remove all of the toxins. Even one of NPs own engineers says as much Chronicle Herald, Feb. 28: In an email between Northern Pulpâ?Ts technical manager and Dillon Consulting, a Toronto-based consulting firm, written on Nov. 29, 2017 the technical manager said in reference to the effluent coming from the proposed Northumberland Strait pipeline, â?osome say effluent quality will be worse than today because of all the polishing that is happening across the Boat Harbor basinâ?"and they are correct to some extent. ** Contaminated sludge from the effluent treatment system will be burned in the boiler facility -- thus spreading more pollutants into the air -- regardless of scrubbers, there will be some percentage of release. ** Piping the warm, dilute effluent out into the Northumberland Strait is creating an unacceptable and irresponsible risk to humans and to the lobster and other shellfish industry. As commented upon by Dr. John Krawczyk, MD, Kings Head, NS, Nova Scotia Advocate, March 6, 2019. Pumping toxic effluent directly into the Northumberland Strait is not an acceptable alternative for all the above reasons. The effluent will not be toxin free no matter how it is treated and will bio-accumulate in bi-valves mussels, scallops, oysters and lobsters. Seafood will be contaminated. The archaic expression dilution is the solution to pollution is no longer acceptable. Humans are at risk! I would add to this that, not only will we be risking the industry, but also the entire ecology of the surrounding Northumberland Strait. All shellfish are extremely sensitive to toxins -- and also to temperature and to acidity in water as their shells are formed of calcium. I have thus far seen no proof that there wont be damage to the shellfish and other aquatic flora and fauna of the Strait. In fact, I have read the opinions of several marine biologists that such effluent could be extremely harmful to shellfish. And I quote from a study on just such effluent: Untreated pulp and paper mill effluents are very toxic to most aquatic life. Concentrations as low as two percent can be acutely toxic to fish. Sufficient treatment can render the effluent essentially nontoxic much of the time however, treatment processes used by most mills reduce toxicity but do not eliminate it. Even effluents receiving good treatment may exhibit sporadic and dynamic increases in toxicity due in part to spills or dumping of spent pulping chemicals. Sublethal exposures to aquatic organisms to pulp effluent may affect a number of their physiological and behavioral functions. Toxicity of Pulp and Paper Mill Effluent: A Review of Literature:, Floyd E. Hutchins, Western Fish Toxicology Station, Corvallis, Or. ** There are now serious questions being asked about missing mercury at that site, and the building a new facility on mercury contaminated soils see Northern Pulps Environmental Documents: Missing Mercury, etc.. by Joan Baxter, Halifax Examiner, March 5, 2019 ** Perhaps the greatest and most damning reason of all is that, for 50 years, this mill has subjected the people of Pictou to terrible pollution, egregious health hazards, and obnoxious odours. Regardless of what improvements have been made, it has been more of the same old, same old. How much more should they, ESPECIALLY the people of Pictou Landing First Nations, be expected to endure? That this terrible environmental racism has been allowed to persist to this day is reprehensible. This latest plan to now pipe effluent into the Strait is just more of the same. Enough is enough. Name: Email: @gmail.com Address:

Privacy-Statement:

agree x: 72 y: 27

From: @smu.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 12:03:40 PM

Project: replacement_effluent_treatment_facility_project Comments: By Page number: xxxv â?" â?oIn addition, NPNS has had a Toxicity Prevention and Remediation Plan in place for many years which provides a structured approach for addressing treated effluent toxicity problems, should they occur.â? -this seems to conflict with the above table, in that â?~Accidents, Malfunctions, and Unplanned Eventsâ?T are all deemed to have non-significant environmental effects. If the effects of any unplanned events are non-significant, why would a remediation plan ever be needed? 8 â?" â?oReduced greenhouse gas emissions by replacing fossil fuels with natural gasâ? -this is great, but â?~naturalâ?T gas is, in fact, a fossil fuel, and one that also needs to be reduced considerably in the next decade and beyond Stocker et al. 2018. Are there plans to convert to even lower-carbon power-sources or offset additional CO2 emissions? 25 and 115 â?oâ?¦chloride ion is naturally present in salt water, in the form of sodium chloride. The presence of chloride in the ocean does not represent a concern for the environment.â? -while this may be true in the general sense, it is a logical leap and could be perceived as misdirection. Itâ?Ts like saying that Aluminum tailings are not of concern because it is a naturally-occurring element in reality, Aluminum is one of the most widely occurring natural metals, but when soils are acidic it can become toxic to plants because it preferentially binds to sites normally occupied by base cations at neutral pHs. In other words, the environmental context, and concentrations, are what cause the problems for many naturally-occurring ions, including most salts. Presumably, marine-life in the proposed area is adjusted to â?~naturalâ?T chloride concentrations of water in the Northumberland Strait. If increases of Cl- concentrations are expected to be within the tolerances of marine life, and within the range of historic variability for a particular diffusion area, the proponents should say that instead of simply regarding the ion as unimportant. 29 â?oâ?¦not a current technologyâ? - please define â?ocurrent technologyâ? 86 section 5.6.4 and 417 section 8.12.3.1 â?" -these sections may have relevance for North Atlantic Right Whales not mentioned directly in the report, because they are not normally known from the Northumberland Strait waters and other marine mammals because the marine component of the pipeline involves underwater noise and traffic. While the sound levels may not be sufficient to cause acute hearing damage, similar construction projects have shown clear impacts on the behaviour of marine mammals in other jurisdictions Culloch et al. 2016. Some additional monitoring and modification of construction schedules may be necessary to avoid 1 increasing stress to these animals and 2 displacing them from feeding grounds. DFO should be consulted for more specific recommendations. 121 â?othe findings of this study cannot be considered conclusive or causal in any way.â? -this choice of language is overly defensive and only serves to cast doubt on the proponents. The cited study was not perfect, but the lead author DID write â?oIn the field, Mytilus caged near untreated municipal wastewater and bleached kraft pulpmill effluents have a significantly greater chance of developing haemocytic leukemia than do mussels exposed to reference sites.â? -Consequently, saying that it canâ?Tt be conclusive or causal â?oin any wayâ? is neither accurate nor honest. Moreover, taking the old-fashioned industry-to-public communication approach, wherein an appropriate question based on peer-reviewed research is responded to using the triumvirate of conflate lots of things cause this, deny we donâ?Tt know what causes this, and attack the study was flawed! is clearly not objective, and I think the proponents can do better. I recommend an â?oacknowledge, critique, and explainâ? approach instead. E.g., â?oYes, the cited study drew this conclusion, and it is concerning. No, the study was not perfect in its attributions of cause and effect, so we

followed-up with the lead author should provide a more detailed account of this discussion for accuracy. In the end, we believe the NEW facility will be better / worse pick one.â? It might also be a good idea to commit to a follow-up biomonitoring study once the harbour has been reclaimed. 332-333 â?oMitigationâ? and â?oConstruction Phaseâ? -it would be a good idea to do some quick nest surveys for those barn swallows, as their nests might be in existing structures near the ETF footprint. If that is the case, the construction phase should avoid conducting work during the nesting season, to avoid displacing the birds or interrupting their foraging patterns through excess noise and emissions. Literature Cited: Culloch, R.M., Anderwald, P., Brandecker, A., Haberlin, D., McGovern, B., Pinfield, R., Visser, F., Jessopp, M., and Cronin, M. 2016. Effect of construction-related activities and vessel traffic on marine mammals. Mar. Ecol. Prog. Ser. 549: 231â?"242. doi:10.3354/meps11686. Stocker, T.F., Qin, D., Plattner, G.K., Tignor, M.M.B., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., and Midgley, P.M. 2018. Global warming of 1.5Â°C. In Report of the Intergovernmental Panel on Climate Change. doi:10.1017/CBO9781107415324. Name: Email: @smu.ca Address:

Privacy-Statement: agree x: 72 y: 26

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 6, 2019 12:21:06 PM

I am writing this email in regard to the Northen Pulp effluent disposal proposal. Pleas know as a young professional that moved back to Nova Scotia from Alberta I am strongly opposed to the proposal and can not possibly believe that anyone would even consider this as a viable option. Furthermore my husbands occupation will be directly impacted if the plant is to close and he could very well loose his job however still we do not support this as the risks associated with the plan impact our community and family far more than those associated with with a job loss. We need to think of the long term heath of our environment and community; we are resilient we will flourish if the mill closes. Please do not focus on the fear of a few in this monumental decision. My family swims fishes and uses our straight .....think of the fisheries the tourism the health that can be negatively impacted unless you can guarantee 100% that this will not be the case . This proposal can not be passed it can not move forward too much is at risk . You have put the environment and people at risk for too long. Do what is right to what is best for the greater good . Do not think of your job loss do not let fear of job loss outweigh the unknown of our environment.

Respectfully submitted

From: @nnseafoods.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 12:46:17 PM

Project: replacement_effluent_treatment_facility_project Comments: I am writing to you as a concerned citizen and an employee of North Nova Seafoods in Caribou, NS. This plant provides jobs year round to 150 people as well as supporting hundreds of Fishermen. These jobs will cease to exist if this pipe is allowed to go as planned by Northern Pulp. I am also concerned about the environment and health of those of us living in Pictou County. Name:
Email: @nnseafoods.ca Address:
:

Privacy-Statement: agree x: 68 y: 17

From:
To: Environment Assessment Web Account
Subject: Call for the rejection the Northern Pulp Effluent Treatment Project
Date: March 6, 2019 1:06:21 PM
Attachments: Northern Pulps rejection request.docx

March 2 2019

Northern Pulps proposal to pump effluent into the Northumberland Strait must be rejected because of the significant adverse effect that it will have on the Strait.

I was born and raised in Pictou county. I have fished the waters of the Northumberland Strait for 30 years. There was a time when we did not think much about the effects our actions had on the ocean. We see now firsthand how fragile the ocean is. We now work with DFO to preserve an ecosystem, an industry and a way of life. We have reduced our lobster trap numbers from 300 to 280, stopped fishing single trap trawls and are increasing the carps size. We have also increase the web size of our herring nets to allow the small fish to go free. In recent years we have seen the Northumberland Ferries Limited and the town of Pictou implement sewage systems, so that they no longer dump their sewage into the ocean . Land owners along the Strait have built sea walls to stop erosion and the accompanying sediment. And these changes are working. The last several years have seen an increase in lobster catches in our area. Sustained scallop seasons.

Proving that our oceans and fishery are sustainable is very important to the world. Dumping industrial waste into the ocean does not constitute Sustainability. This is a step backwards for Nova Scotia ...for Canada.

"Our Oceans, Our Future
As Canada's Minister of Fisheries and Oceans, it gives me great pleasure to present Canada's Oceans Strategy. This far-reaching policy framework will make Canada's vision for modern oceans management a reality.

As a country bordered by three oceans, Canada is truly an oceans nation. Today we see an ever increasing number of demands on oceans and their resources. While traditional fishing and marine transportation continue to be of prime importance, they are now joined by other uses, such as aquaculture development, oil and gas exploration and development, recreational and commercial fishing, and eco-tourism. Canada's oceans also support important features of Canada's social and cultural identity. Managing these demands is critical to the protection of the marine environment and the long-term sustainability of Canada's oceans and their resources.

On January 31, 1997, the Government of Canada brought the Oceans Act into force, making Canada the first country in the world to have comprehensive oceans management legislation. The Act authorizes the Minister of Fisheries and Oceans Canada to lead the development of a national oceans management strategy, guided by the principles of sustainable development, the precautionary approach and integrated management."

source: Robert G. Thibault
Fisheries and Oceans Canada, Oceans Directorate, *Canada's Oceans Strategy,* 2002, Cat. No. Fs23-116/2002E, Ottawa - Ontario: Fisheries and Oceans Canada 2002, iii

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My fishing grounds are the waters along Caribou Island. It is an extremely fragile area. It is extremely sensitive to water temperature changes. If we get a Nor-Eastern the water becomes brown with sediment. It takes several days for the sediment to clear and fish to return. Northern Pulp proposes to dump 90 million litres of effluent per day on this area. Northern Pulp estimates that the propose pipe will dump 48mg of Suspended Solids per litre into the Strait. **For a grand total of 4.32 tonnes of Suspended Solids per day.** This is daily. That is 1,576 tonne per year. The area will never have a break / never be given a chance for it to recover*. The long term effects of this have to be studied.*

"*(5.6.1* Replacement ETF Effluent Discharge

Adsorbable Organic Halides (AOX) mg/L 7.8
Total Nitrogen (TN) mg/L 6.0
Total Phosphorus (TP) mg/L 1.5
Colour TCU 750
Chemical Oxygen Demand (COD) mg/L 725
Biochemical Oxygen Demand (BOD5) mg/L 48
Total Suspended Solids (TSS) mg/L 48
Dissolved Oxygen (DO) mg/L >1.5
pH - 7.0 to 8.5
Temperature oC
25 (winter)
37 (summer)
Total Dissolved Solids (TDS) or Salinity g/L 4
Addi□onally, the project is designed with key established water quality guidelines and/or will meet ambient water quality (current background) at the edge of a standard mixing zone (CCME 2009 - Canada-wide Strategy for the Management of Municipal Wastewater Effluent)."
source:(NP EP Proposal)

The sediment from the construction of the pipe alone will be catastrophic. We have witness firsthand the significant adverse effect that the construction of the Confederation Bridge, in 1993,had on the fishery. It has taken about twenty three years for lobster stocks to return up to 90km away. This was a finite project, with a recovery time. The proposed NP is a constant 4.32 tonnes per day! Every day.

I've always had a since of pride about living in Nova Scotia, Canada. I've felt that we were moving forward towards a greener country. Northern Pulps proposal to dump effluent into the Northumberland Strait is a step backwards. **I am asking you to Reject the proposal on the grounds that the significant adverse effects cannot be mitigated.**

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 1:22:24 PM

Project: replacement_effluent_treatment_facility_project Comments: The EA decision should be based on science, not emotion or hearsay. NP should be given a chance to make this work, the mill is far too important to the larger NS forest industry to let fail without a resonable attempt to do it right, and if an extension to the BH Act is needed, it should be granted. Name: Email: @eastlink.ca Address: : Privacy-Statement: agree x: 64 y: 25

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 1:36:37 PM

Project: replacement_effluent_treatment_facility_project Comments: This is great news. I believe this is the right time for Northern Pulp to grow and prove to the community they are here for the long term. With the new upgraded system you will not see any untreated effluent leave the mill which is a significant improvement and they are just going to keep improving. We all want to see boat harbour cleaned up which we will. Northumberland Straight will have the best treated waste and it will keep improving over the years like it has in the past. If this mill has to close you will see the population drop tremendously and it will not only effect the mill workers but also lots of indirect jobs. It has been co existent for more than 50 years so there is no reason why all of a sudden now it is an issue when the mill wants to improve their system. Hopefully one day everyone can see eye to eye and this will all be put behind. Northern Pulp is a huge asset to Pictou County. Name: Email: @hotmail.com Address:

Privacy-

Statement: agree x: 52 y: 24

From:
To: Environment Assessment Web Account
Subject: Fwd:
Date: March 6, 2019 1:40:15 PM

Dear Minister,

I am writing to disclose my concerns with Northern Pulps new treatment facility. First off, I would like to describe my frustration with this environment assessment in the sense that I do not find it fair to read through 1700 pages and only have 30 days to respond to you in regards to the many topics I find appalling.

The many issues I have with this proposal are numerous. I would like to describe the sections I find troubling which must be considered by yourself in formulating the decision under subsection 34(1) of the Environment Assessment Regulations.

a) The location of the proposed undertaking and the nature and sensitivity of the surrounding area: Having grown up in Pictou and New Glasgow, I have worked on the water and lived in this surrounding land area. I am unsure how a pipe would be able to bypass a colony of protected birds which are found near the Pictou Causeway, Munro's Island, Caribou Provincial Park, and Water Side Provincial Park. This area is known to be a habitat for species at risk, and I would like to be informed with how this pipe would not alter life of various marine and land species. These migratory and salt water habitat birds that are on the specicies at risk, listed as threatened, endangered within the footprint of the pipe proposal.

b) The size, scope and complexity of the proposed undertaking: Again, I am unsure how the Boat Harbor cleanup process would be suitable for a federal assessment and undertaking yet a project of such huge cost and nature would only require a 50 day provincial assessment. Viewing reports through the FOIPOP request show that Dillion consultants raised the issue of heavy metals, such as metals and mercury and of Dixons and furans in the effluent. In January 2018, Dillion sent a list of questions to Northern Pulp, KSH consulting and TIR, saying it needed information on the "percentage of dioxins and furans in the final effluent going into the strait daily". In February 2018, Dillion again wrote to Northern Pulp reminding the technical manager of the need to acknowledge these substances, noting that questions have arisen regarding the content of metals in the discharge. So far, Northern Pulp cannot address in their proposal, the chemical characteristics or concentration of known

chemicals in their effluent. I would like to understand in common language, how this would be acceptable in 2019. For an area where I live and breathe in, I am extremely frustrated that this level of arrogance to human health is allowed to be documented and presented in a formal means of proposal from a company.

c) My concerns expressed should be seriously noted. I will refuse to live in this area or province if you shall allow a pipe of poison and sludge system of this nature to be granted. I will not allow myself or my family to suffer to this level of criminal environmental behavior. I have attended various committees and understand the EcoJustice may be following this case to the Supreme Court level. At this time, this level of jurisdiction has granted Pictou Landing First Nations to be considered and consulted by this company for any future construction. I would hope you would be on the right side of history in regard to this serious case of environmental racism this group has already endured for the last 53 years. I stand firm in support, as do many of my friends and family with the closure of Boat Harbour and will not support an extension of any sort for Northern Pulp to continue using Boat Harbour for a treatment facility of their poisonous waste.

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Bleach Chlorine Mills and the Impacts on Marine Life: The molecular chlorine or chlorine-containing compounds currently used as bleaching agents by the pulp and paper sector react with materials released from wood during the pulping process, resulting in the formation of chlorinated organic compounds which are in part discharged into the aquatic environment via effluents. Canadian mills are estimated to use over 610 000 tonnes of chlorine annually to produce over 10 million tonnes of bleached pulp and to release over a million tonnes of chlorinated organic compounds to the aquatic environment. The dioxins and furans are part of the bleaching process and are considered “toxic" under Sections 11(a) and 11(c) of the Canadian Environmental Protection Act and the Federal Government . TSS and BOD are regulated under Sections 34 and 36 of the Fisheries Act which is a Federal act thus requiring Federal involvement. The chemical composition of bleached pulp mill effluents is variable and not well characterized. Approximately 250 compounds have been identified in bleachery effluents but many more remain unidentified. Thus, substantial quantities of chlorinated organic compounds, both of known and of unknown composition, enter the Canadian aquatic environment from bleached pulp mill discharges. Many of these chlorinated organic compounds are persistent and have been detected in water, sediments and biota up to 1400 km from bleached pulp mills outfalls. Compounds with low chlorine substitution

degrade within hours to days, whereas highly chlorinated organic compounds may persist from days to weeks or longer. Persistence may be longer in winter, especially under ice. Some chlorinated organic compounds can be biologically degraded or transformed and transformation may lead to more persistent and bioaccumulative compounds. Chloroveratroles, for example, transformation products of chloroguaiacols which are unique to bleached pulp mill effluents, are capable of accumulating in fish up to 25 000 times the concentration in water. Seventy-five percent of Canadian bleached pulp mills discharge effluents that are acutely lethal to fish, sometimes at concentrations as low as 3.2% effluent. A few individual chlorinated organic compounds in these effluents approach or surpass concentrations that cause mortalities in aquatic organisms ranging from algae to fish.
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Thank you for reading my letter of distress.

A very concerned local resident of Pictou County-

From:
To: Environment Assessment Web Account
Subject: Environmental assessment response northern pulp
Date: March 6, 2019 1:48:49 PM

To whom it may concern
Am very concerned about the proposed plan to dump effluent into caribou harbour,I fish lobsters in Wallace west of pictou,yano I think it's a joke in 2019 we are talking about having a industrial plant dispose there waste into any body of water let alone a free flowing ocean

My concern is the impact on my fishing industry,how do we truly no that the effluent coming out of the proposed pipe won't kill all the fish and further more who with be crazy enough to purchase the seafood if they actually do survive because everyone nation and world wide would know that those lobsters crab herring etc swim in mill run off

I thank you for your time really hope to see environmental racism come to a hault or someone people will be on the hook for large amounts of money..we say no pipe!!

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 1:57:26 PM

Project: replacement_effluent_treatment_facility_project Comments: No! Just a big no! Be responsible, stop polluting our oceans, our air, our land, our future. Be smart! Name:
Email: @eastlink.ca Address:

Privacy-Statement: agree x: 67 y: 34

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 2:21:07 PM

Project: replacement_effluent_treatment_facility_project Comments: This new Effluent Treatment Facility is state of the art and a leap in science with the latest technologies. I fully 100 approve it. It would be total and absolute financial insanity for the Province of Nova Scotia to shut down the pulp mill when it is proven beyond the shadow of a doubt that both Industry Forestry fishing can co-exist together as they already do in other Provinces in Canada. Furthermore Northern Pulp MUST be given an EXTENSION past the January 2020 deadline,for the proper installation of the pipe and construction of the new treatment facility. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 57 y: 21

From:
To: Environment Assessment Web Account
Subject: Writing in relation to Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 6, 2019 2:28:47 PM

I have lived in the town of Pictou for over 50 years. Back then (pre-mill), it was a vibrant town with all the amenities. It is a town steeped in history. I will forego all of what was to offer and go straight to the point. As a young boy I remember when the pulp mill opened. I vaguely remember the foul smell and the reported flakes of a substance that was landing on peoples' cars.

52 years on into the future. I now own that house in which I lived as a young boy – *a circa 200 year old* house that sits prominently on the Pictou Harbour waterfront, with Northern Pulp in the background.

I know the pulp mill well. I grew up with it. I even worked there for a couple months in the early 80s in the spring after my 1st year and 2nd year of university – I worked in the woodlands division when it was Scott Paper. Nevertheless, we now are 35 years beyond that time and I have since witnessed a decaying plant and the simultaneous decline of a community, in part due to the effects of this putrid and rancid smell that often is emitted from those stacks. Today, all of the windows in my house that face south (toward the mill) remain closed permanently. I dare not open in case that waft of sickening air permeates into my living space. Further, I am a runner. I run daily. As soon as I awaken, I must look out the window toward the mill. The wind direction dictates the direction in which I run. Unfortunately on some days, when the wind is from the due south, there is no escaping the foul smell. What am I breathing? Does anyone seriously believe that these odours are harmless? Is this Soviet Union or East Germany of the 1960s?

Pictou's air quality is not of its own doing. This mill is not even in our civic community. It is located across a body of water in the rural municipality of Pictou – a political unit unto its own. People of the town have borne the brunt of this bad air simply due to geography and meteorology. That is, the prevailing winds – primarily blowing from the south and southwest – directly in the path toward our little community.

I have listened and read intently to all of the discussions about the mill. My conclusion is that the behaviour of this pulp mill and its current state is beyond resolve. Its egregious violations, its displays of greed, its lies and half-truths, its ignorance, its poor stewardship of the land, and its disrespect of the lives of citizenry deem this mill to be not worthy of supporting.

Mercury, sludge, toxic, chemical effluent, stench, contamination, cover-up --- these are but a few of the words that go hand-in-hand with this company. There are many other words I am sure. To those Who say it is "the smell of money", I say it is the smell of illness, of cancer, and of death. To the supporters of the mill – the saw mill operators and truck drivers, please come

live in the town of Pictou. Bring your families. Enjoy the stench. Real estate is cheap – house prices have been stagnant for 30 years.

Tell me – which community would accept a pipe carrying toxic chemicals to pass through their watershed? Citizens of Halifax – would you accept this? Citizens of anywhere in Canada – would you accept this?
Of course not. Further, the gall of Northern Pulp to propose that the pipeline be diverted toward the very town which bears the brunt of its toxic shit, then crossing its water source, then proceeding into the Northumberland Strait – right below the waters of the very fishermen who are actively opposing your ill-thought solution. Unbelievable!

I have focused primarily on my own perspective in this letter – from a resident of the town of Pictou. It goes without saying that the good people of Pictou Landing and the Boat Harbour situation is deplorable. I applaud chief Paul for her stance. I also applaud the efforts of the fishermen in protecting their industry.
"No to the effluent plan". Instead of a 21st century solution to a problem, Northern Pulp has offered a very poor 19th century solution. It is clear that the pulp mill is well past its *best-before* date.

I am not naïve to know that there would be economic consequences to whichever decisions are made. I understand what the mill was, but that is now history. Our world has changed. Yes, I understand the jobs discussion. After a mill closure I am confident that a new equilibrium will emerge. We cannot be afraid of change. I want to be on the side of right. In 100 years will the narrative be about propping up a pulp mill that pollutes, that pillages our forests, destroys the environment, and destroys communities, or do I want to be part of a narrative that takes back our pristine province. We are on the cusp of being a "1 million inhabitants" province. Time to shed the old ways and embrace our new strengths.

NO PIPE OVER LAND NOR IN STRAIT

From:
To: Environment Assessment Web Account
Subject: Letter concerning Northern Pulp
Date: March 6, 2019 2:34:30 PM

Dear Minister,

I am writing to disclose my concerns with Northern Pulps new treatment facility. First off, I would like to describe my frustration with this environment assessment in the sense that I do not find it fair to read through 1700 pages and only have 30 days to respond to you in regards to the many topics I find appalling.

The many issues I have with this proposal are numerous. I would like to describe the sections I find troubling which must be considered by yourself in formulating the decision under subsection 34(1) of the Environment Assessment Regulations.

a) The location of the proposed undertaking and the nature and sensitivity of the surrounding area: Having grown up in Pictou and New Glasgow, I have worked on the water and lived in this surrounding land area. I am unsure how a pipe would be able to bypass a colony of protected birds which are found near the Pictou Causeway, Munro's Island, Caribou Provincial Park, and Water Side Provincial Park. This area is known to be a habitat for species at risk, and I would like to be informed with how this pipe would not alter life of various marine and land species. These migratory and salt water habitat birds that are on the specicies at risk, listed as threatened, endangered within the footprint of the pipe proposal.

b) The size, scope and complexity of the proposed

undertaking: Again, I am unsure how the Boat Harbor cleanup process would be suitable for a federal assessment and undertaking yet a project of such huge cost and nature would only require a 50 day provincial assessment. Viewing reports through the FOIPOP request show that Dillion consultants raised the issue of heavy metals, such as metals and mercury and of Dixons and furans in the effluent. In January 2018, Dillion sent a list of questions to Northern Pulp, KSH consulting and TIR, saying it needed information on the "percentage of dioxins and furans in the final effluent going into the strait daily". In February 2018, Dillion again wrote to Northern Pulp reminding the technical manager of the need to acknowledge these substances, noting that questions have arisen regarding the content of metals in the discharge. So far, Northern Pulp cannot address in their proposal, the chemical characteristics or concentration of known chemicals in their effluent. I would like to understand in common language, how this would be acceptable in 2019. For an area where I live and breathe in, I am extremely frustrated that this level of arrogance to human health is allowed to be documented and presented in a formal means of proposal from a company.

c) My concerns expressed should be seriously noted. I will refuse to live in this area or province if you shall allow a pipe of poison and sludge system of this nature to be granted. I will not allow myself or my family to suffer to this level of criminal environmental behavior. I have attended various committees and understand the

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d) Whether environmental baseline information has been submitted for the undertaking is sufficient for predicting adverse effects: As we know now, Northern Pulp did not create any base line date to understand any negative impacts to marine life or lobster larvae. They consulted a marine biologist who stated there was once a study done in 1960 and did not hold any true value to the nature of this current Northern Pulp wish to create a pipeline through the Northumberland Strait. Most pulp mills put in oxygen delignification systems back in the 1980s or 1990s but not Northern Pulp. They have never paid for themselves to reduce chemical use and goes on without the use of this system. We know as well, they have not added this system to their proposal. I would like to understand why this is, as they promote the system to the public and state it will be added. Tax payers should not be on the hook for this system. It is very clear that the elimination of boat harbor basin

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Bleach Chlorine Mills and the Impacts on Marine Life:

The molecular chlorine or chlorine-containing compounds currently used as bleaching agents by the pulp and paper sector react with materials released from wood during the pulping process, resulting in the formation of chlorinated organic compounds which are in part discharged into the aquatic environment via effluents. Canadian mills are estimated to use over 610 000 tonnes of chlorine annually to produce over 10 million tonnes of bleached pulp and to release over a million tonnes of chlorinated organic compounds to the aquatic environment. The dioxins and furans are part of the bleaching process and are considered “toxic" under Sections 11(a) and 11(c) of the Canadian Environmental Protection Act and the Federal Government . TSS and BOD are regulated under Sections 34 and 36 of the Fisheries Act which is a Federal act thus requiring Federal involvement. The chemical composition of bleached pulp mill effluents is variable and not well characterized. Approximately 250

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anomalies, biochemical changes, and behavioural alterations in aquatic organisms, have been observed in Canadian field studies at 0.5 to 5 % whole effluent. Laboratory studies using individual chlorinated organic compounds that are commonly discharged from bleached pulp mills have demonstrated such chronic effects as deformities, and embryo and larval mortalities in fish. These chronic effects include significant irreversible factors which jeopardize the continuance of the species and the integrity of the ecosystem. Thus, the levels of whole effluents discharged from Canadian bleached pulp mills to the aquatic environment and the resulting acute and chronic effects observed both in the field and in the laboratory combine to represent a significant risk to the aquatic ecosystem.

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Thank you for reading my letter of distress.
A very concerned local resident of Pictou County-

Sent from my iPhone

From:
To: Environment Assessment Web Account
Cc:
Subject: Letter to N.S. Environmental Assessment Branch Re.: Northern Pulp Effluent Treatment Facility Project
Date: March 6, 2019 2:50:12 PM
Attachments: image001.png
Northern Pulp Environmental Assessement 20180306.pdf

Please see the attached letter from Unifor Atlantic Regional Director, regarding the Northern Pulp Effluent Treatment Facility Project.
Full text of letter also found below.

Secretary/Secrétaire

UNIFOR

63 Otter Lake Court, Halifax, NS, B3S 1M1

March 6, 2019

Environmental Assessment Branch
Nova Scotia Government, Environment Department
Halifax, NS

Re: Northern Pulp Replacement Effluent Treatment Facility Project

Greetings,

Unifor proudly represents 240 workers at Northern Pulp, 12,000 workers in Nova Scotia, and 23,000 forestry workers across Canada. We are Canada's largest union in the private sector with 315,000 members in every sector of the economy, and regularly advocate for good jobs, sustainable development, and progressive change for a better future.

Northern Pulp has proposed a world-class multi-million dollar investment to fully meet new, more stringent, environmental standards. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector. With this proposed investment, Northern Pulp will be on the leading edge of environmental responsibility and stewardship in the industry. We are writing today to encourage a rapid conditional environmental assessment approval for this project.

Northern Pulp's proposed new effluent treatment facility incorporates the AnoxKaldnes BAS biological treatment process purchased from Veolia Water Technologies, one of the world's leading firms in this field. With more than €2billion in annual revenue and 130 business units around the world, Veolia Water Technologies operates with over 9,000 employees; more than 60% of whom are researchers, engineers and project managers. Moreover, the Water Technologies division is part of the much larger France-based Veolia Group, with €25 billion in annual revenue and 169,000 employees around the world.

We are confident that with appropriate government oversight, a partnership between two global industry leaders, Paper Excellence (Northern Pulp's parent company), and Veolia, is fully capable of rigorously implementing proven technology that will meet all required environmental standards for this project. These two successful global leaders in their fields rely on fully addressing their environmental responsibilities.

Beyond the essential matter of this project meeting the technical requirements for effluent treatment, we would also like to draw your attention to the broader implications of this decision-making process. The Nova Scotia *Environment Act* is recognized as an essential piece of legislation designed to protect our shared environment, and guide our economic development. The *Act* rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

> *The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.*

It is on this principle that we would like to bring forward a fuller understanding of the vital economic role played by Northern Pulp in the community, and the wider Nova Scotia economy.

A failure to provide approval for this project puts at serious risk the very future of the mill, with far-reaching implications for the entire inter-connected Nova Scotia forestry sector. Beyond the direct operations of the mill, the wider economic impact of Northern Pulp is best understood through the role it plays in sustaining the province's 93 sawmills (responsible for 2,000 direct jobs), and the broader woodland operations held by the more than 30,000 forest landowners (responsible for a further 1,300 direct jobs).

Simply put, each element of Nova Scotia's forestry sector relies on the others. The province's woodland operations supply logs to sawmills for processing into lumber and other wood products, with the leftover woodchips then sent to Northern Pulp as raw material. The top eleven sawmills in Nova Scotia, which account for 96% of the lumber produced here, all have ties to Northern Pulp – more than 90% of sawmill woodchips in the province end up there.

Beyond providing logs to the sawmills, the province's woodland operations also rely on Northern Pulp as a result of their use of selective

harvesting. This best-practice approach involves selectively removing smaller trees to allow others to grow, creating a healthier forest and minimizing the overall environmental impact. These pruned trees are sent to Northern Pulp, which takes 35%-40% of the pulpwood from the provincial market.

Without Northern Pulp as the end market for sawmills and woodland operations, the entire inter-connected forestry sector is at risk. Like many businesses, sawmill and woodland margins are slim, and the removal of a key source of revenue can easily push the operation over the tipping point, resulting in a failure of the whole business. Given the geography of the industry, it is simply uneconomic to transport these unprocessed heavy commodities long distances to pulp mills in other provinces, or the United States.

It is no surprise that an independent economic assessment of Northern Pulp conducted in 2015 found far-reaching impacts. The key findings of that study showed the operations responsible for:

- 339 direct jobs
- 5 spin-off jobs for each direct job
- 2,043 combined direct and spin-off jobs
- Over $100 million in labour income
- $315 million in annual spending and investment
- 1,300 companies in the supply chain affected
- 1 in 12 jobs in Pictou County

It is essential to keep in mind that these are good-paying jobs at risk, the kind of jobs which remain scarce in many rural and smaller communities. A recent analysis by the Forest Products Association of Canada highlighted the vulnerable nature of many forest-dependent communities, finding more than 600 communities across Canada, including several in Nova Scotia, where more than half of all household income comes from forestry jobs. The loss of good jobs in these dependent communities is even more devastating than in larger communities with more diverse local economies.

Nova Scotia’s forestry sector is an essential ingredient in our economy, delivering a $2.1 billion annual economic impact, 11,500 direct and indirect jobs, is the second-largest source of employment among good-producing sectors, and the province’s third-largest goods exporter. Around the world, forestry is increasingly recognized as a renewable green industry with the potential for a strong future as part of a sustainable economy.

The *Environment Act* clearly articulates the link between sustainable development and long-term economic prosperity. We believe that it is not only possible to make decisions that deliver both strong environmental standards, and good jobs, but that it is our responsibility.

Sincerely,

Atlantic Director, Unifor

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Halifax Office
63 Otter Lake Court
Halifax, NS B3S 1M1

UNIFOR
theUnion | lesyndicat

Bureau d'Halifax
63 Otter Lake Court
Halifax, NS B3S 1M1

JERRY DIAS
National President
Président national

RENAUD GAGNÉ
Quebec Director
Directeur québécois

ROBERT J. ORR
National Secretary-Treasurer
Secrétaire-trésorier national

March 6, 2019

Environmental Assessment Branch
Nova Scotia Government, Environment Department
[Submitted online at: https://www.novascotia.ca/nse/ea]
P.O. Box 442
Halifax, NS, B3J 2P8

Re: Northern Pulp Replacement Effluent Treatment Facility Project

Greetings,

Unifor proudly represents 240 workers at Northern Pulp, 12,000 workers in Nova Scotia, and 23,000 forestry workers across Canada. We are Canada's largest union in the private sector with 315,000 members in every sector of the economy, and regularly advocate for good jobs, sustainable development, and progressive change for a better future.

Northern Pulp has proposed a world-class multi-million dollar investment to fully meet new, more stringent, environmental standards. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector. With this proposed investment, Northern Pulp will be on the leading edge of environmental responsibility and stewardship in the industry. We are writing today to encourage a rapid conditional environmental assessment approval for this project.

Northern Pulp's proposed new effluent treatment facility incorporates the AnoxKaldnes BAS biological treatment process purchased from Veolia Water Technologies, one of the world's leading firms in this field. With more than €2billion in annual revenue and 130 business units around the world, Veolia Water Technologies operates with over 9,000 employees; more than 60% of whom are researchers, engineers and project managers. Moreover, the Water Technologies division is part of the much larger France-based Veolia Group, with €25 billion in annual revenue and 169,000 employees around the world.

We are confident that with appropriate government oversight, a partnership between two global industry leaders, Paper Excellence (Northern Pulp's parent company), and Veolia, is fully capable of rigorously implementing proven technology that will meet all required

environmental standards for this project. These two successful global leaders in their fields rely on fully addressing their environmental responsibilities.

Beyond the essential matter of this project meeting the technical requirements for effluent treatment, we would also like to draw your attention to the broader implications of this decision-making process. The Nova Scotia *Environment Act* is recognized as an essential piece of legislation designed to protect our shared environment, and guide our economic development. The *Act* rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

> *The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.*

It is on this principle that we would like to bring forward a fuller understanding of the vital economic role played by Northern Pulp in the community, and the wider Nova Scotia economy.

A failure to provide approval for this project puts at serious risk the very future of the mill, with far-reaching implications for the entire inter-connected Nova Scotia forestry sector. Beyond the direct operations of the mill, the wider economic impact of Northern Pulp is best understood through the role it plays in sustaining the province's 93 sawmills (responsible for 2,000 direct jobs), and the broader woodland operations held by the more than 30,000 forest landowners (responsible for a further 1,300 direct jobs).

Simply put, each element of Nova Scotia's forestry sector relies on the others. The province's woodland operations supply logs to sawmills for processing into lumber and other wood products, with the leftover woodchips then sent to Northern Pulp as raw material. The top eleven sawmills in Nova Scotia, which account for 96% of the lumber produced here, all have ties to Northern Pulp – more than 90% of sawmill woodchips in the province end up there.

Beyond providing logs to the sawmills, the province's woodland operations also rely on Northern Pulp as a result of their use of selective harvesting. This best-practice approach involves selectively removing smaller trees to allow others to grow, creating a healthier forest and minimizing the overall environmental impact. These pruned trees are sent to Northern Pulp, which takes 35%-40% of the pulpwood from the provincial market.

Without Northern Pulp as the end market for sawmills and woodland operations, the entire inter-connected forestry sector is at risk. Like many businesses, sawmill and woodland margins are slim, and the removal of a key source of revenue can easily push the operation over the tipping point, resulting in a failure of the whole business. Given the geography of the industry, it is simply uneconomic to transport these unprocessed heavy commodities long distances to pulp mills in other provinces, or the United States.

It is no surprise that an independent economic assessment of Northern Pulp conducted in 2015 found far-reaching impacts. The key findings of that study showed the operations responsible for:

- 339 direct jobs
- 5 spin-off jobs for each direct job
- 2,043 combined direct and spin-off jobs
- Over $100 million in labour income
- $315 million in annual spending and investment
- 1,300 companies in the supply chain affected
- 1 in 12 jobs in Pictou County

It is essential to keep in mind that these are good-paying jobs at risk, the kind of jobs which remain scarce in many rural and smaller communities. A recent analysis by the Forest Products Association of Canada highlighted the vulnerable nature of many forest-dependent communities, finding more than 600 communities across Canada, including several in Nova Scotia, where more than half of all household income comes from forestry jobs. The loss of good jobs in these dependent communities is even more devastating than in larger communities with more diverse local economies.

Nova Scotia's forestry sector is an essential ingredient in our economy, delivering a $2.1 billion annual economic impact, 11,500 direct and indirect jobs, is the second-largest source of employment among good-producing sectors, and the province's third-largest goods exporter. Around the world, forestry is increasingly recognized as a renewable green industry with the potential for a strong future as part of a sustainable economy.

The *Environment Act* clearly articulates the link between sustainable development and long-term economic prosperity. We believe that it is not only possible to make decisions that deliver both strong environmental standards, and good jobs, but that it is our responsibility.

Sincerely,

Atlantic Director, Unifor

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 6, 2019 2:59:21 PM

Project: replacement_effluent_treatment_facility_project Comments: Please dont approve Northern Pulps proposed effluent pipe into the Northumberland Straight because: - This is 2019 not 1967. Ive had enough of the lies and broken promises by the pulp mill and government over the years, and destruction of our environment by this big corporation. - The proposed line goes through the Town of Pictous watershed and, given the mills past history, a leak is inevitable. - To put this untreated effluent into the Northumberland Straight and take the chance of damaging the ecosystem and losing the fishing industry would be devastating and more costly to the economy than closing the mill. I dont want to see another toxic mess in the Straight, like the one in Boat Harbour, that we can never clean up. My vote is for closing the mill today!!! Thank-you. Sincerely, Name: Email: Address:

: Privacy-Statement: agree x: 66 y: 22

From:
To: Environment Assessment Web Account;
Subject: Correction Re: EA Comments on Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 6, 2019 3:14:29 PM
Attachments: EA Commnets on NPNSC"s Replacement Effluent Treatment Facility Project_ .docx

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My apologies, could you please disregard the previously attached comments and file this version instead.
Thank you

On Wed, Mar 6, 2019 at 3:06 PM @gmail.com> wrote:

> Good Afternoon,
>
> Please see attached comments on Northern Pulp Nova Scotia Corporation's Replacement Effluent Treatment Facility Project. If confirmation that these comments were revived could be provided that would be appreciated.
>
> Regards

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

Please see below our joint comments on the ***Environmental Assessment for a Replacement Effluent Treatment Facility Project by Northern Pulp Nova Scotia Corporation***.

We are an environmental engineer and a biologist from Pictou, NS, so this project is of significant importance for us both personally and professionally. We frequently visit the Northumberland Straight area of Pictou with our families for recreation and also have many friends and family who live in Pictou; so being assured that the new effluent treatment plan by Northern Pulp will not jeopardize the environmental conditions of the area is extremely important for us.

After reviewing the environmental assessment (EA) submitted by Northern Pulp Nova Scotia Corporation it is our mutual opinion that much of the supporting information submitted as part of this Class I EA is incomplete. This is presumably due to the project timeline and that significant components of the proposed project required a redesign which only commenced in late 2018. The redesign of the effluent discharge system was required in order to avoid ice scour in the originally proposed Pictou Road effluent discharge area. The project team should be commended for making this change to avoid potential environmental impacts resulting from damage to the proposed effluent diffusers, however, **the scope of the environmental assessment should not be reduced (or finalized after EA approval) given the need for a project redesign**.

In many cases field work that was completed for the original design was used for the redesigned project. There is a significant difference between the original project scope and the redesigned project as presented in the EA; namely the introduction of a 15.5km pipeline and an entirely new location for discharging the treated effluent into the marine environment. Critical information is missing from the submitted EA including any biological assessments along the routing of the on land pipeline (which passes through the watershed for the Town of Pictou's municipal groundwater supply) and no marine habitat surveys were completed in the area now proposed for treated effluent discharge.

Additional, the EA relies heavily on the 1992 Pulp and Paper Effluent Regulations (PPER) which are part of the Fisheries Act. The report states that *"The effluent is anticipated to meet compliance with federal PPER."* It should be noted that the EA provides no evidence to support this statement. No calculations of maximum total suspended solids (TSS) or biochemical oxygen demand (BOD) (which is how the PPER regulates effluent) are provided.

A status report on the PPER was published by Environment & Climate Change Canada (ECCC) in 2012 (http://publications.gc.ca/site/eng/420919/publication.html) which found that a review of environmental effects monitoring (EEM) data from active pulp mills indicates that *"…some effluents appear to continue to cause effects on fish and/or fish habitat."* Further, a consultation document on the proposed modernization of the PPER prepared by ECCC in 2017 (https://www.nben.ca/en/marine-fisheries-aquaculture?download=5045:proposed-modernization-of-the-pulp-and-paper-effluent-regulations-consultation-document-environment-and-climate-change-canada-september-2017) noted that *"effluents from 70% of pulp and paper mills are impacting fish and/or fish habitat and the impacts at 55% of these mills are indicative of a higher risk to the environment."* This is despite the fact that

"Effluent samples from these mills were compliant with BOD and SS limits 99.9 percent of the time, and were non-acutely lethal to fish 97.6% of the time." As indicated in the consolation document ECCC are currently working to modernize the PPER and are aiming to publish proposed amendments to the PPER for comment in 2019. Clearly Northern Pulp Nova Scotia Corporation are only required to adhere to current regulations, however, the work being conducted by ECCC should be considered when assessing the potential for cumulative environmental effects of the proposed project. ECCC's findings indicate that compliance with the 1992 PPER itself does not guarantee that there will be no adverse effects to the marine environment. NSE should exercise a precautionary approach when determining the potential for adverse environmental impacts of the proposed project.

Lastly, we are concerned that a Class 1 EA was deemed appropriate for this project. On NSE's website it is noted that *"Class 2 undertakings are typically larger in scale and are considered to have the potential to cause significant environmental impacts and concern to the public. These types of developments include, but are not limited to, solid waste incinerators, petrochemical facilities and pulp plants"* From existing mill operations the proposed project involves an entirely new effluent treatment system, a new process to burn waste sludge (from the new effluent treatment plant) in the mill's power boiler, a new 11.4 km on land pipeline, a new 4.1 km marine pipeline (involving marine trenching and possible construction of a small jetty for installation) and an entirely new marine discharge location. Given this **it is our opinion that a Class II EA should be required**. While initially it was agreed that a Class I EA was sufficient by NSE, the scope of the proposed project has changed significantly (as noted above) since that time.

Based on the comments above and below, in particular the lack of land based and marine biological assessments and indications from ECCC that active pulp mills complying with the federal PPER are actually impacting fish and/or fish habitat **we would implore NSE to not approve this project at this time**.

Please see the table below with more specific comments.

Respectfully,

Section	Comment
2.3 para. 7, 8	The report indicates that *"…it was not possible to conduct field work in the new pipeline corridor or marine environment in order to inform this EA Registration"* The rationale for not completing these biological assessments is that an alternative pipeline route and discharge location was identified in fall 2018 due to the presence of ice scour found in the originally proposed treated effluent discharge location. Presumably the timing of this discovery would have not allowed for biological field investigations in 2018. The report indicates that *"Follow up field work as appropriate for the work proposed will be completed in parallel to the EA Registration review…"*. The full extent of biological impacts cannot be assessed without proper field work first being undertaken. The scope of the assessment should not be lessened due to construction time constraints and design delays based on site conditions As per the proposed project schedule, the project will not be completed prior to legislated closing of the BHETF anyways. NSE should require full biological assessments, which could be conducted in spring / summer 2019, prior to approval.
5.2.2.9 Table 5.2-1	Table 5.2-1 (also presented in Table 5.6-1) provides information on the anticipated daily maximum treated effluent water quality as reprinted from the Receiving Waters Study (Appendix E). The Receiving Waters Study indicates that this data was provided by KSH (the design consultant for the effluent treatment system). No supporting documentation was provided from KSH as part of the EA submission. How was the treated effluent water quality data presented in Table 5.2-1 and Table 5.6-1 calculated? What level of accuracy is the data?
5.3.2.5	Given the majority of the pipeline will be buried under 1m of fill or asphalt how will inspection of pipeline condition be conducted? The report indicates visual inspections be conducted.
5.4	The proposed project schedule indicates that the new effluent treatment facility would not be completed prior to the legislative closure of boat harbor effluent treatment facility (BHEFT) as per the Boat Harbor Act. The NS provincial government has stated publically that an extension will not be provided for the BHEFT. Is the proposed project even viable?
5.4 Table 5.4-1	The report indicates that the assessments listed below are not yet completed: • Avian / turtle follow-up field studies, • MEKS field surveys, • Vegetation, wetland and watercourse follow-up field studies, • Marine seismic, geotechnical and habitat surveys The potential environmental impacts of the proposed project cannot be fully assessed with this work not yet completed, in particular the marine habitat surveys. NSE should require these assessments be completed prior to granting approval.
5.7.2.7, 7th bullet	The report indicates that *"Scheduling of project activities will be coordinated through consultation with local fish harvesters, Northumberland Ferries and other stakeholders and best-efforts will be made to schedule activities to minimize interference" A*s per table 4.5.1 the proposed schedule for the construction of the marine pipeline is April / May 2020 – Oct. 2020 which entirely

	overlaps with lobster fishing season as well as the Northumberland Ferries operational season. The proposed project would likely be very disruptive to Lobster fishing as well as to Northumberland Ferries.
8.7.2.5	The report indicates that no field assessments for wetlands in the pipeline footprint area were completed due to the pipeline redesign required in fall 2018. Functional assessment information is only provided for WL-1 and WL-2 within the effluent treatment facility (ETF) footprint. Some of the wetlands in the pipeline footprint area would likely be considered wetlands of special significance by NSE given their location within a source water protection area or their type being salt marsh. The assessment of potential impact to wetlands cannot be determined without proper field assessment and functional assessment work being completed. This work should be completed prior to NSE making a decision on the proposed project.
8.12.2.3, para. 5	To describe benthic invertebrate habitat the report references a marine habitat survey completed by AMEC in 2015 for a different project. Does the AMEC habitat assessment cover the full extent of the marine project footprint area for the proposed project? It appears that no marine habitat survey was completed specifically for the proposed project. A new marine habitat survey should be completed prior to NSE making a decision on the proposed project.
8.12.3.3 para. 10	The report states that *"Effluent quality will necessarily comply with all federal and provincial permit conditions and regulatory requirements such as PPER."* Has a calculation been completed to confirm effluent will comply with the PPER? The PPER sets maximum daily and monthly limits on BOD and TSS based on the mill's reference production rate. What is the reference production rate for the mill? This information along with the concentrations of BOD and TSS in the treated effluent and flow rates (both provided in the EA report) could be used to calculate compliance with the PPER. This information does not appear to be provided.
8.12.3.3 para. 10	The report states that *"It was determined in the receiving water study (Stantec 2018; Appendix E) that water quality at the end of the mixing zone for the three-port diffuser will reach ambient conditions within less than 2 m from the diffuser in terms of total nitrogen, total phosphorous, TSS, DO, pH, and salinity. Colour will return to baseline conditions within 5 m of the diffuser. Temperature will be within 0.1 °C of background at the end of the 100-m mixing zone."* It is noted that given the project redesign initiated in fall 2018 no background water samples were collected from Caribou Harbour, therefore, background water quality data from the previous discharge location at Pictou Road (6km from the current proposed discharge site) was used. How can it be concluded that water quality will return to ambient conditions within 100m of the diffuser when no background water quality samples were collected in this area? Also no background information was collected for AOX, COD, or BOD. NSE should require the collection of background water samples from the proposed effluent discharge location before approving this project.
9.2.4.2 Para. 3	The report indicates that "*Due to uncertainty regarding effluent composition and approximate concentrations of substances present in the future treated effluent (which will not be verified until the project is operational), the identified candidate COPCs in effluent are considered preliminary at this time)."* How can cumulative human health and environmental effects be determined to be non-significant given that the chemical composition of the treated effluent is not fully known?

10.4.3.1	The mitigation measures provided for an accidental release of treated effluent from the pipeline or the effluent treatment facility are construction specifications and a proposed maintenance and inspection program. If a leak is encountered the mill should be required to stop operations (cease effluent flow). Further, what is the risk to groundwater if a leak occurs in the land-based pipeline? This is not discussed in the report and is of particular concern given that the pipeline crosses through the watershed for the Town of Pictou's municipal well water supply.
10.4.4.1	As a mitigation measure for potential damage to the treated effluent diffuser the report states that *"Given the strong currents of the Caribou Channel at the outfall location significant diffusion is still likely to take place without the diffuser nozzle(s) in place;"* While the Receiving Waters Study (Appendix E) indicates that effluent would predominantly be transported with offshore current there are several scenarios where far-field modeling results indicate effluent intrusion into Caribou Harbour. Given the proposed treated effluent discharge area is known to have ice present what is the likelihood of diffuser damage and what are the cumulative effects of treated effluent intrusion into Caribou Harbor? The report indicates that *"Upon detection of any marine outfall pipe damage or diffuser fouling, repairs would be promptly performed;"* the mill should be required to stop operations (cease effluent flow) in this scenario.
12.2 Groundwater VEC	The report indicates that interactions between the project and groundwater are not anticipated. The rationale for not including groundwater as a valued ecosystem component (VEC) is that *"…it is unlikely that groundwater from the PFA* (project footprint area) *would affect residential water supplies."* Is groundwater for municipal use considered in this section? It appears only private residential wells were considered. The potential for impacts on the town of Pictou's municipal well water should be considered.
12.3.8.1, para. 7	The report states that *"…any potential environmental effects on water quality during the operation and maintenance phase will be highly localized."* and *"that water quality at the end of the mixing zone for the three-port diffuser will reach ambient conditions within less than 2 m from the diffuser in terms of total nitrogen, total phosphorous, DO, pH, temperature, and salinity. Colour will return to baseline conditions within 5 m of the diffuser."* What is the cumulative effect of absorbable organic halides (AOX) which include Dioxins? As per the Receiving Water Study background concentrations of AOX is n/a (assumed to be negligible). The treated effluent contains a concentration of 7.8 mg/L of AOX with a concentration of 0.05 mg/L at the end of the mixing zone 100m from the diffuser. Given the high volume of treated effluent discharge at 62,000,000 L / day and the 50 year projected lifespan of the project what are the long term impacts of AOX presence above existing conditions? This is of particular importance given that AOX are known to be persistent and accumulate in the environment. (https://webarchive.nationalarchives.gov.uk/20110313212212/http://www.environment-agency.gov.uk/business/topics/pollution/39123.aspx)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 3:38:49 PM

Project: replacement_effluent_treatment_facility_project Comments: Hello, Firstly, Id like to say that it is ludicrous to even consider a proposal for a pipeline carrying partly treated pulp mill effluent through the Town of Pictous watershed on its way to an important fishing area. Already the presence of the toxins from the effluent in Boat Harbour, and the leaks that have happened mean that people in Pictou Landing First Nation and in the Pictou Landing area in general have good reason to distrust the safety of the aquifer. Why take this same risk for the Town of Pictou? Please prioritize the health of the forests, all the life in the Northumberland Straight and the safety of the air we breath, when making your decision. If any of these deteriorate more than they already have, human communities in the area will suffer. This mill has a terrible colonial history from the very beginning, when the Nova Scotia Water Authority gained permission from Pictou Landing First Nation to use Boat Harbour for the mills effluent by pretending that a not yet in use sewage lagoon near Saint John was a treatment facility for the nearby pulp mills waste water. This continued with a series of broken promises by Nova Scotia governments to close the Treatment Facility. Now that it is finally slated to close, Chief Andrea Paul has made it very clear that Pictou Landing First Nation does not agree with the mills proposal for a new waste treatment process that would mean the discharge of partly treated effluent into the Northumberland Straight. Please break from the colonial way of doing things and respect the people of Pictou Landings right to free, prior, informed consent about developments affecting them, according to the United Nations Declaration on the Rights of Indigenous Peoples. Canada has ratified this dec laration, so we should abide by it. The answer should be no! Please dont approve this pipe because if it cannot go ahead the mill might close and that would be a very good thing because it would give the environment a chance to recover. This includes the air, the waters of Boat Harbour and the Northumberland Straight, and the forests which have endured years of clear-cutting, whole tree harvesting and spraying. Besides the ecological benefits of the closure of the mill, other kinds of economic activities that are hampered by the pollution from the mill could flourish if it were to close. There is a climate emergency on earth caused by human activity. We need to do our part to curb greenhouse gas emissions and preserve the ability of ecosystems like forests to absorb carbon dioxide. The closure of the mill would be an opportunity to change forestry practices in the province that could lead to an end to clear-cutting. This would be a step in the right direction for the climate and for the sake of the forests themselves as living entities. Successive federal and provincial governments have pandered to the will of the various owners of the pulp mill at Abercrombie Point since its construction was first proposed. Your government has shown you can stand up to the mill owners by not extending the deadline for the closure of the Boat Harbour Treatment Facility. Please stand up to them now and refuse to approve this preposterous proposal. Thank-you, Name: Email: @gmail.com Address:

Privacy-

Statement: agree x: 70 y: 19

From:
To: Environment Assessment Web Account
Subject: Pulp Mill
Date: March 6, 2019 4:26:26 PM

I am against giving the pulp mill any right whatsoever to pump any pollutants into the water surrounding Nova Scotia. I am against the pulp mill in every way. I do not want them to have the right to harvest our crown land, and think we should have a small sustainable forestry plan for the province. I do not believe a foreign owned company should have rights to our land. Letting them pump pollutants into our water is unacceptable.

Thank You,

Teacher, HRCE

From: @petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:40:58 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:41:27 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:41:45 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:43:48 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@eastlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:43:50 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@ns.sympatico.ca)

From:	noreply@petition.web.net
To:	Environment Assessment Web Account
Subject:	In support of Northern Pulp"s EA application
Date:	March 6, 2019 4:43:50 PM

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Signed by:

@me.com)

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To: Environment Assessment Web Account
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Thank you.

Signed by:

@rogers.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:45:27 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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@gmail.com)

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Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:47:59 PM

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Thank you.

Signed by:

@yahoo.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:48:34 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@eastlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:49:46 PM

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:50:45 PM

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Thank you.

Signed by:

@northernpulp.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: Soutien à l"évaluation environmentale de Northern Pulp
Date: March 6, 2019 4:53:39 PM

Je vous écris pour appuyer la demande d'évaluation environnementale présentée par Northern Pulp pour sa nouvelle installation de traitement.

On a beaucoup parlé de Northern Pulp et de ses répercussions sur la collectivité locale. Je suis d'accord avec beaucoup de gens, y compris Unifor, pour dire que Boat Harbour doit être fermé et nettoyé pour respecter les Premières Nations de Pictou Landing et leurs terres. Je sais aussi qu'il y a beaucoup d'avantages à avoir 300 emplois bien rémunérés à Pictou et à soutenir des milliers d'autres en Nouvelle-Écosse, particulièrement dans les collectivités rurales.

La Loi sur l'environnement de la Nouvelle-Écosse est reconnue comme une loi essentielle conçue pour protéger notre environnement commun et guider notre développement économique. La Loi énonce à juste titre son objet au moyen d'un ensemble de principes de développement durable qui devraient guider son application, notamment :

------> Le lien entre les questions économiques et environnementales, en reconnaissant que la prospérité économique à long terme dépend d'une saine gestion environnementale et qu'une protection efficace de l'environnement dépend d'une économie forte.

Dans cette situation, la science devrait déterminer la meilleure voie à suivre. La Nouvelle-Écosse, tout comme le reste du Canada, possède l'une des normes mondiales les plus élevées en matière de gérance environnementale dans le secteur forestier.

Le travail du gouvernement et de chaque personne que nous élisons pour nous représenter au gouvernement consiste à trouver la meilleure voie à suivre lorsqu'il y a de nombreux intérêts concurrents et parfois opposés. Les collectivités d'un bout à l'autre du Canada parviennent à trouver un juste équilibre où de bons emplois dans les usines coexistent avec une industrie de la pêche et des collectivités prospères.

Nous pouvons et nous devons trouver cet équilibre pour Pictou. Il y a beaucoup en jeu. Des emplois. L’environnement et le respect des Premières Nations. Nous pouvons et nous devons trouver une solution qui soutient les trois.

Merci.

Signé par :
@unifor.org)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:54:04 PM

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Thank you.

Our whole household income relies on Northern Pulp, mine as a direct employee and my husband as well who works as a harvester operator for one of Northern Pulps forestry contractors! This whole process has been so stressful and has caused us to not make any unnecessary purchases due to all this uncertainty!

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:54:29 PM

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Signed by:

@eastlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:54:38 PM

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Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:58:07 PM

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@hotmail.ca)

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To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 4:58:12 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:10:28 PM

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Subject: In support of Northern Pulp"s EA application
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Thank you.

I Support Northern Pulp and an extension to the closing of Boat Harbour to allow for sufficient time to complete the New Effluent Plant. Northern Pulp is and has been one of the largest Employer's of Construction Workers in N.S. for 54 years .

Signed by:

@ns.sympatico.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:14:51 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Signed by:

@yahoo.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:15:03 PM

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@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:18:32 PM

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@unifor506.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:22:54 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:27:26 PM

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:29:17 PM

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Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Subject: Re: Northern Pulp Replacement Effluent Treatment Facility Project
Date: March 6, 2019 5:31:15 PM

March 6th, 2019

To whom it may concern

I am writing you to voice my *strong opposition of Northern Pulp's proposed on-site activated sludge treatment system*, which will pump millions of litres of hot toxic pulp daily through 11.4km of pipe across sensitive watersheds, directly out of Caribou Harbour, one of Nova Scotia's key tourism entry points and into the Northumberland Strait, one of Nova Scotia's most important lobster and fishing/breeding grounds.

As a cottage owner in Pictou County for over 20 years I am being asked to trust that the research has been exhaustive and thorough and that I have nothing to worry about based on a company with a dismal track record and an environmental assessment report that reports there will be no residual effect on the environment...whatsoever, in any scenario!

Let me start by saying that I find it unfathomable that Dillon Consultings' 'executive summary' of the Environmental Assessment report developed on behalf of Northern Pulp, indicates that not one single item within the submission would have any significant 'Residual Environmental Effect Predicted'. Not one out of 18 areas affected (including marine habitat, ground water, wildlife, plant life...etc) will have any residual effect; including no effect during construction, no effect during ongoing operation, no effect during ongoing maintenance, no effect during accidents, no affect during malfunctions, no affect during unplanned events! How can this even be possible?

Not to mention the amount of fresh water and forests consumed daily to feed the mills ongoing operations, or the air pollution that we have all been living with which becomes literally unbearable depending on which way the wind blows and whether the mill is in its '130% operational efficiency' mode!

Here is an additional part that causes me significant concern. What exactly will be coming out of the pipe and dumping into the Northumberland Strait? How can we possibly know, when they don't even know. The Dillon EA report referred to above has the following statement:

'At this time, effluent chemistry characteristics including the specific substances present in the treated effluent and their anticipated concentrations will not be known with certainty until the project is operational'

Clearly additional information is required before any decisions can be made on Northern Pulp's proposal. Why are we not insisting that this should either be a closed loop system or nothing at all. Give Pictou County a chance to thrive with clean air and clean water.

The County and all of its residents deserve that much!

Yours respectively,

Cottage Owner,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:32:13 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:39:38 PM

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Thank you.

Signed by:

@hotmail.com)

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 5:43:31 PM

Project: replacement_effluent_treatment_facility_project Comments: I live on Caribou Island and do not what a pipe from northern pulp going out in the Strait.This would be close to my home.Should be done on site! Name: Email: @live.ca Address: Municipality:

Privacy-Statement: agree x: 71 y: 34

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 5:49:10 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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@hotmail.com)

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Date: March 6, 2019 5:49:54 PM

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:09:02 PM

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Thank you.

Signed by:

@eastlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:10:07 PM

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Date: March 6, 2019 6:18:09 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:36:08 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:41:56 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:42:04 PM

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Thank you.

Signed by:

@nb.sympatico.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:52:37 PM

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Signed by:

@gmail.com)

NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 6:58:28 PM

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Signed by:

@gmail.com)

New Glasgow, NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:03:27 PM

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Thank you.

Signed by:

@me.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:12:17 PM

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

@mac.com

Signed by:
@mac.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:14:21 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:20:02 PM

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Thank you.

Solidarity from 222

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:37:37 PM

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@hotmail.com)

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To: Environment Assessment Web Account
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Date: March 6, 2019 7:48:49 PM

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@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 7:57:34 PM

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Signed by:

@unifor.org)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:13:20 PM

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Thank you.

Signed by:

@gmail.com)

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 8:17:22 PM

Project: replacement_effluent_treatment_facility_project Comments: We are writing to express our opposition to Northern Pulpâ?Ts Proposed Replacement Effluent Treatment Facility Project as we feel it will result in significant adverse effects to the environment. Although we oppose the continued environmental pollution the mill has caused to the air, land and water as well as the on-going degradation of our forests within the province, for the purpose of this letter we will concentrate primarily on the effluent discharge into the Northumberland Strait in relation to the proposed Effluent Treatment Facility ETF. Our family have been property owners on Caribou Island for over 40 years, close in proximity to where the proposed effluent discharge outlet will be located. We have the utmost concern as to how this proposal will not only affect the environment, but the fishery, tourism, recreation and the general health and well-being of residents in Pictou county and beyond. Perhaps the biggest objection to the argument the Northern Pulp Nova Scotia NPNS proposal makes for the acceptance of the ETF and the discharge of effluent into the Northumberland Strait, is the lack of an objective, transparent, and unbiased opinion. This is no more evident than the fact that NSPC is the client of Stantec who has prepared the study. This as well as the limitations put upon the consultant are brought to light in the Sign-off Sheet of Appendix E1 which states: â?oThis document entitled Addendum Receiving Water Study for Northern Pulp Effluent Treatment Facility Replacement Project â?" Additional Outfall Location CH-B, Caribou Point, Nova Scotia was prepared by Stantec Consulting Ltd. â?oStantecâ? for the account of Northern Pulp Nova Scotia Corporation the â?oClientâ?â?¦â?The material in it reflects Stantecâ?Ts professional judgement in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and Clientâ?¦â? As we have no real knowledge â?oof the scope, schedule and other limitationsâ? in the contract between Stantec and NPNS, we cannot know if this assessment is truly unbiased, and given the terms as stated above, could not be perceived as being independent. Likewise, the â?oscheduleâ? as stated in the above, in itself questions if there was appropriate time to conduct a thorough enough research and analysis. We feel that much of the analysis is based on assumptions and models that we would not truly know if correct until this proposal was implemented, and at that point it would be too late should it be discovered that any of the key assumptions donâ?Tt hold true. Therefore, we feel that much of key information as written in Northern Pulpâ?Ts proposal is potentially flawed and requires further examination and scientific assessment by an independent third party. Table E.1.1-1: Summary of the Significance of Project-Related Residual Environmental Effects found in the Executive Summary, Pg. xxxiv, of The Northern Pulp Nova Scotia Effluent Treatment Facility Environmental Assessment Registration Document states within all of the Valued Environmental Component Vac categories that there was â?oNo Significant Residual Environmental Effect Predicted NSâ?. This includes such wide ranging environmental categories as Wetlands, Marine Mammals, Sea Turtles, and Marine Birds, Marine Fish and Fish Habitat, Harbour Physical Environment, Water Quality and Sediment Quality, to name only a few. However throughout the submission it is stated that the outcomes are predicted, so it is clear that results are best guesses and far from certainties. We do not feel that this assessment can be a true reflection of the potential damage to each of the VACâ?Ts based on the assumptions. It has been proven time and again that when it relates to the environment, assumptions are often misplaced. Examples of such assumptions can be found within the footnotes of the above noted table: â?oWater quality has been assessed through modelling of the treated effluent discharge. Through the analysis it has been

determined that under â?~worse caseâ?T conditions water quality at the end of the mixing zone for the three-port diffuser will reach ambient conditions within less than 2 m from the diffuser in terms of total nitrogen, total phosphorous, TSS, DO, pH, and salinity. Colour will return to baseline conditions within 5 m of the diffuser. Temperature will be within 0.1 Â°C of background at the end of the 100-m mixing zone.â? The key term to consider in the above statements is â?oWater quality has been assessed through modelling of the treated effluent discharge.â? It is not a certainty that results in actual conditions which are harsh and unpredictable will be the same as modelling that has taken place. Due to the importance of this, it again illustrates that modelling, testing and data needs to be completed by an independent, third party source. Likewise, in our eyes, it defies logic that: â?owater quality at the end of the mixing zone for the three-port diffuser will reach ambient conditions within less than 2 m from the diffuser in terms of total nitrogen, total phosphorous, TSS, DO, pH, and salinity. Colour will return to baseline conditions within 5 m of the diffuser. Temperature will be within 0.1 Â°C of background at the end of the 100-m mixing zone.â? With effluent discharge at a rate of 62,000 to 85,000 litres per day, the mere volume of effluent flowing through the end of diffusers would result in the effluent being pushed out with such force that reaching ambient conditions a mere 2 m of the discharge point is questionable. The consecutive statement that â?ocolour will return to baseline conditions within 5 m of the diffuserâ? appears to discredit the previous statement. If it takes 5 m for the colour to return to baseline conditions, would it not be likely that there must be chemicals within the effluent after 2 m of discharge? It is also stated within the Executive Summary, pg. xxxiii, par. 3, that â?oit is anticipated that the effluent plume will not be visible when it reaches the waterâ?Ts surface.â? It is clearly stated that it is anticipated, not known. Should a plume of any type be visible, it will have direct and lasting effects on our tourism industry as the Caribou - Wood Islands ferry to PE Island will pass directly by the discharge point. This is an example of only one direct consequence and does not speak to the many others including the fishery, recreation usage, environmental effects and general reputation of the province. Again, assumptions simply is not strong enough when an issue as important as this is at stake. Furthermore, as stated in on Pg. 21, Section 3.0 Regulatory Environment, Disposal at Sea DAS: â?oDetailed design has not been completed for the construction of the marine outfall and pipeline. Underwater geotechnical investigations and underwater habitat surveys are planned to inform pipeline routing and construction methodology.â? Seeing as this has not been completed, it would appear to be impossible to accurately determine what the water quality or plume distance will actually be from the discharge point. Further footnotes within Table E.1.1-1: Summary of the Significance of Project-Related Residual Environmental table state: â?oAn update of NPNS air dispersion modelling was undertaken. The facility is expected to be in compliance with the provincial and federal air quality criteria for both existing and future conditions with the new ETF operational. Follow up and monitoring using Northern Pulpâ?Ts current regulated source emission testing program will verify the environmental effects predictions.â? The blaring question in the above statement is who will be doing the monitoring of emission testing? As has been historically proven NPNS nor the government can be trusted to monitor or truthfully report test results within a timely manner. Again, the term â?ois expected to be in complianceâ? is used. This is not a certainty so the legacy of NPNS polluting our air beyond acceptable levels will simply be compounded. Additional footnotes of the above noted table also state: â?oIt is not predicted that the installation of the pipeline will result in long term serious harm to fish or fish habitatâ? . Again, the key term to consider in the above statement is â?oIt is not predictedâ?¦â? This is far from a certainty and the repercussions of this assumption will be devastating and long-term to not only the environment but the entire economy of the province. Finally, the same footnotes of the above noted table also state: â?oEnvironmental Effects Monitoring EEM and a Follow Up and

Monitoring Plan, including toxicity testing of treated effluent and water quality sampling, will be completed to monitor the potential effects of the effluent discharge. In addition, NPNS has had a Toxicity Prevention and Remediation Plan in place for many years which provides a structured approach for addressing treated effluent toxicity problems, should they occur.â? It would be irresponsible and unethical for NPNS to be the sole Stewart in this vital role, that of gatherer and retainer of this information and in turn deciding when Remediation Plans would be implemented. Again, this would need to be overseen by an independent third party with total transparency. Unfortunately, the government has not proven that they have the best interests of their electorateâ?Ts health in mind when such monitoring of air and effluent has needed to be maintained in the past, so another regulating body may have to do the monitoring. As noted on Pg. 46, Project Description, Section 5.2.2.10, Hazardous Material Use and Storage, the effluent will include the following chemicals: urea, phosphorus, sodium hydroxide, sulfuric acid and an anti-foam agent to support its process. These are not chemicals that we wish to be in the waters where we swim, fish and boat in. Nowhere in the document does it discuss the very real possibility of the effluent causing hypoxic conditions within the waters of the Northumberland Strait. Nor does it appear to discuss the effects of warmer effluent entering sensitive ecosystems other than to state the distance it will take for the water to reach an ambient temperature or the on-going challenges this will create with climate change. On pg. 32, Section 4, Alternatives Considered for Conveyance of Treated Effluent, Table 4.2-4: Alternatives Considered for Final Discharge Location or Method, states that Pictou Harbour is unacceptable as a final discharge location as: â?oPreliminary modelling indicated that Pictou Harbour has limited mixing with the Northumberland Strait â?" water in Pictou Harbour tends to stay within the Harbour. Though treated, effluent would therefore result in the accumulation and increasing concentration of residual contaminants contained in the treated effluent, over time. Given the discharge rate, effluent contaminant accumulation could result in negative effects on the Harbour over time.â? As stated above, there is clearly an admission that effluent contaminates create negative effects over time. It goes on to state that discharging effluent into Boat Harbour is also not acceptable as: â?oThis option would see the release of treated effluent continue from the same location as the BHETF presently discharges. This would mean that, even if the discharge characteristics remain the same or improve, there would be no appreciable changes to existing conditions today in the local communities and in the Strait.â? The aim must be to improve the current conditions, not have â?ono appreciable changesâ? . Yet this proposals response is to continue to dump effluent into the Strait, just at a different location. The toxins within the effluent remain, despite what were are being told of the disbursement rate. As evidenced by the above noted table, it would appear that the Caribou Harbour location for the discharge point of the effluent is viewed as the best of the four locations that were considered for discharge into the Northumberland Strait. However, this does not go to reason that this means of effluent treatment and disposal is safe or acceptable to the environment, the fishery, tourism or the well-being of the people who live, work and recreate within the Strait and surrounding area. It can only be comprehended that out of four really bad options, this is the best of the worst, which simply isnâ?Tt acceptable. Appendix E1, pg. 17, par. 4, states: â?oStatistical analysis of flow directions at CH-B revealed that 85 of the time flow is either in the southeast or northwest directions.â? Appendix E1, Pg. 27, par 2, Section 4.0 Conclusions, states: â?oThe cumulative effects by the end of the one-month assessment periodâ?¦â? There is an admission that not all of the effluent will be disbursed by off-shore currents , yet there appears to be no measurement of what the total concentration of residual contaminants that enter Caribou Harbour will be. The above statement also shows that such testing was only done over a very short period, one month, so any actual long-term results are not taken into account. Pictou Harbour is clearly stated as being an unacceptable discharge location, yet despite this,

Caribou Harbour which is of similar in size, is very shallow and has a very diverse ecosystem, is being considered as an acceptable discharge location. Based on over 40 years of personal experience, tides and currents running up Caribou Harbour can be strong and extreme. It is therefore not our belief that 85 of the currents will be off-shore and result in the disbursement of effluent further out into the Strait. Regardless of the volume and frequency of the prevailing currents, effluent will regularly enter into Caribou Harbour with each tide and whenever the currents are running inland. Effluent and the toxins within will not be effectively disbursed due to the size, depth and confinement of the harbour. Eutrophic conditions have noticeably increased within Caribou Harbour in recent years. The nutrient-rich effluent from the ETF will simply compound this problem and put the entire Northumberland Strait at risk which could have devastating effects on the fishery. Climate change, with resulting increasing water temperatures will simply exacerbate this issue. At the end of Pictou Harbour is the Waterside Beach which is enjoyed by both local folks and tourists from all over the world. Behind the beach, and facing the harbour is a wetland which is fed by no more than a few small culverts underneath the causeway entering Caribou Island. Drainage of these wetlands is therefore limited. It is likely, therefore, that toxins from the effluent would accumulate within this as well as the many other wetlands within the harbour. In the case of Waterside, there could potentially be higher than acceptable toxins leaching into a very popular and highly used recreation area. In relation to the fishery, Appendix R, Scientific Literature BKME Effects on Lobster, Pg. 1 A Summary of the Scientific Literature Related to the Effect of Bleached Kraft Mill Effluent on the American Lobster Homarus americanus states: â?oNote: This report uses the Stantec Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement, Pictou Harbour, Nova Scotia report Stantec, 2017 and the Stantec Addendum Receiving Water Study for Northern Pulp Effluent Treatment Facility Replacement Prokect-Additonal Outfall Location CH-B, Caribou Point, Nova Scotia Stantec, 2018 as the basis for determining the location, composition and behaviour of the released treated BKME. It is important to note that the values and distances in the Stantec reports Stantec 2017, Stantec 2018 have been generated through modelling and not through onsite testing. Therefore, if modeling predictions prove to be inaccurate, then the predicted impact on lobsters as described in this report are invalid.â? Therefore, the information as stated in the findings of this report all hinge on Stantecâ?Ts modelling reflecting real world conditions, which cannot be validated as â?oDetailed design has not been completed for the construction of the marine outfall and pipeline.â? Pg. 21, Section 3.0 Regulatory Environment, Disposal at Sea DAS As stated on pg. 11 of the above Appendix under the heading â?oRecommended Scientific Researchâ? it states: â?oStudies to more accurately assess the potential for impact to adult lobsters including lethality, behavior, and sublethal impacts are recommended to be carried out with current treated BKME.â? â?oCompleting studies of lobster larvae with todayâ?Ts treated BKME would allow for confirmation and better understanding of potential lethal and sublethal effects. Therefore, the previous article on the Effect of Bleached Kraft Mill Effluent on the American Lobster cannot be verified as being accurate until studies are completed using BKME from the new ETF, making the study irrelevant. Finally, in addition to what we feel are questionable and potentially bias conclusions of the report, there are the following key points that we feel need to be considered more deeply before a final decision can be made: â?¢ A fully independent, thorough, scientific and environmental assessment of the potential ramifications of the project needs to be completed, taking into account the impending federal regulations that will soon be coming into effect. This review should be allowed to take as much time as is necessary. â?¢ The 30 day timeline set out for the public to fully evaluate and respond to this proposal and future environmental assessments is much too short and needs to be extended. Likewise, there is not possibly enough time for the Minister to review all concerns and evidence from the public so as to make such an important decision that could potentially affect

generations to come. â?¢ A decision to allow Northern Pulp to proceed with their proposal could have deep and lasting adverse effects to the local fishery, tourism, recreation and entire economy not only of Nova Scotia, but that of the entire Northumberland Straight including New Brunswick and Prince Edward Island as well. If the fishery were damaged as a result of Northern Pulpâ?Ts proposal, the province may open themselves up to potential lawsuits from not only the local fishing and tourism industry, but other provinces as well. Tourism, which is vital to the economy of the area will undoubtedly take a serious blow, as a big reason those that come to visit the area are for the beaches and perceived clean waters within the area. If there is damage to the fishery, potentially no one along the Strait could make a living from the sea. â?¢ In the last few years, municipal, provincial and the federal governments have all invested heavily to clean up municipal sewage from being dumped directly into the oceans, harbours and waterways of Nova Scotia communities. Yet here we are considering allowing a corporate entity to dump potentially worse effluent into one of the most ecologically diverse and sensitive waters in our province. By allowing this project to move ahead, it will have a direct and long-lasting effect as to how Nova Scotia is viewed within the world. Do we wish to be seen as a banana republic or do we wish to diversify our economy and ensure that we leave as clean and preserved an environment as possible to our children and future generations? The potential loss of NPNS and its effects will be long gone by the time our children are adults. The potential devastating environment effects of allowing the proposed ETF and discharge of effluent into the Northumberland Strait could last for generations and beyond. Our oceans cannot continue to be dumping grounds. Is the risk worth the potential irreversible damage to the environment, economy, and health of the people of Nova Scotia and beyond? We resolutely feel that it is not, and in the interests of all Nova Scotians, we feel it is your duty and responsibility not to allow this project to move forward. REQUEST: For this reason, we are requesting that the Minister orders an Environmental Assessment Report. Respectfully submitted, *Please acknowledge receipt of these comments.
Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 66 y: 28

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:18:02 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:19:04 PM

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@unifor.org)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:28:17 PM

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From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:35:45 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:49:50 PM

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Thank you.

Signed by:

@rogers.com)

From:
To: Environment Assessment Web Account
Subject: Boat Harbour
Date: March 6, 2019 8:50:54 PM

They've had their chance to change. 5 years is more than enough time to make a plan. Time to get rid of them if they don't comply. It's a horrible decision to have to make, agreed, but surely there are more life-supporting ways to live in our beautiful Province that support and glorify what we've been given. Let the chips fall where they may!!!
Sincerely,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 8:52:06 PM

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Thank you.

let us all try and do the right thing we have so many stores closing now do we want to put more people out of work.Thank you so much.

Signed by:
@hotmail.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulps effluent treatment EA - concerned citizens /
Date: March 6, 2019 9:06:00 PM

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442

Email: EA@novascotia.ca

Dear Ms. Miller:

Re: Northern Pulp Nova Scotia - Environmental Assessment Registration Document- Replacement Effluent Treatment Facility

The Northern Pulp Nova Scotia Replacement Effluent treatment Facility has many concerns for me and my spouse. As residence of Pictou County, Nova Scotia this issues hits us right in our backyard. I myself am a second generation fishermen and father of two - a three year old and a one month old new born.

Besids my knowledge as a fishermen I am also a Red Seal Tradesmen trained as an Industrial Mechanic (Millwright) which gives me more insight into the industrial workings of a pulp mill.

In Northern Pulp's EA submission, there are many issues that are of great concern for me that need more review and information to insure the heath and safety for both the people of Nova Scotia and the Northumberland Strait to which we fish and share with surrounding Provinces. I am asking that you, as the Minister for Nova Scotia Environment, order an environmental assessment report of Northern Pulp's proposed effluent treatment facility for the following reasons.

1. Protection of Fish and Fish Habitat:

Since I am a lobster licence holder, the new treatment facility outfall is a major concern - what affects will it have on lobsters and their habitat as well as the lobsters reproduction system which includes their larvae. This information is so important because it is what will allow the survival and future sustainability of our industry. In

Appendix R of Northern Pulp's EA is where you find the lobster study information which is very limited. Here in the executive summery it states *". It is important to note that the values and distances in the Stantec reports (Stantec 2017, Stantec 2018) have been generated through modelling and not through onsite testing. Therefore, if modeling predictions prove to be inaccurate, then the predicted impact on lobsters as described in this report are invalid.*

This statement here concerns me as to how valid the receiving waters study is as well the lobster study. This area needs much much more information and in-depth studying to ensure our lobster and larvae are not harmed from the effluent leaving the outfall location.

2. Scallop Buffer Zone:
While on the topic of lobster, I would like to bring to your attention a link to the DFO website that describes our scallop buffer zone. Here is how the buffer zone reads as to the conditions for the commercial fishers licence set out by DFO and Enforced by DFO fishers officers as to the fisheries act and is found as Scallop condition 7: *No person shall fish for scallops in that portion of scallop fishing area 24 in those waters adjacent to the Province of Nova Scotia within one [1] nautical mile from the nearest point of land in the counties of Cumberland, Colchester, Pictou, including Pictou Island in the Northumberland Strait, and Antigonish.*

With this pointed out I would then like to refer to Northern Pulps EA, registration document- section 8, page 382 figure 8.12-10 and then the wording on page 384 where they state the outfall location is outside of this buffer zone. If Northern pulp worked with DFO more, they would have been shown and explained that their figure in there EA was incorrect and that the scallop buffer zone is one nautical mile from any point of land. This means their outfall is located inside a marine refuge area which is intended to protect the juvenile American lobster http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/sfa-zpp-eng.html.

Here are other limitations within scallop buffer zones that are set out by DFO.

Prohibitions:
- Scallop dragging.

- No other human activities that take place in this area are incompatible with the conservation of the ecological components of interest.

3. Total Suspended Solids

- The outfall location is located just off the Caribou Harbour channel and the accumulation affects from the suspended solids in the effluent is another huge concern. One of the first meeting with Northern Pulp and the fishers was held at the Pictou County Wellness Center in early December of 2018. At this meeting KSH solutions stated when asked the following question "Where does the heavy solids go?", his response was, " Away". Well on page 84 of the EA document, Table 5.6-1 the total suspended solids (TSS) is 48mg/L . When you do the long hand and work that out for their daily water usage of 85 million litres a day that is just over 4 tons of solids sent out into the Northumberland Strait daily. This is unacceptable. Four ton of solids won't just go away as KSH stated. The accumulative affect and build up is unknown and needs to be addressed.

4. Shell Fish Closure Zone:

Also a concern not addressed in Northern Pulp's EA is what will or what is the probability of a shell fish closure zone around the outfall. Will it be based on depth and volume of water affected? Will it be left up to DFO, not a Northern Pulp issue, but only to be a issue and concern to the fishermen? The area of the proposed outfall is one of the last remaining herring school breeding/ spawning ground for which I fish during the fall herring season 16F. As fishers we have drastically reduced our quota to continue to protect and look after the herring stocks for generations to come. As DFO knows the herring stocks are in very poor shape and as a precautionary measure, have cut quota in hope to rebound the stocks.

What is this outfall going to do to these herring spawning grounds? This is just one more reason that more in-depth studies need to be done to these very critical species.

These are just a few of my concerns as a fisher, but working full-time this winter as a Millwright and with a new born in the house, having time to study this EA in such a short time has been challenging.

5. Power Boiler

Now my next few points of concern are with the burning of the sludge and what will be taken out of the new effluent treatment system to be burnt in there power boiler and sent out into the air - the

power boiler that does not have a precipitator! This is the same power boiler that failed emissions tests in 2015, 2016 and 2017. As stated in a news article in the The NG News, dated Jan 22 2018, the reason for the failure of the emission limits was because of what was burned in it -
"These included changes to what went into the boiler, and how it was burned, which led to more efficient burning of that material and fewer particles leaving the boiler.

One significant improvement was to reduce the amount of sawdust and shavings, and to increase the size of the bark put into the power boiler. That had a significant improvement on performance"

If this boiler is what is going to be burning the sludge it concerns me that this was not addressed fully. How they will get there mixture right to pass any emission limits test? How will the particular mater be taken out of the air? I feel Nova Scotia Environment needs more information on this matter to insure public heath is not at risk.

6. Plant Drainage

Now my finial point that I'm going to mention and touch on is an in Plant issue that deals with there drainage and cleaning of their systems like the digester, pumps, and their pipe lines within the plant that are full of green liquor, brown liquor, white liquor , black liquor and any other chemical substances that are used in the pulp making process. During shut-down periods, these substances get flushed with acid for cleaning purposes. During these shut-downs or during emergency break-downs within the plant, at any given time, these substances are flushed down a drain and out into Boat Harbour. Any process interruption is drained off and sent down a drain out into Boat Harbour as well.

No where in Northern Pulp's EA does it mention a process for kraft interruption or their cleaning processes for the items mentioned above. The EA does not mention how the new system will handle these chemicals in their raw formate or how the microorganisms that are used in the AST system will interact with these chemicals. This is a major concern because these types of incidents happen far too often in this plant and more information should be addresses to what will the affects be on the AST system. Any slight mix up in their process will affect there AST system which then affects the outfall discharge.

I want to thank you for your time in reading my submission and hope that you take my concerns as serious as I do for the heath and well being of the Northumberland Strait. That all species and their larvae are protected and studied to ensure they will be around for years to come. If fishermen are held to respect Marine Refugee Areas to insure safety of the juvenile lobster, so should Northern Pulp. There

should be no risk put on any species in the Northumberland Strait that could cause adverse affects to a commercial fisheries and to human recreational enjoyment. Let's get this assessment done right and protect the water and the air from harm that can not be reversed. I look forward to hearing from you with regards to these issues.

Thank you

Sincerelv:

@hotmail.com

From: @gmail.com
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Treatment Plant
Date: March 6, 2019 9:13:57 PM

Good day,

I believe the gouvernement of Nova Scotia would be grossly negligent given the planets' climate crisis to consider allowing any chemical pulping of any product to continue in a way that is harmful to the environment.

The pulp mill has been a boil to Pictou since it's inception. Though it bears with it a few positions, the pollution it produces has too negative effect on it's residents and it's wildlife. The folks that work there could be re-trained to produce an organic sustainable product, that doesn't require the pollution of the straight that is the livelihood of so many others, not to mention a tourist attraction for both NS and PEI.

I implore you to only consider the health of your citizens and the future of your planet when you consider the next life of this facility.

Respectfully,

Citizen of Canada

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 9:19:35 PM

Project: replacement_effluent_treatment_facility_project Comments: Lets make this work !Too many jobs at stake. Name: Email:

: Privacy-Statement: agree

x: 68 y: 22

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:28:12 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: @northernpulp.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 9:29:18 PM

Project: replacement_effluent_treatment_facility_project Comments: The replacement effluent treatment facility at Northern Pulp has received a fair bit of media attention during the development of the project. I am writing to urge anyone involved in the review of the project to remember that the review must be based of science and regulations, and not emotional decisions. The project is designed to meet or exceed all current requirements for pulp and paper effluent in Canada, regulations which every pulp mill operating in the country must meet. The effluent will no doubt have an impact on a very limited area of the straight, however any effluent from any treatment facility, be it a municipal facility, or an industrial facility will have an impact on its receiving waters. The design of the treatment facility and pipe is such to minimize this impact. Again, please follow the science, and regulation when evaluating this project. Name: Email:

Privacy-Statement: agree x: 81 y: 21

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:34:17 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:35:26 PM

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Thank you.

Signed by:

@hotmail.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Waste Proposal
Date: March 6, 2019 9:37:10 PM

Hello,

My name is Nova Socian born and raised in Halifax. I am sending this email to express my concerns over Northern Pulp and their new waste proposal.

Every year I patiently wait for spring time to enjoy one of the things I love most about our province; the Northumberland Strait. From The beautiful beaches, to the only rivers left in our province that are home to the last of the wild Atlantic Salmon.. To think that Northern Pulp and their proposal to pipe their effluent into the Strait is even being considered, disappoints me deeply. The last 50 years we cannot erase..but it is time for change.

I have always planned on staying in my home province and rasing a family here. I am afraid of losing the opportunity to show my future children what our beautiful province has to offer. I am afraid of the increasing and alarming risks to human life in the surrounding area of Pictou County and beyond.

Thank you for taking the time to listen to my concerns, and I hope for future Nova Scotians that you will do all you can to put forward a provincial and federal assessment.

Thank you,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:40:49 PM

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Signed by:

@icloud.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:43:29 PM

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Signed by:

unifor.org)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:45:10 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:47:16 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:48:31 PM

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Thank you.

Signed by:

@seasidehighspeed.com)

From:
To: Environment Assessment Web Account
Subject: from re. EA Northern Pulp
Date: March 6, 2019 9:52:41 PM

Environmental Assessment Branch
Nova Scotia Environment
PO Box 442
Halifax, Nova Scotia
B3J2P8 Christina McKay 1104 Belmont on the Arm
Halifax, N.S.
B3H 1J3

To the Minister of the Environment,

I am writing regarding Northern Pulp's proposal to pipe effluent from their plant at Abercrombie out into the Northumberland Strait through Caribou Harbour.

My family have owned cottages at Moodie Cove for over one hundred years. We share this cove, and the beautiful Lighthouse Beach, with the Pictou Landing First Nation. We, like the PLFN, have suffered from the air emissions and water pollution coming from Northern Pulp and Boat Harbour for over 50 years. As successive generations of children have come to play at the beach, we have noted, even in our small cove, the effects of eutrophication and warming in the Strait. There is less biodiversity: the tidal pools are empty of creatures. The mud is black and oozing at low tide, and the shellfish are dead near the tide lines. There are fewer fish. It is clear that Northern Pulp, and its predecessors, Scott Paper and Kimberley Clark, have poisoned this place, its people, and all its living creatures. It is a beautiful place, but it is blighted.

I am writing to you to tell you that the proposed pipeline will deliver the same destruction only a few kilometres down the shoreline. The whole Strait is under threat from Northern Pulp's plans to spew its effluent into prime fishing grounds and a vulnerable ecosystem.

In this letter, I will outline some of my many grave concerns about Northern Pulp's plan. These include:

1. The actual safety and maintenance of any pipeline, both over land and underwater.
2. The failure to take ice scour into account in the current pipe models
3. The effects of high effluent temperatures on an already-warming Strait. There is a lack of climate-change modeling to account for higher

ocean temperatures.
4. The lack of current, peer-reviewed studies on the effects on human health from both this proposed pipe and the burning of sludge and its contribution to toxic air emissions
6. The lack of specific detailed information about the content of this future effluent to be piped into the Strait.
7. The lack of any current, peer-reviewed studies to demonstrate the lack of toxic effects from the effluent on lobsters or other fish in the Strait and the fact that this proposal claims to meet current regulations when in reality, the regulations themselves are outdated and weak.
8. The fact that our province, in making plans for our environmental future, needs to apply the precautionary principle.

The fact is that to our knowledge, Northern Pulp's current effluent pipe has leaked at least twice since 2014. It was this first leak, and the spillage of over 47 million litres of effluent onto the sacred burial grounds of the PLFN that precipitated the signing of the Boat Harbour Act. Northern Pulp, despite previous legislation and regulations that should have forced them to monitor their equipment with the utmost diligence and meticulousness, failed to discover their own failure. And even more stringent requirements four years later did not produce any better effects: a neighbour, walking their dog, discovered that the current pipeline had leaked yet again.

Surprisingly, no official government reports are available to let the public know the amount, and the damage resulting from, October 2018's effluent spill. Should Northern Pulp carry out its plan to place an even more contentious and unwanted pipe along the #106 and out into Caribou Harbour, I fear that such a pipe would not only be subject to the poor maintenance record of its own corporation, but also to potential sabotage from angry citizens. How safe is a pipe, either overland or underwater, when so many cannot countenance its presence in their community and over their watershed?

The real dangers of ice in the shallow waters of the Strait also pose a significant threat to an underwater pipe. According to a report from the Canadian Coast Guard on Ice Climatology and Environmental Conditions (CCG, 2012), ice rafting is a frequent occurrence. In this case, huge sheets of ice can drift or be blown up to override each other and form stacks along the shoreline. In addition, ice scouring along the shallow bottom poses a risk to pipelines, outfalls, diffusers and submarine cables.

There is no section of this report that addresses eventual ice scour or ice rafting and the definite damage it would do to a pipe spewing effluent in to the Strait at shallow depths.

The current EA proposal estimates that the temperature of the effluent exiting into the Strait via the pipe could be up to 37 degrees in the summer and 23 degrees in the winter. The current modelling accounts for an area of dispersal, and estimates that the temperature changes could be negligible in a wider area beyond the pipe. However, recent media reports this week brought forth research that demonstrates that there are marine heatwaves sweeping through the world's oceans as a result of rapidly accelerating climate change.

According to an article in The Guardian from March 4, 2019, "Global warming is gradually increasing the average temperature of the oceans, but the new research is the first systematic global analysis of ocean heatwaves, when temperatures reach extremes for five days or more." In addition, the article states that "The scientists compared the areas where heatwaves have increased most with those areas harbouring rich biodiversity or species already near their temperature limit and those where additional stresses, such as pollution or overfishing, already occur. This revealed hotspots of harm from the north-east Atlantic to the Caribbean to the western Pacific." Ocean systems are increasingly battered by multiple stressors.

The double-barreled punch of a high nutrient load along with higher temperatures will be absolutely devastating for the Strait. Boat Harbour currently buffers these stressors by lowering the temperature of the pollutants and removing a great deal of the solid biomass. With current ocean research demonstrating that our waters cannot adjust, cannot adapt and are indeed suffering much like our forests are with the effects of climate change, how can we justify adding up to 90 million litres of effluent per day into an already-stressed ecosystem?

Another grave concern is the fact that as this EA is a class 1 proposal, limited information is provided about the plan to collect and burn the sludge that will accumulate in the proposed EFT. No Human Health Risk Assessment has been carried out to ascertain additional dangers to human health should the sludge be burned in the stacks belonging to NP. These are stacks which have repeatedly failed emissions testing regulations in previous years. As it seems, according to the EA, the actual content of this sludge is not entirely certain. How can we risk burning it and emitting it into the air breathed by tens of thousands?

According to the EA document Section 9-15, At this time, it is only possible to identify candidate COPCs [contaminants of potential concern] that may be evaluated should a HHRA [Human Health Risk Assessment] of the project be a regulatory requirement. This is due to the fact that chemical process engineering design work is continuing and there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential

concentrations of substances present in the effluent." As I am to understand this, there is no current certainty about what the effluent will actually contain. Furthermore, according to page 489: "At this time, effluent chemistry characteristics (***including the specific substances present in treated effluent and their anticipated concentrations***) will not be known with certainty ***until the project is operational***". In other words, we are to take this EA proposal at its word despite the fact that we don't know what they will be burning in the stacks, or indeed, what exactly they will be spewing out into the Strait.

The proposed Northern Pulp pipe outfall location in Caribou Harbour is a critically important fishing and spawning ground for lobster, rock crab, herring, ground fish, and many other species. Current toxicity tests are based on a "kill test" scenario, where the number of trout left in a bucket of effluent determine how dangerous the effluent might be to the species affected. This is simply not good enough in 2019. The idea that NP's effluent "passes regulations" is simply inadequate and hollow. Greg Egilsson, Chair of the Gulf NS Herring Federation and who fishes very close to the proposed pipe outlet, estimates that within a radius of just a few kilometres, there are 86 lobster fishermen, of whom 10 to 15 are First Nation, and more than 22,500 traps are set in the area (Halifax Examiner). The deep channel where they want to place the pipeline is crucial for lobster and herring larvae, and that herring spawning stock are already depleted.

In fact, according to the paper "Bleach Chlorine Mills and the Impacts on Marine Life" (Effluents from Pulp Mills Using Bleaching. Environment Canada 1991), " Seventy-five percent of Canadian bleached pulp mills discharge effluents that are acutely lethal to fish, sometimes at concentrations as low as 3.2% effluent. A few individual chlorinated organic compounds in these effluents approach or surpass concentrations that cause mortalities in aquatic organisms ranging from algae to fish." In other words, the "kill test" is absolutely inadequate, and more stringent regulations must be applied immediately, and this EA proposal should be required to submit to these, not simply the limp regulations they've "adhered" to so far.

The FOIPOP obtained by environmental lawyer Jamie Simpson (Ahern, Brendan"Environmental lawyer says correspondence inside Northern Pulp contradicts company claims to the public" The Chronicle Herald 28 Feb, 2019) contains correspondence within NP that indicates clearly that the mill itself knows that despite their claims to the contrary, the new ETF would be worse than the old facility because of the elimination of the Boat Harbour Basin. Boat Harbour achieves a "polishing" of the effluent and a removal of a substantial amount of solids. What is pumped out into the Strait through this new proposed pipe is not, in fact, "state of the art": it is worse by far. Northern Pulp might be proposing a newer system, but the location is much riskier. Because of this, more toxins (though, as the report admits, still "unknown") will

reach the Strait.

Finally, I beg you to scrutinize the EA proposal put forth by Northern Pulp with utmost care and concern. The same such care and concern were not given to the PLFN, who have endured fifty years of environmental racism with the appropriation of Boat Harbour and subsequent destruction of their air and aquatic environments.

Please be reminded that the Federal Government published a document entitled "A Framework for the Application of Precaution in Science-based Decision Making about Risk" [Privy Council Office (PCO), 2003]. This paper addresses the application of precaution in its various forms - "precaution", "the Precautionary Principle" or "the precautionary approach" - all of which have three basic components: the need for a decision; a risk of serious or irreversible harm; and a lack of full scientific certainty. This guiding document requires that precaution must preside over all decision phases. Precaution must be clearly linked to scientific analysis, and cannot be applied without an appropriate amount of assessment of scientific factors and consequent risks.

SImply the fact that this nearly 2,000 page EA proposal was dumped on the general public with less than 50 days to comment is in itself a cause for grave concern. How can external, peer-reviewed studies be mounted in such a short amount of time? How can the public find time, and expertise, needed to comment effectively?

The 1999 Canadian Environmental Protection Act entrenches the "precautionary principle" in its preamble, where it recognizes that the "Government of Canada is committed to implementing the precautionary principle. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." In addition, section 76.1 of CEPA 1999 specifically directs the Ministers to apply a weight-of-evidence approach and the precautionary principle when conducting and interpreting the results of assessments of existing substances. We do not even know for certain, based on the EA proposal at hand, what these “existing substances” are, or in what quantities they might exist.

The government’s precautionary principle must supersede any social, ethical or even political or economic considerations. We can no longer afford to allow the economy to trump our fragile environment. We must, above all, apply caution first.

Please, do not approve this Environmental Assessment for Northern Pulp.

Sincerely,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:52:55 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmail.com)

NB

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 9:57:26 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@outlook.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:00:48 PM

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Thank you.

Signed by:

@hotmail.com)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 6, 2019 10:01:38 PM

Project: replacement_effluent_treatment_facility_project Comments: this is not 1967 lets move forward we used to put motor oil on roads we dumped garbage in the east river Pictou just stopped dumping raw sewage in pictou harbour. the waters along Little Harbour are closed to shellfish harvesting because of high levels of e coli the lobster fishing along little harbor has never been better and the effluent is going into strait now . let the dept of environment due its job and review the proposal and make ther determination and both sides live with it. both industies need to survive and florish so Pictou county can move forward and florish. jobs lost with closing of Trentron works have not retuned. jobs lost with closing of matitme steel have not returned. tourists turning away from Pictou county becausse of repots of peoples have to wear masks to breath are not doing anything for our economy. lets focus on the science not the negative fear mongers and fishers who work 2 months and draw ei the rest of the year. maybe this is someth ing the federal government needs to review and treat all Canadian workers the same our call center employees work for years and when the call centers close they get regular not special beneifts Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 53 y: 24

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:08:37 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:14:45 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@live.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:22:51 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

I am a concerned/heavily taxed Northern Pulp employee. I need help for my tax money. I pay lots

Signed by:
@outlook.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:32:32 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@shae.ca)

From:
To: Environment Assessment Web Account
Subject: Comments on Northern Pulp Replacement Effluent Treatment Facility for Environmental Assessment
Date: March 6, 2019 10:32:35 PM

March 6, 2019

Dear Sir or Madame,

Re: Comments on Northern Pulp Replacement Effluent Treatment Facility

Please acknowledge receipt of this letter: e-mail: @eastlink.ca

In August 2011 I moved to Pictou from Ontario outside of Ottawa. I am a retired . When moving to Pictou I was not concerned about the Mill since the province I had lived in had strict environmental enforcement and heavy fines, often 1 million dollars or more. It was a mistake for me to assume that Nova Scotia would be similar.

When the ETF project was first proposed I attended a Northern Pulp information open house. Since then, the pipe route has substantially changed. The first route was mostly underwater. The current plan is above land, underground and underwater. Due to the change in the route I had many more questions about the project. Northern Pulp should have held another open house so members of the public could get their questions answered about the new route. Therefore, there has not been adequate information provided to the public or adequate public consultation.

Furthermore, the Citizens' Committee for Northern Pulp is not accessible to the public as the company will not reveal who is on the committee. one of the founders of the face book group, Clean Up the Pictou County Mill, was refused this information from Northern Pulp more than once. When minutes of Citizen's Committee meetings are published there are no names, not even the name of the chair person. This is not accepted practice and highly unusual. A copy of minutes is attached in the appendix.

The main issue I will focus on is the pipe route going near the watershed for Pictou drinking water, the history of past pipe blow outs and leaks and the quality of the effluent. The later two can both have an effect on our drinking water. The second issue I will focus on is burning the sludge.

I am very concerned about the proximity of the pipe route to watersheds for Pictou drinking water. Section 9.1.2 page 493 of the RETF states:

As the current proposed pipeline route traverses a drinking water supply area, there is a potential that accidental releases from the effluent pipeline in this area (should they occur) could potentially impact potable water supplies.

In the section of the ETF document entitled executive summary page XXXV it states:

In summary, based on the results of this environmental assessment registration with planned mitigation and the implementation of best practices to avoid or minimize adverse environmental effects, the wastewater treatment facility projects effect on the environment during all phases is rated as not significant.

Northern Pulp can only estimate what the chemical composition will be for the effluent. They claim this information will be not be known for certain until the new facility is operational. Yet they tell us there will be no adverse environmental effects. By this time it will be too late. We are to believe them that everything will be fine. Their poor environmental record tells us otherwise, major leaks in the effluent pipe, numerous failed air quality tests and ash slurry spills. None of their antiquated equipment was replaced until your Department told them to. Please refer to the Appendix I which details Northern Pulp's environmental record at the end of these comments.

My concerns for drinking water for Pictou relates to future pipe breaks and pipe blow outs. There has been a history of several of these occurrences in the current pipe going to Boat Harbour. The leaks speak to lack of monitoring of the effluent pipe, as well as poor maintenance and lack of preventative measures. Northern Pulp states that leaks are normally not part of an environmental assessment. However, in view of the leaks that have occurred I want you to take this in to consideration.

It is not acceptable that the pipe go anywhere near the watershed for Pictou drinking water. The residents of Pictou will not allow this to happen. The town of Pictou cannot risk a leak damaging their drinking water supply. Northern Pulp will have to propose a new route to totally avoid this area.

Let us look at the monitoring system for leaks that Northern Pulp is required to have and how this system failed to detect the leak in October 2018 which is still under investigation by your department:

Section 7 of Northern Pulp's Industrial Approval states that:

d) The Approval Holder shall monitor flow at Point A, the end of the effluent transmission pipe, on a continuous basis. This data shall be recorded daily and tabulated monthly

e) The Approval Holder shall operate and maintain real time flow monitoring equipment at the end of the effluent transmission pipeline which is designed to immediately notify the Approval Holder in the event of a total loss of flow or a reduction of flow below normal operating conditions

f) The Approval Holder shall immediately investigate any flow reduction or loss notification received from equipment outlined in Condition 7(e). These incidents, together with the reason for the loss or reduction of flow causing the alarm, shall be recorded and tracked monthly

g) The Approval Holder shall immediately notify the Department of a loss or reduction of flow which results or may result in a release of untreated effluent to the environment.

According to their Industrial Approval Northern Pulp currently has to have a system to monitor the flow at the end of the pipe. None of the breaks or blow outs in the pipe were discovered by Northern Pulp. All were discovered by residents of Pictou Landing First Nation and Pictou Landing. In 2014 there was environmental damage done at Pictou Landing First Nation when the pipe blew out. The most recent effluent leak on October 21, 2018 was discovered by William Palmer and his wife when were out for a morning walk. For a Nov 6, 2018 article in the Halifax Examiner entitled *Containing Northern Pulp's Mess,* author, Joan Baxter spoke with Mr. and Mrs. William.Palmer who have lived near Indian Cross on Pictou Landing since 1985. Quoting Joan Baxter " as Palmer told me, he and his wife have discovered "all" of the leaks near Indian Cross Point — six of them — since they moved to the property there in 1985. The mill had been on annual shut down for a day when the leak was discovered on October 21, 2018 so it is still not known how much of the fluid spilled was pulp effluent or other chemicals used in maintenance."

If Northern Pulp installed a monitoring system, per their Industrial Approval, obviously the monitoring system did not work properly to alert the company of a leak. The leak in October 2018 was discovered the day after Northern Pulp's annual shutdown. If the Northern Pulp monitoring system measures a drop in water pressure one system is not adequate. Perhaps cameras have to be used on land and under water cameras in the ocean. Once the project is operational the ETF filing states there will be monitoring but provides no further details. This is not good enough. A monitoring system to detect leaks needs to be detailed in their proposal as well as any other monitoring systems.

Section 9.1 Human Health page 489 of the ETF for an environmental assessment states:

At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational.

In a CBC Halifax radio program on February 25, 2018 environmental lawyer from Halifax spoke about information he obtained through the Freedom of Information Act. In an email between Northern Pulp's Technical manager and Dillon Consulting, written on Nov. 29, 2017, Manager " Effluent going in to the Northumberland Strait will be worse than today because of all the polishing going on in Boat Harbour. " During this radio program lawyer further noted that the DOE told NP they have to specify toxins that will persist over time and this information has not been provided.

You cannot approve this project without knowing what the chemical composition of the effluent will be and the long term effects of toxins..

In 2014 when the old precipitator was not working properly, the air quality in Pictou was so bad I could not open my house windows for months. Some tourists who had reservations did not spend one night in Pictou (I volunteered at the Visitor Information Centre). In retrospect I should have worn a mask anytime I was outside. No community should have to live with such poor air quality.

Construction will have a negative effect on tourism which Pictou businesses depend on. There will be delays in traffic in Pictou by the first rotary coming in to town,(the newer second rotary is not shown on the map that Northern Pulp has filed with the pipe route) to and from the Ferry as well as delays in the Ferry to and from PEI. This is clearly stated in the document. I would like more detail on what they mean by delays. Up to how many hours? Will some Ferry trips be delayed until the next scheduled Ferry trip? Will the Ferry be delayed for a day or days ? If there are major delays in the Ferry Pictou will not receive as many tourists. The year that only one Ferry was running tourists who visited the Visitor's Information Centre in Pictou were down 30%. (I volunteered there). The disturbance to the sea bottom to dig up and lay the pipe will disrupt fishing in the area. The two most important means of income in this area are fishing and tourism. We cannot risk potential damage to our fisheries, tourism, our beaches or our drinking water supply.

<u>Burning of Sludge</u>
Northern Pulp cannot state with certainty the chemical composition of the effluent until their replacement facility is operational. Yet, they assert that it will meet or be below all regulations.

At Boat Harbour the effluent is currently treated for up to 30 days. It is my understanding that during this long treatment most of the heavy metals and hazardous chemicals sink in to the sludge. The treatment ponds are drained, the sludge is removed and then put in to a very large container cell.

The new proposal has the effluent treated for only about 24 hours. Then Northern Pulp is proposing to burn the sludge. They have disclosed what they expect in the air emissions when the sludge is burned. However, they also state they will not really know until the system is operational. I am concerned about the chemical and heavy metal concentration in the sludge being burned. Northern Pulp has a terrible history of at least 14 times they did not pass air quality tests. Furthermore, when they have failed air quality tests they are not shut down. They continue to operate. In the meantime residents have been exposed to cancer causing chemicals.

Having lived in Ontario for over 55 years, I have been shocked that Northern Pulp does their own testing and knows when Stantec, the testing company, will be arriving.No company should be allowed to do their own testing. When the company has failed air quality tests they should have been shut down immediately to investigate and solve the problem and then new air quality tests done within a week. The public does not know the results of the tests until a minimum of one month after the testing. It used to be 3 months. In the meantime when an air quality test has been failed, we have been exposed to toxic cancer causing air emissions without knowing it. This is unacceptable. Northern Pulp ran their power boiler for months with no pollution control equipment on it. The pollution control equipment was at the plant but they did not install it until a few months after they were told to. I cannot understand why any government department would allow this company to operate their power boiler with no pollution control equipment. Ontario would have shut them down immediately until the pollution equipment was installed. For a company that is on Canada's List of Environmental Offenders with a terrible environmental record Northern Pulp seems to have been given far too much latitude.

In summary, in view of Northern Pulp's poor environmental record, I have concerns about the pipe route for future pipe breaks or blow outs and Northern Pulp's inability to detect leaks. As well, the quality of the effluent will be worse than what comes from Boat Harbour. I also have concerns about the chemical emissions from the burning of sludge,as well as the impact on our tourist and fishing industries.

I am asking the Honorable Margaret Miller not to approve Northern Pulp's project. This project could damage our fishing, tourism, beaches, air quality, and Pictou drinking water. As a resident of Pictou since 2011, I am totally opposed to the pipe route going over the watershed for our drinking water. I am also opposed to the effluent pipe going in to the Northumberland Strait and burning the sludge. .Residents of Pictou have the right to breathe clean air and drink clean water. We are counting on the Department of Environment to protect us.

In 1967 when Scott Paper opened there were very different considerations at play. Today we know how fragile our environment is and how we must make decisionsto protect it now and for future generations.

Please do not approve this project.

Thank you for your consideration.

Pictou, Nova Scotia

Appendix I

Northern Pulp list of failed emission tests, Ministerial Orders, Ministerial Directives, pipe blow outs, leaks, spills, warning reports, legally binding orders etc.. This list may not be complete due to my time constraints. It starts after Northern Pulp took over Neenah Paper at the end of March in 2011.

Summary from April 2011 to October 10, 2018

14	*Failed air emission tests*
2	*or more Pipe blowouts / leaks **
1	*Ash slurry spill*
8	*Directives*
1	*Legally binding order*
5	*Ministerial Orders*
2	Warning Reports
1	Federal Fine $225,000. **

*Due to time constraints for this response I could not determine how many of 5 other leaks at Indian Cross since 1985 occurred after April 2011.

** **Placed on list of Government of Canada's Environmental Offenders Registry. Convicted of Pollution Prevention provisions (subsection 36(3)) of the Fisheries Act**. Refer to: https://environmental-protection.canada.ca/offenders-registry

Details

Fall 2011 Exceeding emissions power boiler particulate 634 mg/Rm3 standard 500 mg/Rm3

Feb 20, 2012 Directive under the Environment Act that the mill "provide written notification that the construction or installation of the power boiler air pollution control equipment has been completed." In his Directive to Northern Pulp, Inspector Specialist Marc Theriault also noted that the mill had broken Prohibition section 67 of the Environment Act, in that "No person shall knowingly release or permit the release into the environment of a substance in an amount, concentration or level or at a rate of release that causes or may cause an adverse effect... "

Spring 2012 Exceeding emissions power boiler particulate 921 mg/Rm3 standard 150 mg/Rm3t

Fall 2012 Exceeding emissions recovery boiler particulate 462 mg/Rm3 standard 375 mg/Rm3

March 7, 2013 Directive for Northern Pulp to "complete an engineering study for the recovery boiler air pollution equipment...and provide an implementation schedule by September 30, 2013." Another inspection report, dated March 7th, 2013, also written by Theriault, notes that "Stantec's Fall 2012 Source Emissions Testing Report...indicates particulate emissions exceeded the limit outlined...[for] total reduced sulphur concentrations." The USA's Environmental Protection Agency notes that

Sulphur Dioxide, especially when combined with other particulate matter (like that which comes out of Northern Pulp's stacks on a daily basis), can cause or worsen respiratory diseases, can aggravate existing heart disease and can lead to premature death.

Fall 2013 Exceeding emissions recovery boiler particulate 666 mg/Rm3 standard 375 mg/Rm3t

November 4th, 2013 Directive for Northern Pulp to provide data on the total reduced sulphur levels on a monthly basis and a detailed description of the work being done to improve sulphur emissions.. Theriault's third report notes that they are still exceeding the Total Reduced Sulphur

February 9, 2014 Ash slurry spill reached Pictou Harbour.

June 10, 2014 Pipe blew out on Pictou Landing First Nation releasing 47 millions of litres of **"toxic"** pulp mill effluent.

Summer 2014 Exceeding emissions power boiler particulate 236 mg/Rm3 standard 150 mg/Rm3 Exceeding emissions recovery boiler particulate 544 mg/Rm3 standard 375 mg/Rm3t

August 21,2014 Issued a legally binding order directing Northern Pulp to replace its precipitator and get its emissions in line.

Fall 2014 Exceeding emissions recovery boiler particulate 390 mg/Rm3 standard 375 mg/Rm3t

April 7,2015

Issued Warning report because information required by Condition 14c of Approval was not submitted on time. Exceeding emissions power boiler particulate 155 mg/Rm3 standard 150 mg/Rm3 Exceeding emissions recovery boiler particulate 833 mg/Rm3 standard 375 mg/Rm3 322% of limit

May 28,2015 Ministerial Order to install precipitator and provide significant amount of information over the next 5 months. Northern Pulp shut down on May 30, 2015 and did not start up again until the precipitator was installed and operating.

June 25, 2015 Issued Directive dated June 15, 2015 and Warning Report dated June 25, 2015 because particulate emissions from the exceeded approval limit during the winter of 2015

September 2015

Exceeding emissions power boiler particulate 190 mg/Rm3 standard 150 mg/Rm3 127% of limit

October 26, 2015 Environment Act Directives

1. Pursuant to Envronmental Act 122A(1) the following action(s) must be completed by November 30, 2015 Northern Pulp shall ensure an Independent third party engineering evaluation be completed for the entire power boiler system … The evaluation shall recommend the necessary operational modifications and/or capital upgrade Intended to lead to lower emissions and to contribute to achievlng compliance with the power boiler emission llrnlts In Approval 2011-078857-A01.

2. Pursuant to Environment Act 122A(1) the followlng actlon(s) must be completed by December 31, 2015 Within 30 days of the completion of the next scheduled source testing as required In 9(ac) of Approval 2011-o76857-A01, Northern Pulp Nava Scotia Corporatlon shall ensure that a final report on source testing Is completed and submitted to the Department that Is consistent with the requirements of Approval 2011..076657-A01.

Jan 20, 2016

Conviction: Federal: Pollution Prevention provisions (subsection 36(3)) of the Fisheries Act **Amount of fine(s):** $225,000.00

June 2016 Exceeding the allowable emissions stack test

September 12, 2016 Summary Offence Ticket $697.50 because the particulate emissions from the Power Boiler exceeded the approval limit in testing in Spring 2016.

November 21, 2016 Summary Offence Ticket Sept 12, 2016 was withdrawn in Pictou Court due to faulty testing equipment

December 2016 Exceeding emissions power boiler particulate 157 mg/Rm3 standard 150 mg/Rm3 105% of limit

May 31, 2017 Directive dated May 31, 2017 and Warning Report dated May 31, 2017 because particulate emissions from the Power Boiler exceeded the approval limit during the fall of 2016

June 2017 Exceeding the allowable emissions power boiler particulate 224 milligrams per reference cubic metre. The boiler permit allows 150 mg/Rm3. 149% of limit

Ministerial .Orders 1 October 13, 2017, Northern Pulp Nova Scotia Corporation shall submit to Nova Scotia Environment (NSE) a detailed report which explains the work planned for the scheduled October 2017 shutdown intended to lead to lower particulate matter emissions and to contribute to achieving compliance with the power boiler emission limits in Approval 2011-076657-A01.

2. On or before November 15, 2017, Northern Pulp Nova Scotia Corporation shall submit to NSE a detailed report which explains the work completed during the scheduled October 2017 shutdown intended to lead to lower particulate matter emissions and to contribute to achieving compliance with the power boiler emission limits in Approval 2011-076657-A01.

3. On or before December 15, 2017 or within two weeks of receipt, Northern Pulp Nova Scotia Corporation shall submit to NSE the Jansen and Megtec reports (including conclusions and recommendations) and/or any other reports for the two audits completed on the power boiler and/or power boiler emission control equipment in the summer of 2017.

4. Effective the date of this Ministerial Order (MO) and up to January 30, 2020, Northern Pulp Nova Scotia Corporation shall post all power boiler particulate matter emissions results (i.e. The Source Testing Results - Power Boiler-Particulate Matter tables in the third-party consultant reports that are associated with Condition 9(h) of Approval 2011-076657-A01) on the Northern Pulp Nova Scotia Corporation website and/or other forums for public access. Each power boiler particulate matter emissions result

shall be posted within thirty (30) days of receipt of the associated final source testing report submitted by the third-party consultant

Feb 9, 2018 ash slurry leak reached Pictou Harbour The Directive says the mill, located at Abercrombie Point near Pictou, must submit a plan to prevent further discharges of power boiler ash slurry into a ditch northwest of the facility's power boiler ash pond by June 29.

October 21, 2018 Pipe leak at Indian Cross discovered by a resident. This leak is still under investigation. It took over 2 weeks to clean it up. Northern Pulp's monitoring system did not detect the leak.

Norther

Northern Pulp Minutes of last meeting of the CLC Committee Meeting Dec. 19th, 2018. .

Everything seems perfect and the Effluent leak gets just a two line mention.

Date: December 19th, 2018
Location: Northern Pulp Pineo Boardroom
Attendees: NPNS Executive, CLC Committee Chair, NPNS Employee Representative, Representatives from Pictou, Moodie Cove, Abercrombie and Greenhill.
Regrets: Pictou Landing First Nation and Pictou Landing
Introductions & welcome members – introduction of new Abercrombie member.
Review of 2018 Environmental Plan and Introduction of 2019 Environmental Operating Plan
Water & Wastewater Objectives
• No effluent toxicity incidents in 2018.
• Dioxins and Furans again non detect as per the Regulations in 2018 (non-detect for last several years).
• BOD 1,200 kg/day range. TSS 1,500 kg/day range. Both well below regulated limits.

Air Objectives
• Ambient Air Monitoring stations located at Green Hill and Pictou Landing.
• No exceedances reported for 2018.
• Stack testing results for Power Boiler and Recovery Boiler located on PEC website, NPNS page.
• Recovery Boiler and Power Boiler particulate under regulated limits for 2018.

Action item: N/A for Recovery Boiler particulate testing on NPNS website should be noted and explained with *. Testing frequency outlined in the IA is now less than 4 times/year based on several years of low results.
Solid Waste Objectives
• Fulfill government requirements around solid waste regulations.
• Determine realistic ways of diverting solid waste away from landfill.
• Continue to segregate out domestic waste systems.
• Continue NPNS waste recycling program.
Woodlands Objectives
• Participate in the annual Sustainable Forestry Initiative Advisory Committee meeting
• Maintain current certifications held. ISO14001 Woodlands Environmental Management System and Chain of Custody (SFI, PEFC).
Other Objectives
• Maintain annual updates to environmental preparedness and response manual.
• Attend environmental courses or conferences where applicable.
• Continue to maintain an active Community Liaison Committee.

Pulp line break
Discovered land leak on Oct 21, 2018. No effluent entered the river. Consultant hired to evaluate and monitor the spill site. NPNS following all consultant recommendations – some complete, others in progress.
Cap and Trade
This program limits the amount of greenhouse gases NPNS can emit. Provincial government is trying to put a price on carbon gases. Nova Scotians will pay more for electricity and fuel beginning in January 2019. NPNS falls under the industrial sector of the cap and trade system.
Effluent Treatment Centre Replacement Environmental Assessment Process
• Initial EA submission planned for Fall 2018.
• Spring 2018 discovered ice scour on the route including the outfall location along with another shipwreck. June 2018 needed a new extension route. Outfall pipe required to be buried in deeper water.
• Spring 2018, hearing from community and stakeholders, NPNS took time to research alternate route. Began looking at Caribou route as an alternative. Completed a receiving water study for the new outfall location in deeper water.
• December 2018; filed an injunction against fishers to get survey boat work completed. Temporary injunction granted on December 18. Safety plans need to be developed to put surveyors back in the water.
• Treatment technology selected and purchased.
• MBBR Moving Bed Biofilm Reactor was purchased as an upfront step in the Activated Sludge Treatment (AST) process chosen. Well known vendor with proven technology.
• Oxygen Delignification study complete; project will follow after the treatment plant is completed.
• CLC members given two Eco Metrix studies that will form part of the EA submission. Members asked to review and comment.
1. EEM Monitoring Program.
2. Baseline Monitoring.
Action item: Incorporate CLC comments into the two Eco Metrix studies.
• Proposed pipeline will run along route 106 and runs alongside Pictou's watershed. CLC raised concern as it could affect town water in the event of a pipeline leak. EA will address concerns of Pictou town.
• CEAA, Fisheries & Oceans, Health Canada, Transport Canada and Environment Canada are all involved with NPNS EA submission.
• CEAA stated in May 2016, NPNS did not require a federal assessment.

Action item: Find a better way to share information on project delays with the public.

Continuous Improvement
In 2018 84 employees submitted ideas that were implemented on ways to improve NPNS operation and/or costs.
Communications
• Social media campaign continues, recent ads include stakeholder support, industry partnerships (Elmsdale Lumber, Darrin Carter Logging Ltd)
• Ongoing media relations strategy: Proactive when opportunities present (11th million tonne, Fill the Can Foodbank Fundraiser); with respect to effluent treatment facility projects – proactive and reactive measures.
• PEC, NPNS consistently communicating with Unifor Atlantic & National representatives to discuss collaboration efforts regarding ETF.
• Continued sponsorship of major events such as Summer Street Golf Scramble 2019; Coldest Night of the Year 2019.
Government Relations
2018 – 2019 Strategy
• Continue to broaden communication messaging audience.
• Inform employees with updates. Distribute internally all communication products released to public.
• Liaise with Atlantic Canada forest industry stakeholders.
• Continue to engage retirees.
• Expand audience reach with social media platforms.
• Implement phased communications plan focused on ETF.
Woodlands
Lahey Forestry Review
• Released in August 2018
• 80 meetings, 160 attendees and 250 written submissions were presented.
• 70 page report recommending change has been adopted.
• Took into account ecosystems and biodiversity.
• Triad model approach to forestry.
• 30% of forest is to be left natural from crown owned lands for conservations.

• 15 – 20 % is intensive forestry and can be clear cut.
• 30% of land is owned by private woodlot owners.
• Lahey put forth 45 recommendations in a package deal. No cherry picking.
• All recommendations were adopted.
Action item: Arrange for a tour of the Debert nursery in the spring/summer of 2019.
Comments from CLC members:
• Fishing and Forestry should continue to co-exist together.
• Most of the concerns around the county are about the effluent pipe.
• Some information on Facebook and around the coffee shops is wrong and misleading.
• Some people already have their minds made up and don’t care about facts.
• Political overtones playing on public fear.
• Government is in conflict. A federal assessment would take it out of the NS provincial governments’ hands.
• PLFN would need to support an extension to the BHA.
• Building trust is a long term process. The info presented today should be given to the public as there was not a large attendance at the information sessions in December 2017.
• Try to explain our plans in plain language so the public is able to understand some of the more complex work being done by NPNS.
• Focus more on the federal regulations that govern the industry.

Meeting adjourned.

The End

From:	noreply@petition.web.net
To:	Environment Assessment Web Account
Subject:	In support of Northern Pulp"s EA application
Date:	March 6, 2019 10:40:48 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

ON

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 10:41:09 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@bellaliant.net)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Review
Date: March 6, 2019 10:42:39 PM
Attachments: Letter to Minister.doc

Dear Hon. Margaret Miller

Please accept my letter to the response of the Northern Pulp document submitted recently on the pipe to be placed in Northumberland Strait.

Thanks

This email has been checked for viruses by Avast antivirus software.
https://www.avast.com/antivirus

March 6, 2019

Honourable Margaret Miller
Minister of Environment
Province of Nova Scotia

Dear Hon. Miller:

Re: Northern Pulps Replacement Effluent Treatment Facility Project

This letter is one of many that I hope will be written to you from the people of the Province of NS that are concerned about what is happening in Pictou County with Northern Pulp and our waters.

I am a life long resident of Pictou area and 4th generations in the fishing industry and I also have had family in the logging industry.

Have been educated in this province and presently work with municipal government but for over 10 years I owned and operated a Bed & Breakfast in the Town of Pictou. I consider myself very lucky to have grown up in this area and the Province of Nova Scotia and I am a proud Maritimer that cares about what happens to our environment and our province.

The document submitted by Northern Pulp is 1700 pages long and the public has been given 30 days to respond to this lengthy and technical detail report. A lot of this report is above the average persons understanding but still was good to be available to the public although many feel there are some things left out and one concern is the mercury content.

Although there are many concerns my biggest concern is the effluent along with the thousands of litres of warmer water that will be pumped into the Northumberland Strait. This will kill lobster larvae and god knows what else; it's inevitable and would directly breach Section 36 of the Federal Fisheries Act. A federal assessment is inevitable. The fact is that the sea bottom, where Northern Pulp plans to dredge to bury the pipe in Caribou Harbour and the Northumberland Strait, is federal land, which I believe should necessitate a federal assessment. A full Federal assessment study should be done on the marine environment with the millions of litres of effluent that will be discharged into the Northumberland Strait once the pipe hopes to be in place. Our waters are under federal protection. Also enough evidence has shown that the likely hood that it will cause adverse effects or environmental with effects to our eco system. This is very concerning to us all.

Also, many people worry that the provincial government cannot fairly assess this effluent treatment plan for a pipe to enter into our ocean. The province should step aside because of the conflict of interest and the Canadian Environmental Assessment Agency be given this due to the Province of Nova Scotia is really an employer to Northern Pulp. I feel the government should no longer be subsidizing a foreign owned company.

Bleached Kraft mills are killing us and damaging our environment, maybe its time changes are to be made. Do we really need to have pure white paper and toilet paper at such a cost to us all and if so then a better way of doing so needs to be looked into and not to be killing our province and water to provide this?

Please do not let our province choose money and a foreign owned company over our water, air , food and our health.

Sincerely,

, Pictou Co. NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 11:06:46 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 11:08:14 PM

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Thank you.

Signed by:

@bellaliant.net)

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 6, 2019 11:17:41 PM

Project: replacement_effluent_treatment_facility_project Comments: As minister of the environment I strongly feel that this project requires alternate solutions. This is a great opportunity for a pulp mill and province to invest in a closed loop system and look at how this may be an advantage economically for the company. Continually our province makes decisions based on fear of loss of jobs instead of being at the forefront of innovation and creating long term jobs. We are about to fix boat harbour and introduce an entire new set of problems. Should this project move forward it will certainly be an instant regret and another future problem and cost for the province. I spent my youth on these shores and am now an avid fly fisherman. The eminent loss of Atlantic salmon habitat alone would be enough to reject this project. It is certainly enough to require a full environmental assessment. There is so much investment from all parties to market and fight for something we all no will be detrimental to this sensitive ecosystem. All of th is private and public money should be going towards finding a solution that solves the problem. Please make this a defining point in your career where you reflect back on this decision with pride. C a must. F is the right choice. c an environmental-assessment report is required - An environmental assessment report is a much larger report, or series of reports, analysing the environmental issues raised by the entire project. This report would be produced within 2 years, and is then followed by a public review period, a review either by a Panel or by the Minister, and a decision would be made at the end of that process. The whole process could take up to 3 years or more to complete. f the undertaking is rejected because of the likelihood that it will cause adverse effects or environmental effects that cannot be mitigated Name: Email: @hotmail.com Address:

Privacy-

Statement: agree x: 74 y: 21

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 6, 2019 11:45:49 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@telus.net)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:01:53 AM

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Thank you.

Signed by:

@gmail.com)

@ns.sympatico.ca
Caribou Island, NS,

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

March 5, 2019

Good morning ladies and gentlemen,

This letter has been prompted by Northern Pulp Nova Scotia's Replacement Effluent Treatment Facility Environmental Assessment Registration Document.

WHO WE ARE

My name is and I live on Caribou Island with my wife,

Through my various promotions with Scott Paper Limited, a distant cousin of Scott Maritimes, I worked in their New Westminster, B.C. mill which manufactured paper towels, bathroom and facial tissue. Some of these were produced from its own groundwood pulp, which was bleached with hydrogen peroxide.

Although I prospered with the company, after 5 years in Toronto I decided to return to Halifax to better raise our family. It was a difficult decision as over 18 years I had grown considerably within Scott Paper Limited, one of the most reputable companies on the Toronto Stock Exchange. We now live full-time and work on Caribou Island.

NPNS' RETF PROPOSAL PERPLEXITIES

I have several concerns, particularly the following that I would like you to take into account when deciding on the merits of accepting NPNS' RETF proposal as is.

A.

It is truly astonishing how over a half-century of producing mill effluent, there is so little science from Northern Pulp on determining the array of compounds that are part of its effluent, despite world renowned oceanographic institutions — the Bedford Institute of Oceanography and Dalhousie University's Department of Oceanography — nearby.

Possibly the following statements from NPNS' Replacement Effluent Treatment Facility Environmental Assessment Registration Document (RETF EARD) may offer an explanation.

Presently, there is no regulatory requirement to conduct a human health risk assessment (HHRA) study in association with the NPNS project. The project is currently in a Class 1 EA Process in Nova Scotia that does not specifically require the completion of a HHRA (Human Health Risk Assessment) in advance of registration of an EA.

NPNS' RETF EARD 9.0 Page 489

So,

At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational.

ibid 9.1 Page 489

Nevertheless, NPNS has advanced, from Australia, the Toxikos 2006 study 'Comment on Bell Bay effluent and potential impact on nearby seal colonies' for a future Human Health Evaluation. NPNS regularly states the mill effluent in the Toxikos report is comparable to that of its own projected operation, and therefore the risks to human health are negligible:

The Toxikos (2006) HHRA was a highly conservative assessment that substantially overestimated exposure and risk to potential human consumers of fish and shellfish that may be influenced by the effluent diffuser discharge in Bell Bay. The authors concluded that there were negligible risks to human health from consuming any marine food item harvested in the vicinity of the effluent diffuser, for any of the substances that were assessed in the HHRA.

Ibid 9.1 Page 491

However an audit of the Toxikos (2006) study's methodology by Dr. Andrew W. Wadsley was released in May 2007, with the following contradictory conclusion:

This review found that calculation errors, use of inappropriate parameter values, failure to include background dioxin concentrations, and failure to use the permitted maximum limit of dioxin in the pulp mill effluent, results in an underestimation of dioxin concentrations by a factor of 1,390 in the Human Health Risk Assessment and by a factor of 90 in the Marine Impact Assessment. The impacts of these errors are far reaching and invalidate all of the quantitative ecotoxicological analyses prepared for assessment under the Tasmanian Pulp Mill Assessment Act 2007 and for assessment of the pulp mill project under the Australian Environment Protection and Biodiversity Conservation Act 1999.

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.582.2806&rep=rep1&type=pdf

The Wadsley audit was cited in 2010 by the Tasmanian Times

https://tasmaniantimes.com/2010/08/why-tasmania-needs-a-science-reform-commission/

which also included this paragraph:

In an article by Charles Waterhouse from The Sunday Tasmanian on 24 September 2006 were excerpts from a leaked DPIPWE draft review of Toxicos' assessment on impacts on marine life from the proposed Gunns Pulp Mill.

The draft states:

'Toxicos fails to conclude or describe the risk to seals of bioaccumulating dioxins from exposure to pulp mill effluent. Evidence exists that the effect of exposure is significant, "therefore the Toxicos implication is misleading and their conclusion false". Toxicos states that dioxins are not significantly bioaccumulated by fish. This statement is profoundly inaccurate, misleading and directly contradictory to references cited by Toxicos and Toxicos statements. The method used to determine the risk of bioaccumulation in fish is inappropriate. The assessment using effluent concentration by Toxicos is invalid and misleading and all conclusions based on this information are unsubstantiated. Toxicos demonstrates a complete lack of understanding of the meaning of biomagnification.'

The conclusions from the Toxidos (2006) study and the Dr. Andrew W. Wadsley's audit are so contradictory that a thorough Human Health Risk Assessment is called for prior to releasing NPNS' effluent into the Northumberland Strait as its impact on *sensitive aquatic organism, marine mammals, birds, fish and humans* may be significant.

B.

Should any of the *sensitive aquatic organism, marine mammals, birds, fish* be adversely impacted, would the repercussion on Nova Scotia's fishing industry be at all similar as to when Alberta discovered in 2003 one black Angus cow to have bovine spongiform encephalopathy (mad cow disease) which caused the United States to immediately close its borders to Canadian beef and cattle which in turn caused about another 40 countries to follow suit?

https://globalnews.ca/news/1830438/timeline-canadas-2003-mad-cow-disease-crisis/

C.

The effluent's proposed outfall location is a particularly poor one. On the western side of the proposed outfall, the Caribou Island lighthouse is less than a couple of

kilometers away. Attached below is the Nautical Chart for the Caribou Harbour and it is clear how shallow the harbour is at this point. I recall one concerning experience while circumnavigating the island on my Expedition sailboat, a laser hull with a single self-furling sail, and running aground while attempting to get out of the incoming ferry's way.

On an incoming tide, especially as the current at this point circles clockwise, a good portion of the effluent will flow into the harbour; and whatever solids that are in the effluent will likely settle on the shallow shores, possibly edging Caribou Harbour towards becoming another Boat Harbour.

http://fishing-app.gpsnauticalcharts.com/i-boating-fishing-web-app/fishing-marine-charts-navigation.html?title=CARIBOU+HARBOUR+boating+app#12/45.7600/-62.6850

It is clear that the proposed plan B water route has not been surveyed nor sampled.

The Water Quality data off Caribou Island is from Pictou Harbour,

This section provides an overview of water quality sampling in Pictou Harbour in 1990, 1995 and 1998 (Dalziel et al. 1993; JWEL 1996; ENSR 1999). Pictou Harbour was used as a proxy for Caribou Harbour with respect to water quality, in the absence of available water quality data for Caribou Harbour.

NPNS' RETF EARD Environmental Effects Assessment 8.11.2.4 Page 143

Surely the Environmental Assessment Branch, Nova Scotia Environment should request the NPNS' proposed plan B water route to include a survey and sampling of this very different Caribou Harbour.

In conclusion, I would like to say that we have been blessed to build a home on the shores of the Northumberland Strait. The Waterside beach is large and magnificent. We get lobsters and scallops harvested off our strand by a fisher friend and occasionally we share our neighbour's oysters from her licensed but

still secret oyster bed in Caribou Harbour. In the fall we watch the northern gannets dive into herring schools, marvel as red-throated loons moult their red plumage, enjoy the night-ballet of lit herring-boats knowing that winter is fast approaching. We shall feed the crows, pheasants, chickadees and snow buntings. Some years gray seals give birth on the ice off the Hamilton Point. In late spring, we will witness fawns and now less frequently kits. In the summer, children and parents will build sand castles by the water's edge. By August, when it is too hot in New Glasgow, Trenton, Stellarton, Westville and Pictou, families will come to cool off in the Strait's balmy waters.

We have shared this wonderful corner with Korean, French, Chinese, Afghani, British, Austrian, Angolan, Portuguese, Iranian, Mauritanian, Turkish, American and Canadian friends who have all expressed what a beautiful spot this Caribou paradise is. It is truly one of Nova Scotia' unsung treasures. Please protect Caribou Harbour and the Northumberland Strait for Nova Scotians, our children, our fishers and the friends of Nova Scotia.

Yours sincerely,

N.S. ENVIRONMENT
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MAR 07 2019
RECEIVED

February 25, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, Nova Scotia B3J 2P8
EA@novascotia.ca

The Honourable Margaret Miller
Minister of Environment
minister.environment@novascotia.ca

Dear Minister Miller,

Re: Northern Pulp's Replacement Effluent Treatment Facility Project

I am writing in response to Northern Pulp's Replacement Effluent Treatment Facility Project. I am a resident of in Pictou County, where I have lived for the past years, raised my children, planted and harvested gardens. My home borders on the Caribou River; at high tide I can canoe down river, under the Waterside bridge, to the ferry side of Caribou Island. It is in very close proximity to where the proposed effluent pipe would be located.

It is very evident, as I have canoed those waters over the years, how closely connected all these waters are. The Caribou River is brackish (the salt water from the Strait floods the river at high tide) bringing salt water, seaweed, crabs, the occasional seal. It is clear how closely connected this river is to the waters on the other side of the bridge, to the waters of Caribou Harbour, as they rise and fall at high and low tide.

I taught elementary school in and every morning, as I drove the Shore Road over two bridges, I saw how interconnected all these waters are.

This river is home to trout, smelt, great blue herons, eagles, kingfishers, to name but a few.

I lived in Pictou when we first arrived, years ago, where the odor of the mill made people close windows and avoid going outside. , there were days when the smell made you close your car windows and want to leave town.

During these years, I have been aware of a multitude of issues with the mill:
effluent spills
pipe breakages and leaks
pollution in the air
the death of Boat Harbour
the impact of the mill's pollution on Pictou Landing
the huge amount of water the mill consumes every day
the huge amount of effluent discharged every day
health problems that people in the area have reported (a study was done by Dr. Daniel Reid decades ago)
the clearcutting of Nova Scotia

Many of these are issues no mattter how the effluent is disposed of. But I want to speak specifically to the proposal at hand. There are major gaps in the information:
There has been no study about the effects on lobsters.
There is no information in the proposal about what the effluent will be composed of.
The effluent will be more dangerous than the current Boat Harbour because of polishings.
Toxins that will accumulate over time have not been addressed (The Department of Environment has said that the current level of toxins already don't meet current standards.)

There is no specific route for the pipe, so there can be no review of the safety of the route. (As far as we know, the proposed route runs a pipe along the Causeway, through Pictou's watershed, beside the road to Caribou Harbour, around the end of Caribou Island . . .)

These are all identified risks that need more investigation.

When therei s a breakage in the pipe, and there are breakages in all pipes, it will be an ecological disaster, affecting drinking water, the fishery, the tourist industry, our homes, the life of fish, animals, and plants. The effect will be widespread, as tides and currents spread the effluent, and disastrous.

We know what resulted at Boat Harbour, and we know how important our environment is for our survival, as a country, as a province, and as a country. We know that we cannot afford to take a chance. We know that we need a further, and federal, assessment of Northern Pulp's Replacement Effluent Treatment Facility Project.

I ask you to reject this proposal. If you refuse to reject it, I ask you to make no decision before further assessment.

Sincerely,

, Nova Scotia.

February28,2019

I am writing to you to ask you reject the proposal by Northern Pulp to dump 90 million litres per day of effluent into the Northumberland Strait.

I have a BFA and work as a fisher in the Northumberland Strait. I moved to Pictou County as a child in 1967 when my father took a job with the opening of the pulp mill. Fifty years ago good wages seemed like the only important thing. Now we see the adverse health effects that those decisions, made half a century ago, have on those we love.

I have struggled deeply to write this letter. I want you to feel how devastating your decision could be on this area and the people that call it home. I cannot believe that in 2019 we are even considering allowing a foreign company to destroy an ecosystem that provides such solace to so many, in harmony with a lucrative fishing industry. They say when you know better, you do better. WE SEE BOAT HARBOUR....we see the millions that is going to cost to clean it .....we know better. DO NOT LET BOAT HARBOUR HAPPEN AGAIN. Not to our Strait.

The Northern Pulp propose project must be rejected because:

1) No current data regarding the significant adverse effect that the proposed outfall will have on the area has been done. I have seen firsthand how extremely sensitive to wind and weather and the resulting silt has on lobster and crab fishery in this area.
I remember when the adjacent area formerly known as Little Entrance was permanently filled in by a storm in 1979 making Munroes Island no longer an island. Data about tides in this area, used by NP, predates this event. Thus making it impossible to predict the current tidal patterns in the area.

QUOTE:" **2.1.2 Physical Oceanography**
Even though some oceanographic and hydrometric data are 20 to 30 years old, it is reasonable to believe that the amplitude and direction of tides and currents did not appreciably change to affect the results of this study. Similarly, ocean water temperature and salinity are relatively constant characteristics and are unlikely to have significantly changed over the past 30 years. "
(Northern Pulp Environmental Assessment Report)

QUOTE :"Two channel entrances once defined Caribou Harbour, the Big Entrance between Caribou and Monroe's Island where the PEI ferry passes through, and the Little Entrance at the eastern end of the harbour. In 1979, a massive storm swept already encroaching silt into Little Entrance and closed this second passage permanently.

The 100 ft wide channel was the deepest point in Caribou Harbour separating Munroe's Island from the mainland.

In 1937 construction began at Caribou Harbour on a ferry terminal to serve traffic between Nova Scotia and Woods Island, PEI. Some say that the project's dredge was dumped too close to shore creating more silt. Construction of terminal altered the sediment patterns along the northern side of Munroe's Island and also affected the Little Entrance."
(This research was supported by the Social Sciences and Humanities Research Council This project was developed by Katherine Knight of York University)

2) The proposed area borders an extremely popular Caribou/Munroes Island provincial park and nature reserve. I see the pleasure that it brings to locals and tourists to be able to walk on such a pristine place.

QUOTE:" When some people want a vacation, complete with history, scenery and great experiences, they call a travel agent. Those who want to experience all this and more without breaking the bank visit Caribou/Munroes Island Provincial Park in Pictou County.

Visitors to the Caribou/Munroes Island park can enjoy the mile- long sand beach and warm salt water swimming. There is also a walking trail along the beach that leads to Munroes Island, which was a farm until the 1940s and is now a wilderness reserve. Eagles, ospreys, seals, herons and many other species of birds are seen on the 10-kilometre round trip."

(https://novascotia.ca/news/release/?id=20030626004
Natural Resources (to July 2018) NATURAL RESOURCES--Caribou/Munroes Island Provincial Park A Perfect Stop)

3) The Northumberland Strait proposed area has not been thoroughly studied. The research is for the Pictou Harbour proposal.

QUOTE:" **1.3 STUDY AREA**

The study area (***Figure 1-1***) comprised an area of 46 km x 42.5 km (***Table 1-1***), encompassing the surrounding waters of the estuary of East River, Pictou Harbour, Pictou Road, Boat Harbour, and offshore into the Northumberland Strait." (Northern Pulp Environmental Assessment Report)

The elements that led to the rejection of the proposed Pictou Harbour site are present at the new Caribou Point proposed site. Caribou Point is extremely shallow water. It is location of commercial and recreational fishing, as well as home to migrating birds. No information is provided on the significant effect daily distribution of effluent would have on this area.

QUOTE:" File: 121414584 2.32

The potential outfall location initially proposed by KSH at approximately 500 m from the mill and outlet of the Pictou Causeway (HWY 106) was not considered further in this study for the following reasons:

• It was located in a shallow water in the range of 3 to 4 m. This depth range did not meet the criteria for preferred water depth for a discharge point for the effluent, including a likely reduced capacity for effluent mixing in the receiving environment at these depths.

• The presence of environmental sensitivities in the general vicinity of this location. These sensitivities include gaspereau fisheries and migratory bird habitat particularly in the winter." (Northern Pulp Environmental Assessment Report)

4) Public consultation was for the Pictou Harbour site proposal not the current Northumberland Strait proposal.

Nothing less than a full rejection of the Northern Pulp Effluent project is acceptable. No extension should be given. Northern Pulps' own EP report states that they knew about the closing of Boat harbour since 2015.

QUOTE:" ***2.1.3*** **The Boat Harbour Act**
In June 2014, there was a leak of untreated effluent due to a breach in the transmission pipeline from NPNS to the exis□ng BHETF. This leak prompted conversa□ons between the Province and Pictou Landing First Na□on (PLFN), eventually culmina□ng in a commitment to close the BHETF and remediate the area. The introduc□on of the *Boat Harbour Act*, which received Royal Assent on May 11, 2015, prohibits the use of the provincially-owned facility for the receipt and treatment of effluent from NPNS a□er January 31, 2020." (Northern Pulp Environmental Assessment Report)

I am including photos because I want to put a face on the people whose lives and futures you hold. I want you to see the Northumberland Strait as the place of beauty that we do. Not as the environmental dump it is proposed to be.

We are counting on you to do the right thing.

@gmail.com

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MAR 07 2019
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This is and aerial photo taken by Jeff Vienneau (www.avinova.ca). Posted by author.

File: Caribout Island Light.jpg
Created: 19 June 2007

The mouth of Caribou Harbour.

March 2 2019

Northern Pulps proposal to pump effluent into the Northumberland Strait must be rejected because of the significant adverse effect that it will have on the Strait.

I was born and raised in Pictou county. I have fished the waters of the Northumberland Strait for years. There was a time when we did not think much about the effects our actions had on the ocean. We see now firsthand how fragile the ocean is. We now work with DFO to preserve an ecosystem, an industry and a way of life. We have reduced our lobster trap numbers from 300 to 280, stopped fishing single trap trawls and are increasing the carps size. We have also increase the web size of our herring nets to allow the small fish to go free. In recent years we have seen the Northumberland Ferries Limited and the town of Pictou implement sewage systems, so that they no longer dump their sewage into the ocean . Land owners along the Strait have built sea walls to stop erosion and the accompanying sediment. And these changes are working. The last several years have seen an increase in lobster catches in our area. Sustained scallop seasons.

Proving that our oceans and fishery are sustainable is very important to the world. Dumping industrial waste into the ocean does not constitute Sustainability. This is a step backwards for Nova Scotia ...for Canada.

"Our Oceans, Our Future
As Canada's Minister of Fisheries and Oceans, it gives me great pleasure to present Canada's Oceans Strategy. This far-reaching policy framework will make Canada's vision for modern oceans management a reality.

As a country bordered by three oceans, Canada is truly an oceans nation. Today we see an ever increasing number of demands on oceans and their resources. While traditional fishing and marine transportation continue to be of prime importance, they are now joined by other uses, such as aquaculture development, oil and gas exploration and development, recreational and commercial fishing, and eco-tourism. Canada's oceans also support important features of Canada's social and cultural identity. Managing these demands is critical to the protection of the marine environment and the long-term sustainability of Canada's oceans and their resources.

On January 31, 1997, the Government of Canada brought the Oceans Act into force, making Canada the first country in the world to have comprehensive oceans management legislation. The Act authorizes the Minister of Fisheries and Oceans Canada to lead the development of a national oceans management strategy, guided by the principles of sustainable development, the precautionary approach and integrated management."

source: Robert G. Thibault
Fisheries and Oceans Canada, Oceans Directorate, *Canada's Oceans Strategy,* 2002, Cat. No. Fs23-116/2002E, Ottawa - Ontario: Fisheries and Oceans Canada 2002, iii

My fishing grounds are the waters along Caribou Island. It is an extremely fragile area. It is extremely sensitive to water temperature changes. If we get a Nor-Eastern the water becomes brown with sediment. It takes several days for the sediment to clear and fish to return. Northern Pulp proposes to dump 90 million litres of effluent per day on this area. Northern Pulp estimates that the propose pipe will dump 48mg of Suspended Solids per litre into the Strait. **For a grand total of 4.32 tonnes of Suspended Solids per day.** This is daily. That is 1,576 tonne per year. The area will never have a break / never be given a chance for it to recover. *The long term effects of this have to be studied.*

"*(5.6.1* Replacement ETF Effluent Discharge

Adsorbable Organic Halides (AOX) mg/L 7.8
Total Nitrogen (TN) mg/L 6.0
Total Phosphorus (TP) mg/L 1.5
Colour TCU 750
Chemical Oxygen Demand (COD) mg/L 725
Biochemical Oxygen Demand (BOD5) mg/L 48
Total Suspended Solids (TSS) mg/L 48
Dissolved Oxygen (DO) mg/L >1.5
pH - 7.0 to 8.5
Temperature oC
25 (winter)
37 (summer)
Total Dissolved Solids (TDS) or Salinity g/L 4
Additionally, the project is designed with key established water quality guidelines and/or will meet ambient water quality (current background) at the edge of a standard mixing zone (CCME 2009 - Canada-wide Strategy for the Management of Municipal Wastewater Effluent)."
source:(NP EP Proposal)

The sediment from the construction of the pipe alone will be catastrophic. We have witness firsthand the significant adverse effect that the construction of the Confederation Bridge, in 1993,had on the fishery. It has taken about twenty three years for lobster stocks to return up to 90km away. This was a finite project, with a recovery time. The proposed NP is a constant 4.32 tonnes per day! Every day.

I've always had a since of pride about living in Nova Scotia, Canada. I've felt that we were moving forward towards a greener country. Northern Pulps proposal to dump effluent into the Northumberland Strait is a step backwards. **I am asking you to Reject the proposal on the grounds that the significant adverse effects cannot be mitigated.**

@gmail.com

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:04:38 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 2:53:46 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 4:41:17 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@yahoo.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:08:16 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:
@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 8:15:37 AM

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Thank you.

Signed by:

@rocketmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 8:21:35 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@yahoo.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 8:35:28 AM

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Everybody must be protected in this situation and a solution for all is there. I fully support this application be approved.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:03:09 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

If NPNS closes it will put the whole community in an economic crisis. Pictou County cannot afford to lose these jobs and many people would have to leave here to find work elsewhere. These are good paying jobs and they need to stay here.

Signed by:

@northernpulp.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:37:23 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:38:29 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@eastlink.ca)

NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:40:30 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:45:26 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@tncweb.ca)

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 9:45:30 AM

Project: replacement_effluent_treatment_facility_project Comments: The ocean doesnt belong to a corporation its everyones resource. Why we are even going through an assessment period, is wrong on so many levels. The effluent is poison, pure and simple. People cant drink the effluent, so why would we ever allow it to be dumping into the ocean in our backyard? Lets stop this once and for. Name: Email: @hotmail.com Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 74 y: 11

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 9:48:54 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 10:10:38 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Give the mill a chance to get it right. They are trying to do their best to make it right. Pictou County can not afford to lose the mill.

Signed by:

@hotmail.com)

From: @yahoo.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 10:10:39 AM

Project: replacement_effluent_treatment_facility_project Comments: My son will be the 4th generation of fish harvester to depend on the Northumberland Strait to provide a living for he and his family the effluent pipe into the Strait represents a serious treat to his families future my parents and my family have endured years of poor/dangerous air pollution from the mill, property values in the town of Pictou have fallen and local business in the tourist industry have suffered a move to pipe sludge from the mill into the Strait is a terrible idea and shutting the mill down now will provide many remediation jobs to the county, now is the time to act and do the right thing!! Name: @ Email: @yahoo.com

Privacy-Statement: agree x: 50 y: 21

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 10:22:46 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 10:38:54 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 10:47:12 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 11:00:08 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

ON

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 11:33:27 AM

Project: replacement_effluent_treatment_facility_project Comments: Please make sure the Province of Nova Scotia sticks with the deadline for closing off effluent to Boat Harbour. 5 years was more than enough time to fix this. Name: Email: @gmail.com

: Privacy-Statement: agree x: 50 y: 14

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 11:37:47 AM

Project: replacement_effluent_treatment_facility_project Comments: I am not in support of a pipeline for effluent to flow into our waters. Our fishing industry and the environment that keeps it healthy is much more important than mill jobs. If the mill can not operate without polluting our environment, it needs to close. Name: Email: @gmail.com Address: : Privacy-Statement: agree x: 70 y: 28

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 11:49:41 AM

Project: replacement_effluent_treatment_facility_project Comments: I vote for Project Alternative 1 - Do nothing and close the NPNS Mill. Name: Email: @yahoo.ca

: Privacy-Statement: agree x: 56

y: 23

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 12:38:16 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:09:47 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@live.com)

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 7, 2019 1:09:53 PM

Project: replacement_effluent_treatment_facility_project Comments: To whoever this may concern I am against a pipe flowing into the strait , I know you only consider the jobs and the economy but for the sake of 300 jobs why do you want to kill thousands of people . This proposed pipe will go directly across the water table for the town of Pictou and surrounding communities . This pulpmill has never given a damn about people . I myself have hauled paper from this mill back when it was owned by Scott in those days we could eat at the cafeteria and when it was smoke smog or steam down low to the ground you drove into the mill where you load and you could stay in there so you were not trying to tie down the load in the smog . Then along came Nima who now stopped us from going to the cafeteria or even use the washroom and no more tying down the loads inside out of the smog , along comes sinar mars and now you had to sit outside in the smog to put the loads on or tie them down outside .. I was in boat harbour this past fall cleaning out one of the settling ponds and I asked if they were giving us a course on contaminants they said no none needed , I only worked 2 days and had sores on my face around my eyes and red and sore eyelids .. why ??? ,, they had to replace me because I refused to go back there you think that just pumping it into the sea is good . I did not touch the sludge I hauled to northern pulp as I call it THE BLOB ... Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 61 y: 10

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:15:54 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

In solidarity. JB

Signed by:
@rogers.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 7, 2019 1:18:18 PM
Attachments: image001.png
EA Letter.pdf
NNS Intake Pipe.pdf
Importance: High

Dear Minister:

Re: ***Northern Pulp's Replacement Effluent Treatment Facility Project***

I am writing to you as a concerned citizen, a lobster fisherman and business owner. As an owner of North Nova Seafoods Ltd (NNS) a seafood processing plant located in Caribou I am concerned on a number of levels – for the community, the plant workers jobs, the fishermen and the direct effects on the plant operating processes.

This plant operates year-round processing a variety of species including Lobster, Snow Crab, Rock Crab, Jonah Crab, Shrimp, and Herring. Throughout the year the plant employs over 150 people here in Pictou County with direct wages paid out each year over three million dollars.

As part of the process here in the plant there is an intake pipe out in the harbour that takes water into the plant used during the cleaning process. The plant has many wells on site that are also used during the processing, but this is not enough water to support the plant. The intake pipe is necessary for the plant to operate. The water is tested regularly to ensure that it is cleared to use. This is a very sensitive issue as the plant is making a ready to eat product and there are obviously strict CFIA guidelines that are followed here. This intake pipe will be a mere few kilometers away from where the proposed effluent pipe is going. With a proposal to discharge 70-90 million litres of treated effluent from a bleached kraft mill every day this will obviously shut the plant down from using the intake pipe anymore for the necessary water to operate. I have included some pictures to give you an idea of exactly what we are looking at with the pipes.

On top of the jobs that the plant provides it also supports hundreds of fishermen with T4's issued to them in the 10's of millions of dollars each year. NNS

operates its own private wharf right here in Caribou in front of the processing plant. This wharf supports over 60 local fishermen. NNS then puts trucks on the roads all year long going to about 10 wharfs directly here in the Straight then over another 50 throughout NS from Cape Breton to Yarmouth and into PEI and NB. NNS and myself as a lobster fisherman is very concerned about the harm to fish and fish habitat that could result from Northern Pulp's proposal to discharge 70-90 million litres of treated effluent from a bleached kraft mill every day through a 10.5k pipe into the prime fishing grounds of the Northumberland Strait.

Thousands of families from all three provinces, including First Nation communities in those provinces, make their living from these fisheries. Many fishermen come from families which have fished for generations. They have made changes to help keep our waters clean, so that their children and grandchildren can fish also. Owner-operator fishermen are an important part of our regional economies. Fishermen generate many jobs in our communities. They buy their supplies locally, and they spend their profits locally.

I am also concerned about the continued health of the Northumberland Strait, which attracts thousands of tourists, visitors and summer residents who fish, dive, swim and boat in its beautiful waters. The Northumberland Strait is a key part of life and the economy of Pictou County and draws people to our area.

I am further concerned about the health of people living close to Northern Pulp. For decades air emissions from the mill have been a problem affecting residents' health and local businesses. Northern Pulp has frequently failed stack emission tests. The new treatment proposal would add additional air emissions to an already bad situation.

I believe this project requires a more rigorous review than it will receive from the province of Nova Scotia, which has decided to require only a Class 1, 50-day review, including only 30 days for public comment.

The government's past handling of effluent from this mill has resulted in one of the most contaminated sites in Canada, Boat Harbour. I want to see a strong, science based review of this project which will protect the present and future health of our Strait and the economy which depends on healthy waters.

Sincerely,

Controller

@nnseafoods.ca

Dear Minister:

Re: ***Northern Pulp's Replacement Effluent Treatment Facility Project***

I am writing to you as a concerned citizen, a lobster fisherman and business owner. As an owner of North Nova Seafoods Ltd (NNS) a seafood processing plant located in Caribou I am concerned on a number of levels – for the community, the plant workers jobs, the fishermen and the direct effects on the plant operating processes.

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As part of the process here in the plant there is an intake pipe out in the harbour that takes water into the plant used during the cleaning process. The plant has many wells on site that are also used during the processing, but this is not enough water to support the plant. The intake pipe is necessary for the plant to operate. The water is tested regularly to ensure that it is cleared to use. This is a very sensitive issue as the plant is making a ready to eat product and there are obviously strict CFIA guidelines that are followed here. This intake pipe will be a mere few kilometers away from where the proposed effluent pipe is going. With a proposal to discharge 70-90 million litres of treated effluent from a bleached kraft mill every day this will obviously shut the plant down from using the intake pipe anymore for the necessary water to operate. I have included some pictures to give you an idea of exactly what we are looking at with the pipes.

On top of the jobs that the plant provides it also supports hundreds of fishermen with T4's issued to them in the 10's of millions of dollars each year. NNS operates its own private wharf right here in Caribou in front of the processing plant. This wharf supports over 60 local fishermen. NNS then puts trucks on the roads all year long going to about 10 wharfs directly here in the Straight then over another 50 throughout NS from Cape Breton to Yarmouth and into PEI and NB. NNS and myself as a lobster fisherman is very concerned about the harm to fish and fish habitat that could result from Northern Pulp's proposal to discharge 70-90 million

litres of treated effluent from a bleached kraft mill every day through a 10.5k pipe into the prime fishing grounds of the Northumberland Strait.

Thousands of families from all three provinces, including First Nation communities in those provinces, make their living from these fisheries. Many fishermen come from families which have fished for generations. They have made changes to help keep our waters clean, so that their children and grandchildren can fish also. Owner-operator fishermen are an important part of our regional economies. Fishermen generate many jobs in our communities. They buy their supplies locally, and they spend their profits locally.

I am also concerned about the continued health of the Northumberland Strait, which attracts thousands of tourists, visitors and summer residents who fish, dive, swim and boat in its beautiful waters. The Northumberland Strait is a key part of life and the economy of Pictou County and draws people to our area.

I am further concerned about the health of people living close to Northern Pulp. For decades air emissions from the mill have been a problem affecting residents' health and local businesses. Northern Pulp has frequently failed stack emission tests. The new treatment proposal would add additional air emissions to an already bad situation.

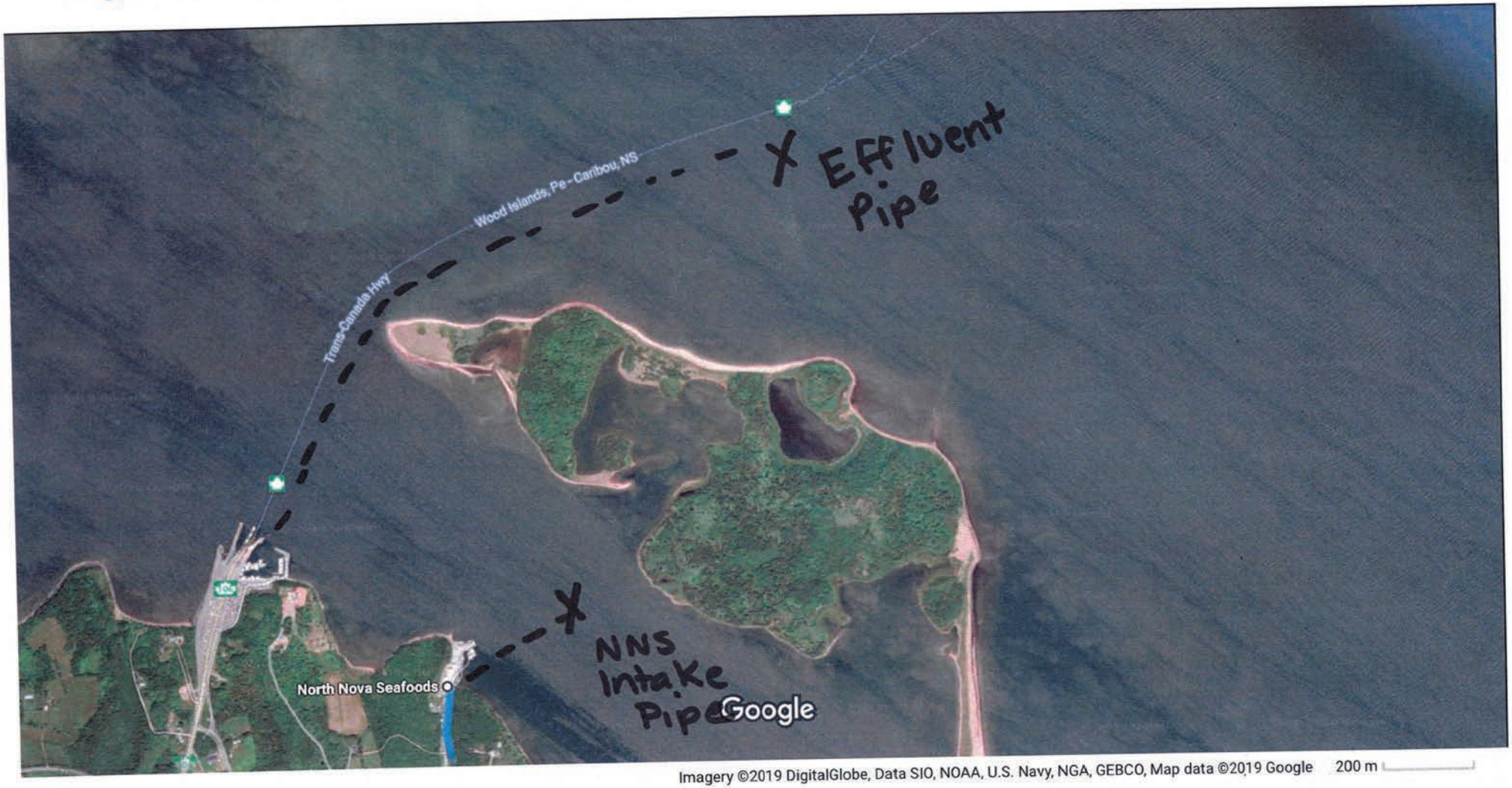
I believe this project requires a more rigorous review than it will receive from the province of Nova Scotia, which has decided to require only a Class 1, 50-day review, including only 30 days for public comment.

The government's past handling of effluent from this mill has resulted in one of the most contaminated sites in Canada, Boat Harbour. I want to see a strong, science based review of this project which will protect the present and future health of our Strait and the economy which depends on healthy waters.

Sincerely,

Google Maps North Nova Seafoods to Caribou, Nova Scotia

Drive 2.0 km, 4 min



Imagery ©2019 DigitalGlobe, Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Map data ©2019 Google 200 m

From: @petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:20:25 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@outlook.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:33:48 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:37:08 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:40:13 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 1:57:13 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 2:16:52 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

This community and the surrounding area need these jobs.
The environment is a very important issue however a short extension for the Mill would be a small price to pay in relation to how long it has already been operating.

Signed by:
@unifor2289.ca)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 2:19:56 PM

Project: replacement_effluent_treatment_facility_project Comments: I disregard with the discharge of Effluent treat or otherwise into the Northumberland Strait . Enviromental damage is irreversible and cannot be justified via political or economic arguements . Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 50 y: 20

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 2:23:12 PM

Project: replacement_effluent_treatment_facility_project Comments: Honourable Margaret Miller, Nova Scotia Environment PO Box 442 Halifax, NS B3J 2P8 Phone: 902-424-3736 Fax: 902 424-1599 Email: minister.environment@novascotia.ca Dear Minister Miller, All the light of reasoning in the shafts of empirical evidence and logic as to why Northern Pulps Environmental Assessment fails is in thorough and accurate report, which appeared in the Halifax Examiner this week. Google: Northern Pulpâ?Ts environmental documents: missing mercury, a pulp mill that never was, and oodles of contradictions Im sure youve read this excellent investigation of Northern Pulps effort to convince the province, via your department, of their due diligence. Sorry to say, its doo-doo diligence and smelt it and scooped it up. Its in the trash of corporate obfuscation which I trust you will empty. I will add my passion heat regarding the ownership of Northern Pulp and why we should not allow this company to grow its unethical roots in the land of the Acadian forest, as it unmercifully uproots its contents, so vital to our and other species health and wellbeing, without regard to the ecological nightmare its creating, as it has done in Indonesia in the Borneo Rainforest. Regarding the mills relevance, the labour union rep. at the mill spoke during CBCs Information Morning broadcast from Pictou a month ago about the owners deep pockets. These deep pockets are filled with the blood from his destructive clear-cutting onslaught in the Borneo Rainforest, which obliterated the Penan people, destroyed the orangutans and hundreds of thousands of other floral and faunal habitat to enhance our own billionaires thirst for profit as they fill their processed junk foods with the blood money palm oil that replaced earths lungs thousands of potential cures for dis-ease--including cancer-- that lie in the richest of biological wonders--the rainforest ecosystem and the survival of our closest along with chimpanzees relative species --the orange ape. The owner of Northern Pulp is not doing Nova Scotia any favours in the long run which is getting shorter every year as more clearcutting takes place. You must be a cog in the wheel of convincing the employees of this company that there is support and life after this plant closes. Like the tide, dozens of enterprises in tourism, heritage, fisheries, farming, ecotourism and vital clean corporations will move their families and their operations into Pictou County when they see its health, beauty and sustainability restored by your department. That is your legacy, Minister Miller. Do you want it or not? Northern Pulpâ?Ts environmental documents: missing mercury, a pulp mill th... Cover photo: Point D, where treated Northern Pulp wastewater currently flows from Boat Harbour into the Northumb... Sincerely, Freelance Writer : to over 100 concerned citizens of Nova Scotia Name: Email: @yahoo.ca Address

Privacy-

Statement: agree x: 73 y: 20

From:
To: Environment Assessment Web Account; info@friendsofthenorthumberlandstrait.ca
Subject: Re:
Date: March 7, 2019 5:09:18 PM
Attachments: .pdf

I apologize for emailing you again but was hoping I could use the attached .PDF as my submission rather than the one I emailed you at 14:23. The only thing that has been altered is the size of the photo on the first page as it was modified when I originally formatted the .PDF.

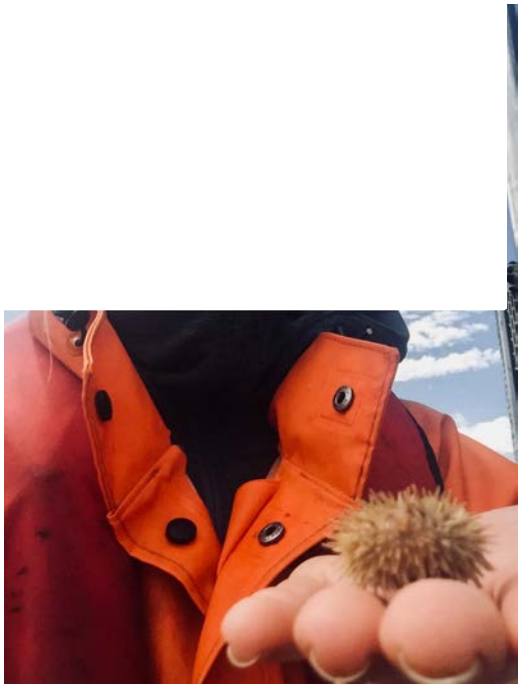
Many thanks,

On Thu, Mar 7, 2019 at 2:23 PM @gmail.com> wrote:

>

Honourable Margaret Miller, Minister of Environment
Environmental Assessment Branch, Nova Scotia Environment
P.O. Box 442 Halifax, Nova Scotia B3J 2P8

Minister Miller,



I am contacting you in relation to Northern Pulp's Replacement Effluent Treatment Facility Project. I am addressing you as someone who makes their living in the fishing area 26A in the Gulf of St. Lawrence. These fishing grounds encompass the area of the southeastern part of Northumberland Strait between Nova Scotia and Prince Edward Island and the western half between Prince Edward Island and Cape Breton. Firstly I would like commend each of the members in my community who are addressing the issue in of Northern Pulp's presence on The Northumberland Strait. I have never publicly expressed my feelings regarding the environmental atrocity that is Northern Pulp but cannot go without taking this opportunity to make this personal appeal to you. My community is often regarded as being divided but many have been brought together by their concern over the treatment of our waters & residents. I could not be prouder to be from Nova Scotia except that our representation is truly failing us by supporting an industry over its own citizens. You have been disregarding the voices of a concerned community. **I urge you to recognize your support of Northern Pulp over the people of this area as the destruction of the cultural heritage of communities along the Northern Shores of Nova Scotia & take commendable action in requiring an environmental assessment report (EAR) to be conducted Canadian Environmental Assessment Agency (CEAA).** Together with the supported of obedient Provincial Governments the pulp mill operation in our community have a continuous track record of negating our community and neglecting our environment. Nova Scotia's culture was formed by our & continues to develop from the interactions within environment of our scenic coastlines. **I demand you address the environmental effect of Northern Pulp's operation on the culture of Northern Nova Scotia by stepping away from the situation & ordering an EAR of the proposed area from the CEAA before any actions can taken in relation to the proposed pipeline.**

I can attest that the culture contained & surrounding the area of the proposed pipeline is boundless compared to the value of the pulp produced at Northern Pulp in Abercrombie, Nova Scotia. I was raised in a 'fishing family' in Pictou County, Nova Scotia; graduating from in Alma from Northumberland Regional High School where I received my first formal education on the injustices related to the area's pulp mill through a law class. At the time my peers & I would get inundated with the presence of sulfur and other pollutants in the air as we learned. I continued my studies at Dalhousie University's School of Nursing learning the significance of social and cultural determinants of health. After attending a lecture on environmental racism I discussed the concept with my Father; while he had never heard the terminology before that he was very much aware of its effects on the coastline. When I developed the Northumberland Strait was the therapeutic entity that sought me through. I could be dead but I'm a fisherman. The Strait taught me how to transition through life; it gifts me with joy, gratitude & some pride in myself. My Father forced me onto the water each morning & into having a purpose. I will never find the words to describe how pushing off of our wharf, spending the day the day on my water & returning home with bounty healed me. I've been vegetarian for fifteen years & I've never eaten a lobster. As a child I watched my Grandfather & Father struggle with daily catches that were in the double digits poundwise. Today we benefit from the environmental effects of a warming planet; there is no better feeling knowing you're top boat & I love seeing my Brother & Grandfather floating as we sail in with catches that are ten times what they were in the early 2000s. I know programs in the area are benefiting us too but we as a society must address the environmental conundrum that is the Northumberland Strait. A decade has passed since I first brought up the environmental racism with my Father yet there is significant distress in the area regarding the multitude of issues caused by Northern Pulp's continued operation. My father has remained a positive example for me by continuously expressing his belief that the conversation regarding these issues must be solution-focused. My sister's partner is a engineer technician at Northern Pulp and my partner works the forestry which is heavily dependent on the funding provided by the pulp and paper industry. As a family I feel like we have done very well by maintaining respectful discussion regarding the operation of Northern Pulp. However I am deeply distressed by the Provincial Government's delinquency in caring for our waters & am now asking you to consider the direct environmental effects on the culture of this area as your personal decision. **I urge you to hand off the responsibilities of an EAR to the CEAA before the situation worsens.**

I make my living on the Northumberland Strait in more than one way. I am a deckhand, working alongside my Brother, Father & paternal Grandfather out of Skinner's Cove in River John, Nova Scotia. Since 2017 I have supplemented my income by working in the tourism industry as a server at The Pictou Lodge; an institution built in 1926 that accommodates those visiting the area. Here I meet people from all over the world who are travel to our beautiful shoreline because of the nature of The Northumberland Strait. Hearkening first hand accounts of what Come-From-Aways cull on our shores frames the global perspective on Nova Scotia as a whole. These conversations have defined how fortunate I feel to live & work here; I have a great love for the sea. I assure you that our culture and waters are worth more than pulp. If Northern Pulp

continues to operate alongside a submissive provincial government I know the tourism industry this area has worked to build up will collapse with the environment; No one wants to vacation in a cesspool. **The culture here is informed by the environment which will be affected if you permit Northern Pulp to operate without and EAR conducted by the CEAA.**

My partner & I have both grown up in homes that our Great-Great-Grandfathers had lived in. We have both acquired knowledge informed by a multi-generational relationship with this environment. His family has been farming the shoreline of Caribou Harbour since arriving here from Scotland in the early 1800s. This area is the proposed site of Northern Pulp's pipeline. **I encourage you to think of it as ground zero & your legacy by acknowledging the significant cultural value of the Northumberland Strait in handing off responsibility of an EAR to the CEAA.** The culture of this area is indubitably conjoined with commercial fishing which both of our families sustained themselves from. In 1939 my Grandfather was born in a farmhouse very near Skinner's Cove & has been sailing 'The Strait' since childhood. The first vessel he operated was one he had fashioned by welding two car hoods together. He continues to fish has witnessed the coastal transformation of this area over his lifetime. Fishing beside my Brother, Father and Grandfather gladdens my heart in ways that I cannot express in words. I fear that I am at the end a line and will be unable to pass on my knowledge and skill set to a future generation because my government doesn't value the very environment it exist within. My Grandfather's experience is quintessential to who I am as a person; part of this experience is how this environment has been altered by the undeniable results of a changing, polluted environment. He recalls bluffs that have eroded, forests that no longer exist & much, much colder waters. I know our commercial fishing operation will be unsustainable if the mill pollutes our beautiful Strait. I am disgusted by the multitudes of wrongdoings by industry & governments alike since the mill began its operation in Abercrombie. **There must be an objective, independent EAR completed by the CEAA of the Northumberland Strait to address the environmental effects of Northern Pulp's operation on the scenic coastline to identifying how these effects will impact the socio-economic conditions on our culture which has significant historic and future value.**

Those of us who live, work & play on The Northumberland Strait can palpate the environmental effects of the unsustainable pulp & paper industry. There is no wonder why. For a short period during the 1970s my Grandfather supported his family by working at Canso Chemicals, the company who made “the caustic” required for the pulp mill. During this time my Grandfather had a continuous cough, skin rash & eye irritation. At that time he sought the opinion of his family physician Dr. Skinner regarding his ailments who told my Grandfather he was insane for working there. My grandfather has always reported to me that he felt helpless and silenced as Canso Chemicals released straight, untreated waste into Pictou Harbour during early morning hours. He left his employment at Canso Chemicals knowing that they waited until children were sleeping in their beds to illegally dump toxic effluent. If you think you know what dangers are present in under Our waters you have no sense of the situation whatsoever. **An EAR of the Northumberland Strait must be conducted by the CEAA to determine the environmental effects of pulp production in Abercrombie before any decisions regarding future production in the area. In vivo veritas.**

By conforming to Northern Pulps demands I ensure you that you will be forever regarded as the executioner of a culture. I know this community & you are unprepared for dealing with the consequences of not handing an EAR to the CEAA. **Take action by washing your hands clean of any decision-making by electing the CEAA to do an EAR at the proposed site.** I assure you that otherwise the Provincial Government will overloaded: there will be an impassable, occupied causeway. I believe a reasonable answer to having effluent dumped in my workspace is having it tanked & dumped where those responsible for that work. If you expect this community to live & work in effluent I would expect the same from you. **Order an independent EAR conducted by the CEAA or you will be unleashing an inferno of anguish on this community & our culture beyond anything you could possibly conceive of.**

With some hope,

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 2:33:13 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe that Northern Pulp should be permitted to put an â?oon siteâ? effluent treatment plant, and that the effluent should be discharged into the Northumberland Strait via a pipeline / diffuser system. The mill and the fishermen have co-existed for over 50 years, with the mill effluent going into the Northumberland Strait via Boat Harbour. I had an opportunity to visit the Boat Harbour treatment facility about 2000-2001, when it was being managed by . I saw a treatment facility that was well run, meeting all the government guide lines of the day. If the effluent treated on site at the mill, exceeds government guidelines, then it should be allowed to go out in to the strait. No one in the fishing community seems to be in dire straits. They all seem to be driving newer vehicles, and living in nice homes. If you ask a fisherman how the fishing is, they all have the same responseâ?"â?onot as good or better than last yearâ? as if the average person knew how well they did last year. If the mill is forced to close because they cannot discharge effluent into the Northumberland Strait, not only the employees at the mill, and all those who supply product to the mill will be affected. I believe the housing market will take a substantial hit, and with that the tax base will be eroded in many areas of Nova Scotia, particularly in Pictou County. This may also lead to a reduction in income earned by many, resulting in lower taxes for the province, which will lead to reduced services in health care, schools and roads, to mention a few. I do not believe tourism will be greatly affected by discharging effluent into the Northumberland Strait. We have a very short tourist season in all of Nova Scotia, and I believe the income generated by tourist is far exceeded by the income generated by the mill. I feel very confident saying 100 of the people who are against the discharge of effluent into the Northumberland Strait are the same people who wipe themselves, in the morning, with a product that has its start in a mill similar to Northern Pulp, so, if they are adamant about changing their lifestyle then they should think about going back to what I used as a child when using the facilities â?" a page out of an Eatonâ?Ts catalogue. Name: Email: @live.ca Address:

:

Privacy-Statement: agree x: 59 y: 19

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 2:38:05 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

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In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

I trust all the professional ocean and fishery scientist professionals that work on all of our behalves everyday in Nova Scotia, will do their very best work in resolving any concerning question anyone may have.

Signed by:

@hotmail.com)

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 2:41:35 PM

Project: - Choose - Comments: Just a few questions 1 Was it ever considered to change over from the kraft process to a different process that may be less environmentally damaging? If so how quickly could it have been done and at what cost? 2 Is it possible to dig three parallel sets of 10 holding tanks 30 tanks in all. Each holding tank would be 500 metres wide by 150 metres long by 4 metres deep and contain the daily outflow of effluent. Then the effluent in tank one possibly could be cleaned and sent to tank 2 and so on . By the time it had gone through tank ten or holding area 10 the effluent through filtration, reverse osmosis, aeration,chemical treatment, bacterial treatment and other cleansing processes would it not be fairly clean water and if so then allowed into Northumberland Strait. Perhaps fewer than 10 holding tanks, perhaps 8,would be required. The other two parallel sets of holding areas would be put into use when the first set needs to be cleaned and refurbished. Question 3 Could the waste product garnered after cleaning the holding tanks be safely disposed of? We need to safeguard our environment in a creative way so that SUSTAINABLE fishing, farming and forestry practices can be carried on. Name: Email: @ns.sympatico.ca

Privacy-Statement: agree x: 58 y: 27

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 2:50:42 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

We must not forget our women ...you came from a mother who is a woman .so please let s not betray them..LOVE

Signed by:

@rogers.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 3:16:53 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@rogers.com)

From: @hotmail.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 3:25:17 PM

Project: replacement_effluent_treatment_facility_project Comments: Please make sure an in-depth assessment in done before this project can go forward, preferably pushing it to a federal level assessment. Ideally, the pipeline will not be able to be installed at all, as Northern Pulp has been harming our community for over fifty years, and to put toxic effluent in the strait would be absolutely detrimental to fisheries, tourism, and the health of many people in Pictou County, NS, and on either side of the Northumberland Strait. People over profit. Environment over industry. We can create clean jobs, it just takes government initiative. We the people have no choice but to put our faith in the provincial government, and you, Margaret Miller. Please dont let us down by polluting our province and choosing the pulp mill over Nova Scotias citizens as we have seen for so long. Thank you. #nopipe #savethestrait Name:
Email: @hotmail.ca Address: Municipality:
: Privacy-Statement: agree x: 64 y: 26

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 3:28:12 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

I am originally from Pictou N. S. now living in the town of Hinton Ab. Which also has sawmill as well as a pulp mill. I see every day how pulp mill and communities can coexist and high environmental standards up held. Their is a balance to this problem that must be found for all involved please let work together and find a solution as we have in Hinton thanks

Signed by:
@hotmail.com)

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 3:33:20 PM

Project: replacement_effluent_treatment_facility_project Comments: March 7, 2019 Honorable Minister Miller, The legislation the current Liberal government introduced last year, Bill C-69, which has passed the House of Commons and is currently with the Canadian Senate, contains important new measures to strengthen environmental protection and Indigenous participation. The current new treatment facility proposal and associated environmental assessment submitted by Northern Pulp would have triggered a Federal Assessment under this new Act. The new treatment facility, which includes a pipeline direct to the Northumberland Strait to dispose of their estimated 62 to 90 million liters of â?~treatedâ?T effluent per day, will cause harm to the marine ecosystem. The triggers that would have directed Northern Pulpâ?Ts submitted EA to be designated a federal assessment, are inclusive of health, social, economic, gender-based and long-term impacts on Indigenous peoples, when you consider the potential impacts this toxic effluent will have on the Northumberland Strait and the associated fisheries. This includes the health of the people potentially impacted, directly or indirectly via the consumption of contaminated seafood, air emissions specifically PM 2.5, mental health, deleterious substances, dioxins and furans, methyl mercury, etc. Northern Pulps proposal includes burying the effluent pipe 4.1 kilometers beneath the seabed, which is federal land. As Section 67 of current CEAA 2012 Act, sets the framework for the environmental assessment of projects being carried out on federal land that are not considered designated projects and for which a full environmental impact assessment under the Regulations Designating Physical Activities is not required. As the seabed of the Northumberland Strait and Caribou Harbour are federal crown land it is subject to requirements under section 67 of CEAA. Section 67 states as follows: â?¦..an authority must not carry out a project on federal lands, or exercise any power or perform any duty or function conferred on it under any Act of Parliament other than this Act that could permit a project to be carried out, in whole or in part, on federal lands, unless: a The authority determines that the carrying out of the project is not likely to cause significant adverse environmental effects or b The authority determines that the carrying out of the project is likely to cause significant adverse environmental effects and the Governor in Council decides that those effects are justified in the circumstances under subsection 693.â?T Based on the current CEAA 2012, this project is subject to review by a federal authority in order to determine whether the carrying out of the project will cause significant adverse effects on the surrounding environment, or if any potential significant adverse effects are justifiable. Northern Pulps submitted EA does not include a study on the impact to lobster or herring larvae, or bivalve shellfish including scallops. Also note, requesting a federal assessment are approximately 20 of the Canadian Senate, the government of Prince Edward Island, a working group of 3000 fishermen including Pictou Landing First Nations, all the local MLAâ?Ts, as well as thousands of concerned citizens including many local physicians. You obliviously are aware of the conflict of interest our provincial government has, as the government is both the funder either directly or indirectly, and regulator. Our provincial government remains liable for damages caused by this effluent, including the inevitable damage this new effluent treatment proposal will cause. The damages to Boat Harbour, as well as the impounded western section of the Pictou Harbour, caused by the Pictou Causeway, built to encourage the mill to come here, will amount to many hundreds of millions to remedy. This new proposal and associated damage it may affect on the fisheries, of not just Nova Scotia, but New Brunswick and P.E.I. as well, could potentially amount to billions. If Northern Pulp is so confident in their new treatment

facility, I wonder if they would consider assuming the risk and associated cost to compensate the fishermen of three provinces, in the event the effluent does what fishermen expect it to do? Considering Northern Pulp has not performed any actual lobster or herring larvae studies and have no idea as it pertains to the detrimental impact the effluent will have regarding bio accumulative effects on the numerous bivalve shellfish, finfish, lobster, crab, or any of the associated species larvae. Please designate this for a federal review. Name:
Email: @eastlink.ca Address:

Privacy-Statement:

agree x: 65 y: 22

From:
To: Environment Assessment Web Account
Subject: Federal Assessment Submission
Date: March 7, 2019 4:01:53 PM
Attachments: Fed. Assessment Letter.pdf

This email and any attached files are confidential and intended solely for the intended recipient(s). If you are not the named recipient you should not read, distribute, copy or alter this email. Any views or opinions expressed in this email are those of the author and do not represent those of the company from which this email is being sent from. Warning: Although precautions have been taken to make sure no viruses are present in this email, the company cannot accept responsibility for any loss or damage that arise from the use of this email or attachments.

March 7, 2019

The Hon. Margaret Miller
Minister of Environment

Dear Minister Miller:

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project.

My name is I grew up in the Town of Pictou and now live on the Sunrise Trail along the beautiful Northumberland Strait for almost 34 years.

When the pulp mill first started production I was only 10 or 11 years old and the smell from the mill was almost unbearable. I can remember gagging all the time because the smell was so bad and so strong it took my breath away and it has not improved much over the years. When I was a teenager I used to go swimming at Lowden's Beach which was located directly across from the Lighthouse Beach in Pictou Landing. Lowden's Beach was a beautiful beach at that time but it was not long before the dark scum from Boat Harbour ruined the beach. The mill still has that awful smell and numerous visitors have not stayed or will not stay in Pictou because of the smell. This drives people away from this area and hurts the tourism industry.

Pictou County is an area that has a beautiful shoreline with many beaches that locals and cottagers enjoy during the summer months. I have noticed that the Northumberland shore has changed over the last 34 years. The waves and tides are much higher than they used to be and the winds are changing by getting stronger. I have seen winter sea ice buildup on the shore numerous times over the years where it has moved huge rocks. We should not underestimate the power behind these ice flows that are so strong. The forces of Mother Nature should not be taken lightly because the weather is something we cannot control.

I refer to the Nova Scotia Environment Act because it is important to note this project will cause **adverse effects or significant environment effects.** It will create negative effects on the environment that cannot be remedied. In Northern Pulp's Environmental Assessment Registration Document it states,

> "At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentration) will not be known with certainty until the project is operational. Due to uncertainty regarding effluent composition and approximate concentrations of substances present in the future treated effluent (which will not be verified until the project is operational), the identified candidate COPC's in effluent are considered preliminary at this time." (Consulting, January 2019)

This is unacceptable and clearly not a reality because we now have an unknown variable that we are supposed to believe will have no effect on our environment and the Northumberland Strait's ecosystem. It will not only effect people livelihoods but most importantly the environment. Northern Pulp does not know if the effluent can be remedied and once the process starts it will continue until a time they no longer require a pipe in

the Northumberland Strait. It is hard to fathom that Northern Pulp thinks the residents of Pictou County truly believe the environment will not be harmed. It will be too late to worry about the eco-systems, the fisheries and tourism that will all suffer because of such a poorly executed project. To expect the residents to put their trust and faith in such an unconceivable plan that Northern Pulp is going to run a pipe out into the Northumberland Strait right through the center of a marine ecosystem is beyond comprehension. I cannot even think of any words that would express the negative impact this will cause to the environment and to sacrifice the environment for industry is just morally wrong.

Northern Pulp has also provided the same data specific to the Pictou Harbour project on the Caribou Harbour project. There is no data provided on long term effects from the effluent flowing into Caribou Harbour and Northern Pulp did not hold public consultations for the Caribou Harbour Project. We do not know the impact this project will have on the tourism industry but the fishery is definitely understated by Northern Pulp **assuming** there will be no effect or **highly unlikely** there will be no effects.

I cannot stress enough the importance of local knowledge from the residents who have lived with the pulp mill in their neighborhood for over 50 years. PLFN has been living with this toxic waste in their backyard so they know more than anyone what it has done to the fish and wildlife they have hunted over the years. All you have to do is ask the fishermen who have been fishing on the Northumberland Strait for hundreds of years with fishing gears passed down through the generations. They know these waters and the ecosystems that are vitally important to the marine environment and the fishermen who fish these waters. The fishing industry provides economic growth and sustainability to Pictou County and we cannot overlook the forest industry that has to start sustaining our forests for the future or there will no nothing left to harvest. It only took 1 cow to cripple the beef industry in Canada so we do not want a repeat in the fishing industry. The fishermen pride themselves on the Atlantic Lobster Fishery so I cannot imagine putting a pipe out into the Northumberland Strait for Northern Pulp's effluent would even be considered.

> A statement from the project's Executive Summary as follow:
> "It is **not predicted** that the installation of the pipeline will result in **long term** harm to fish or fish habitat. " (Baxter)

The consultants for Northern Pulp went so far as to find a project similar to the Northern Pulp project. In Joan Baxter's article in the Halifax Examiner she states:

> "The consultants looked for a project that was similar to the NPNS project, which had undergone a human health risk assessment, so they could compare the potential human exposures and risks associated with a marine treated effluent discharge from a kraft pulp mill.
> For this Northern Pulp chose a study done by Toxikos Consultants in 2006 for a highly controversial pulp mill proposed for Bell Bay, Tasmania. It would be impossible to check the veracity of the study because the mill was never built." (Baxter)

Northern Pulp had 5 years to come up with a plan when Boat Harbour closes in January, 2020 but the community only has 30 days to make a response to a document with so many pages to comprehend.

It is very troublesome that Northern Pulp's pipe route is going through the Town of Pictou's watershed. If there is ever a leak that effluent is going directly into the water source for a town. Northern Pulp's latest leak in 2018 was found by residents whose property borders the Boat Harbour system and there has been no information available on the effects or how much of the effluent was leaked before it was found.

The residents of Nova Scotia have been paying for this environmental disaster for over 50 years and the time has now come for it to end. The taxpayers of Nova Scotia have spent hundreds of millions of dollars on this pulp mill and we deserve better than the 50+ years of toxic waste.

Lastly the treatment of the PLFN from previous and present owners of Northern Pulp is truly heartbreaking. How do you right a wrong after years of environmental abuse and the lies the PLFN were told before the mill was even built and continued throughout the course of over 50 years? Boat Harbour is situated in the PLFN backyard and it has been used as a dumping ground for far too long. The Pictou Landing First Nation's countdown clock is ticking because there will be no extension and Boat Harbour is going to close on January 31, 2020.

In conclusion the only acceptable option is to move forward with a Federal Assessment. Trust is such a small word that had many consequences in regards to the pulp mill in Pictou County. Assumptions and predictions do not qualify for a Class 1 Assessment.

Regards,

From: noreply@infogrove.com
To: Environment Assessment Web Account
Cc: @gmail.com
Subject: Support for Northern Pulp Environmental Assessment
Date: March 7, 2019 4:04:30 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 4:16:40 PM

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Thank you.

Signed by:

@hotmail.com)

NB

From: @spda.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 4:24:13 PM

Project: replacement_effluent_treatment_facility_project Comments: This application should be rejected for the following reasons: â?¢ Partially treated effluent is not acceptable for the otherwise pristine waters of the Northumberland Strait. The present effluent from Boat Harbour is already beyond acceptable, and I understand that the suspended solids in the proposed effluent will be even higher than the present Boat Harbour situation. â?¢ Pumping partially treated effluent into the Northumberland Strait has the potential of contaminating the waters of five of Canadaâ?Ts provinces. â?¢ The fisheries at stake in these five provinces are too valuable to be put at risk. Name: Email: @spda.ca Address:

Privacy-Statement: agree x: 62 y: 18

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 4:30:05 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 4:35:15 PM

Project: replacement_effluent_treatment_facility_project Comments: I wish to congratulate Margaret on not agreeing to a proper well informed environment assessment. Also for discouraging the federal CEAA what do they know Best of luck Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 68 y: 25

From: noreply@infogrove.com
To: Environment Assessment Web Account
Subject: Support for Northern Pulp Environmental Assessment
Date: March 7, 2019 4:42:33 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Replacement Effluent Treatment Facility Project
Date: March 7, 2019 4:46:03 PM

March 7, 2019

To Environment Minister Margaret Miller

I would like to voice my *strong opposition to the Northern Pulp's proposed replacement effluent treatment facility project*, which will pump 85 million litres of hot toxic pulp effluent daily through pipeline across sensitive watersheds, directly out into the Northumberland Strait, one of Nova Scotia's most important lobster and fishing/breeding grounds. This area is also important for recreation, and tourism, with beautiful coastlines with gorgeous beaches.

As a cottage owner in Pictou County for over 20 years, I am being asked to trust that the research has been exhaustive, and thorough, and that I have nothing to worry about based on a company with a dismal track record.
Dillon Consultings' 'executive summary' of the Environmental Assessment report developed on behalf of Northern Pulp, indicates that not one single item within the submission would have any significant 'Residual Environmental Effect Predicted'. Not one out of 18 areas affected (including marine habitat, ground water, wildlife, plant life...etc) will have any residual effect; including no effect during construction, no effect during ongoing operation, no effect during ongoing maintenance, no effect during accidents, no affect during malfunctions, no affect during unplanned events! Sounds a bit unbelievable. Take a look, or a smell of Boat Harbour, an environmental **racism** disaster.

What exactly will be coming out of the pipe and dumping into the Northumberland Strait? How can we possibly know, when they don't even know. The Dillon EA report referred to above has the following statement:
'At this time, effluent chemistry characteristics including the specific substances present in the treated effluent and their anticipated concentrations will not be known with certainty until the project is operational'
This statement is not comforting.
What we do know according to "Appendix E", is the 85 million litres a day of treated effluent will be up to 37 degrees C in the summer and 25 degrees C in winter. This is a problem in a lobster and fishing breeding ground. The fresh water, and the warmth of the water effect lobster habitat. What is its affect on fish, shellfish and birds? This area has a large and diverse number of birds that depend on a healthy environment.

The past handling of effluent from this mill has resulted in one of the most contaminated sites in Canada, Boat Harbour. I want to see a strong, science based review of this project which will protect the future health of our Strait and it's inhabitants, both great and small. The economy of Nova Scotia depends on healthy waters and quality seafood.

I am also concerned regarding the bio-solids that are removed as part of the treatment system. According to Guy Martin, the principle consultant with KSH Consulting in Montreal and lead engineer for the design in the construction of the waste water treatment plant for Northern Pulp," the solids that are lost within the production and the bio-solids that are removed as part of the treatment system, those will be pressed and the current plan is to use them as fuel in the mills part boiler."
We need to know that all mercury, will be removed before burning because of how harmful inhalation of mercury vapour is. Mercury vapour can produce harm on the nervous, and immune systems.Damage by mercury to the lungs can prove fatal.

I also believe there is a conflict of interest happening here. The Canadian government has put up millions of dollars into this company. How can this project be looked at objectively? Perhaps the environmental assessment should be handed over to the Canadian Environmental Assessment Agency

Additional information is required before any decisions can be made on Northern Pulp's proposal. Please give Pictou County a chance to thrive with clean air and clean water.

Regards,

From: noreply@infogrove.com
To: Environment Assessment Web Account
Cc: @rogers.com
Subject: Support for Northern Pulp Environmental Assessment
Date: March 7, 2019 4:49:03 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 5:05:01 PM

Project: replacement_effluent_treatment_facility_project Comments: Madam Minister: I write today to express my disgust with your ministry even remotely considering allowing Northern Pulp to proceed with their recently registered proposal to relocate their Effluent dumping site from Boat Harbour to the Pristine waters of the Northumberland Strait. This proposal will pass through Caribou Harbour where my wife and I live in what we believed would be our retirement home which we purchased in .At that time we had no advance warning that we would have to face the threat of having to deal with the negative impact of living on the waters that will be polluted with potentially hazardous chemical and solid waste effluent being disposed of directly into the waters that our condominium fronts on. These are tidal waters and are subject to significant storm surge which brings sediment up from the bottom and will wash ashore onto the land where our condo was built. A total of 31 other condos, the majority of which are owned by seniors will also be impacted as will the beaches of Caribou Monroes Island Provincial Park.The land upon which a total of 32 ground level condos are located is a waterlot Grant meaning that the Condo property extends out into Caribou harbour and must be recognized as Private property. Neither the Government of Nova Scotia nor Northern Pulp have a legal right to cause harm to private property. Like a majority of the condo shareholders in this project, we are seniors who may well be forced to proceed with legal action to protect our homes. The properties here will also likely see diminished value as a result of the aforementioned proposal. PM TRUDEAUS recent remarks saying that the Nova Scotia Government has the lead with respect to this matter suggest our only hope to save our homes lies with you and your government. I appeal to your sense of fairness and justice in making your final decision on the outcome of your deliberations.The people of Pictou County have had to live with this pollution producing company ever since it began operations some 50 years ago. Enough already. As for the job loss factor, your Government showed no such concern when the Trenton works facility was shut down however, that shutdown put more employees out of work than the mill shutdown will impact. The forestry industry can be repurposed to produce valuable products without the associated pollution. I note that the Boat Harbour Remediation project will cost NS taxpayers $217 million, however, it is unlikely that the Northumberland Strait could be similarly remedied. If the Northumberland Proposal is approved, it will totally negate the Northumberland Costal Restoration project which I believe is also Government funded. Waste, waste and more waste ought to be the Liberal campaign slogan in the upcoming provincial election which your government has little to no hope of winning should it approve the Northern Pulp proposal.It appears your government has more interest in protecting the interests of foreign investors than it does the citizens who vote you into power. Any counter argument respecting job losses can be offset by job creation that would arise from repurposing the Nova Scotia Forestry industry, or redirect the provinces pulp wood supply to the Port Hawkesbury mill which is currently experiencing shortages of raw materials. Madam Minister If I inadvertently drop a kleenex onto the streets of any community I would most likely be charged and convicted of littering. Yet your government is considering allowing a profit motivated Foeign Company to pollute the waters of the Northumberland Strait with what could be the equivalent of quadrillion of kleenex and chemical waste into the waters along its coastlines in both PEI AND Nova Scotia. The results of the CEAA assessment of the Boat Harbour remedial project will demonstrate clearly the potential environmental disaster Northern Pulps proposal and your failure to protct our environment could cause. It is my belief

that you ought to wait upon the findings of CEAAs assessment at Boat Harbour prior to granting Northern Pulp Authorization to proceed with their outrageous proposal. You have the power to prevent this disaster. Exercise that power. Respectfully submitted,
Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 78 y: 33

From:	noreply@petition.web.net
To:	Environment Assessment Web Account
Subject:	In support of Northern Pulp"s EA application
Date:	March 7, 2019 5:11:02 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@outlook.com)

ON

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:26:26 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Date: March 7, 2019 5:39:34 PM

In regards to northern pulps plan to pipe effluent into the Northumberland strait, I think this plan should be stopped, this day and age we should be moving to more green environment friendly ways to conduct business, we should not leave a environment disaster for our children, the risk to our water our fisheries and our air we breathe is to important to risk with this plan. The ice in the Northumberland strait would destroy this pipe, and monitoring of what comes out of pipe would have to be done daily and if test results are bad ,then it's to late the damage is done our ecosystem will already be destroyed much like boat harbour. Also the plan to burn soilds in there boilers is akin to environmental terrorism that the people of this area should not have to endure, also the way this plan was put in place was very divisive for pictou county, pitting family against family, neighbors versus neighbors, its time this government came up with plan to help the people of pictou county and this pipeline into our ocean playground is not the answer. Please help stop the environmental terrorism that the people of pictou county have to endure. This plan should undergo the highest level of scrutiny possible to help alleviate the concern that so many people have that have endured this crisis for over 50years, please help pictou county stand up to this foreign owned company that has been treating its neighbors with disdain. Whether it costs a billion dollars or more the only answer is build a closed loop system that will not pollute our waterways with a toxic waste water pipeline into our oceans. Thank you,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:41:07 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

I ask that you sit down and discuss this issue, and allow the vouce of workers' unions to influence your decision. Uni-for is a contientious and rank and file union. They deserve a seat at the table to deliberate these important sustainability issues.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:41:46 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@infogrove.com
To: Environment Assessment Web Account
Subject: Support for Northern Pulp Environmental Assessment
Date: March 7, 2019 5:44:50 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:46:13 PM

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Thank you.

Signed by:

@eastlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:49:42 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: @eande.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 5:52:02 PM

Project: replacement_effluent_treatment_facility_project Comments: All toxic effluent must be treated and neutralized before it is discharged into either Boat Harbour or further out in the Northumberland Strait. The sea around us is not a garbage dump. It must be a healthy environment in which untold living species can continue to survive and not be poisoned by industrial production waste. Name: Email: @eande.ca Address:

Privacy-Statement: agree x: 45 y: 25

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 5:54:19 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Our forest industry is vital for positive growth in Nova Scotia and to achieve this we need to have a positive path forward and without Northern Pulp continuing to operate I don’t think it would be achievable. I am in full support of Northern Pulp to keep operating with a new Effluent Treatment system. Thank you

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:16:02 PM

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Thank you.

@live.com

Signed by:

@live.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:22:01 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:22:44 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@msn.com)

NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:23:17 PM

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Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:34:41 PM

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Thank you.

Signed by:

@eastlink.ca)

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 6:43:01 PM

Project: replacement_effluent_treatment_facility_project Comments: I dont know how you can even begin to consider this project. Out biggest, most natural beauty is not a dumping ground for effluent. do you want to eat food that comes from the strait once you start this process? I dont care how careful you are, accidents happen. this facility could ruin the livelihood of thousands of tax paying people at the very least. The damage to sea creatures is unimaginable when I think about leakage into the strait. there has got to be a better way. Name: Email: @ns.sympatico.ca Address: Municipality: : Privacy-Statement: agree x: 44 y: 22

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 6:46:37 PM

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Thank you.

@me.com

Signed by:
@me.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 7:04:36 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@execulink.com)

ON

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 7:14:31 PM

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Thank you.

Signed by:
@gmail.com)
NS

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: Soutien à l"évaluation environmentale de Northern Pulp
Date: March 7, 2019 7:19:44 PM

Je vous écris pour appuyer la demande d'évaluation environnementale présentée par Northern Pulp pour sa nouvelle installation de traitement.

On a beaucoup parlé de Northern Pulp et de ses répercussions sur la collectivité locale. Je suis d'accord avec beaucoup de gens, y compris Unifor, pour dire que Boat Harbour doit être fermé et nettoyé pour respecter les Premières Nations de Pictou Landing et leurs terres. Je sais aussi qu'il y a beaucoup d'avantages à avoir 300 emplois bien rémunérés à Pictou et à soutenir des milliers d'autres en Nouvelle-Écosse, particulièrement dans les collectivités rurales.

La Loi sur l'environnement de la Nouvelle-Écosse est reconnue comme une loi essentielle conçue pour protéger notre environnement commun et guider notre développement économique. La Loi énonce à juste titre son objet au moyen d'un ensemble de principes de développement durable qui devraient guider son application, notamment :

------> Le lien entre les questions économiques et environnementales, en reconnaissant que la prospérité économique à long terme dépend d'une saine gestion environnementale et qu'une protection efficace de l'environnement dépend d'une économie forte.

Dans cette situation, la science devrait déterminer la meilleure voie à suivre. La Nouvelle-Écosse, tout comme le reste du Canada, possède l'une des normes mondiales les plus élevées en matière de gérance environnementale dans le secteur forestier.

Le travail du gouvernement et de chaque personne que nous élisons pour nous représenter au gouvernement consiste à trouver la meilleure voie à suivre lorsqu'il y a de nombreux intérêts concurrents et parfois opposés. Les collectivités d'un bout à l'autre du Canada parviennent à trouver un juste équilibre où de bons emplois dans les usines coexistent avec une industrie de la pêche et des collectivités prospères.

Nous pouvons et nous devons trouver cet équilibre pour Pictou. Il y a beaucoup en jeu. Des emplois. L’environnement et le respect des Premières Nations. Nous pouvons et nous devons trouver une solution qui soutient les trois.

Merci.

Signé par :

@unifor.org)

QC

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 7:22:39 PM

Project: replacement_effluent_treatment_facility_project Comments: I believe that the following comments stated in para 3 of section 9.1 of the companys registration documentsum up the reasons why this project should not be given approval: At this time, effluent chemistry characteristics including the specific substances present in treated effluent and their anticipated concentrations will not be known with certainty until the project is operational. How can a project of this magnitude be allowed to proceed when the company does not even know what items will be contained in its effluent? The proposed area where the effluent will be discharged is very sensitive. It is an important fishing and recreational area. If something detrimental were to result from the emissions, it would devastate the areas environment, along with its fishery and tourism economy. This project is far too important to be looked at under this quickie assessment. I believe it should be rejected out-right, or at the very least a more in-depth environmental assessment report be conducted. When I was a student in an environmental science course, I wrote a paper about the devastating effects caused by the Sydney Steel Plant dumping toxins into the infamous Sydney Tar Ponds. I implore you to do everything in your power to prevent a future student from writing the same type of report about Northern Pulps emissions into the Canso Strait. Thank you. Name:
Email: @gmail.com Address:

: Privacy-

Statement: agree x: 58 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 8:00:47 PM

Project: replacement_effluent_treatment_facility_project Comments: I recently submitted comments expressing my opposition to this project. In those comments I mistakenly identified Canso Strait as the area in which the proposed pipeline is to be located. Of course the identified area is in fact the Northumberland Strait. I sincerely regret and apologize for this error. Thank you! Name:

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 7:40:33 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

@gmail.com)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 7:46:58 PM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia Environment, I am writing to express my disapproval of the Replacement Effluent Treatment Facility Project proposed by Northern Pulp, a foreign owned company globally recognized for their environmental exploitation. Because of the mills history and that of its owners, I urge this agency to be skeptical of assertions made in the proposal. Northern Pulp has made public their desire to continue operating the mill only where it is economical. The potential environmental exposure to the harmful contaminants of the effluent, the impact on a commercial fishery that contributes multiples more in jobs and dollars to the province than the pulp mill, and ultimately the impact on the health of the population in the region are all areas which cannot be appropriately addressed scientifically on an only if it is economical basis. These are real concerns effecting tens of thousands of people where the science indicating no harm will be done has to be beyond questioning as there is no way to reverse the environmental impact of this project after it has commenced. With 5 years advance notice to close Boat Harbour, Northern Pulp was given a significant lead time to satisfy the concerns of stakeholders in this project. Yet they chose not to perform conclusive and evidence based scientific research, such as exposing those species in the Northumberland Strait of concern to fisherman to effluent in a fish toxicity test or assessing the impact of cumulative exposure to diluted concentrations. The reason they have not performed these inexpensive and transparent tests is because the science does not support them. This is also the fish toxicity test they so frequently cite as an acknowledgement of their environmental responsibility. The reality is that the regulations to which they are subjected have not developed at a rate comparable to the level of environmental awareness of the citizens of Nova Scotia. An effluent test allowing 49 of fish subject to the effluent to die is in no way an environmental regulation, but an industry negotiated threshold acknowledging that they cannot operate profitably by treating the effluent to a better concentration. This agency is tasked with protecting the environment and I expect it to do so by denying this proposal. Finally, I believe the provincial government has failed to acknowledge that the Northumberland Strait is regulated under the Fisheries Act and is therefore federal jurisdiction. I believe anything short of a federal environmental assessment on this project, as was done on past proposals submitted by the mill, would be insufficient and could only be attributed to the common belief that there is no way this project would pass a federal environmental assessment. I kindly request that this project be recommended for a federal assessment. Thank you for hearing my concerns. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 56 y: 21

From: @live.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 8:07:13 PM

Project: replacement_effluent_treatment_facility_project Comments: My concerns are the unaccountable loss of several tons of mercury in the 1970â?Ts near PLFN. There was an estimated loss of 10-15 tons over a 10-year period Montreal Gazette archives. The peak was 5 tons of mercury in 1975 Canada Press 1977. In my opinion, we are tempting fate with this amount of Methyl Mercury in the ground. JIF Consulting has found 3 areas of mercury in the groundwater surrounding Pictou Landing. Methyl Mercury bio-accumulates in seafood. Humans who consume seafood that contains Methyl Mercury can develop Minamata disease. This is a devastating disease that was first encountered in Minamata Bay in Japan where humans developed this disorder after consumption of toxic seafood. There is no treatment for this disease. Pregnant mothers transfer this Methyl Mercury to the placenta and in turn to the developing fetus causing severe brain damage. In Canada, we have had Minamata disease diagnosed in Ontario, at the Grassy Narrows and White Dog First Nations communities. This developed after Dryden Pulp and Paper spilled 10 tons of mercury into their river. Pumping toxic effluent directly into the Northumberland Strait is not an acceptable alternative for all the above reasons. The effluent will not be toxin free no matter how it is treated and will bio-accumulate in bi-valves mussels, scallops, oysters and lobsters. Seafood will be contaminated. The archaic expression dilution is the solution to pollution is no longer acceptable. Humans are at risk! We have the most pristine cold waters. In 2017 the value of our seafood exports was $2.0 billion. Infrastructure at Halifax Stanfield Airport has begun to increase with holding areas for lobster and with 3-5 air cargo shipments to China per week, as well as lights to Seoul, Korea. Why would we want to put this at risk? In 2013 the WHO declared PM 2.5 carcinogenic to humans. Once in the air it can stay in the air for days to weeks and it can travel hundreds to thousands of miles. The new precipitator installed on the recovery boiler addresses a percentage of the PM2.5. The main boiler has no precipitator, but has scrubbers. These mechanisms require constant maintenance to operate with high efficiency. The results of the operating efficiency should be transparent and made public and tested more frequently. We are concerned about our local lumber industry and how they would be forced to adapt if The Mill ceases to operate. The lumber industry will change in the upcoming year when the new laws will be enacted regarding sustainable forestry practices. It will be a reshaping of the lumber and forestry Industry and these industries will need direction and support from the community and the federal government. It is never Wealth over Health it is always Health over Wealth. This information has been exposed over and over again. Fifty years of environmental racism is shameful and it is time to resolve this issue. Honour the Boat Harbour act. We need a Federal Assessment, not just a Provincial assessment. No more extensions. Peopleâ?Ts Health and High Quality standards of environmental protection should be our goal. We have to live with Industry. We donâ?Tt have to live with industry that pollutes. Northern Pulp doesnâ?Tt know what is in their effluent and there are just too many unknowns to accept the consequences. Name: Email: @live.ca Address:

: Privacy-Statement: agree x: 65 y: 24

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 8:12:09 PM

Project: replacement_effluent_treatment_facility_project Comments: Appendix-J1-1 page 2.18 under Crustacea refers to American Lobster . Caribou area lobster are Cold Water Lobster and are less heat tolerant than the American lobster . Numerous studies clearly refer to the diference . Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 45 y: 14

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 8:15:44 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: @icloud.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 8:27:41 PM

Project: replacement_effluent_treatment_facility_project Comments: I am so concerned that if this project gets the go ahead the Northumberland Straight will be polluted. Presently weâ?Tre trying to educate ourselves, including the school population about environmental hazards so this threat to the beautiful waters bordering Nova Scotia and Prince Edward Island is critical. Please choose to keep our water and shores safe for sea life and humans for generations to come. Name: Email: @icloud.com Address:

Privacy-Statement: agree x: 55 y: 20

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 8:27:54 PM

Project: replacement_effluent_treatment_facility_project Comments: Nova Scotia is shooting itself in the foot economically by pandering to private companies and treating home based business fishing and forests as disposable. Northern Pulp should not be part of our future. We have an opportunity to lead the country in environmental standards and innovations. Start now by banning the pipe. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 57 y: 20

From:
To: Environment Assessment Web Account
Subject: Replacement Effluent Treatment Facility Project
Date: March 7, 2019 8:27:54 PM
Attachments: 2014 Larvae experiment.docx
letter from . UPEI.docx
letter from Dillon.docx

As a citizen in Pictou I am writing to express my concern with the idea of pumping treated effluent into the Northumberland Straight.

For the last 14 years I have been Pictou Lobster Stock Enhancement Research Project run by the Northumberland Fisheries Museum. The hatchery was commissioned in 2004 primarily to attempt to repopulate the lobster stock in LFA 26a located outside Pictou harbour where the stock level had severely dropped. This drop coincided with the years that the pulp mill effluent pipe in Pictou Harbour was leaking effluent.

Following the break in the effluent pipe from the mill in 2014 I conducted an experiment to see the effect on lobster larvae. (see attache file: 2014 Larvae experiment.doc)
As you will see, the conclusion at the end of the experiment was 100% stagnation in growth. This would lead to death on a stage I larvae.

In January 2018 I read comments in favor of the Northern Pulp plan from a As he was shown as an expert, I sent him my experiment data and received the attached file.(letter from). As you will read he had no knowledge with lobster larvae and his final comment is:. **I would encourage pressing the mill for increased testing on this basis. This should be done with graded concentrations of effluent, along with modeling of the effluent plume to truly assess the risk.**

Following this I sent my concern to Northern pulp and Dillon Consultants. In April I received the attached reply (see attached letter from Dillon) where I was lead to believe this would be checked out.
Thank you for submitting your lobster larvae experiment. As a part of the Environmental Assessment process, industry experts have been hired at each stage of
the process, with the understanding that Northern Pulp wants to find a path forward that protects the environment while also allowing for the mill to continue operations.

I have not been able to find where any further studies have been done or that the effect of effluent of lobster larvae has been taken into consideration.
As you can see from my experiment, our pulp mill effluent posses a sufficient risk to lobsters by the high morality of larvae. This need further study and must be taken into account prior to any approval of the project.

Thank you for the opportunity to express my concerns.

LARVAE EXPERIMENT 2014, LSERP

Experiment: Effects of effluent collected from tidal pond on Pictou Landing shoreline following the break in the effluent pipe from Northern Pulp.

Date: Summer 2014

Location: Pictou Lobster Hatchery

Conducted by: , director, and a summer student,

Method: Two conical 25-liter tanks were filled with 21 liters of hatchery sea water from Pictou harbour.

Each tank 1 and 2 were aeriated to maintain oxygen levels.

Water temperature of each tank maintained between 19 and 21 C

250 ml of collected effluent was added to tank 1. It is noted that effluent was collected in shoreline pond following one tide change, concentration was not tested.

20 lobster larvae, 3 to 8 hours old stage I, where added to each tank.

Small amount of live brine shrimp added each day for nutrient.

Observations: Day 1- to 3, all larvae in both tanks swimming and look well.

Day 4- tanks 2 larvae showing signs of molting. Tank 1- no change.

Day 5- tank 2- most larvae at stage II but numbers at 18. Tank 1 uneaten brine shrimp indicated larvae not eating

Day 7- tank 2 numbers down to 15

Day 14- Tank 2 numbers down to 10 mostly at what appeared to be stage III.

Day 21- Tank 2 numbers at 4 stage IV, Tank 1 still had 20 larvae at stage I.

Experiment was stopped after 28 days after no change in either tank.

Conclusions: Diluted effluent did not kill lobster larvae in 4 weeks, however they did not develop but stagnated at the stage I with zero growth which would lead to 100% mortality.

April 3, 2018

@hotmail.com

Northern Pulp Nova Scotia, Effluent Treatment Facility Replacement Project Update

Dear

Thank you for engaging with the Environmental Assessment (EA) study for Northern Pulp's replacement Effluent Treatment Facility. The feedback we receive during the EA study process is important and will continue to guide the environmental planning for the project.

Responses to Your Comment

Lobster Larvae Experiment

Thank you for submitting your lobster larvae experiment. As a part of the Environmental Assessment process, industry experts have been hired at each stage of the process, with the understanding that Northern Pulp wants to find a path forward that protects the environment while also allowing for the mill to continue operations. Expertise has been sought in engineering and environmental sciences.

The findings you have provided have been passed on to the team for their consideration. Please note that the experiment as described was conducted on untreated effluent from a pond that was not tested for concentration of parameters. This is not a direct comparison to the impacts that treated effluent will have on lobster larvae. Under Pulp and Paper Effluent Regulations, effluent must be treated before discharge to ensure fish are not harmed. In the future, the effluent pipe from Northern Pulp will carry treated effluent whereas now the pipeline carries untreated effluent. We do appreciate you sharing your findings, and ask that you share any other information you believe will be relevant to the EA.

Sharing Information

In Spring 2018 we will return to the community with another series of Open House sessions which will provide answers to questions raised during the initial phase of engagement and present the recommended environmental plans and seek feedback. Indigenous community and stakeholder engagement will also be ongoing through the next phase of the project.

If you have further questions or comments, please contact the project team at npns.effluenttreatmentfacility@dillon.ca, 1-877-635-8553 x 5050 and/or visit the

From: @upei.ca>
Sent: January 21, 2018 12:09 AM
To:
Subject: Re: Pictou pulp mill

Thank you for sharing this with me, I find the results very interesting. Little or no research has been done with lobster and pulp mill effluent. We are doing some research with some locally used pesticides and lobster in collaboration with homarus and even with common pesticides, this is the first American lobster data available. They are not the easiest critters to work with.

Please understand that I based my comments on what we know from 30 years of pulp and paper research, assuming the mill would meet the effluent quality standards that are possible with advanced biological treatment, and that the dilution of the effluent in an area with the highest tidal exchange in the strait is likely to be great. I qualified to the reporter that I felt it was valid to have concerns, and if those concerns or great, which they are, most testing and information should be required before going ahead. But one cannot control what parts reporters put in print. I don't find all of the information provided by the mill to be sufficient myself. But on the balance, the possibility of a very limited area of impact is possible or even probably.

The science out there is not perfect, you can't test every organism with every effluent. No two pulp mill effluents are the same. I simply made comments on best available evidence based on pulp mill around the world. There are still a few pulp mill effluents out there that have significant effects, while some do not (see attached paper) however we can limit those effects with proper treatment. That by the way is not just a matter of having a fancy treatment system, it involves recycling all liquors in your pulping process, avoiding spills in the mill that can disturb a treatment system for a month, and operating that treatment system properly. The more complicated the treatment system, the harder it is to operate. This involves an environmental ethic and culture within the mill. Judging by some of the politics going on, that is perhaps not good.

While your experiments would not meet the rigor of scientific peer review, I do believe that they present interesting and valid preliminary evidence. I would encourage pressing the mill for increased testing on this basis. This should be done with graded concentrations of effluent, along with modeling of the effluent plume to truly assess the risk. I would be happy to participate in such with in collaboration with a fisheries organization such as Homarus.

Regards

From:
To: Environment Assessment Web Account
Subject: Northern Pulps Replacement ETF Project
Date: March 7, 2019 8:45:47 PM

Dear Environment Minister Margaret Miller;

We are writing to express our concerns about Northern Pulps Replacement ETF Project as descried in their EA application to the N.S. Department of the Environment. We have lived along the West River in Pictou County approximately 15 kilometers from the pulp mill for forty-seven years and have first hand knowledge of its effects on the surrounding community related to air quality and water pollution. We have stated our primary concerns below.

1. On page 45 Sect.1-7 of the Registration Document, Northern Pulp states that it plans to burn large volumes of sludge from their new wastewater treatment system in the existing power boiler. This power boiler has exceeded emission limit levels in the past according to test results posted on Northern Pulps website and does not have a precipitator as is required by other jurisdictions. It is reasonable to conclude that burning toxic sludge in a boiler with filtration issues could adversely effect air quality. Pictou County already has some of the highest rates of cancers in the country.

2. According to Northern Pulps application, the treated effluent will contain solids (pg.84 table 5.6-1 of the EA document lists the amount as 4 tons daily) which were previously settled out in the Boat Harbour tailing ponds. Northern Pulp hasn't identified in their EA application, which toxic chemicals and heavy metals will be in these solids. How can scientists and regulators study the effects this effluent would have on marine life if they do not know what is in it? Your decision should be based on science but there is no science here.

Any contamination of lobster and fish exported under the Atlantic Canada brand, could destroy the reputation of that industry.

The issues raised by Northern Pulps Replacement ETF Project are very troubling. The missing information regarding the identification of toxins and chemicals in the effluent could result in serious health risks to Pictou County residents from dangerous air emissions. There could also be consequences to marine life from these unidentified solids settling on the ocean floor of the Northumberland Strait.

We are therefore requesting that you require Northern Pulp to provide this information before their application is considered and that you then order an Environmental Assessment Report on this project.

Respectfully;

From:
To: Environment Assessment Web Account
Subject: NORTHERN PULP REPLACEMEMT EFFLUENT TREAMENT PROJECT
Date: March 7, 2019 8:56:02 PM

No extension! No pipe!

I wish to express my concerns with Northern pulp causing further air and water pollution.

Northern pulp say there will be "no significant environmental effect". Referring to the canadian environmental protection act; kraft mill effluent has significant effects on aquatic life. Effluent is toxic. Northern Pulp says that they dont really know what the chemistry of the effluent will be. We have heard this before and seen the contamination from leaks and now in our air. Mercury, furans and dioxins found!
Pumping toxic effluent directly into the Northumberland Strait is not an acceptable alternative. The effluent will not be toxin free no matter how it is treated and will bio-accumulate in bi-valves (mussels, scallops, oysters) and lobsters. Seafood will be contaminated. When the pipe leaks the water shed or our land will be contaminated.
I am also concerned with the idea they have on burning sledge. Please stop this.

Fifty years of environmental racism is shameful and it is time to resolve this issue. Honour the Boat Harbour act. We need a Federal Assessment, not just a Provincial assessment. No more extensions.

People’s Health and High Quality standards of environmental protection should be our goal.

We have to live with Industry. We don’t have to live with industry that pollutes.
Please do not allow this industry to distroy our earth any longer.

From: noreply@infogrove.com
To: Environment Assessment Web Account
Cc: @yahoo.ca
Subject: Support for Northern Pulp Environmental Assessment
Date: March 7, 2019 9:06:54 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

From:
To: Environment Assessment Web Account
Subject: Submission re: Northern Pulp
Date: March 7, 2019 9:26:15 PM
Attachments: CofC submission re Northern Pulp treatment proposal 05March2019.pdf

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Please find my submission attached.

All the best,

organizing on unceded ancestral territory of the Mi'kmaq Nation

The Council of Canadians | Le conseil des canadiens
Atlantic region: 902.422.7811 | 1.877.772.7811

www.canadians.org

The Council of Canadians is a watchdog organization that provides independent analysis and supports grassroots campaigns for social justice. Without government or corporate funding, we rely on individual supporters like you to keep our campaigns and organizing efforts going. Click here to donate.

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8
Submitted via email: ea@novascotia.ca

07 March 2019

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

Dear Minister Miller,

I write to you on behalf of the Council of Canadians, a grassroots social justice organization with more than 100,000 supporters across Canada concerned with protecting our water and environment for future generations. We are working to eliminate the social harm and inequality that climate change perpetuates, and the historical injustices that Indigenous people and people of colour have experienced in the present day.

The Council of Canadians calls on the Nova Scotia government to reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project based on the following:

Concern: Lack of evidence provided by proponent on risk
Northern Pulp's submission does not prove a lack of significant risk, and is missing critical data on many issues. One example of this is mercury, which is recognized by Health Canada to have significant risks to human health. Northern Pulp hardly mentions their site on Abercrombie Point is contaminated with mercury and disrupting this contamination on a site surrounded by water requires extreme caution and a full examination (reference Joan Baxter's article in the Halifax Examiner: *Northern Pulp's Environmental Documents: missing mercury, a pulp mill that never was, and oodles of contradictions*, March 5, 2019).

The company's claims that damage will be minimal, there will be no significant residual damage in any situation (whether by normal operation or accident), and whatever damage done can be mitigated, are not quantified. There is insufficient evidence to know exactly how broad that damage will be, hence the company's claims are not credible and should not be accepted.

Fishing is a major part of this community, and the economic backbone of not just Nova Scotia but the other two provinces who would be impacted by the proposal – Prince Edward Island and New Brunswick. The tourism industries in the Maritime provinces are also vital, part of this being dependent on outdoor recreation, which is also highly valued by the people who live

here. The reality is that once ecosystems are damaged, they are not easily healed; just as damaging one part of the system inevitably impacts the whole. As such, we do not accept that monetary compensation is appropriate mitigation for damaging an ecosystem and a sustainable industry.

Per Nova Scotia's Environment Act (*Purpose of the Act,* 2.b.ii.), "the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation."

Concern: Lack of Indigenous consent

According to the United Nations Declaration on the Rights of Indigenous Peoples, Indigenous peoples have a right to free, prior and informed consent. We expect that Nova Scotia Environment will go above and beyond the base expectations to ensure the appropriate level of consultation occurs moving forward, specifically around issues of consent.

It is clear that Pictou Landing First Nation (PLFN), both the elected leadership and the community, are opposed to this proposal and want the government to keep its promise of closing the current effluent treatment facility. They want Boat Harbour closed on schedule, and they do not want the risks to the fisheries that piping effluent into the Northumberland Strait represents.

Years ago, the concerns of PLFN about how effluent would affect their community were ignored. All of their concerns proved to be accurate. We believe their concerns are accurate today too.

Concern: Lack of community consultation, inadequate time for meaningful community response

The community was not consulted on the actual project submitted by Northern Pulp for environmental assessment. Any public consultation was on a somewhat similar ETF proposal discharging into a completely different location. In addition, a 30-day period for public consultation on 2000 pages of previously undisclosed information does not fulfill requirements for meaningful public review and input.

Concern: Climate change

Oceans are already stressed by climate change. Scientists warn that the Gulf of St. Lawrence is warming more rapidly than almost anywhere on Earth. Adding additional stressors to a system that is already stressed is not wise. The Northumberland Strait is an area that requires additional protection, not additional degradation.

This past October, The United Nations' Intergovernmental Panel on Climate Change released its dire warning that we have just over 11 years to curb GHG emissions before the Earth's climate tips past a point of no return. Industry creep is such that government is willing to risk other billion-dollar industries as well as the global climate for this fundamentally undemocratic and unsustainable industry.

What we do need is a just transition to a sustainable economy, and specifically for the hundreds of workers employed by Northern Pulp. We also need to knit all the climate solutions we know into a more compelling and tangible vision to protect our oceans and our planet.

Conclusion

This project is simply not worth the risk. The precautionary principle means it is incumbent on the Nova Scotia government to err on the side of caution.

A bigger picture reflection on this, such as Joan Baxter's "The Mill" (in chapter 16: The Politics of Pulp, for example) or Dr. Ingrid Waldron's "There's Something In the Water: Environmental Racism in Indigenous and Black Communities," points to a failure by successive provincial governments to protect the people of Pictou Landing First Nation and the broader community, and environment in and around Boat Harbour and the Northumberland Strait. Although you have a task at hand with specific considerations, please keep these bigger issues in mind.

The Council of Canadians calls on you to reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project. If you don't feel you can do this with the evidence before you, please call for a full Environmental Assessment report on this proposal. Either way, **we support the closure of the effluent treatment facility in Boat Harbour on schedule.**

Sincerely,

| The Council of Canadians

Organizing on unceded and unsurrendered ancestral territory of the Mi'kmaq Nation

cc: Nova Scotia chapters of the Council of Canadians
Friends of the Northumberland Strait

From:
To: Environment Assessment Web Account
Subject: Replacement Effluent Treatment Facility Project
Date: March 7, 2019 9:54:50 PM

Dear Minister:

I am writing in regards to Northern Pulp's Replacement Effluent Treatment Facility Project.

My family has fished the grounds off the east end of Pictou Island for four generations.

obtained my Fishing Masters IV, and now fish lobster with my father in the Northumberland Strait.

In section 9-15 of the EA it is stated that "there is presently uncertainty regarding the chemical composition and characterization of the marine treated effluent discharge." On page 489, the report admits that "effluent chemistry characteristics will not be known with certainty until the project is operational." Despite this uncertainty the Executive Summary states "No Significant Residual Environmental Effect Predicted" during any portion of the project to any aspect of the environment. They then conclude "It is not predicted that the installation of the pipeline will result in long term serious harm to fish or fish habitat."

The lack of certainty in the effluent composition has obvious concerns as to how the environmental risk assessment was modelled by the company. Without knowing the composition of the effluent, how can the effect on the environment be measured. 87 million litres of treated effluent with an unknown chemical composition is to be discharged daily into the ocean and across the board they predict no significant effect. This indicates to me that no accurate modelling was completed by the company and that they clearly do not respect this province's environment, nor intelligence.

My family has enjoyed many summer vacations playing on the beach and swimming in the Northumberland Strait. Last year my wife and I got married on Pictou Island, and hope to raise our family in a clean environment without fear of pollution and contamination.

It is clear to me that this project has a large likelihood of causing adverse effects to the environment that cannot be mitigated. I urge you to order a full environmental assessment before moving forward on this proposal, if at all. I would be proud to see my home province focus on transitioning this community to prosper in a way that values the environment we live in and the health of our people.

Thank you for your time and consideration.

Pictou, Nova Scotia

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 9:57:21 PM

Project: - Choose - Comments: Dear Minister: I am writing in regards to Northern Pulpâ?Ts Replacement Effluent Treatment Facility Project. My family has fished the grounds off the east end of Pictou Island for four generations.

btained my Fishing Masters IV, and now fish lobster with my father in the Northumberland Strait. In section 9-15 of the EA it is stated that â?othere is presently uncertainty regarding the chemical composition and characterization of the marine treated effluent discharge.â? On page 489, the report admits that â?oeffluent chemistry characteristics will not be known with certainty until the project is operational.â? Despite this uncertainty the Executive Summary states â?oNo Significant Residual Environmental Effect Predictedâ? during any portion of the project to any aspect of the environment. They then conclude â?oIt is not predicted that the installation of the pipeline will result in long term serious harm to fish or fish habitat.â? The lack of certainty in the effluent composition has obvious concerns as to how the environmental risk assessment was modelled by the company. Without knowing the composition of the effluent, how can the effect on the environment be measured. 87 million litres of treated effluent with an unknown chemical composition is to be discharged daily into the ocean and across the board they predict no significant effect. This indicates to me that no accurate modelling was completed by the company and that they clearly do not respect this provinceâ?Ts environment, nor intelligence. My family has enjoyed many summer vacations playing on the beach and swimming in the Northumberland Strait. Last year my wife and I got married on Pictou Island, and hope to raise our family in a clean environment without fear of pollution and contamination. It is clear to me that this project has a large likelihood of causing adverse effects to the environment that cannot be mitigated. I urge you to order a full environmental assessment before moving forward on this proposal, if at all. I would be proud to see my home province focus on transitioning this community to prosper in a way that values the environment we live in and the health of our people. Thank you for your time and consideration.

Email: @gmail.com Address:

Privacy-Statement:

agree x: 71 y: 18

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 10:00:18 PM

Project: replacement_effluent_treatment_facility_project Comments: My husband and I have a great concern over the effluent from Northern Pulp which will be spewed into the Northumberland Strait from Northern Pulp if their proposal goes through. We live at Braeshore, Pictou County, N. S. Our residence is very close the beach where we enjoy swimming in the summer and walking along the beach with family and friends. We also enjoy watching the lobster fishermen haul their traps during the season. It would be a terrible shame for the fishermen to lose their jobs because of the contaminated water which would be caused by Northern Pulps proposal which I understand, there would be 70 to 90 million liters of treated effluent still containing toxic substances spewed into the Strait daily. When we moved into our house here in Braeshore in the early I took a walk to the beach just before dark one evening and all along the shoreline was knee high foam with a brownish ting which I thought at the time came over from Boat Harbour, acros s the water from us, where the effluent was being pumped from Scott Paper which the pulp mill was called at that time I took photos of the foam just in case I may need them sometime and still have them in my possession. I also sent copies at that time to the Department of the Environment but never heard back from them. Let us keep our beautiful Northumberland Strait free from contamination from Northern Pulp. Thank you. Name: Email: @eastlink.ca Address:

Privacy-Statement:

agree x: 64 y: 23

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 10:18:39 PM

Project: replacement_effluent_treatment_facility_project Comments: Northern Pulp effluent treatment facility Volume of effluent 82,500 cubic meters/day is 57,300 litres per minute, system maximum. 70,000 cubic meters/day is 48,600 litres per minute, the rate which is most commonly created during the normal operations which the plant manager reported to me in conversation. Please note: the volume of one cubic meter is 1000 litres. The Northern Pulp Nova Scotiaâ?Ts proposed average daily waste water is 62,000 cubic meters per day of effluent, which is a rate of 43,056 litres per minute of liquid waste from the the Northern Pulp Mill and is also 717 litres per second. The volume of liquid waste from he Northern Pulp Mill is extremely high. The upper maximum waste effluent suggested by Northern Pulp could reach 82,500 cubic meters of daily effluent which would be 954.8 litres per second entering into the clarifiers and then subsequently entering the environment. The current effluent temperature from Mill production to the Boat Harbour Effluent Treatment Facility is at 40- 42 degrees Celsius. There is no known heat loss for the current pipeline although it is likely more than a kilometre in length. However, current effluent streamâ?Ts flow rate and its polyethylene/polypropylene piping likely prevents any heat loss, because the Mill is in steady state operations/production. The proposed treatment system will rapidly reach a steady state heated condition. The proposed treatment tanks will not be able to cope with the magnitude of heat thermal energy to significantly make a difference within 24 to 48 hours of steady state operations. The heat loading is 700 to 900 litres per second at 40 to 45 degrees Celsius. Heat exchangers as proposed can not handle the energy associated with the time limits of the system. A 1,000,000 L one million litre storage tank may have the capacity to store Northern Pulp liquid waste effluent for 20 minutes /- 1 minute. At 40,000 L/minute of NP liquid waste effluent, fills a 1,000,000 L storage tank within 25 minutes /- 1minute, assuming it was empty at before hand. The in-ground basins proposed for the Northern Pulp Nova Scotiaâ?Ts effluent treatment clarifiers are at 12,000,000 litres which is approximately four 4 hours holding capacity. With 700 to 950 litres per second entering the clarifier, the turbulence within the clarifier and heat loading will nullify its capacity to remove heavy solids dropping from the waste water suspension or remove floating solids from the turbulent waters given foaming issues. The addition of defoaming agents while helping to cut bubbles, the effluent flow rate will overpower a defoaming agent. The kraft digestion process of the pulp wood fibres, the sulphites, the hydroxides, the heat, and the off-gasing of the oxide s of sulphur will be a huge issue. The proposed 11.4 km pipeline which is 36 inches inside diameter will contain 7,479 cubic meters of waste effluent, or approximately 7.5 million litres of effluent should a catasrophic pipe failure occur. This environmental risk is significant, given the communities have no experience with large effluent pipeline failure. The 7.5 million litres of effluent does not include headwater effluent that would continue to be pumped or gravity fed from the Mill should the transmission pipeline fail. The proposed 12 million litre clarifiers have a maximum four hour capacity to treat the effluent. The current Boat Harbour Effluent System has approximately seven to ten days by comparison. The open clarifiers will pose a very significant occupational health risk to Northern Pulp Mill workers/employees. The daily exposure limit to hydrogen sulphide H2S is less than 1 part per million ppm. The three clarifiers will off-gas hydrogen sulphide from 5 to 50 ppm depending upon winds. Hydrogen sulphide toxicity is not well addressed given labour regulations. This one gas can be potentially deadly as 100 ppm H2S with be fatal within 30 seconds. The effluent treatment facility does not address hydrogen sulphide gas emissions. Clarifiers The primary stage

clarifier may remove 2.3 grams of suspended solids per litre of waste water with an on-going rate of only 0.3 grams per litre clarification as stated. Already stated, the in coming turbulent flow by the 700 to 950 Litres/second inbound waste waters into the clarifiers will negatively impact settling, raking or screening actions of the on-going success in the clarifier systems. Clarifiers work best with a calm steady state fluid, where there is little turbulence and there are more than 12 to 24 hours for heavy solids to fall from a mechanical suspension and lighter weight solids can float to the waterâ?Ts surface to be skimmed off. Clarifiers work on the differences in specific gravity and do not address water soluble chemicals... Little discussion is made of wood fibres and the inorganic composition of the water waters. The process chemicals in a Kraft pulp digestion process are all water soluble. The waste wood fibres lost in the waste waters, float due to the specific gravity. The first stage clarifier does not describe any wood fibre retention, nor the capture of water soluble chemicals. The clarifier is designed to capture only dense total solids which may or may not settle out in the very turbulent clarifier environment. Waste matter from the clarifiers will be diverted to a sludge tank and ultimately to the Power Boiler para 5.2.2.8. The text as presented is misleading. It states: Pressed sludge/solids containing water will be combusted in the power boiler to produce heat. The text should state any water component of the waste sludge is totally released to the atmosphere. While the power boiler, produces stream and electricity, any moisture in the combustion chamber can only exit via the chimney and into the atmosphere of Pictou County. Should this same moisture contain soluble sulphites, sulphides and related process chemicals, these will all be made airborne by the combustion process. Please also note: The combustion/power boiler is the least equipped for pollution abatement. Marine Pollution at Caribou Harbour The Caribou Harbour opening suggested for the effluent diffuser is adjacent to Northumberland Ferry vessel route. This means the visitors to Nova Scotia or leaving the Province via the ferry service will be subjected to high concentrations of sulfur dioxide gases and related sulfur oxides arising from the effluent diffuser. The effluent water exiting the proposed diffuser apparatus with be toxic to marine life. With respect to ferry users, the effluent is â?ofreshâ? water not salt water , very hot 25 to 35 degrees Celsius and very gasified. This will result in the effluent rising to the surface of the Northumberland Strait water immediately. The notion that these waters will mix uniformly by natural blending is misleading. The differences in temperature and specific gravity will cause the effluent to create a continuous rift pattern which will prevent wishful mixing/blending as suggested by Northern Pulp. The analogy is higher industrial chimneys from factories were thought to better diffuse airborne pollution. Scientists and engineers now know this does not occur in fact. The proposed position of the effluent diffuser is immediately upstream of the Caribou Provincal Park, the Pictou Lodge and across the harbour is the Pictou Landing First Nations lands. As the Northumberland Strait tides fall twice daily the Northern Pulp effluent will be mixing and flowing toward these locations. The smell of oxides of sulfur, sulphur dioxide, hydrogen sulphide and related kraft pulp wastes will greatly impact breaches, cause undue respiratory stress for humans and other mammals on, in or adjacent to the Northumberland Strait. Marine Habitat 717-949 litres of Northern Pulpâ?Ts liquid effluent will enter the Northumberland Strait per second. The Biological Oxygen Demand BOD, the pH and maybe physical attributes, may have been pretested. The BOD usually requests a laboratory test which requires at least an hour of lab time to perform the testing. Stopping production because of a failure of BOD testing all not happen due to the safely to the workers and the plant processes. Compliance issues will be next to impossible to evaluate as the waste water will be entering a saltwater environment well below the surface waters. 717-949 litres of very hot water per second will be entering the Northumberland Strait. The huge temperature variation with receiving waters of 25 to 35 degrees Celsius will be lethal to marine life. Northern Pulp Management suggest they expect this lethal impact to be spread over an area of 100

meters/any direction from each diffuser. However tidal action, thermal rifts and the specific gravity difference will cause the warmer waste waters to rise, having a larger impact on fish and marine mammals. The inorganic waste chemicals from the NP Millâ?Ts operations, will impact shellfish life and subsequent marketing. Little work has been done to accurately quantify waste metals for the Millâ?Ts operation. The quantities of iron, nickel, chromium, molybdenum and other ingredients within stainless steel and chromium plated steel roller surfaces have left an impact in Boat Harbour. Having tested the embankment soils and having had a third party test laboratory analyze the soil samples, there was a noticeable trend likely from eroded stainless steel, worn pipes, worn roller surfaces, etc.. that 50 years of operations has lead to chronic heavy metal waste/pollution rather than an acute issue. Should Northern Pulp and this kraft pulp process operate for another 25 years or more, the inorganic elemental pollution needs to be addressed as part of current evaluation. The lead, tin, antimony, cadmium from bushing/metal bearings, chromium from hard electroplated chromium rollers, chromium/nickel from stainless steel piping, cadmium plated bolts and fasteners, all these metal suffer daily erosion, corrosion and cavitation which will impact the Northumberland Strait lobster fishery. The oxides of sulfur, the changes in salinity, water temperature, turbidity will impact fish habitat and the migration of fish stocks within the Strait. Northern Pulpâ?Ts Environmental History Paper Excellence and Northern Pulp Nova Scotia operated the kraft pulp mill without an electrostatic preceptor for more than a year without reporting its failure to the community or its regulator. Northern Pulpâ?Ts Power Boiler has failed emissions testing. The Northern Pulpâ?Ts Recovery Boiler failed emissions testing. Regardless of failed airborne pollution testing, the Mill operations continued until appropriate shutdowns could be scheduled well after directions/Ministerâ?Ts Orders were given to the Mill management. The proposed size of the first and second stage clarifiers and the â?oBAS technology may appear interesting to the environmental assessment decision makers. However, there is only a four hour residency of waste waters to remain in holding tank system. However with waste waters of 700 - 950 litres per second entering each of the first and second stage clarifiers, this flow rate will cause extreme turbulence. The magnitude of the waste water flow rate limits the capacity of the clarifiers. Furthermore the off-gasing of hydrogen sulphide from the clarifiers will create a process that is difficult to understand and control as well as potentially deadly to workers exposed to the open clarifiers. The recent Mill Management, while perhaps willing invest to operator training, most likely will under resource this waste treatment system as previously demonstrated. The waste treatment proposal only addresses the BOD/COD, pH attributes of the waste waters. The off-gasing from sulphites/sulphides/oxides of sulphur, wear metals, inorganic chemical iron, nickel, chromium, cadmium, sodium sulphide, sodium sulphates pollution, and the huge thermal pollution issues are not addressed by the proposed plan of action. The high density polyethylene or polypropylene piping system to transport the waste water effluent to the final marine site will effectively insulate the waste waters and prevent heat loss. The daily loss of 62,000,000 to 82,500,000 litres of hot water 35 to 40 degree Celsius into the environment is â?ocriminal. Conclusions: The proposed effluent treatment system is undersized for the clarifiers and the current daily waste water volumes. Once effluents have passed the clarifier system, there is little opportunity for subsequent remediation should BOD testing indicate an issue. BOD testing requires an hour to complete in an onsite laboratory test, which only provides three hours to stop production of the Mill should a compliance issue arise. Waste effluent at 35 degrees C. or more will enter the Northumberland Strait killing marine life. This effluent thermal loading alone is deadly, regardless of BOD/COD/ heavy metals, total suspended solids, etcâ?¦ The projected waste water path via the diffusers, does not accurately address the thermal toxicity to marine life, the foul smelling oxides of sulphur by-products, the chronic heavy metals contamination from the Millâ?Ts equipment, piping, pumps, chromium electroplated rollers, presses etc. which will

enter the Northumberland Strait. The waste waters are out of the visual sight of the Mill Management, its response teams, and could have days of non compliant waste disposal before regulatory processes would require immediate shutdown of the proposed waste treatment system. This would be at the expense of fisherman, marine life, and a valuable coastal zone area for tourists, residents and endangered marine mammals. Lastly An Industrial Approval should not be considered by the Province of Nova Scotia for the continuing operations of the Northern Pulp Nova Scotia Limited the Mill until the Mill replaces the existing kraft caustic digestion technology and implements a closed loop water pulping process: such that there is little or no waste management issue, no need to dump waste process chemicals and spent waters into the marine environment of Pictou County, the Pictou Landing First Nations or the Strait of Northumberland. Sincerely Chemist

. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 48 y: 28

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 7, 2019 10:22:19 PM

Project: replacement_effluent_treatment_facility_project Comments: March 6, 2019 Environmental Assessment Branch Nova Scotia Environment P. O. Box 42 Halifax, NS B3J 2P8 Dear Minister: I am writing regarding the Northern Pulp filing for Environment Assessment for their proposed effluent pipe into the Northumberland Strait. I have been a fisherman for 37 years and I have some concerns that enough study has not been done and a Federal Environment Assessment should be done so the everything that can be done will be. First - Where NP plans to put their pipe and run their effluent into the Strait it is in an area where the tides meet at the Bell Bouy. The effluent will be taken in all different direction with the the rising and falling tides. Second - NP have not stated what will be in the effluent when it comes out off the pipe into the Strait. If the Minister does not know - how can she be 100 sure that nothing will be harmed? Not the marine life, not the ecosystem or even the people swimming in the water. All along the coast there are a number of beaches that residents and tourist visit and enjoy. Just down the shore from the Caribou wharf, where the purposed pipe will be, there is a Provincial Park where there is also a camp ground. Last summer they had the most campers they ever had and they come there from all over and the beach is a big draw. If the effluent pipe is there no one would want to swim or even be on the beach which would be a terribly loss for the area. ` Third - if the pipe is going to be buried, how will they know if it has broken or leaked. We know that there was a pipe break carrying effluent and it was only detected by a person out walking. What if it happens where no one would notice - how would they know and what would the ramifications be it it leaked for a long time? There is heavy ice in the Northumberland Strait most winters, how could the pipe survive the heavy pressure that would be applied to it. How can the people enjoy the water for swimming, digging clams and fishing on Caribou Island, Pictou Island and all along the shore if they do not know what is in the water? Taking a big risk with their health. I strongly urge that you make a choice for a Federal Assessment to make sure that our environment is not ruined by NP effluent. Thirty days is not long enough for everyone to reply to the finding that could cause thousands of days of destruction to our marine life. Pictou, Nova Scotia. Name: Email: @gmail.com Address: :

Privacy-Statement: agree x: 52 y: 20

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 7, 2019 10:39:49 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Subject: MY EA Submission for Northern Pulps Replacement Effluent Treatment Facility Project
Date: March 7, 2019 11:13:41 PM
Attachments: This is to advise that on February 7.docx

To the Nova Scotia Minister of Environment,

Please find a Word Document attached of my submission to the Northern Pulp Replacement Effluent Treatment Facility Project.
If at all possible could you please notify me of receipt. I thank you for your time and appreciate the opportunity to speak on this very important matter to all Nova Scotians and our good neighbours in Prince Edward Island and New Brunswick.

Most Sincerely,

This is to advise that on February 7, 2019, Northern Pulp Nova Scotia Corporation (Northern Pulp) registered the Replacement Effluent Treatment Facility Project for environmental assessment, in accordance with Part IV of the Environment Act.

This is my submission to Northern Pulps EA.

A big undertaking a lot of information, well over 1600 pages and could cause a great impact on the environment, so where to start?

How about classification first?

Class 1 undertakings are usually smaller in scale and may or may not cause significant environmental impacts or be of sufficient concern to the public.

Class 2 undertakings are typically larger in scale and are considered to have the potential to cause significant environmental impacts and concern to the public.

Do you really feel this is a small scale undertaking....if so why is there over 1600 pages to explain?

Given the damage to Boat Harbour and what it will take to clean it up, is it to be considered a non significant environmental impact?

If so, then why a Federal Class II to clean it up?

If it takes a Federal Class II to clean up a mess, then it should it not take a federal Class II to move it, from one location to another?

Plus in your Class II classification under Category it says Industrial Faculties it says

#3. Pulp Mill, Which should indicate anything to do with a Pulp Mill. It does not say Class I for Mods, It classifies the whole facility as a Class II.

The Effluent

Dillion Consulting said this.

In an email between Northern Pulp's technical manager and Dillon Consulting, a Toronto-based consulting firm, written on Nov. 29, 2017 the technical manager said in reference to the effluent coming from the proposed Northumberland Strait pipeline, "some say effluent quality will be worse than today because of all the polishing that is happening across the Boat Harbor basin—and they are correct to some extent."

On page 489- 90-91 Section 9.1 they state

At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational. Some other current areas of uncertainty include limited recent or current baseline

environmental media and marine food item chemistry data, and limited data on traditional marine food item harvesting and consumption patterns within the PLFN community

The Toxikos (2006) HHRA was a highly conservative assessment that substantially overestimated exposure and risk to potential human consumers of fish and shellfish that may be influenced by the effluent diffuser discharge in Bell Bay. The authors concluded that there were negligible risks to human health from consuming any marine food item harvested in the vicinity of the effluent diffuser, for any of the substances that were assessed in the HHRA. This study considered numerous substances, but through a multi-step screening process, ultimately selected only four COPCs for assessment (i.e., cadmium, mercury, selenium, PCDD/F). The Toxikos (2006) screening procedure is addressed further in Section 9.2.4.2.1.

It is believed that the assumed effluent chemistry characteristics and composition as well as the effluent diffuser design for the Tasmania project are similar to what is proposed and designed for the NPNS project (KSH Consulting, Personal Communication). Both mill facilities utilize ECF bleaching processes, and this will not change for future NPNS mill operations.

I question where the Department of Environment would allow Effluent that is quoted by the Firm Dillion Consulting to be not only less treated as what is presently coming out of Boat Harbour, but also containing unknown substances and quantities, until it is actually going out into the Strait without a Class II assessment.
I also question why Northern Pulp who continue to state that there are dozens of Bleach Kraft Mills in Northern America, that they would chose a Toxicology Report done for a Paper Mill in Bell Bay, Tasmania that was never even built ?

How can you use a report that had no real effluent to test, but simply an assumed and imaginary waste product?

Further to add, because such Mill was such an environmental risk the banks refused to back financing to have it built.

So why not a Toxicology report from one of the dozens in operation here in North America?

This is a very serious question the Nova Scotia Department of Environment should be asking.

If Northern Pulp and Dillion Consulting are using such a report to base their confidence in this treatment faculty to be a successful operation, then I think that should be waving enough red flags and blaring sirens to tell you this needs a much deeper investigation.

If the same information could not pass the litmus test to build a Billion Dollar state of the art Pulp Mill, then surely it should also fail the test to build a treatment plant for a Mill that is over fifty years old.

Effluent Volume.

5.2.2.9 of the Dillion Report
The maximum effluent flow rate of 85,000 m3 /day was used for the analysis of effluent water quality following treatment. The highest flow rate represents the most challenging conditions for plume dispersion at the discharge point and is therefore considered to be worst case. Flows lower than the maximum daily effluent flow will result in improved mixing. The current annual average flow is 63,600 m3 /day for comparison.

Dillion says they are using 85,00m3/day as worst case scenario and saying the daily average is 63,600 m3/day for their comparison. Yet In February of 2016, Nova Scotia Environment has said it had resolved the outstanding issue of an Appeal by Northern Pulp. In doing so it allows NP to take a daily maximum of 92,310m3/day. If this can be the case then the worst case scenario presented by Dillion is untrue and the plume will spread further and be of worse quality.

Temperature of Effluent

5.2.2.9 of the Dillion Report as per table 5-2-1

Temperature oC 25 (winter) 37 (summer)

Although we see nothing in the Dillion report as to Lobster larvae and the effects on them by the Effluent I give you this information.

Lobster larvae and the Waste Water Pipe into Northumberland Strait The writer of this has just completed researching some of the many studies done about how Cold water Lobster hatch and eventually become Market size . Female lobsters develop eggs that adhere to the shell overwinter and hatch the following late June into July. These larvae live in the top 2 meters of the water for about 20 to 30 days while they grow through three stages and finally reach stage 4 and then fall to the water bottom where they live in the mud /sand / rocks for at least 5 years and reach a weight of 500 grams (1 LB.) . Each shell moult sees the lobster gain about 40% in weight. By year 6 to 8 they reach 750+ grams and can be caught and sold. Some are not immediately caught and live to be much larger. It is the life of the hatchlings or larvae that was my research. It's a lengthy story but I'll shorten it to this summary ; Cold water Lobster are found from the coast of Gaspe down along the eastern shores of N.B. / NS and along the north shore of N.S. and around Cape Breton . Water temps during the hatching months ranges from 10C at Gaspe to about 15C down off Caribou, Chance Harbour, Little Harbour and beyond. The PEI shore has similar temps. Larvae live well in 10C water and better in temps up to 14 C . After that temp there is a lot of mortality until at 22C none survive. The warmer the water the faster they grow and rate of survival lowers a lot. If they survive until stage 4 size they drop down to the floor of the water and make homes among the rocks, mud , sand where most will live for another 5 years - moulting each year and increasing weight about 40% at each shell moult . By years 6 to 8 they have reached a weight of 1.5 lbs. and become legal catch. Some escape and live on for many more years. The temperature of the waste water from the proposed pipeline from the Pulp Mill across the Pictou Harbour and out to Northumberland Strait is estimated to be 25C in cooler months to 37C in warmer summer months. All 70 to 90 million litres. This being flowed into 15C N . Strait water will gradually warm the coastal waters the larvae live in. Every degree above 15C will shorten the life of a cold water lobster larvae. When the temperature reaches 16.5C survival rate lowers until at 22C none survive.

Dispersion of the Effluent

5.3.1.11 Dillion Report

Marine Outfall Construction

The terminus of the effluent pipe consists of an outfall location with a three-port diffuser, situated at a depth of approximately 20 m.

Initially in the public presentations and diagrams shown we were told that the pipe would have the Effluent exiting through six port diffusers. Now it has become three. With this reduction to three ports that would mean that the exit flow of the effluent would be at a greater force and not spread over as great an area as with six diffusers. Thus making much of data given about dispersal of the Effluent would not seem to be relevant.

This very questionable effluent quality and quantity is enough to say that there is just too much risk to damaging the fisheries to not make the decision to have a Class I Provincial, but rather insure it is a Class II Federal Assessment.

As we are now not talking about the possible loss of a Billion Dollar Mill, but instead a possible loss of a Multi Billion dollar Industry. Again I say the risk is too great for such a weak assessment. Give it the due diligence it deserves.

To not go into a lengthy letter I will leave the effluent as the most in depth of my submission. The rest i will just present as bullet points that I feel are also a strong indicator of needing a Class II Federal Assessment.

- They say Non Significant effect on Migratory Birds. Yet within 1500 ft of leaving Northern Pulp Property the route of the Pipe will attempt to pass through a large nesting colony of Cormorants, which in Nova Scotia is a protected species.

- They say Non Significant effect on Groundwater. Can they be sure of this with at least two serious pipe leaks? More importantly since they have plans to run the pipe over the Town of Pictou's Watershed. To also add without Community or Council meetings to inform us of this, but letting the Town and the Citizens find out through a media release of a meeting that took place between PLFN and Fishers.

- The proposal calls for the pipe to go underwater at Caribou Harbour and run out into the Strait for 2.1 KM.
  They do understand that the Caribou Harbour by simply viewing the Marine Chart at
  http://fishing-app.gpsnauticalcharts.com/i-boating-fishing-web-app/fishing-marine-charts-navigation.html?title=CARIBOU+HARBOUR+boating+app#12/45.7600/-62.6850

  Quite dramatically shows that the greater majority of the harbour is less than 5 meters deep and the bottom is a shift and moving sandbar.
  It also has a busy Ferry Terminal that uses a Channel for the Northumberland Ferry Service to Move in and out through. This Channel gets dredged every few years, so having a pipe run anywhere close by would be detrimental to not just the ability to dredge, but also the possibility of pipe damage due to dredging.

  A further danger for damage to the pipe would be the Ice in the winter. From information gather from the Canadian Seabed Research. Ice Scouring is common in the Strait and it comes with great force at times creating deep cuts or grooves in the sea bed.

  There were 133 ice scour events reported from the SSS data collected in 2014. Scour measurements were taken from unscoured, smoothed seabed datum to the deepest point of the scour. The ice scour events identified occurred in water depths from 2 to 13 m. Scour was most frequent in water depths of 4 to 5 m. Sediment transport within the Northumberland Strait highly influences scour degradation and the extent of infilling that occurs (CSR 2015).
  In terms of ice scour orientation, the majority of occurrences were found between 120 and 140 degrees azimuth, which is aligned with the predominant currents in the Strait. Ice scour lengths were predominantly in the 10 to 70 m range (76 % of occurrences), with a few occurrences exceeding the 100-m threshold. The width of most ice scour marks was less than 4 m (81 % of occurrences). Further details regarding ice keels and their distribution in the Northumberland Strait can be found in Obert and Brown (2011).

- As for a possible failure in the system where an accidental occurrence happens one must realize with the length of the pipe now extended to over fifteen Kilometers, that means there could be 100s of thousands of liters of Effluent that could be above legal allowable limits in the pipe. I see no plan in place to have this Effluent safely removed before it ends up in the Strait especially in winter. So just how would an accident of this nature be dealt with? Also if there is a failure in any section of the underwater pipe or it's Diffusers during the Winter when Ice is in the Strait, how is that to be rectified? Does the Northern Pulp Shutdown until the Ice is gone and the pipe can be repaired.

I will now end this letter of submission as I think there is more than enough proof here and questions ask that need to be answered seriously and concise before even the thought of a pipe being laid is given. There is so much more that I can present to you, like the burning of the dried sludge and the damage being done to our forests and on and on.

If the Mill closes, it will not be the loss of the Forest Industry, the forest will still be there. Of course there will be job loss, as unfortunate as that may be for some, Pictou County and Nova Scotian's will come together to help and other jobs will be found through reinventing our forest resources. That is what we do in this great Province of ours.

But if the pipe goes in we do risk two other Industries, those being the Fisheries and Tourism. Both of these will not return if the pipe fails. If the fish are gone there is no reinvent a harvest that is not there. The failure in the Strait will spread to the rest of Nova Scotia, PEI and New Brunswick, because we go by Atlantic Seafood Products and one tainted fish to the world means they are all tainted.

Once word gets around of the pollution then tourists will not come as they flock here mainly for the fact as our License Plate says...Canada's Ocean Playground.

I am really hoping that for the very first time in the History of Pictou County and the Mill, decisions will be made for the right reasons like the health of our communities and of our land and waters.

Most importantly not decisions made for anyone's personal gain or the gain of any Political Party, or Business, big or small.

I thank you for taking the time to read my submission.
Please do the right thing for Nova Scotia and Nova Scotians.

Most Sincerely,

From:
To: Environment Assessment Web Account
Subject: Re: Comments on Northern Pulp's Replacement Effluent Treatment Facility Project Environmental Assessment
Date: March 7, 2019 11:50:34 PM
Attachments: CH-B.png

Dear Minister of the Environment,

I am writing in concern regarding the Northern Pulp Replacement Effluent Treatment Facility Project. I am a property owner on Caribou Island and have spent a lot of time over the past 30+ years exploring the area; whether it be swimming, canoeing, windsurfing or combing the beaches and tidal flats. I am very familiar with Caribou Island and surrounding areas, and feel that I can offer some insight into this assessment that may be of use.

On a personal level and on behalf of my fellow members of the Nova Scotia Windsurfing Association, I would like to address the risk of direct human contact with the effluent in the vicinity of the proposed outfall location CH-B. While this proposed outfall location is stated to be 4km from shore, it is in fact roughly 2km from both Caribou Island and Munroe's Island, both of which contain provincial parks (see attached map). I have been windsurfing off Caribou Point for over 20 years and it just so happens that this proposed outfall location is a typical gybe (turning) point when sailing in this area under common wind directions. High speed turning on a windsurf board can commonly lead to spectacular crashes and sometime force unwanted ingestion of water. As a result, this sea water can be trapped within the ear canal or sinus cavity for an extended period of time. As hilarious as this may sound, it happens frequently during a day of sailing. For this reason, I would like this project's assessments to not discredit the human exposure factor at this location simply due to assumed remoteness. I insist that a more complete assessment be required in order to address the human health risks as a result of direct and prolonged exposure to effluent laden seawater.

I would also like to see specific studies regarding the potential intrusion and accumulation of effluent-borne contaminants affecting the water quality in Caribou Harbour, Caribou Rivers and other nearby tributaries. Given my experiences within these waterways, I can attest to the significant incoming tidal currents passing the proposed outfall boundary, pushing water into Caribou Harbour many kilometers upriver of Big and Little Caribou River and into various lagoons and saltwater marshes. I worry that the constant ebb and flow in this area could lead to long term accumulation of pollutants, which could be detrimental to the health of these sensitive and important ecological areas that are home to a diverse range of aquatic and avian life.

It should be noted that this proposed outfall site was chosen late in 2018, and appears to have not undergone any detailed analysis of a baseline water quality analysis the area. As stated in section 8.2.1, the Pictou Harbour water quality data is being used as *"a proxy for Caribou Harbour with respect to water quality, in the absence of available water quality data for Caribou Harbour)*" Using Pictou Harbour as a baseline is contradicted in 9.2.1 stating that Pictou Harbour and other surrounding areas are prohibited from local shellfish harvesting due to water quality issues whereas in Caribou area "*there are several active recreational and commercial fisheries in the area and there are also currently four provincially licensed marine shellfish aquaculture operations (all for American Oyster) in the vicinity of Caribou and Munroes Island, which are located relatively near to the location of the proposed effluent diffuser (CH-B)*." The fact that a commercial bi-valve fisheries exists in this area and are prohibited in the "proxy" reference area is evidence enough of the dissimilarities that should warrant that specific baseline measurements are performed in the new outfall location.

I general the most glaring gaps within this proposal are the constant omissions of studies, which are cited to be due to the lack of time to perform studies or having current information

available. Within this proposal there is consistent language of uncertainty and broad assumptions made using far reaching parallels or outdated data. Given the level of concern, it is only fair that more rigour and certainty be included within this assessment up front. It is clearly stated within section 2.0 of the proposal that the only biological field studies completed were on Northern Pulp Nova Scotia premises and have not considered the pipe corridor or marine environment whatsoever. It is obvious that the proposed route and outfall location chosen in the fall of 2018, could not be properly assessed for reasons beyond the cited "*seasonal constraints and by physical opposition and obstruction".* This is no excuse for omissions of proper studies, in regards to the most vulnerable and largest impacted areas of the project. Follow-up studies are promised, however, according to a recent Auditor General report, our provincial regulator's current track record indicates poor enforcement and monitoring of these projects as they progress. We simply need more detail upfront given what is at stake here.

I strongly urge you to delay your decision on the approval of this project and demand a more thorough Environmental Assessment Report to be completed by NPNS. Within this report I would expect to see a complete and relevant HHRA, updated environmental studies and more opportunity/time for input from the local communities, First Nations, concerned citizens, and the collective Maritime Fisheries from all neighbouring provinces.

Regards,

P.Eng - Engineers Nova Scotia Member

Nova Scotia Windsurfing Association www.nswindsurfing.com

Registration-Docment-Section-1-7 (1).pdf - Adobe Reader
File Edit View Window Help
39 / 168 78.7% Fill & Sign Comment

Northern Pulp Nova Scotia Corporation
Replacement Effluent Treatment Facility
Environmental Assessment

Site Location Map
Figure 1.1-1

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

- Approximate Project Footprint Area*
- Approximate Outfall Location
- Pictou Landing First Nation
- Wetland
- Open Water
- Roads
- Watercourse
- Rail

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY Northern Pulp Nova Scotia, GeoNova, ESRI

MAP CREATED BY: SCM
MAP CHECKED BY: AB
MAP PROJECTION: NAD 1983 UTM Zone 20N

2km
0 0.5 1 2 3 4
Kilometres

*Precise Project Footprint to be determined following completion of detailed design

PROJECT: 17-6461 Date: 2019-01-30

From:
Sent: Friday, March 08, 2019 10:24 AM
To: ASKUS <ASKUS@novascotia.ca>
Subject: Northern Pulp

Hi,

Since I had a difficult time finding the Environment department and don't know if I have the correct department, please refer to the correct department. This is the last day for comments and must be received TODAY.

Northern Pulp had four years to make changes, and did not. Our forests have been destroyed, waters polluted, animals wondering in cities due to displacement, at the hands of Northern Pulp.

This company even tried to prevent the book THE MILL from being placed in book stores, why I read it and all employees in this department should also read! A quote from GM and President of Scott Paper in the 1960s (Northern Pulp now) , "They can't believe how stupid the government of Nova Scotia is and are still laughing in Philadelphia in 2016."

If you allow effluent pumped in our waters again, we all know it will be a tragic disaster.

Northern Pulp has been given our resource and taxpayer's money for years and is concerned with profits only,
Unrestrained Capitalism at its worst! It's time to listen to us (those who vote) and I'm one of them!

Thank you

From: noreply@infogrove.com
To: Environment Assessment Web Account
Subject: Support for Northern Pulp Environmental Assessment
Date: March 8, 2019 1:13:02 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Response
Date: March 8, 2019 1:19:55 AM
Attachments: minister letter.docx

Attached is a letter to Minister Miller in regards to Northern Pulp

Thank you

Dear Minister McKenna,

I am writing to you in relation to the Northern Pulp's Replacement Effluent Treatment Facility Project. My name is and I live in Caribou River Nova Scotia. My family has a history of being fishermen in this area, and currently my father, grandfather, uncle and myself are all employed in the local industry, two of whom are license owners. Combined, we own over 80 years of personal knowledge of the fisheries within the talked about area. More personally, coupled with working on fishing boats, I have been employed by multiple fisheries science organizations, including The Gulf Nova Scotia Fleet Planning Board, and the Fishermen Scientists Research Society, that conduct work throughout the Northumberland Strait. Included with my family knowledge, and personal work experience,

The Proposal by the Northern Pulp company affects me a great deal, due to my great involvement with the local fisheries in all aspects. My personal fishing endeavors, as well as all my immediately family work to make a living on the Northumberland Strait, and this proposal is of great threat to our way of life. The strait maintains a way of life for many people in this area, as we all depend on this beautiful body of water to support our lives and well being.

I would like to raise three separate points as to why I object to the pipe proposal, first of which would be the whole idea of pumping this so called treated effluent directly into the marine environment. Living in and fishing in this area for my entire life, I have observed that the proposed area of discharge is subject to extremely strong tidal flows. The theory behind changing proposals, as stated on page 33/34 is that the Pictou harbor area was not selected because it did not have enough tidal flows and that nutrients etc. could build up in the harbor and over time become harmful. The key here to me, are the words over time. This means that these chemicals in certain amounts are harmful, because over time they would accumulate. This statement also applies to the proposed outfall, because even though the area is subject to more tidal flow, therein lies the problem. The tide will go out and move the effluent and mix it, but then what will happen when the tide comes back in? This tidal flow can be confirmed, because whenever we are fishing, and someone loses a buoy, marking where their traps are located, it can normally be found further along the shore, by another fisherman, or even on the beach by a passerby. The tide coming in will already have the effluent in it and be subject to accepting more effluent from the pipe, and therefore, will start to accumulate, essentially causing the same problem that northern pulp was trying to avoid with the change of outfall location. Throughout the entire document, Northern Pulp only mentions the term Bioaccumulation once, and that's in the definitions page, at the very first of the report. This to me, is blatant ignorance. With increased nutrients in the water column, and to think the effluent will not make its way to the top of the water column is ludicrous, the process of photosynthesis will take in those extra nutrients will therein be passed along the food chain and be biomagnified. This will lead to the eventual time when the nutrients will be too high and become harmful, and they will already be passed through the entire food chain. This idea ca n also be visualized more clearly if you take into the consideration the suspended solids within the effluent. On page 84 in table 5.6-1 Of the report, it claims that there will be 4.8 grams/liter of effluent. If this is pumped at the maximum of 85,000 cubic meters per day, this would equal out to be over 4 tons of suspended solids per day. Where will those suspended solids go? Do they disappear? This process will not just stay in the

immediate outfall site, pumping such a large amount of effluent will begin to displace the water already occupying that space, and the affected area will begin to grow, magnifying these adverse impacts to a much greater area than is indicated in the Northern Pulp document. This relatively simple concept is a blatantly overlooked by northern pulp, who seem to be employing the "tides will take the effluent away and then it won't be our problem anyway" and that is just unacceptable. In this day and age, to have such a close-minded approach is disastrous, and I am not willing to put my future way of life into the hands of an organization so blinded by reality.

Secondly, I would like to raise an issue with the effluent itself, that being the proposed temperature of the effluent when it exists the pipe. On page 46 of Northern Pulp's report, is the table that comprises of the anticipated daily maximum effluent water quality. In this table it states that the temperature of the effluent will be 37 degrees Celsius in the summer, and 25 degrees Celsius in the winter months. This is just too warm. It is unacceptable to be pumping anything into the Strait at this temperature, as it can be extremely harmful to the ecosystem. There was a study conducted on the ambient temperature done by the Gulf Nova Scotia Fleet Planning Board in 2017, where the sent-out temperature probes throughout the Strait, from April to late fall, and throughout that entire time, there was not a single temperature recorded that was above 23 degrees. This includes the height of summer. (these probes were on the sea floor and not the water's surface.)[1] This means that the effluent emitted from the pipe is at least 10 degrees warmer on average. It doesn't take a scientist to figure out that water with a 10-degree difference is vastly different and could potentially cause a lot of problems. I believe there is not sufficient research on the potential impacts to the lobster populations with relation to temperature. Appendix R in Northern Pulp's report consistently cites a paper from the 1960's that deals with lobster larvae exposure to effluent. Would it not be better to do some updated research on the subject? Also in appendix R, its stated that larvae as well as adult lobsters will be unaffected within a certain distance from the diffuser? How can this be? will there be a fence holding all the effluent in? introducing a constant flow into the area will permanently change the makeup, and this will be a constantly changing number? Eventually that 2-10 meters could be 2-10 miles? How do we know for sure? There is very little research conducted in this area. This effluent is not going to stay in one spot, and will spread like a disease, and I'm not willing to risk that disease killing off one of the most commercially important fisheries in the province.

My last point that I would like to bring up, would be section 4, on page 25/26 where it states that Northern Pulp would not be able to remain competitive. This is a very loose term, that being competitive. What exactly does that mean? Does that mean that they immediately lose money and would have to shut down? Or simply mean that their profit would not be the same as it would be with the current pulp it produces. In that section it cites appendix B. Upon reading that appendix, it claims high wood use as well as electrical costs would make it not viable for their company. This seems to be very misleading, because after a quick google search of Northern Pulp’s own website, they claim to be almost entirely self-sufficient, because they use their own power generation facility to produce 90% of their electrical needs.[2] So, which is it? Seems that citing electrical costs as a means of not being able to switch to a different product and change operation systems, is a round about way of saying they won’t make as much money, because they only pay 10% of their electricity in the first place. It would not appear to be very good business practice if paying for more than 10% of your electricity consumption would cause the business to close. It appears to me, that looking at changing products and systems for the

Northern Pulp Mill Is more a matter of unwillingness based on very grey area terms, versus an idea that it is not possible.

Based on these three points,

1) The tides providing lasting impacts that can cause the toxins to spread and become bioaccumulated and potentially toxic over time
2) The potential threat to lobster fisheries and other fisheries due to the extremely elevated temperature of the effluent, coupled with the lack of research into the fisheries and the impact this project could have
3) The shady reasoning provided by Northern Pulp that they have investigated other options

I think a decision such as this should be forwarded to the federal government. The province should be willing to defer the decision making process, because it affects people that are not in their jurisdiction to begin with, coupled with the idea that such an important decision should be more thoroughly looked at, and not just a 30 day assessment when there is the possibility for much more research to ensure the well being of not only hard working people but also ensure that the animals and creature of the Northumberland Strait are safe and are able to thrive in their natural habitat. This request is not only founded on it being a big decision, but in fact that the Government of Nova Scotia has been helping fund the design and planning for this project, and that, therefore, would be a conflict of interests and hence the decisions should be handed over to the Federal Government.

1) https://fleetplanningboard.ca/wp-content/uploads/2017/10/Temperature-report-2017-.pdf
2) http://www.paperexcellence.com/npns-operations-today

From:
To: Environment Assessment Web Account
Subject: Previous email
Date: March 8, 2019 2:43:36 PM

Hello, last night you received a letter from me and in in that letter it is directed to a minister mckenna. I can assure you that was a mistake and the letter is actually directed towards minister Miller. Thank you.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 1:31:08 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:
@unifor2002.org)

Saint John, NB

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 2:57:17 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@icloud.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 2:59:12 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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Thank you.

Signed by:

@easlink.ca)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 6:37:44 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Pictou co and the province need this to work

Signed by:
@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 6:54:54 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

NO PIPE

Signed by:
@gmail.com)

From: @hotmail.co.uk
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 8:23:02 AM

Project: replacement_effluent_treatment_facility_project Comments: I am seriously opposed to any further extensions to northern pulp . They have been given enough time to fix their problem . The present government must stand up for the environment and the good of all Nova Scotians . The common people must be given back hope that the government is not a run by big corporations . Please review the Lahey report again and again. Name:
Email: @hotmail.co.uk Address:

Privacy-Statement: agree x: 69 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 8:29:36 AM

Project: replacement_effluent_treatment_facility_project Comments: I believe the proposed replacement effluent treatment facility project will cause irreparable damage to our fragile Northumberland Strait. I worry about our fishing industry, our tourism, my home, our health, and all the species that live in the waters here. Please do not allow Northern Pulp to endanger our precious area. Name: Email: @gmail.com

Privacy-Statement: agree x: 42 y: 22

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 8:35:00 AM

Project: replacement_effluent_treatment_facility_project Comments: This mill after 50 years of cause pollution and illness in pictou needs to be closed. This application should be rejected for the following reasons: Â· Partially treated effluent is not acceptable for the otherwise pristine waters of the Northumberland Strait. The present effluent from Boat Harbour is already beyond acceptable, and I understand that the suspended solids in the proposed effluent will be even higher than the present Boat Harbour situation. Â· Pumping partially treated effluent into the Northumberland Strait has the potential of contaminating the waters of five of Canadaâ?Ts provinces. Â· The fisheries at stake in these five provinces are too valuable to be put at risk. There are so many pieces of legislation that should prevent this mill from polluting, but all have failed. No wonder people have so little faith in the system. Name:
Email: @hotmail.com Address:
: Privacy-Statement:
agree x: 54 y: 22

From: @glinx.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 8:53:26 AM

Project: replacement_effluent_treatment_facility_project Comments: It seems to me that given the enormous amount of controversy surrounding the effluent pipe and Northern Pulps proposals, that there only two options open to the government: to undertake or have undertaken the most detailed,high-level, wide-ranging, publicly transparent, intensive environmental assessment possible, including a federal assessment, or to shut down the Mill. There is no need for extending the deadline, since much data is already available,and the problems have been known about for years, without effective action. Name:
Email: @glinx.com Address:

Privacy-

Statement: agree x: 44 y: 27

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 9:09:57 AM

Project: replacement_effluent_treatment_facility_project Comments: Please do not pump this effluent In to the ocean. It is not economically or socially responsible. The costs will be great and your only hope,which is no hope at all is that you will die before the repercussions are over whelming. Think Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 74 y: 20

From:
To: Environment Assessment Web Account
Subject: Northern Pulp 's Replacement Effluent Treatment Facility Project
Date: March 8, 2019 9:10:15 AM

Dear Minister

I am writing this note in regards to Northern Pulp's Replacement Effluent Treatment Facility Project.

Our family are proud Nova Scotians with strong connections to Pictou and Pictou Island for many generations. Three of our four children are currently raising families in this wonderful province. We want them to remain in a province that respects the environment , the people , the forests and their the marine species that are part of the food chain.

We are proud that the current government has recognized the damage to Boat Harbour caused by the effluent from Northern Pulp. We applaud the government's commitment to righting this wrong.

Two wrongs however do not " make a right". The planned process to discharge Northern Pulp's effluent in to the Northumberland Strait is wrong. The current and future health and safety of people , marine life and the environment must have the greatest weight in the decision making process.

How can a daily dump of nearly 100 million litres of effluent, of unknown composition, not have a negative impact? How could any additional toxins in our environment and food chain be deemed safe in a globally warming environment? What is the risk assessment associated with constructing and maintaining a 15.5 km pipeline going overland and then through Caribou Harbour ? Why do we as a province continue contributing to the all the questionable decisions that have allowed the Northern Pulp Mill to begin and continue operations ?

The Class 1 Assessment is not adequate.

Please support those impacted directly and indirectly by the closure of Northern Pulp to develop new opportunities that support the recent sustainable forestry report released by the government.

Please give us reason to continue to be proud Nova Scotians who encourage our children to raise their families here , contribute to our economy, sustain our fisher heritage, protect our natural resources and support sustainable industries that protect our future. Please allow us to be proud of the principles and values of this government that become evident in your decision making process.

Thank you for your consideration.

Wife of a fisher
Mother of a fisher
Mother of four children who have grown up in Kentville , Town of Pictou and Pictou Island
Friend of many fishers and pulp mill workers
Grandmother to little children whom I hope and pray can be proud of their Pictou Island, Pictou County and Nova Scotian heritage and what we leave behind in this world

Sent from my iPad

From:
To: Environment Assessment Web Account; CEAA.BoatHarbour.ACEE@canada.ca; Sean.Fraser@parl.gc.ca
Subject: Mercury not addressed in the Northern Pulp EA
Date: March 8, 2019 9:20:08 AM

Hello Premier McNeil, Minister Miller, and Mr. Fraser,

I have concerns around the construction of NPNS's proposed new ETF next to the former Canso Chemicals plant could disturb the mercury remaining at the site and lead to its spread in the environment, now or in the future.

The Canso Chemicals property is known to be contaminated with mercury. It contains "on-site secure landfills" built between 1992 and 1999. The landfills contain free mercury from contaminated soils as well as mercury-contaminated materials generated from the demolition of the old Canso Chemicals buildings. Mercury is also known to have seeped into bedrock on the site.

Mercury is an environmental toxin which is persistent and bio-accumulative. It does not "go away" and can build up in the environment and in the food chain. There is no known safe level of human exposure to mercury.

Plans for Northern Pulp's new ETF show that the clarifiers and the activated sludge basins with depths of seven metres and greater would sit very close to the former Canso Chemicals site. There is a possibility that mercury from the contaminated site could seep into the treatment system and end up in the sludge that will be burned, or in the effluent released into the Strait.

The EA submitted by NP does not address any of these serious health risks. This proposal should not be approved as it stands now based on the serious risk presented to the people and the environment.

Thanks

Toxins

Toxins

FOOD CHAIN

Shark
Pike
Albacore
Halibut

Tout
Tuna
(can)

Krill

Salmon
Pollock
Oyster

Mercury level

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 9:38:40 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@enbridge.com)

ON

From: @bellaliant.net
To: Environment Assessment Web Account
Cc: @bellaliant.net
Subject: Registration of Undertaking - Northern Pulp - Written Comments Submission
Date: March 8, 2019 9:40:12 AM

Good Day,
After reading a few of the articles in the Chronicle Herald in respect to Northern Pulp's (NPNS) registering their EFT project - and with a diffused discharge of upward of 60 million litres a day of treated effluent to be discharged into the Northumberland Strait.
I have, as a resident living on our one and only ocean, in another region of the province on the Eastern Shore within the noted MPA, a few concerns and questions please.
Please note... I am no way an expert on the subject - just a concerned citizen.
1) If Dillon Consulting, EcoMetrix Inc. and NPNS are confident in the effluent NOT having any significant impact on the ocean bed and species of marine life - of not being affected; are these people willing to put their words where their mouth is - ie.
They (EcoMetrix Inc.) having performed lethality tests on Rainbow Trout by placing 10 trout in a bucket of pure treated effluent and determining the effluent to be deemed safe as it were, if half of the 10 trout did not die within 96 hours.
So the question comes to mind... are they willing to drink, let's say a half dozen glasses of this effluent to prove they are correct...is anyone who has this opinion of the treated effluent willing to drink glasses of this effluent? We are expecting our fish on and off our shorelines to be okay with it. So did British Columbia years ago and then reporting how many Salmon were affected with cancer in the Fraser River later on.
2) Have we, as a province contacted someone such as Dr.Boris Worm - Marine Ecologist and Killam Research Professor at Dalhousie, a speaker on CBC radio - along with being a scuba diver himself...
Have we asked for a non biased educated opinion of someone such as him - if not perhaps we should !!
3) Are we as a province educated enough to make the final decision that the fish, lobster, any marine habitat for that matter that is fished and with having this food put on our tables 100% confident that this end product will have no significant impact on our health. Are we prepared for future lawsuits?
I for one, who each year few times purchase lobsters in Pictou with other family members...will no longer be doing so.
I am a two time breast cancer survivor who was advised by Oncologists that with no cancer in my family and at the time notably being subjected to chemicals - this was a primary reason of the cancer.
This is also chemicals you are willing to put in our ocean.
4) Is there no way at all this effluent that is discharged daily - can it not be recycled - for the lack of a better phrase - is it possible for the plant to filter, recycle etc. this effluent and reuse it themselves. Has this option been scrutinized at all?
These are my thoughts and questions as a resident and concerned citizen of our beautiful province.
Just trying to keep it that way.
Thank you for time,

From:
To: Minister, Env; Environment Assessment Web Account
Cc: office@antigonishmla.ca; ec.ministre-minister.ec@canada.ca; Sean.Fraser.C1@parl.gc.ca
Subject: Northern Pulp Treatment Facility Replacement Submission Comments
Date: March 8, 2019 9:48:09 AM

Dear Minister Miller

I would like to ask that you, read this message and respond with next steps your Department is prepared to take to protect our Northumberland Strait's ecology, the livelihoods in three provinces that are dependent on it and our future oceans health. I would also ask that those copied read this correspondence being my local MLA, Randy Delory, our Federal Minister of Environment, the Honorable Catherine McKenna responsible for our oceans and my local MP Sean Fraser.

There are many aspects to this submission that I am uncomfortable with. First of all the timelines have been pushed and pushed to the point that the urgency has created a atmosphere of confusion based on quick responses by Northern Pulp which do not adequately address the environmental concerns that need to be addressed. There is critical data that I feel is not available to ensure we and our strait are properly protected from this waste. The waste has been determined by Northern Pulp to be "acceptable" and in fact this is a better solution than the existing process. The make up of the waste has not been clearly identified and mention of mercury has been suppressed if not avoided. This is only one toxic substance that must be thoroughly investigated as to the effect on the health of the Strait as well as the local community and those consuming the sea food from this area. Long term effects are not mentioned. Broad based terms such as "acceptable" and "minimal" do not do this toxic stew credit. We cannot accept the risk of damage to our lobster and other sea creatures in larval and adult forms, without a clear and concise path of study without ambiguity. It is unfortunate that Northern Pulp has waited this long to correct the Boat Harbour waste disposal process and the people of NS should not be held accountable for their lack of response over the past several years. In some ways I also hold the NS Government responsible in lack of urgency many years ago and letting this environmental disaster get to this point. We must now pit those supported by the plant to the industries dependent (in three provinces) on the Strait's health. I find the submission is fraught with ambiguity and essentially written with bloated text to disallow proper assessment over the 30 day period allowed. The whole idea of dumping this waste directly into the Strait flies in the face of what our Federal Gov't has committed only recently. Recall the quote by Jonathan Wilkinson, Minister of Fisheries, Oceans and the Canadian Coast Guard:

"The health of our oceans is in danger and the time to act is now. Hundreds of thousands of Canadian jobs rely on sustainable oceans. Our Government is working with our international partners, including those in the G7, to combat illegal fishing, support ocean science, and tackle marine plastics. This way, we can protect our beautiful coasts and build prosperous, stronger, and more resilient coastal communities. Healthy oceans mean a healthy, thriving and growing Canadian economy."

It is important to restate, healthy oceans mean a thriving and growing Canadian economy. We need more protections for our coasts, and not allowing a toxic stew to be dumped directly in the Strait will go towards achieving this. Sustainable economies do not base themselves on an unending attack on our natural resources. The NS Government needs to look at different approaches to grow our economy.

I feel that it is the responsibility of the NS Government to take all the precautions necessary to protect our environment and marine industries. If you do not do this who will? Given the above it is in the interests of the populace at large, the environment that cannot speak for itself, and our fellow Canadians in NB and PEI that the Proposal be rejected and continue on the path of closing the existing treatment facility.

Kind regards

From: @dal.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 10:04:11 AM

Project: replacement_effluent_treatment_facility_project Comments: March 8, 2019 IN RESPONSE TO: Dillon Consulting Limited 2019. Northern Pulp Nova Scotia environmental assessment registration document: replacement effluent treatment facility. https://www.novascotia.ca/nse/ Prepared by

Dalhousie University. Professor. Department of Community Health and Epidemiology, School for Resource and Environmental Studies, Rowe School of Business Dalhousie University. Assistant Professor. School for Resource and Environmental Studies. *Explanation of key topics provided below, when comments become available for public viewing. Dear Honourable Margaret Miller, Minister of Environment, The following is a response to the misrepresentation put forth by Northern Pulpâ?Ts Environmental Assessment EA of the scientific contributions our study, Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia Hoffman et al. 2017, provides. We would appreciate that you consider our rebuttal. This was a â?opilotâ? study as indicated by the title and subsequent sections of the study therefore, it was not meant to provide causal evidence to implicate the presence of airborne VOCs as solely emanating from Northern Pulp â?othe millâ?, as the EA suggests. Nevertheless, we were interested in documenting VOC-related air quality in the vicinity of the mill, given that pulp mills are present across rural Canada. Publicly accessible Environment and Climate Change Canada ECCC data VOC concentrations [Granton NAPS ID: 31201, located southwest of the mill], and local meteorological conditions [Caribou Point] http://climate.weather. gc.ca/climateData/ http://maps-cartes.ec.gc.ca/rnspa-naps/ were examined using temporal 2006â?"2013 and spatial analytic methods to investigate prioritized air toxic ambient VOC concentrations near a pulp plant to determine whether these emissions concentrations were in the range of US EPA air toxic levels EPA 2015d https://www3.epa.gov/ttnamti1/files/ambient/airtox/nattsworkplantemplate.pdf. Results highlight associations with wind direction and the Granton NAPS siteâ?Ts ambient VOC concentrations in relation to the location of the mill. Compared to all other wind directions, prevailing winds from the northeast and the mill typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations however as stated in the study, the origins of VOCs are â?oinconclusiveâ?, and â?oother local sources likely contribute to air toxics emissionsâ?. The millâ?Ts EA states that â?o[this study] did not attempt to rule out contributions from other potential sources of VOCs in the areaâ?, which is clearly not a true statement - other potential local emission sources were discussed in detail in the publication. Figure 1, for example, is a map displaying other local point source emitters in the community e.g., tire manufacturing facility, coal-fired thermal electrical generatin g station. VOCs 1,3-butadiene, benzene, and carbon tetrachloride routinely exceeded EPA air toxics-associated cancer risk thresholds, regardless of whether the mill contributed to these VOC levels, and is a significant finding that warrants further investigation. The EAâ?Ts statement: â?oWhen other study uncertainties are considered [â?¦] there is no current air quality issue with the seven targeted VOCs in the Pictou County areaâ? is misleading. Due to the limited number of sampling sites, the problem with the location of the sampling site in relation to the location of the mill, and the short duration of our study, we explicitly identified the need for further investigation on this question. As commonly identified by environmental researchers, absence

of evidence is not necessarily evidence of absence. Therefore, the limitations caused by sparse data does not necessarily mean there is no problem with air emissions in this community and there is no justification for this erroneous con clusion, as stated in the EA. The EA statement, â?oThe seven VOCs are not known based on literature review to be associated with pulp and paper mill activities and air emissions to any significant extentâ?, is both unclear and undefined. Furthermore, the EA does not specify how the literature was reviewed/cited to support this statement. According to the millâ?Ts own self-reported NPRI report in 2012, 143.18 tonnes of VOCs were atmospherically emitted on-site ECCC 2012. An estimated 3.195 tonnes of benzene were released to the air from a stack higher than 50 m and 0.022 tonnes were released within 50 m of the ground. Benzene can combine with chlorinated hydrocarbons associated with the Kraft bleaching process to form a range of toxic compounds which can be volatilized. Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not officially reported to have been released by Northern Pulp, these VOCs may become airborne through evaporation from pulp and paper wastewater Soskolne and S ieswerda 2010. Boat Harbour the millâ?Ts effluent treatment facility may therefore contribute to ambient concentrations of VOCs. The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane EPA 1985. However, we address other local and area sources which likely contribute to the observed VOC concentrations, which warrants further investigation. We note that direct links between 1,3-butdiene and vinyl chloride with pulp and paper industries have not been reported in the scientific literature to date. With regards to the EA statement, For the carcinogenic inhalation TRVs that were applied, the authors did not adjust these values from the default USEPA target cancer risk level of 1 in 1 million to the target cancer risk level that is current public health policy in Nova Scotia and most other provinces i.e., 1 in 100,000. Thus, the TRVs for carcinogens cited in the paper should have been ten times higher than indicated. This correction would alter the conclusions of the study substantially in that for the seven VOCs considered, there would be no to negligible exceedances of the TRVs that were appliedâ? , their proposal is not relevant given that Health Canada has no formal standards for air toxic emissions, and we were not looking at environmental remediation sites only background community concentrations. In contrast, the US NATA process is based upon a 2005 scientific risk assessment process well laid out by EPA which established the cancer risk levels to which the ECCC da ta were compared Hoffman et al. 2017. Furthermore, it should be stated that our study was published in an excellent, internationally-recognized environmental science peer-reviewed journal Environmental Science and Pollution Research and met the journalâ?Ts quality control standards. To reiterate the value of this study: â?oDespite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with pulp and paper emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in pulp and paper towns and contribute to poor health in nearby communities.â? Various recommendations were put forth to improve the rigor and validity of the present study e.g., a field component consisting of real-time measurements of ambient air toxics a comprehensive risk assessment to investigate uncertainties that have implications for risk estimates in the present study. Furthermore, we addressed various limitations and gaps in air quality monitoring, not only locally but nationally, and provided recommendations how air quality management could be improved to support informed public health decisions e.g., epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate considerations, as outlined more strategically placed air monitoring stations evaluation of a wide-suite of air toxics - topics ECCC and applicable stakeholders should consider. To the contrary and to our surprise, the Granton NAPS station has been decommissioned. This information vacuum only

emphasizes the need for more research on these questions. In summary, the intent of this pilot study was to address local air quality conditions in a Nova Scotia rural community, which clearly indicates the need for further investigation. Moreover, this pilot study serves as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of all citizens is safeguarded and prioritized. *Explanation of key topics Hoffman et al. 2017: â?¢ There is growing concern about the toxicity of volatile organic compounds VOCs Cicolella 2008, their presence in air, and the consequences of long-term, low-dose exposure to these agents. Airborne VOCs are varied and widespread pollutants e.g., hydrocarbons, aromatics, and some chlorinated compounds and are increasingly recognized as important precursors to PM2.5 and ground-level O3 formation through photochemical reactions Ryerson et al. 2001. Many VOCs are included in the US Environmental Protection Agency EPA air toxics list. â?¢ â?oAir toxicsâ? are defined as â?othose pollutants that cause or may cause cancer or other serious health effects [â?¦] or adverse environmental and ecological effectsâ? EPA 2015a. â?¢ Ambient air monitoring in the US is conducted in accordance with the Clean Air Act CAA Clean Air Act 1970. CAA amendments identify 187 air toxics, which form the basis for EPAâ?Ts approach to regulating emissions EPA 2015a. Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas EPA 2015b. Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment NATA, a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics EPA 2015c. Such a rigorous initiative has not been implemented in Canada, where no federal guidelines exist for ambient air toxics. Yet, some of these air toxics, as noted in our publication, have been identified as associated with increased risks for chronic disease. See, for example, Paul Villeneuve et al. 2013 https://www.ncbi.nlm.nih.gov/pubmed/23369806 which showed an increase risk of cancer mortality associated with elevated ambient air benzen e concentrations in urban Toronto. â?¢ NATA calculates concentration and risk estimates from a single yearâ?Ts emissions data. The risk estimates assume a person breathes these emissions each year over a lifetime or approximately 70 years. NATA only considers health effects from breathing these air toxics. It ignores indoor hazards, contacting or ingesting toxics, and any other ways people might be exposed.â? https://www.epa.gov/national-air-toxics-assessment/nata-overview â?¢ The National Air Pollution Surveillance NAPS program was established to monitor and assess ambient outdoor air quality at various urban and rural areas across Canada. This program focuses primarily on the criterion air pollutants nitrogen dioxide, ozone, PM2.5 and sulphur dioxide. Several EPA-designated air toxics are routinely quantified in Canada however, at a subset of NAPS monitoring sites. â?¢ VOCs selected for analysis in this investigation were based on EPAâ?Ts list of 30 urban air toxics EPA 2015b and National Air Toxics Trends Station Work Plan Template EPA 2015d. Therefore, this investigation represents one of the few peer-reviewed published studies on record about airborne VOCs in rural Canada. References: Cicolella A 2008 Volatile organic compounds VOC: definition, classification and properties. Rev Mal Respir 25:155â?"163 Clean Air Act 1970 Clean Air Act, SS 1986-87-88, c C-12.1. http://www.canlii.org. Accessed 5 Oct 2015 Environment and Climate Change Canada ECCC 2012 Facility substance information. http://www.ec.gc.ca/. Accessed 29 March 2015 Hoffman E, Guernsey JR, Walker TR, Kim JS, Sherren K, Andreou P. 2017. Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia. Environmental Science Pollution Research International. Environ Sci Pollut Res 24:20685-20698. doi:10.1007/s11356-017-9719-5 Ryerson TB, Trainer M, Holloway JS, Parrish DD, Huey LG, Sueper DT et al 2001 Observations of ozone formation in power plant plumes and implications for ozone control strategies. Science 292:719â?"723 Soskolne CL, Sieswerda LE 2010 Cancer risk associated with pulp and paper mills: a review of occupational and community epidemiology. Chronic

Dis Can 29:86â?"100 U.S. Environmental Protection Agency EPA 1985 Survey of chloroform emission sources. http://www3.epa.gov/. Accessed 15 Oct 2015 EPA 2015a About air toxics. http://www3.epa.gov/. Accessed 18 Oct 2015 EPA 2015b Urban air toxic pollutants. http://www3.epa.gov/. Accessed 21 Sept 2015 EPA 2015c National air toxics assessments. http://www3.epa.gov/. Accessed 21 Sept 2015 EPA 2015d National air toxics trends station work plan template. http://www3.epa.gov/. Accessed 16 Oct 2015 Villeneuve PJ, Jerrett M, Su J, Burnett RT, Chen H, Brook J et al 2013 A cohort study of intra-urban variations in volatile organic compounds and mortality, Toronto, Canada. Environ Pollut 183:30â?"39 Name: Email: @dal.ca Address: Municipality: Privacy-Statement: agree x: 87 y: 19

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 10:15:36 AM

Project: replacement_effluent_treatment_facility_project Comments: It is soon time for those responsible for the stewardship of our planet aka governments to realize that as a very wise man once said â?oYou cannot eat moneyâ?o. Name: Email: @ns.sympatico.ca Address:

: Privacy-Statement: agree

x: 51 y: 9

From: @cfifinance.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 10:27:56 AM

Project: replacement_effluent_treatment_facility_project Comments: To Whom It May Concern: I am writing to express my strong support for Northern Pulp Nova Scotia in its efforts to build a new effluent plant and in support of their request that they be given an adequate extension beyond the time-line in the Boat Harbour Act to allow them to complete this task without a shutdown. I have been in the finance business servicing the forestry, transportation and construction sectors for over thirty years and am also a woodlot owner. I am very familiar with the amount of economic activity generated by a mill such as Northern Pulp. The forestry industry in Nova Scotia is very integrated with each part of it depending on the other. Northern Pulp provides the largest market by far for the by-products of our lumber mills which depend on these sales for their very survival. Northern have also been very beneficial to small woodlot owners. When a person does intensive forest management, commercial thinning, etc. and removes low quality wood, Northern Pulp provides a market for that product, so the landowner can afford to do that type of forest improvement. They provide a market for our low-quality wood at a fair price. They also provide access to silviculture funding for land owners. Northern Pulp in not only a driver of our forestry industry and our rural economy, it is a driver for all of Nova Scotia. They are the largest single customer of the Port of Halifax accounting for roughly 40 of the port business. Without the volume of forestry related freight going out there will be a lot less incentive for ships to come in so it is easy to see that the economic spin-off from this operation is as important to our urban economy as it is to the 100â?Ts of rural communities that depend on the forestry industry. Without this pulp mill, a number of sawmills in NS will be forced to shut down and the demand for our forestry products will collapse and in turn, so will the prices for them. Without viable markets our forestry contractors and truckers will be bankrupted, and our woodlot owners will have no economic incentive or financial resources to manage their land properly. Forest land will be devalued. The jobs from this industry create tax dollars that are much needed to support the demands of Nova Scotians for better health care, education and infrastructure. As a Chronical Herald article once said, â?oyou canâ?Tt build an economy off of whale watching and BBâ?Ts.â? To be prosperous our economy needs industry that actually creates wealth. No one, including myself, argues with the fact that there needs to be a new more efficient effluent plant and that the current practice of dumping that waste in Boat Harbour must stop. That being said, Northern Pulp didnâ?Tt create this situation. They inherited it not 10 years ago when they purchased the mill, a purchase made on the basis there being a lease of the Nova Scotia government owned effluent plant in place until 2030. Since their purchase, they have vastly reduced emissions from the mill largely at their own expense. They are attempting to build a state-of-the-art treatment facility that will replace Boat Harbour with an unreasonable, arbitrary deadline while being fought every step of the way by various interest groups. In summary, Northern Pulp is critical to the survival of our forestry industry and its closure would also be a very substantial body blow to our economy as a whole. If the Boat Harbour effluent plant is unavailable it cannot go on hot idle as Stora did when it ran into difficulty. If this plant shuts down, even for a short time, it is done. After 30 years of effluent going into Boat Harbour, the incremental harm done to the environment by an extension to allow Northern Pulp the required time for the environmental review, permitting and construction etc. does not justify making this mill close. Northern Pulp needs to be given the time needed to navigate the process and to finally build and commission this state-of-the-art effluent plant and be one of the long term economic drivers our economy needs and be able to continue to

generate the wealth we as Nova Scotians desire and deserve. I strongly support that their proposed effluent plant be approved and that there is an extension of the Boat Harbour Act deadline to give Northern Pulp the time to complete the task. Regards,
Name: Email: @cfifinance.com Address:

Privacy-Statement: agree x: 27 y: 6

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 10:53:53 AM

Project: replacement_effluent_treatment_facility_project Comments: I strongly support giving Northern Pulp an extension to construct their treatment facility. They currently meet or exceed current regulations and the new facility will improve the effluent. The province needs more wealth producing industries that employ highly skilled, well paid Nova Scotians and all the supporting jobs and industries. We all consume products made from Kraft pulp every day, tissue, toilet paper, paper bags, diapers, paper, etc.so why would we not benefit from this plant. There are many hundreds of such plants in the world, the closest in the middle of Saint John, New Brunswick, they all have an odour and they all have an effluent flow, many discharge into lakes and rivers and most are much larger than this mill. Canada has some of the toughest environmental regulations in the world. I agree Boat harbour should be shut down, lets stop complaining and move forward and solve this. Name: Email: @eastlink.ca Address:

: Privacy-

Statement: agree x: 55 y: 26

From:
To: Environment Assessment Web Account
Subject: NORTHERN PULP NOVA SCOTIA ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT Replacement Effluent Treatment Facility
Date: March 8, 2019 10:56:47 AM
Attachments: 20190308 EA SubmissionPDF.pdf
CaribouShipGroundingsAndWrecks20190305.pdf

Attached please find my submission requesting there be no pipeline emptying into the Northumberland Strait or Caribou Harbour. In addition, my details for the research I've done confirming 22 ship groundings and wrecksin Caribou Harbour and environs.
Thank you.

Virus-free. www.avg.com

NORTHERN PULP NOVA SCOTIA ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT
Replacement Effluent Treatment Facility

Public Input Submission
Contact Information:

.(Health Education)

@gmail.com

Firstly, I acknowledge the economic benefits Northern Pulp brings to the community, volunteer sector and non-profit groups. For 22 years, I have called Caribou Island my home. Within my line of vision in the harbour, I see Farming, Fishing (sport and commercial), Forestry, Tourism, and Active Living co-existing and integrated. I do not see the Northern Pulp pipeline and outfall as compatible with the highest and best use of Caribou Harbour and the Northumberland Strait. The "quality" of the partially treated effluent is by Northern Pulp's admission not expected to be an improvement from that of Boat Harbour i.e. temperature, salinity, TSS etc. The elements that are not treated onsite at the proposed ETF will still be at polluting levels in the pipeline for example BOD's and then dispersed in the Northumberland Strait by dilution and will negatively impact the Marine environment. There is no indication that pipeline leak prevention monitoring is different from Boat Harbour – visual. For damage by ice, ice scour, or malfunction from sediment, the diffusers will be checked by divers but no frequency is indicated other than annual. **To come into a sensitive ecosystem with minimal monitoring is unthinkable**. As to air emissions, there is inadequate information as to the new sludge burning in the power boiler at maximum production, the emissions and the impact to existing scrubber? Precipitator? capacity. More recently, a significant methyl mercury contamination is reported to exist adjacent to the proposed replacement ETF. There is not enough clarity about heavy metals and the potential health impacts.

I request that the Caribou option be rejected by the Honourable Minister because of the significant environmental effects that can't be mitigated:

Please note that the map used in the Executive Summary does not show Gull Spit as a notable geographic feature. The Canadian Hydrographic Services nautical chart used by Makai Engineering in Appendix F, Figure 1 shows only half of Caribou Harbour but does indicate the presence of Gull Spit which relates to the **narrow silting harbour entrance.** A nautical chart shows water depths, land elevations, North orientation, marshlands, tidal information, watercourse feeding Caribou Harbour. **I request that the Honourable Minister and any other reviewers of the application be made aware of what appears to be an oversight in the Executive Summary as it could impact one's understanding of the significance of Gull Spit to the harbour flushing capacity and sedimentation.** Without Gull Spit noted, the map in the Executive Summary implies a wider harbour entrance.

The ferry channel is dredged regularly due to sedimentation. A May 2008 Transport Canada report about the most recent ferry dredging is found at: https://www.canada.ca/en/news/archive/2008/05/federal-government-improves-caribou-nova-scotia-ferry-terminal.html. The proposed NP pipeline marine portion of the 15.5 km route would run parallel to the ferry channel. In pipeline construction, 4.1 km of a trench 3 metres deep and 10 metres wide would increase sedimentation in the harbour and off of Caribou Point. The description of armour stone to cover the proposed pipe could also change the sediment patterns in the harbour and off of Caribou Point : creating a new artificial "reef(s)" that crosses the harbour perpendicular to the harbour entrance and then parallel to the Caribou Island south shore. Gull Spit at the harbour entrance is a significant feature as is the Nature Preserve, Munroe's Island (opposite Gull Spit) which is part of the Caribou Provincial Park. Approximately 30 years ago, the Little Caribou Entrance to the harbour was still open but is now connected to Caribou Park because of sedimentation. The modelling in the Receiving Water Study which used July 2016 conditions shows that outfall effluent would be inside the harbour. *(Appendix E1-E2 Figure 2.11 CHB Discharge Simulated Effluent Concentration for Typical Tide – Slack High Tide at 11:00 July 22; Figure 2.12 CHB Discharge: Simulated Effluent Concentration for Typical Tide – Ebb Tide at 1400 July 22)* Yet in the application, there is no mention of the flushing capacity of the harbour. A mussel farm license was rejected approximately 18 years ago due to inadequate flushing. **Effluent sediment in Caribou Harbour would impact /reduce / eliminate prospects for existing and future non-polluting socioeconomic development.** To add another source of sediment in the harbour and environs is short-sighted and an avoidable negative impact. The impact of the 25-37 degree effluent as a 15.5 km thermal heat pump isn't addressed nor is the broad impact of cooling effluent in the strait and the currents created or altered by the diffusers and the temperature differential of the effluent and the receiving waters. Whether property sellers on the harbour would need to highlight effluent as one of the disclosure items has not been addressed and neither negative property value and tax base impact nor the quiet enjoyment of current owners.

In addition to the fishers who are based at the Caribou wharf, **Caribou Harbour has 4 Oyster licenses** – verified as current on the NS Department of Fisheries website. The pamphlet I recently obtained at NS Fisheries and Aquaculture, "Harvesting Shellfish in Atlantic Canada" 2004, indicates that "Three federal government agencies work together to deliver the CSSP (Canadian Shellfish Sanitation Program) : Environment Canada, the Canadian Food Inspection Agency and Fisheries and Oceans Canada." "An international reputation for quality and safety". Also, the application does not include what Priority Substances (Canadian Environmental Protection Act, Priority Substances List Assessment Report No. 2, Effluents from Pulp Mills Using Bleaching 1991) are in the effluent when it exits the diffusers. **Backflow of effluent to the harbour** is possible because of the harbour's Easterly exposure, including Nor'easter's. High sustained winds with tides and surges flooding land of low elevation and saltwater marshes. The food chain that is impacted and can't be mitigated because of the scope of the Caribou Harbour ecosystem, impacts food security. There are also climate change predictions for low lying land of at least 1.5 metres.

I was aware of **2 sunken ships in Caribou Harbour** so did a scan of some public records **(Eastern Chronicle, Pictou Advocate, Maritime Museum of the Atlantic, The News) and**

found <u>not 2</u> but 22 reports of strandings and wrecks – a listing is attached. There were also 3 ferry crossing points from Caribou Island to "the mainland" years ago – one at the West end , one mid-island and one at the East end I don't know if there is evidence of old wharf pilings at the East end of the island but there are at the other 2 locations. This information relates to **Section 10.2.8 Discovery of a Heritage Resource.** The **Special Places Protection Act , Historical Sites & Monuments Board of Canada and the Heritage Trust of Nova Scotia** also need to be considered for ensuring that the Marine Heritage of Caribou Harbour and area is not sacrificed.

The ferry service operates from May 1 - December 20 between Caribou Harbour and Wood Islands PEI. There is no mention of the impact of pipeline construction sedimentation to accelerating the next channel dredging timeline or whether the contents of effluent sediment will curtail or complicate the ferry channel dredging in the future. The ferry is the only direct connection between PEI and Nova Scotia. Both provinces emphasize the natural setting and recreational activities in tourism promotion. **The ferry interacting with the effluent plume isn't addressed in the application; for example: colour, odour, froth and aerosolizing of the effluent** – potential negative impact to the iconic tourist experience that reaches beyond the ferry ride. Pictou Island is experiencing success as a recreational destination and that ferry also operates out of Caribou Harbour.

"Those who fail to learn from history are condemned to repeat it" – Winston Churchill, 1948. In 1994, an effluent pipeline proposal into the Strait was refused. What is different today? However, Jean Francois Guillot, Vice President Operations East with Paper Excellence Canada, owner of Northern Pulp stated in a *Northern Pulp Press Release, March 6, 2019.* "Northern Pulp's new wastewater treatment facility **will ensure no untreated wastewater ever leaves the site** and will then continue our practice of releasing treated wastewater into the Northumberland Strait." Honourable Minister, the promise is highly dependent on the criteria for the definitionof treated and pointedly omits the same assurance for the pipeline and effluent which is in my understanding no way close to the quality of the Middle River which is supplied to Northern Pulp for processing – defining "treated" to align with the public's understanding of treated isn't clear and wouldn't be further clarified until after operations are well underway. The comparison of the borrowed Middle River prior to diversion for processing, compared to the partially treated effluent at the outfall, then at the 360 degree? 100 metre mixing zone isn't addressed in the application. I disagree with Northern Pulp's standard for considering the effluent treated and ready for the pipeline. If onsite the processing allows for cooling of product and adjustment of process substances/chemicals, **why does the design of the Effluent Treatment Facility determine it as "pipeline ready" when the effluent is still at polluting levels when it leaves the ETF?** Who has the **Liability** for the effluent which escapes or is expelled offsite, on land and/or in the marine environment? This is not addressed in the application and isn't that related to mitigation? Reversing the effect may not be possible so is a significant environmental effect. There is an old saying about closing the barn door after the horse is out.
The implication is that "new" or "replaced" means improved. What I've understood is that the effluent will be the same and TSS will be increased, therefore **not an improvement**. I believe this is misleading to the public and may have affected understanding and responses about this application. The temperature and salinity are not managed onsite. Public engagement sessions about the Caribou site could have provided this distinction. The Nov. 2017 engagement panels

are not all applicable to the Caribou option. Because there was no public engagement session, I request that the Minister allow time for public comment on any new information following the Honourable Minister's decision. If thought could be given to the variety of literacy levels, that would make the information more accessible.

"One of the most environmentally responsible mills in Canada". Northern Pulp promotes it's smaller footprint for partially treating it's effluent onsite but doesn't acknowledge and to my understanding doesn't include the continuation of that footprint as the pipeline is laid adjacent to Pictou's watershed or the **pipeline's end destination in lobster grounds at risk for losing international certification for the Maritime lobster fishery.** The footprint comparison is a false assurance as is the comparison to other mills which can't be compared reliably to this unique setting.

Negative effects for emissions from burning the sludge are unclear. There must be a thorough analysis of what will be burned, the by-products, the precipitates and the potential health effects before adding to our air.

Caribou River Cottage Lodge, Pictou Lodge, Waterside Beach Provincial Park, Munroe's Island & Caribou Provincial Park, the Fisheries including the Caribou Harbour Oyster Licenses, Gull Spit narrowing the harbour entrance, the 22 ship groundings/ wrecks, the sedimentation conditions that already exist, the Pictou Watershed, no improvement to the effluent, location of the outfall in an ecologically sensitive area, the fluctuating ice conditions with no indication of protection of the diffusers from ice scour, the lack of an early warning detection plan for leaks or pipeline/diffuser loss of integrity, the migratory bird flyway, the numerous sensitive salt water marshes, dune grasses, edible beach plants, the flushing challenges of the harbour, the low lying farmland that is flooded by tides and surges, negative impact to cottage rentals and property values / transactions / leases just as the province has simplified short term rentals, the ferries that are being improved to "green" standards churning through the effluent plume, the present and future uses that are in direct opposition to the polluting presence of the effluent outfall. Algae impact to Caribou Harbour is an example of how the balance may be tipped before any testing occurs. In appendix J1-1 the prediction for algae effect in Caribou Harbour won't occur until "after" the pipeline is commissioned. There is no indication in the application as to how this could be mitigated after the fact. Would the pipeline be closed or continue to be permitted to pollute if testing post commissioning determined issues not in keeping with the predictive modelling? Local knowledge is relevant to this application. There is insufficient time for this project to meet the legislated obligations to PLFN for January 31, 2020.

I do not support the acceptance of this application. This is not a grandfathering of an operation. Relocation of the effluent outfall adds new layers of complexity and risk.

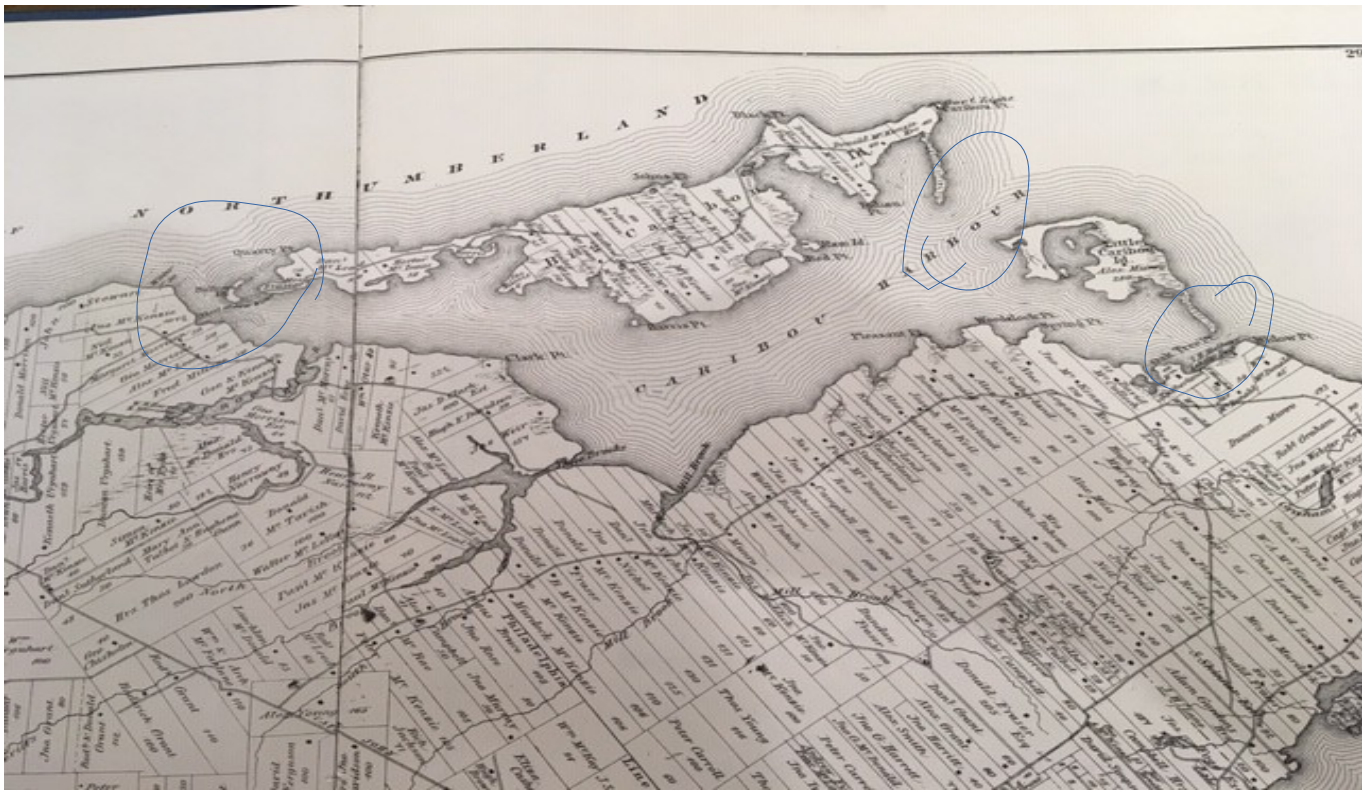
Respectfully submitted,

March 8, 2019

Caribou Harbour Ship Groundings and Wrecks

Caribou Island at Hector Centre , Pictou, NS 2019-02-28 The local papers are a source of marine incidents. To be noted, the list of **22 incidents** is not exhaustive.

Map of Caribou Harbour from Illustrated Historical Atlas of Pictou County Nova Scotia, J.H. Meacham & Co., 1879 shows 3 entrances to Caribou Harbour. 1 at the west end referred to as Ford at Low Tide (a sandbar). Little Caribou entrance referenced with the HILDA was at the southeast of today's (2019) Munroe's Island. Both of those have since silted in and the one remaining entrance - "Big Entrance" - is regularly dredged for the ferries to PEI.



KEY:

E.C. Eastern Chronicle; P.A. Pictou Advocate; M.M.A. Maritime Museum of the Atlantic On the Rocks (novascotia.ca/museum/wrecks/wrecks/year.asp)

E.C. Jne 25, 1846 pg. 3

Brigatine **JUSTINE**, Capt. Smart of and from St. John's, Nfld., bound for Pictou, went ashore June 19th at the big entrance of Carriboo Harbour

E.C. Dec.3, 1846 pg.3

Schooner **CATHERINE**, Webster, master, ashore at Carriboo Harbour – part of cargo taken without damage, taken to Ch'town to be sold by Lloyd's agent

E.C. Nov.28,1850 pg. 3
Schooner **SPREE**, of Ch'town, Capt. Griffiths. Was wrecked Nov. 21st at Carriboo Island
E.C. Nov. 29, 1855 pg.3
Schooner **HELEN**, Matatall, master of Tatamagouche was wrecked on Carriboo Island on the 24th inst.; crew saved
M.M.A. **HARRIETT** 1868-10-17 stranded Caribou Island
Schooner, leak, loss, ran ashore
Voyage from Pannel Bay. Registered at Arichat, NS
M.M.A. **SHANNON** 1868-10-17 stranded Caribou Island
Brigatine loss cause of event – unknown "No room to wear"
Voyage from Georgetown to Charlottetown
M.M.A. **EMMA** 1870-06-09 stranded Caribou Point
Brigatine loss judgement error total loss
Voyage from France to Quebec
M.M.A. **BELLE** capsized and sank July 1, 1875 Capt. William Biggar. (?July 8, 1875)
M.M.A. **OCEAN** 1875-09-04 (01?) stranded Caribou Island tonnage 353
Barque loss fog
Voyage from Cardiff, South Glamorgan, Wales to Quebec, Quebec, Canada
Registered at Memel, Klaipedos, Lithuania
M.M.A. **MARY HART** 1875-10-24 stranded Caribou Island Shoal, Pictou Harbour (note: I think this is an entry error and would more likely be Caribou Harbour, not Pictou Harbour) tonnage 26
Schooner loss stress of weather Total loss Cargo accounted for $200 of loss
Voyage from Cheticamp, NS Registered at Arichat, NS
M.M.A. **ELLEN** 1875-11-20 stranded Caribou Harbour, entrance tonnage 49
Schooner loss Navigation Error Mistook Light Partial loss
Voyage from Charlottetown, PEI to Pictou, NS Registered St. John's Nfld.
M.M.A. **NANCY** 1879-10-19 stranded Caribou Island tonnage 63
Schooner loss stress of weather capsized and stranded Total Loss Cargo accounted for $250 of loss
Lives Lost 5
Voyage from Richibucto, NB to Pictou, NS Registered Shelburne NS
M.M.A. **MAGGIE** 1883-11-17 stranded Caribou, off tonnage 85
Schooner loss stress of weather snowstorm partial loss
Voyage from Bermuda to Charlottetown PEI Registered at Hamilton, Bermuda
M.M.A. **EMMELLE** 1885-04-11 wrecked Caribou Island tonnage 100
M.M.A **HILDA** 1886-05-09 stranded Little Caribou Entrance tonnage 719
Barque loss stress of weather total loss

Voyage from Liverpool Merseyside, England to Pictou, NS Registered at Pictou, NS
M.M.A. **CAPE BRETON** 1887-11-07 Foundered Caribou Island tonnage 100
Dredge loss stress of weather partial loss
Voyage from Wallace, NS to Pictou, NS
M.M.A. **BOUNTY** 1887-12-20 stranded Cariboo Island tonnage 55
Schooner loss stress of weather partial loss Cargo accounted for $300 of loss
Voyage from Charlottetown, PEI to Pictou, NS
M.M.A. **UNION** 1910-07-20 stranded Caribou Island tonnage 77
P.A. **CHARLES A. DUNNING** 11 Oct. 1951 P. 1
Ferry grounded on Gull Rock, Caribou Island
P.A. **SAULT AU COCHON** Nov. 12, 2010 Barge grounded on reef off Munroe's Island / Caribou Provincial Park High winds and 4 metre seas

The News July 16, 2015, Excerpted from Past Times, John Ashton.

"... Pictou County has had accounts reported of buried treasure within its seacoast and landmass. Some are very well known, such as the buried gold of Caribou Island. The story has been passed down for generations and attempts have been made over the years to retrieve the riches. Supposedly, in 1755 a French frigate buried a large cache of gold destined to pay the soldiers at Quebec. They built a "well of stone" and deposited the bullion deep within its rock walls. Over the years attempts have been made to recover the fortune, but have proved unsuccessful. Ghostly sightings at night have been reported of French sailors walking about the beach near Gullrock Lighthouse protecting their stash."

"Another well-known buried treasure story was reported in Rev. George Patterson's A History of the County of Pictou, 1877. A French war ship containing salvaged treasures had escaped the British attach on Louisburg, Cape Breton, in 1758. The French vessel was chased into Caribou Harbour and eventually beached at a little inlet off the Little Caribou River. Instructions were left with the Mi'Kmaq First Nation people that if discovered by the English, the craft was to be burned. The father and uncle of Pictou Deputy Sherriff Thomas Harris found the abandoned French ship. When they returned with implements to move her, she had been torched. Forty-four years later a vessel was reported travelling up the Caribou River at night and in the morning the people of the area discovered a shallow hole dug at the head of tide where all clues point to a buried treasure dig. This author visited this site in 2007 and could see the actual areas that had been dug and examined by treasure seekers...."

"John Ashton is the Nova Scotia Representative for the Historical Sites & Monuments Board of Canada and the Regional Representative for the Heritage Trust of Nova Scotia. "

From:
To: Environment Assessment Web Account
Subject: Addendum to my submission to proposal for NP replacement ETF
Date: March 9, 2019 10:31:30 PM

I request the following references I had misplaced be added to my submission - context for some of my comments.

Table 4.2-4 Pg 67-68 " Preliminary modelling indicated that Pictou Harbour has limited mixing with the Northumberland Strait - water in Pictou Harbour tends to stay within the harbour. Though treated, effluent would therefore result in the accumulation and increasing concentration of residual contaminants contained in the treated effluent over time. Given the discharge rate, effluent contamination accumulation could result in result in negative effects on the harbour over time." The application does not support why Caribou Harbour was clearly deemed better than the Pictou Harbour site even in **Table 6.7-1.** Nor did it illustrate an overlay of nautical maps of both sites to clearly show Caribou Harbour as inferior to the already rejected site. The statement does confirm that when Northern Pulp uses the term "treated effluent" or "treated wastewater" throughout its application and in public engagement , that **when treated, the effluent will accumulate and concentrate residual contaminants over time.** The distance between the 2 points is less than 6 km. An average walker can do that distance in an hour and a half. If compared by modelling for an average current, the time from effluent outfall would be less than that.

Appendix I-1 "all treatment will occur on site" - this contradicts the admission that the effluent will accumulate and concentrate residual contaminants over time. Dilution postpones, not treats and is retrogressive. Together with today's (March 9/2019) report in the Halifax Examiner that a Dalhousie researcher is claiming misrepresentation of her air emissions report in the application, the application has gaps.

Appendix I-1 Panel 6 Footprint "Can the process fit on the mill property, without impacting adjacent natural features and property owners?" There is an omission that the part that doesn't fit on the property, namely the pipeline and the effluent coming from it, would have impacts on adjacent natural features and property owners. The term footprint is not sufficiently defined and skews the understanding of the degree of benefit being claimed by Northern Pulp.

2.4 "....potential environmental effects of the project have been considered for all phases of the project including those potentially arising from credible accidents, malfunctions, and unplanned events." Ship groundings and wrecks are part of the history of the CHB option but no mention in the assessment and no indication of updated , effective monitoring , for the effluent parameters and integrity of the pipeline and diffusers.

2.5.2 Env. Protection Measures " Siting of the marine outfall to minimize the potential impact to marine water quality." Contradictory to I-1 that all treatment will occur on site.

Please note in Appendix E1, Figures 2.11 and 2.12 must be zoomed to more accurately see the simulated effluent in CHB. There is no scale and it isn't entered on a nautical chart. The other figures in that section.are likely the same. Without that, the key is of limited benefit unless the reviewer knows to zoom in. Very limited, and misleading to a reviewer not familiar with CHB. It would be more transparent and credible to cue the reader to zoom to view and to indicate the altitude.

Appendix E3 2.2 Far-Field Modelling Results "Modelling provides relatively higher dilution and less potential effluent impact on Caribou Harbour water. ...transported predominently with the off-shore currents in northwest and southeast directions. The effluent intrusion into Caribou Harbour is predicted to be minimum" The words in this statement are indefinite and more of a wait and see. Given what is at stake environmentally, this too low a standard to go forward with this application.

4.2.5.3 Marine Civil Engineering Geotechnical Considerations "Caribou Island has not had this study".
5.3.1.10 Appendix F Pipe Installation "Removal and disposal of dredged material is not anticipated." The 4.1 km long, 3 metre wide trench for the 1 metre pipe will displace seabed material. The 2008 ferry dredging under Transport Canada's jurisdiction was barged and disposed on land. What information was not included in the application to explain why there would not be removal and disposal?
Land to Marine (Near Shore) Connections "The near shore portion of the pipeline will require planning and management of worksite construction and logistics affected by water depth, fluctuating tidal levels, and ice scour." The application does not indicate why this would be acceptable at CHB but not at Pictou Harbour less than 6 km.away - a conflicting unsupported statement.
5.6.2 Air Contaminant Emissions "Potential for odour to be perceived." This is not sufficiently described.
5.7.2.7 Marine Environment 5th bullet refers to protecting the pipeline from ice scour but doesn't address diffuser protection. This would be an oversight and an error with negative consequences.
6.5 "Engineering considerations for Caribou Harbour" These are not clearly laid out to show the distinction from Pictou Harbour which is more detailed. This is a significant gap for reviewers and can't support CHB as a viable option, just as for the rejected Pictou Harbour option.
Table 6.6-1 Typo? I believe the year would be 2019, not 2018 (Native Council of Nova Scotia shows January 10, 2018)
Table 6.7-1 Effluent quality "Point C results and the discharge from the proposed facility will be similar." The proposed ETF will not be improving the effluent state.
"Fresh water from Middle River makes its way to the Northumberland Strait whether NPNS uses the water or not, therefore the same volume and fresh water mixing occurs naturally." This is a **false** statement. What is "natural" (from my understanding of the term) is the Middle River entering Loch Broom, then Pictou Harbour, then the Strait - fresh water and saltwater mixing occurring along the way by tides and currents and temperature and salinity ambient. The Northern Pulp manmade intervention is **not natural.** In the application, the Middle River is diverted at Loch Broom, to use in mill processes including the proposed ETF, then pumped from the mill site for 15.5 km via pipeline with the last 4.1 km on the seabed before being discharged at velocity from 3 diffusers set 25 meters apart and 100 more metres before predicted to be at ambient temperature and salinity.
7.0 Integration of Study Components "Under the nearshore effluent dispersion scenario, the potential effects zone based on the sublethal toxicity testing is within 323 metres of the discharge at Boat Harbour. Under the offshore effluent dilution scenario, the potential effects zone extends to greater lengths (to ~ 7.3 km)". The accumulation would still occur but in an extended zone. The modelling uses the 85% figure for predominant southeast and north west flow. There is no comment on the modelling of the other 15% which I believe would include winds and currents that come up the harbour from any easterly direction. There would also be currents intersecting from the west across the north shore of Caribou Island. There is no mention of this as part of the modelling.
Many residents who live elsewhere far and wide for the winter have been away during this process. Although I registered face to face in Nov 2017 at the New Glasgow engagement session, by email and online, I didn't receive the update notifications volunteered by Northern Pulp - not one. **Appendix I1 Panel 17 "**We are particularly looking for your input on the recommended route and outfall area (Nov. 2017). I did give input to the Pictou option and again with the Caribou option but didn't receive a response except for one where NP defended

its history of effluent into the strait as a given for the future.
I believe there must be a solution to safe, non-polluting effluent management that doesn't infringe on others. Caribou Harbour and the Northumberland Strait isn't an acceptable choice.
As a stakeholder, I don't give permission for effluent or residue on my property.
Thank you for adding my reference points to my submission.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 11:07:52 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@bellaliant.net)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Pipe Proposal
Date: March 8, 2019 11:08:45 AM

Dear Minister McKenna,

I am writing to you regarding Northern Pulps Replacement Effluent Treatment Facility Project.

My name is . I have lived in Nova Scotia for my entire life. I come from an extensive line of fishermen that have fished the waters of the Northumberland Strait for years and years. I have grown up in the fishery, and am currently employed by my father, whom I help run a commercial license. The fishery is important for my family, as my brother has recently purchased a commercial license of his own and we are all employed in the Fishery. This setup is very common in this area, and many people depend on the Strait to make a living and it is key to our way of life. The potential impact of this project has the possibility to absolutely ruin my way of life and cripple my family and friends. Its these reasons that I am so invested and concerned about this project.

I wish to raise three points of concern with the project.

First, as a fisherman I am concerned, that the proposed effluent pipe will be a detriment to the local fisheries, including that of lobster, rock crab and herring. The proposed outfall location is premium breeding grounds for all of these fisheries, and are of grave importance to the local area, as well as the entire economy of Nova Scotia. I feel as though there should be a greater deal of importance placed on protecting these fisheries. The science provided in Northern Pulps proposal is outdated, being conducted in the 1960's. Our industry is under constant pressure to evolve and become more sustainable and improve our fishing methods as well as our conservancy methods. How can a large corporation, who is not even Canadian owned, come in and attempt to infiltrate our waters, and not be subject to more severe outside pressures to ensure that what they are doing is not only scientifically acceptable but also morally right. Just because they claim that the effluent technically passes whatever loose requirements imposed by the federal pulp and paper mill guidlines, does not mean that is morally right to be pumping anything into the ocean. All levels of government have been claiming that we need to protect the ocean, that we need to cut down on pollution and begin to care for our environment because we won't have it forever. How can someone say this but then consider pumping effluent full of toxins into the ocean. The Government can't have it both ways and are going to have to step up to the plate. Is big industry more important than the health and well being on not only the Environment and ecosystem of the Northumberland Strait, but as well as the health and well being of the people that live there. Nova Scotia is considered Canada's ocean playground, and that's for good reason, the province is surround by the ocean. But what happens if Northern Pulp wants to start pumping their effluent into that playground? No ones going to want to play there anymore.

A separate point I would like to bring up is the monitoring of the pipe and its wellbeing. My main point being that how will the pipe be monitored? They claim that the accidental

release of effluent can occur. There is an example of this in the fall of 2018 when a ruptured pipe was discovered by a passerby in the Pictou Landing First Nations area. How can Northern Pulp claim to monitor their systems when a pipe rupture was undetected on land, let alone if the pipe was buried in the sea floor. I feel as though this risk needs to be better assessed because the potential for effluent to leak throughout the pipeline is very high. This applies for both the sections, land and ocean. This can pose problems for the fisheries and the marine ecosystem in the marine environment, but just as big a problem on land as the pipe is running right through the town of Pictou's water shed. I am sure the residents of Pictou do not want any effluent in their drinking water. Risking these aspects seem to be a very great risk that Northern Pulp is willing to take. I feel as though if the effluent leaking and entering the environment is seen as a problem, why is the idea of pumping it into the Northumberland Strait seen as an acceptable means of disposing of effluent in the first place?

Finally, this entire process, with the timelines put forth in the entire process, is once big farce. Northern pulp has had 5 years, to put together this large report on the entire project. That's fine. Where I draw the problem is that we as a concerned public, have only a fraction of that time, to formulate any concerns and put them forth to the government. In fact, the time line for concerns is only 30 days. This to me is a gross miscalculation. It is a hardly fair that the public has so little time to critique and raise concerns on a project that could potentially have a lasting and detrimental impact on the entire Northumberland Strait region, including that in neighboringprovinces of New Brunswick and Prince Edward Island. This raises an aside to my main point. That being that why is the Government of Nova Scotia the one to make the decision when the Northumberland Strait is a body of water the impacts three separate provinces. As a fisherman, everything I do is monitored and controlled by the federally department of fisheries and oceans. They control everything in the fishery, as a federal body. So why does this decision that has the potential to impact everything mentioned above, being made by a provincial government? This does not seem right. Especially when you take into consideration that the Government of Nova Scotia has funded the planning and design of this project, and as well has helped the Pulp Mill with monetary funding and aiding them over the years with extended boat harbor leases or example, so that they can continue their environmental racism uninterrupted. All this seems to lead to the conclusion the that Government of Nova Scotia is unable to make this decision with a clear and concise conscience and therefore should defer and have the choice put into the hands of the Federal Government so that a more thorough investigation and assessment can take place so that everything is out in the open and there will be no more secrets and fear in the community. Because right now there is fear and division. And all this could be fixed by the Government if they aid on the side of caution, and don't give into the Mill once again. Don't let them have their way anymore. This project should be a Federal issue. No more romance between Northern Pulp and the Provincial Government.

Restating the three reasons that I oppose this project,

1) Lack of sufficient research regarding the Fisheries
2) Lack of monitoring and potential disastrous leaks
3) An underhanded process that only helps Northern Pulp and the overlooking of the Nova Scotian Government that this is a Federal issue

These points are a handful of reasons that I believe this project should be handed over to the Federal Environment Minister. This entire project should be subject to extreme scrutiny and not be taken lightly. A decision that impacts three separate provinces and millions of people should have to be approved by simply a few days' worth of thinking and processing. I plead that the Federal Government be involved, and the that the Northumberland Strait be taken care of and not be put at risk.

Thank you

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 11:16:18 AM

Project: replacement_effluent_treatment_facility_project Comments: Partially treated effluent is not acceptable for the otherwise pristine waters of the Northumberland Strait. The present effluent from Boat Harbour is already beyond acceptable, and I understand that the suspended solids in the proposed effluent will be even higher than the present Boat Harbour situation. â?¢Pumping partially treated effluent into the Northumberland Strait has the potential of contaminating its waters and destroying the lucrative fishery and important recreation industries of the area. It is important to strongly reject this Project as the people of NS are still dealing with the destruction at Boat Harbour and certainly do not need the threat of a similar occurrence in the Northumberland Strait!! Name: Email: @ns.sympatico.ca Address:

Privacy-

Statement: agree x: 51 y: 17

From:	@outlook.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 8, 2019 11:19:28 AM

Project: replacement_effluent_treatment_facility_project Comments: I am writing to express my strong support for Northern Pulp Nova Scotia in its efforts to build a new effluent plant. I believe they must be given an adequate extension beyond the time-line in the Boat Harbour Act to allow them to complete this task without a shutdown. Northern Pulp provides the largest market for by-products of our lumber mills providing small wood-lot owners who remove low quality wood through intensive forestry management and commercial thinning a market at a fair price for this product. Northern Pulp in not only a driver of our forestry industry and our rural economy, it is a driver for all of Nova Scotia. As the largest single customer of the Port of Halifax with roughly 40 of the port business. Without the volume of forestry related freight going out there will be a lot less incentive for ships to come in so it is easy to see that the economic spin-off from this operation is as important to our urban economy as it is to the 100â?Ts of rural communities that depend on the forestry industry. Without this pulp mill, our forestry contractors and truckers will be greatly impacted, and woodlot owners will have no economic incentive or financial resources to manage their land properly. Forest land will be devalued, and jobs in these, and other industries will be lost. This industry generates tax dollars that are much needed to support health care, education and infrastructure for those who live and want to live here. There needs to be a new more efficient effluent plant and that the current practice of dumping waste in Boat Harbour must stop. However, Northern Pulp inherited this situation less than 10 years ago when they purchased the mill, with the commitment that the Nova Scotia government owned effluent plant would be in place until 2030. Since their purchase, they have vastly reduced emissions from the mill largely at their own expense and are attempting to build a state-of-the-art treatment facility that will replace Boat Harbour with an unreasonable, arbitrary deadline while being fought every step of the way by various interest groups. As a parent of young professionals who want to live and work in Nova Scotia, I am very concerned that this type of action will make it impossible for them to raise their families here. After 30 years of effluent going into Boat Harbour, the incremental harm to the environment by an extension which would allow Northern Pulp the required time for the environmental review, permitting and construction does not justify forcing this mill close. Northern Pulp needs to be given the time needed to navigate the process and to finally build and commission this state-of-the-art effluent plant and be one of the long-term economic drivers our economy needs and be able to continue to generate the wealth we, as Nova Scotians, desire and deserve. I strongly support the proposed effluent plant be approved, and an extension of the Boat Harbour Act deadline be given to allow Northern Pulp the time to complete the task. Name: Email: @outlook.com Address:

: Privacy-Statement:

agree x: 63 y: 14

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 8, 2019 11:20:04 AM

Northern Pulp is absolutely horrible in multiple ways. It has to close. I want my kids to grow up in a healthy environment as they should. This environmental disaster has operated because of narrow minded politicians. Shut it down.

Sent from my iPhone

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 11:45:04 AM

Project: replacement_effluent_treatment_facility_project Comments: I have studied the executive summary for this project and the science certainly supports this project and the continued operation of the Northern pulp mill. To that end an limited extension to the Boat Harbour facility operation is warranted. In granting that, the PLFN people MUST be considered with guarantees and compensation for their contribution to the long term economic viability of Pictou County and Nova Scotia as a whole. Name: Email: @gmail.com Address:

: Privacy-Statement: agree

x: 53 y: 15

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 11:54:07 AM

Project: replacement_effluent_treatment_facility_project Comments: I hope that Minister Miller, and DOE staff, have read the compelling commentaries on the Northern Pulp proposal by Linda Panozzo and Joan Baxter that have appeared on March 7 and 8 in the Halifax Examiner. It is excellent investigative reporting and certainly deserves careful consideration. I find it convincing. Name: Email: @eastlink.ca Address:

Privacy-Statement: agree x: 45 y: 20

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 12:28:40 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@rogers.com)

London, ON

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 12:31:48 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@seasidehighspeed.com)

From:
To: Environment Assessment Web Account
Subject: Northumberland Strait = Abercrombie Point
Date: March 8, 2019 1:19:17 PM

Installing a treatment facility on mercury-contaminated land at Abercrombie Point with an effluent pipe to release treated effluent directly into fishing grounds in the Northumberland Strait would be environmentally damaging; this action would adversely affect marine life and the waters it inhabits and on which it depends. Please reconsider and reject this proposal. Thank you.

From: @eco-nova.com
To: Environment Assessment Web Account
Subject: Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 8, 2019 1:22:19 PM
Attachments: COAC 19 Northern Pulp Effluent .pdf

Clean Ocean Action Committee
P.O. Box 363
Clark's Harbour
Nova Scotia, Canada
B0T 1P0

March 8, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442 Halifax, NS,
B3J 2P8 Submitted via email: ea@novascotia.ca

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

Good Day Minister Miller,

Please find attached a letter concerning the Clean Ocean Action Committee's comments on Northern Pulp's Replacement Effluent Treatment Facility Project.

Thank You for your consideration.

Regards,
Director
Clean Ocean Action Committee

Clean Ocean Action Committee
P.O. Box 363
Clark's Harbour
Nova Scotia, Canada
B0T 1P0

March 8, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442 Halifax, NS,
B3J 2P8 Submitted via email: ea@novascotia.ca

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

Good Day Minister Miller,

The Clean Ocean Action Committee (COAC) was formed in 2015, as a consortium of vessel owners, Captians, crew members, fish plant owners, operators and workers whose livelihoods are completely depend on a healthy, sustainable ocean and bountiful fish stocks. We represent over 9,000 individuals totally dependent on the renewable fishery resources on the Scotian Shelf, Georges Bank and the Bay of Fundy. COAC formed to provide fishers and fish processors a unified voice to promote the maximum protection for the renewable ocean resources that have formed the backbone of Nova Scotia's coastal economy for over 300 years.

This letter is to inform your "Environmental Assessment Branch" that we stand in solidarity with the Pictou Landing First Nation and the fishing and tourism industries of the Gulf of St. Lawrence and Northumberland Strait in opposition to the proposed Northern Pulp "Replacement Effluent Treatment Facility Project" and that we call on the Nova Scotia Government to reject this plan outright.

Just as with the oil and gas industry on the Scotian Shelf, Northern Pulp's environmental assessment submission does not prove a lack of significant risk and their report is missing critical data on many essential issues. The report contains insufficient evidence to assess exactly how broad any damage might be and gives no clear indication on what might be done to mitigate this damage should it occur. The company's claim that damage will be "minimal" is not credible and is not supported by the data presented within the report. There is no evidence indicating that the Northumberland Strait or even the Gulf of St. Lawrence can absorb the massive amount of toxic effluent which the Northern Pulp effluent project intends to pump into our fishing and lobster grounds. The Strait and the Gulf of St. Lawrence are already in a state of environmental stress brought on by the accelerating process of climate change. To add the

massive new insult of Northern Pulp effluent to these waters borders on criminality and cannot and should not be permitted. The Nova Scotia Government should be looking for ways to reduce environmental stresses in the Strait not proposing new processes which promote pumping in effluent which will only magnify and exacerbate existing problems.

The fact that Northern Pulp has not, with all the time allotted to them, developed a credible plan to clean up Boat Harbour and deal with their effluent is an insult and a slap in the face to all Nova Scotians. If Northern Pulp continues to refuse to develop and implement a functional and environmentally sustainable effluent treatment plan which does not include pumping toxins into Northumberland Strait we call on the government to stick with its deadline, to implement “The Precautionary Principal” and to close the Boat Harbour plant on the agreed upon date of January 31, 2020.

Most Sincerely,

Clean Ocean Action Committee

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 1:43:44 PM

Project: replacement_effluent_treatment_facility_project Comments: Voters and other residents who care about Nova Scotias economic and ecological future stand opposed to Northern Pulps Effluent Treatment plan. I want to be counted among those who affirm that the evidence points to the fact that the days of allowing massive pollution of our province â?" and others â?" by business interests must now come to an end. For best results, a moratorium on such practices is decades overdue, but it is better to stop now than never. Please disallow this plan, and insist that the Boat Harbour treatment area close on schedule. Clean and sustainable business is the future of Nova Scotia, and our region. There is no longer room for businesses who pollute our air and water we need them to sustain the life of this and future generations. Thank you for listening! Name: Email: @gmail.com

Privacy-Statement: agree x: 57 y: 26

From: @bellaliant.net
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 2:03:09 PM

Project: replacement_effluent_treatment_facility_project Comments: The multiple thousands of people in Nova Scotia, P.E.I. and New Brunswick depending for their livelihoods on a healthy marine environment in the Northumberland Straight cant be ignored and put at risk. An independent Federal environmental assesement needs to be done! Name:
Email: @bellaliant.net Address:

Privacy-

Statement: agree x: 61 y: 30

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 2:12:15 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@bellaliant.net)

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 2:14:32 PM

Project: replacement_effluent_treatment_facility_project Comments: It seems clear to me that the Northern Pulp Replacement Effluent Treatment Facility Project lacks significant data, fails to address the concerns expressed by the community and blatantly ignores the set timeline for the project. The government must reject Northern Pulpâ?Ts proposal and close the effluent treatment facility on schedule. Northern Pulpâ?Ts submission does not prove a lack of significant risk, and is missing critical data. In the proposal Northern Pulp admits that they do not know what will be coming out of the pipe. How can they claim there is no significant risk to the environment, to the fisheries and ecosystem of the Northumberland Strait and the people of Pictou County when they do not know the chemical composition of the effluent? When questioned by CBC television on their recent visit to Boat Harbour the representative from Northern Pulp aknowledged that the effluent will be no better than what is being released into Boat Harbour now. Boat Harbour is a disaster and currently subject to provincial Class 2 and a federal environmental assessment because of the dangerous mix of chemicals and the difficulty involved with removal and remediation. Their proposal to pump that mix of toxins directly into the Strait is simply unacceptable. As recently reported in the news, despite internal recommendations by Northern Pulp contracted consulting firm and marine biologist for a study on the potential impact of effluent on lobster larvae, no testing was done. This is a basic failure by the company to do their due diligence. The response from the companys spokesperson, that they would start testing once the new system was in place, is insufficient and insulting to all concerned. We cannot use the Northumberland Strait as a testing grounds for their pulp waste. The proposal to burn the dewatered sludge in the power boiler is also of significant concern. Issues with the power boiler, first noted to be problematic in 2006, have never been addressed. Particulate matter emissions have been exceeded from that aging stack on numerous occasions. Not knowing what chemicals will be in the sludge, coupled with a glaring lack of properly functioning pollution-abatement equipment in the stack that will be burning it, could spell much worse air quality for local residents. There is little mention of the mercury contamination on the former Canso Chemicals site directly adjacent to the proposed location of the new treatment facility. Disrupting this contamination on a site surrounded by water requires extreme caution and a full examination, but there is little mention of this in the proposal. There is insufficient evidence to know exactly how broad any damage might be. The companyâ?Ts claim that damage will be â?ominimalâ? is not credible and should not be accepted. Fisheries, tourism and outdoor recreation are important economic factors and should not be put at risk. Scientists warn that the Gulf of St. Lawrence is warming more rapidly than almost anywhere on Earth. Adding additional stressors to a system that is already stressed is not wise. The Northumberland Strait is an area that requires additional protection, not additional degradation. The companies request for an extension on the Boat Harbour act should also be rejected. The timelines were clear from the day the legislation was introduced. The mill is owned by a multi-national company that owns pulp mills around the world. They should have had no problem calling on the expertise available to them to complete this project on time. I know jobs will be an issue in this decision. I would simply say that the government should look at the amount of money provided to the mill over the years and commit to providing a similar amount to future business development in Pictou County. The mill claims that Pictou County will be lost without them, but I see a beautiful, historic town of Pictou that cannot attract citizens, businesses or tourists because of the cloud of toxic air from the mill. This project is simply not worth the risk. The precautionary principle means it is incumbent on

the Nova Scotia government to err on the side of caution. Reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project. If you donâ?Tt feel you can do this with the evidence before you, please call for a full Environmental Assessment report on this proposal.
Name: Email: @gmail.com Address:
:
Privacy-Statement: agree x: 51 y: 20

From: @mlb.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 2:22:56 PM

Project: replacement_effluent_treatment_facility_project Comments: The current Northern Pulp facility has operated under various ownership for over fifty years and since that initial startup, has progressively made improvements to lessen environmental impact. The EA submission by NPNS for construction and implementation of a new effluent treatment facility outlines a system far superior to that of which has ever been utilized at the Abercrombie site since 1967 and would be at the pinnacle for this type of technology when compared to any facility of this type on a global scale. There is no doubt that the current Boat Harbor site must be reclaimed after 50 years of operation as an effluent treatment facility, however, there must also be an allowance for an EA to be completed and consideration given to NPNS to complete the necessary work in a reasonable timeframe in order to install a state of the art treatment facility. In addition to the environmental considerations which must be assessed, the economic impacts must also be considered. With the legislated deadline for closure of the Boat Harbor site less than one year away, is it is undeniable that an effluent treatment facility project of this caliber cannot be completed within the timeline for closure as outlined in the Boat Harbor Act. Without an approved EA and extension to utilize the Boat Harbor treatment facility site, it would most certainly be catastrophic to the operations of the NPNS facility. The potential closure of Northern Pulp would affect the very foundations of the forestry/sawmilling sector in the Province of Nova Scotia, causing widespread mill and forestry operation closures, massive layoffs and a trickle effect of spinoff businesses feeling the negative impact of these closures. The overall economic outcome resulting from a closure of the NPNS facility would have a devastating effect on the overall economic status of the Province of Nova Scotia. Whether we want to believe it or deny it, forestry, in all of its facets is a major sector in the Province of Nova Scotia and for well over a century has been the backbone of many rural communities and one of the principal drivers in the provincial GDP. The future of the forestry sector and the economy in the Province of Nova Scotia hinges on responsible decisions in the upcoming months. Name: Email: @mlb.ca

Privacy-Statement: agree x: 63 y: 20

From:
To: Environment Assessment Web Account; @shiftcreativemarketing.com; @juniperlaw.ca; @eastlink.ca;
Subject: Review of Northern Pulp NS EA Registration Documents
Date: March 8, 2019 3:07:57 PM
Attachments: NPEA_EATechnicalReview_2019.03.08.pdf

Good afternoon ,

On behalf of the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, it is our pleasure to provide you with the attached technical review of the Northern Pulp Nova Scotia Environmental Assessment Registration Documents for the Replacement Effluent Treatment Facility.

If possible, please provide confirmation of receipt of the attached report.

Regards,

, B.Sc.
Aquatic Ecologist

Email: @sharedvaluesolutions.com
www.sharedvaluesolutions.com

Shared Value Solutions Ltd.
62 Baker Street
Guelph, Ontario
N1H 4G1

Shared Value Solutions Ltd. is a certified B Corporation and part of a growing movement of companies using the power of business to solve social and environmental problems.

Northern Pulp Nova Scotia Environmental Assessment Registration Document Replacement Effluent Treatment Facility

Technical Review of the EA Registration Document

March 8, 2019

Alison Fraser, MSc, QP$_{RA}$
(226) 706 – 8888 ext. 117
alison.fraser@sharedvaluesolutions.com

62 Baker Street
Guelph, ON, Canada
N1H 4G1

Shared Value Solutions

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8
Fax: (902) 424-6925

March 8, 2019.

On behalf of the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, it is our pleasure to provide you with the results of our technical review of the "Northern Pulp Nova Scotia Environmental Assessment Registration Document - Replacement Effluent Treatment Facility," dated January 31, 2019. In our professional opinion, the Project cannot be approved as currently registered. Given the numerous issues, data gaps and information gaps we have identified in the technical review, we recommend that the Minister, as per Section 13 of the Environmental Assessment Regulations made under Section 49 of the Environment Act, determine either that

- the registration information is insufficient to allow the Minister to make a decision and additional information is required (Section 13(1) (a)), or

- a review of the information indicates that there may be adverse effects or significant environmental effects caused by the undertaking and an environmental-assessment report is required (Section 13(1) (d)).

Please do not hesitate to get in touch with us if you have any questions or concerns with the enclosed report.

With best regards,

Project Director
Risk Assessment Specialist, Shared Value Solutions Ltd.

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Executive Summary

The Northern Pulp Nova Scotia (NPNS) proposed Replacement Effluent Treatment Facility (ETF) ("the Project") is regulated under the Government of Nova Scotia's Environmental Assessment Branch and is currently being considered a Class 1 assessment under the Province of Nova Scotia's environmental assessment (EA) process. The proposed ETF for the NPNS pulp mill is an AnoxKaldnes BAS™ process that will be designed to treat maximum wastewater flow of 85 MLD (62 MLD avg) and is based on a combination of traditional activated sludge treatment (AST) process with moving bed bioreactors (MBBR) for wastewater treatment. Following the public review period of the Class 1 EA Registration Documents for the proposed ETF, the Government of Nova Scotia's Minister of the Environment must decide if additional project information or reporting is required, or if the undertaking is approved or rejected.

As part of the public review period, Shared Value Solutions Ltd. (SVS), on behalf of the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, completed a technical review of the Environmental Assessment (EA) Registration Documents provided by NPNS. The review focused on the technical aspects of the proposed Project design, as well as the validity and comprehensiveness of the environmental effects assessment within the EA. The review yielded a number of issues and concerns related to potential environmental impacts. Where applicable, recommendations for each identified issue or concern, based on the professional opinion of SVS, are provided to the Minister herein.

From a plant design perspective, overall, the new proposed plant design appears to offer a more modern, high rate treatment option than the current wastewater facility design based on aerated stabilization basin (ASB) technology primarily using natural basins and poorly designed "release" (i.e., discharge) into the Northumberland Strait. The proposed design appears to offer increased capability to control operations and optimize treatment performance within a modern wastewater treatment plant than the current infrastructure. Waste solids management and closed loop design for clarifier sludge could be an added benefit of the proposed design. However, several issues and concerns were identified related to the ETF design that must be addressed including whether the EFT will be able to meet more stringent discharge regulations being considered in proposed revision to the *Pulp and Paper Effluent Regulations* (target publication date of 2021).

With respect to effluent modelling, the information provided is considered to be lacking or inadequate. A major limitation of the modelling work (Stantec 2017, 2018) has been the use of water quality data that are old, from different years, from different locations, and from Pictou Harbour instead of Caribou Harbour and the CH-B location. In addition, water-column stratification (ambient density) was not considered in the modelling and the non-tidal counter-clock flow gyre existing around Pictou Island (approximately 6 km from CH-B) was not included/combined with the southeast-northwest direction flow pattern. These limitations must be re-evaluated and included in the modelling, as the MIKE 21 and CORMIX predictions on effluent dispersal and effluent build-up are incorrect.

With respect to the potential for adverse environmental effects to occur as a result of the Project, there were numerous issues and concerns identified related to a lack of detailed assessment on the potential impacts to marine life. More specifically, NPNS has attempted to assess impacts using outdated literature, and without conducting any current field or lab assessments to understand both the short-term and long-term impacts of the proposed Project. Further, NPNS is not clear on what the actual effluent will be comprised of when it is released to the Northumberland Strait, nor does it fully consider the cumulative impacts of the known effluent over time. Without knowing the composition of the effluent (i.e., chemical concentrations), and with the lack of relevant existing environmental conditions data, it is unclear how NPNS can make any informed or accurate predictions on the potential adverse environmental impacts of the proposed Project on the marine environment.

Similarly, a human health risk assessment (HHRA) was not completed as part of the EA Registration Document submission. Rather, NPNS completed a Human Health Evaluation (HHE). A quantitative assessment of potential exposures to project-associated chemicals of potential concern (COPC), and resulting human health risks (if any), was not completed. This is, in part, due to the project-specific effluent chemistry not being fully known (result of the chemical process engineering design work not being complete). As such, the chemical composition of the effluent, including chemical concentrations, has not been fully characterized and potential risks to human health have not been quantified.

Based on a review of the socio-economic baseline information provided and effects assessment conducted of the local assessment area's social and economic environment, it is evident that information has been omitted that prevents an accurate analysis of the potential risks the Project will have on the region's economic and socio-economic wellbeing. Dismissals of adverse effects on fish and fish habitat are informed by a reported lack of, or outdated, data and are therefore misleading in assumptions. This, in turn creates a very low level of confidence in the predicted lack of effects on socio-economic related values and interests held by the region's stakeholders, public, First Nations and the fishing and fish processing sectors.

Overall, the EA does not acknowledge or address the magnitude of potential adverse socio-economic effects on the region's commercial fisheries and the thousands of (Indigenous and non-Indigenous) citizens who are dependent on a resilient fishery. Nor does it adequately consider or address the potential for adverse effects to the marine environment and human health. As such, in our professional opinion, the Project cannot be approved as currently registered. Given the numerous issues, data gaps and information gaps identified in the EA, and summarized below, we recommend that the Minister, as per Section 13 of the Environmental Assessment Regulations made under Section 49 of the Environment Act, determine either that

- the registration information is insufficient to allow the Minister to make a decision and additional information is required (Section 13(1) (a)), or
- a review of the information indicates that there may be adverse effects or significant environmental effects caused by the undertaking and an environmental-assessment report is required (Section 13(1) (d)).

Summary of Issues and Recommendations

The following is a summary list of issues and recommendations, as identified in the technical review that follows the Executive Summary. Numbering has been kept consistent between the summary list and main technical review for ease of reference.

Addendum Receiving Water Study:

- **2.1:** NPNS must provide modelling results for the proposed CH-A effluent discharge location.
- **2.2/2.7:** NPNS must provide a study on sea floor ice scouring at, and near, the proposed outfalls CH-A and CH-B and make recommendations on the best location for an effluent outfall diffuser.
- **2.3:** NPNS must provide field verification of the water column stratification, and these measurements, taken at the CH-A and CH-B locations, and other areas, should be part of a water quality survey.
- **2.4:** Provide a water quality study for the CH-A and CH-B locations and other related areas, including Caribou Harbour and the surroundings of Pictou Island, using numerous sampling stations. As part of this study, one or two reference areas should be considered with several sampling stations.
- **2.5:** Provide an explanation as to how to reconcile the input of MIKE 21 July data for use in CORMIX simulations for August–September, and possible implications of this on the study results.
- **2.6:** A rationale for not completing an industry-standard characterization of the effluent plume at CH-A or CH-B must be presented.

Effluent Treatment Facility Design

- **3.1:** Environment and Climate Change Canada has proposed updates to the Pulp and Paper Effluent Regulations (PPER), to account for changes in the pulp and paper industry, as well as to address findings from EEM studies indicating that the PPER do not adequately protect fish, fish habitat, and the environment (ECCC, 2017). NPNS must address whether or not the effluent from the project will meet the requirements of the proposed updates to the PPER.
- **3.2:** More information should be provided on the data collected in the lab trials conducted in Fall 2018 on the NPNS effluent and site visits to the two Kraft mills in Sweden using BAS™ technology in terms of specific water quality data (BOD, TSS, P, N & COD) and relevant regulations (current and proposed).

- **3.3:** Consideration of the non-biodegradable organic fraction within the effluent should be given, with more specific information on components in effluent that contribute to non-biodegradable fraction of COD, and any other efforts that could be considered in the pulp mill process design to lower COD in the mill effluent prior to biological wastewater treatment.

- **3.4:** More information needs to be provided on metal concentrations in the current ASB effluent (Point C) and metal concentrations expected to be found in the effluent of the proposed ETF.

- **3.5:** More detail should be supplied on (1) what "key performance indicators" will be monitored on daily basis, and (2) what monitoring/testing will be conducted on the influent into the ETF; specifically, what water quality and/or operational parameters will be part of this monitoring/testing framework.

- **3.6:** Historical impacts of the Boat Harbour Treatment Facility are of major concern. NPNS must clearly outline how the proposed effluent treatment facility will be designed and operated in a way that will mitigate the potential for similar environmental impacts to occur.

Effluent Modelling

- **3.7:** Summary information should be provided in the main EA text on both the Preliminary Receiving Water Study and the Addendum Receiving Water Study. How Mike 21 and Cormix models were used should be clearly stated.

- **3.8:** NPNS must provide a water quality study for the CH-A and CH-B locations and other related areas, including Caribou Harbour and the surroundings of Pictou Island, based on numerous sampling stations. As part of this study, one or two reference areas should be considered with several sampling stations.

- **3.9:** Provide a brief description in Section 8.11.5 of what the Follow-up and Monitoring Program entails.

Marine Fish and Aquatic Habitat

- **3.10**: In the interest of assessing the impacts to fish with the highest level of scrutiny and precaution, in our professional opinion, it is recommended that the Proponent should approach the EA with an analysis that goes beyond the provision of Serious Harm to a shift in focus on avoiding harmful alteration, disruption or destruction (HADD) of fish and fish habitat. This approach is being contemplated in the proposed *Fisheries Act* amendments under Bill C-68. Given the high level of concern from fisheries groups regarding harmful alteration, disruption or destruction of fish and fish habitat of the Northumberland Strait, and the potential adverse effects of the Project, Northern Pulp must assess the proposed activities and design of the Project in the context of HADD avoidance. This approach enhances the measures described within the EA.

- **3.11:** NPNS needs to provide more detail on spill response and safeguards against potential accidents or malfunctions along the terrestrial portion of the pipeline. Without this information, it is unclear how the Minister can make an informed decision regarding whether adverse effects or significant environmental effects may be caused by the undertaking and whether these effects can be mitigated.

- **3.12:** In our professional opinion, a comprehensive multi-year baseline study on all marine species present within the Northumberland Strait must be completed in order to understand potential adverse impacts that may result from project activities. Robust studies are required to better understand each species, and the potential impacts the project could have on each. This type of baseline study is the foundation of an EA, especially one focused on a project that has the potential to cause serious environmental impacts. The Minister needs to decide "w*hether environmental baseline information is sufficient for predicting adverse effects or environmental effects related to the undertaking" (Nova Scotia Environment, 2018).* We see no evidence of such baseline information in the EA.

- **3.13:** In our professional opinion, a more detailed environmental assessment that considers all potential fisheries in the Northumberland Strait needs to be completed to adequately assess project impacts. The EA should consider every species fished commercially in the area and should look at sensitivities of all of those fish to changes in water quality and negative health effects of contaminants

- **3.14:** The Environmental Management Plan and the Environmental Protection Plan must be completed and circulated for review and consultation with stakeholders prior to the project being approved. The Project should not be approved until all stakeholders have been consulted on all environmental protection measures within the Environmental Management Plan.

- **3.15:** The proponent must provide more detail on what is meant by moving the alignment to the centre of the road, and on which watercourses, in particular, they intend to carry this out.

- **3.16:** In our professional opinion, geotechnical assessments must be completed and reviewed by project stakeholders. This information is required before the Minister can make an informed decision on all potential impacts of the project. In addition, the Environmental Protection Plan must address prevention and emergency response related to horizontal directional drilling.

- **3.17a:** The EA must provide more details on mitigating benthic disturbance and subsequent TSS mobilization during pipe construction in the Northumberland Strait.

- **3.17b:** The EA should examine the possibility of horizontal directional drilling (HDD) to facilitate the placement of the pipe into the Northumberland straight. HDD could reduce the risks of in-water works that could significantly impact fish and benthic communities.

- **3.18a:** The EA must outline species-specific limits of tolerance with respect to the above parameters described as well as upper and lower limits for chemicals specific to mill effluent. A robust assessment of how changes to the marine environment, and the discharge of effluent contaminants, impact species inhabiting the area must be completed in order to understand impacts of the proposed project.

- **3.18b**: The proposed changes to the PPER must be considered when addressing the species-specific effects including a quantitative evaluation of the impact of the proposed changes on the assumptions and conclusions of the EA.

- **3.19:** In our professional opinion, a project of this magnitude warrants comprehensive field work investigations to be completed. NPNS should conduct a comprehensive baseline assessment to characterize current conditions of the marine environment within the project assessment area, including sediment and water quality.

- **3.20**: The proponent should collect and analyze current water quality data, from the proposed outfall location, in order for the EA to adequately assess impacts to the water quality from the project, and to adequately plan for preventing or mitigating those potential impacts**.**

- **3.21:** Northern Pulp must collect current and relevant data on sediment characterization at the proposed outfall location.

- **3.22:** Proper research needs to be completed to understand possible effects of the effluent on herring spawn, including sub-lethal effects. A rebuilding plan for herring is currently being developed to ensure the regrowth of the stock, and therefore any potential impacts to herring spawn must be fully considered in the EA.

- **3.23:** Research must to be completed to understand possible sub-lethal effects of the effluent on mackerel eggs. Currently, the stock is in the critical zone (DFO, 2017) and a rebuilding plan is being developed to ensure the regrowth of the stock. The EA must clearly assess how potential impacts from the project could affect stock regrowth.

- **3.24:** Atlantic sturgeon must be considered in the assessment, and potential impacts to the species identified.

- **3.25:** As stated in Appendix R of Northern Pulp's EA Registration documents, it is recommended that more research be completed on the effect of the effluent on lobster in each life stage. It is important to highlight that the recommendation given in Appendix R regarding more research on the effect of effluent on lobster must be followed through and completed.

- **3.26:** Detailed field assessment on the sea scallops that inhabit the area near the proposed outfall location must be completed prior to the release of the proposed effluent to ensure there

will be no negative effects on the sea scallops. Otherwise, it is unclear how the Minister will be able to determine if adverse effects or significant environmental effects are likely to occur.

- **3.27:** Detailed field and lab work must be carried out as part of a comprehensive EA that assesses and quantifies sublethal, chronic and cumulative effects on lobster larvae. The level of stakeholder concern regarding lobsters warrants the need for increased scientific understandings and fulsome assessment of impacts, in order for the Minister to make an informed decision regarding potential impacts of the project to lobster.

- **3.28:** Individual species cannot be pinpointed to specific locations within the Northumberland Strait. They do have traditional habitat and areas they are commonly found, but individuals are not restricted to these areas only. The ability, and likelihood, of each species to move throughout the Northumberland Strait must be considered and accounted for in a robust environmental assessment.

- **3.29:** The Northumberland Strait must be also assessed as an interwoven and interdependent ecosystem, not only on an individual species by species basis. NPNS must consider these ecosystem impacts in a more comprehensive and robust environmental assessment. Otherwise, it is unclear how the Minister will be provided with sufficient information to make an informed decision about the likelihood of adverse impacts.

- **3.30:** Despite the PPER regulations, given the high level of concern expressed by the public and harvesters, a biological monitoring program should be implemented prior to final commissioning of the proposed treatment plant and effluent outfall. The collection of this baseline information will significantly strengthen the interpretive power of the biological monitoring program as a whole. This baseline information will allow the biological monitoring program data to be analysed in a BACI (Before-After-Control-Impact) framework so that potential effluent related effects can be considered both spatially (i.e., exposure vs. reference) and temporally (i.e., pre-discharge vs post-discharge).

- **3.31:** Again, despite the PPER regulations, in our professional opinion, and due to the high level of concern expressed by the public and harvesters, the biological monitoring program should be implemented and remain continuous as soon as effluent is released to the Strait. Considering the level of concern from stakeholders in the region and coupled with the uncertainty of the effluent composition and the limited collection of existing environmental condition data, it is imperative that NPNS implement a robust continual biological monitoring program prior to effluent discharge and that continues through operations.

- **3.32a:** The EA must consider both lethal and sublethal effects of the Project and must go beyond the provision of “serious harm” to incorporate how effects, other than direct mortality, could negatively impact the fisheries of the Strait.

- **3.32b:** In addition, analysis and monitoring of lethal and sublethal effects should be carried out independently of one another on locally important species such as lobster, crab, herring and Atlantic salmon.

Marine Mammals

- **3.33**: An ERA is required that considers ecological receptors, including marine mammals such as North Atlantic Right Whales, who may be exposed to chemicals of potential concern from the proposed project.
- **3.34**: The assessment of project effects on the marine mammals, sea turtles, and marine birds VEC (Section 8.13) is considered to be incomplete and underscores the need for NPNS to conduct field studies for this project, especially given growing uncertainty regarding the distribution of North Atlantic Right Whales in their summer foraging range.
- **3.35a:** NPNS must provide more detailed information on visual surveying methods and consider completing these in combination with other marine mammal monitoring methods such as the deployment of passive acoustic monitors or aerial (helicopter or drone) surveys.
- **3.35b:** NPNS must provide more information on Marine Mammals Observer (MMO) monitoring requirements, including information on reporting intervals, accessibility of reports to stakeholders, and whether reporting will trigger any adaptive management measures.
- **3.35c**: NPNS should consider requiring marine mammal monitoring during all project activities that require vessel travel.
- **3.36a:** More detailed and definitive information on the vessel traffic (including vessel type, size, route, speed, schedules) that will be required to complete Project activities must be provided and considered in the EA, given potential impacts to marine mammals.
- **3.36b:** NPNS should ensure that observers are present on all Project vessels to identify the presence and location of marine mammals and to ensure appropriate mitigation measures outlined in EA Section 8.13.3.2 are adequately triggered and implemented.

Cumulative Effects

- **3.37:** The EA must assess cumulative effects of the proposed project on the marine environment, in light of current stressors that have already been identified, including increases in surface water temperature and salinity, as well as decreases in oxygen saturation.
- **3.38:** Discussion is required around the interactions between potential impacts from the new ETF discharges from the outfall, and ferry discharges within the harbour and Strait, and in turn the implications for ecological and human health risks, from a cumulative effects assessment standpoint.

Human Health

- **3.39:** A robust and comprehensive assessment of potential health risks (i.e., through the completion of a Human Health Risk Assessment) is required in order to determine if adverse health effects from the project are likely.
- **3.40:** An adaptive management plan should be provided to address discrepancies between project assumptions and predictions, and what is found to occur in the environment once the project begins. This plan should include an assessment of changes to predicted risks to human health, should the project assumptions not hold true.
- **3.41:** The assessment of potential risks to human health associated with the project requires a fulsome understanding of both the exposure concentrations of Contaminants of Potential Concern (COPC) in the marine environment, and the exposure pathways identified as being of concern to human health (i.e., the consumption of fish and shellfish).
- **3.42:** A more robust assessment of baseline conditions (such as water quality, sediment quality, land use patterns, fish consumption rates and other relevant environmental attributes) must be completed prior to project approval, to understand potential risks to human health related to the project.
- **3.43:** NPNS must confirm that the pilot study will be completed to evaluate the potential impacts to air quality due to the combustion of hog fuel and sludge in the power boiler and must outline adaptive management strategies should the results of the air monitoring and pilot study not align with the assumptions and predictions of the current assessment.
- **3.44:** If 2018 air monitoring data are available from Stantec (2019), they should be included in the assessment.
- **3.45:** Details are required regarding adaptive management measures, to address the potential for actual air emissions to be greater than predicted emissions (based on modelling exercises).In addition, further discussion in the EA is needed regarding what is meant by an artifact of model inputs related to modelled exceedances of H_2S (Section 9.2.4.1).
- **3.46:** The potential risks to human health associated with cumulative impacts of the project and current stressors must be considered in the assessment.

Socio-Economics

- **3.47:** Provide information on the pipeline's lifecycle length and anticipated activities for its decommissioning (i.e., expansion, upgrades, replacement etc.)
- **3.48:** NPNS must include VEC, and more importantly, a robust and consistent effects assessment on indicators related on the acknowledged VEC "health of communities" to capture missing elements of health and wellbeing, including the protection of a resilient fishery and associated economies including harvesting and processing plants; employment, analysis of economic risks and/or benefits at community, regional and provincial level; description for, and management plans for anticipated workforce at both construction and operation phases.

- **3.49a:** Apply an actual ecosystem and integrated approach for the effects assessment that considers VEC interdependencies and an economic risk analysis to other economic sectors in the region – fisheries in particular.
- **3.49b:** Provide a detailed description of the region's economic reliance on commercial fisheries, including individual harvester economic baselines and dependencies as they relate to fishing.
- **3.49c:** Provide analysis of the Project's construction and operation phase effect mechanisms and interactions with harvesters' ability to fish (in terms of access); as well as potential risks to fishing economy due to risks to species' habitat, spawning area integrity and health.
- **3.49d:** Describe how individuals within the lobster fishery (and other fisheries) will be compensated or accommodated for losses as a result of the Project's construction and/or operations activities. An explicit acknowledgement of the adverse economic impacts (and in turn social impacts on regional and community wellbeing and health) for fishers when even just a few days of fishing are interrupted is critical for a balanced effects assessment.
- **3.50:** NPNS must provide a balanced and accurate description of the existing regional socio-economic context, including regional health and wellbeing dependencies on the fish harvesting and fish processing sectors. Using complete baseline information, an economic effects assessment is required that carries forward information referred to within the baseline section including: project effect mechanisms and interactions with existing fisheries economic sector, at a granular level i.e., net losses anticipated due to forecasted days of interruptions due to construction and operations); human health effect mechanisms and interactions with economic risks related to fish processing plant operation requirements and interactions with effluent discharges; project workforce requirements; wages and salaries, and supply chain procurement needs during both construction and operations.
- **3.51:** Provide more baseline information describing the specific aspects of the tourism sector within the LAA that have inter-connections with water – either from recreational usage or from drinking and/or other water uses. These details would be relevant within an eco-system approach to the socio-economic impact assessment**.**
- **3.52:** NPNS must provide information and analysis of the following:

    - Discussion and analysis of risks and in turn, potential adverse social impacts to individuals and families who rely on uninterrupted or undisturbed access to the fisheries; including mitigations for avoiding this adverse impact.

    - Identification of positive socio-economic effects from employment during the 21-month construction period as well as operations and maintenance. It is acknowledged that the project description states that no additional jobs would be created during operations as existing personnel would be retrained for the new facility. Both phases of the Project need to be discussed in terms of what economic benefits would occur (even if no change during operations) within the socio-

economic effects assessment. This allows the impact evaluation to demonstrate both the potential negative as well as the potential positive socio-economic impacts that would be predicted as a result of the Project's various activities, including employment generation and associated indirect and induced impacts during the 21 months' construction.

- A description of human and ecological health pathways, project interactions and effect mechanisms within the socio-economic effects assessment including a human health risk assessment (i.e., drinking water within the LAA's wells; recreational water usage; Indigenous community members' land uses, water and wild foods consumption).

- A discussion and demonstrated planning for health and safety considerations of the surrounding communities as related to construction, should there be a temporary, non-resident workforce hired for construction. Include whether the construction workforce will be housed in surrounding local communities and/or within temporary workcamps. How many workers are anticipated to be hired for the construction phase?

- **3.53a:** NPNS must provide discussion and analysis of potential effects to the health and integrity of the region's commercial fisheries based on results of more comprehensive effluent modelling, data upgrades and effects analysis as per the results of this EA's technical review of these inter-dependent VECs.
- **3.53b**: NPNS must provide discussion and analysis of tourism impacts and human health risks related to Indigenous land and resources, and non-Indigenous lands and resources (i.e., drinking water and marine based recreation).
- **3.53c:** NPNS must provide discussion and analysis of potential impacts of pipeline operations and maintenance (specifically integrity digs) on land and resource use for both Indigenous and non-Indigenous citizens.
- **3.54:** NPNS must provide more fulsome consideration, description and commitment for specific mitigation, management and monitoring measure to address both the ecological and social factors related to the Project's activities at construction and operations as listed in previous comments.
- **3.55**: NPNS must provide a balanced and accurate description of the existing regional socio-economic context, included regional health and wellbeing dependencies on the fish harvesting and fish processing sectors. Using complete baseline information, an economic effects assessment is required that carries forward information referred to within the baseline section including: project effect mechanisms and interactions with existing fisheries economic sector, at a granular level (i.e., net losses anticipated due to forecasted days of interruptions due to construction and operations); human health effect mechanisms and interactions with economic

risks related to fish processing plant operation requirements and interactions with effluent discharges; project workforce requirements; wages and salaries, and supply chain procurement needs during both construction and operations.

1.0 Introduction

Shared Value Solutions Ltd. (SVS) was retained by the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, to conduct a technical review of the Northern Pulp Nova Scotia (NPNS) Environmental Assessment (EA) Registration Document for the Replacement Effluent Treatment Facility (the Project). The purpose of this report is to provide a critical technical review of the EA report prepared by Dillon Consulting Ltd. (Dillon, 2019), which is intended to subsequently inform the Minster's decision regarding project approval. The report aims to outline scientific data gaps and deficiencies in the EA that may result in adverse effects or significant environmental effects, or a lack of sufficient information to determine whether such effects might occur, should the Project proceed.

The review was conducted by:

- . – Risk Assessment Specialist and Project Director (SVS)
- – Aquatic Ecologist and Project Manager (SVS)
- Managing Partner (SVS)
- . – Environmental Scientist and Project Coordinator (SVS)
- – Wildlife Biologist (SVS)
- – Senior Community Development Specialist (SVS)
- Senior Aquatic Scientist (Lebeau and Associates Inc.)
- Wastewater Treatment Specialist

1.1 Review Objectives

The objective of this review is to outline data gaps and deficiencies in the EA. This has been completed using best science and professional judgement. It must be noted, as set out in Section 34(1) of the *Environment Act*, that the Minister must demonstrate that all of the following pieces of information were considered in formulating her decision*:*

- *The location of the proposed undertaking and the nature and sensitivity of the surrounding area;*
- *The size, scope and complexity of the proposed undertaking;*
- *Concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking;*

- *Steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people;*
- *Whether environmental baseline information submitted under subclause 9(1A)(b)(x) [of the Environmental Assessment Regulations, which states "Environmental baseline information"] for the undertaking is sufficient for predicting adverse effects or environmental effects related to the undertaking;*
- *Potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitat;*
- *Project schedules where applicable;*
- *Planned or existing land use in the area of the undertaking;*
- *Other undertakings in the area;*
- *Whether compliance with licences, certificates, permits, approvals or other documents of authorization required by law will mitigate the environmental effects;*
- *Such other information as the Minister may require*

As such, we expect that the Minister will consider all technical review comments contained within this review during the decision-making process, and address concerns accordingly.

1.2 Project Description

The Northern Pulp bleached kraft mill is located at Abercrombie Point adjacent to Pictou Harbour in Pictou County, Nova Scotia and has been operating, under various ownerships, since 1967. The mill produces bleached kraft market pulp at a rate of 280,000 to 300,000 air-dry tonnes per year (ADt/y). Currently, the mill's effluent is treated at a wastewater treatment plant located in the western portion of Boat Harbour, 3.5 km east of the mills across the East River. The current treatment plant consists of constructed sedimentation basins and a natural basin prepared with baffle curtains. Prior to the effluent being released into the Northumberland Strait via a weir in Boat Harbour, it passes through a large, natural final polishing/ stabilization basin. The *Boat Harbour Act,* which was enacted in May 2015, calls for the use of the current Boat Harbour effluent facility to cease as of January 31, 2020. As a result, a new wastewater plant and effluent discharge will be required prior to the 2020 deadline.

The proposed effluent treatment facility, as described in the Project EA report, will use a biological activated sludge process that combines Moving Bed Biofilm Reactor (MBBR) technology with conventional activated sludge. After the effluent has undergone treatment, it will travel along a 15.5 km long effluent transmission pipeline which follows the Highway 106 right-of-way for 11.4 km, then enters

the water adjacent to the Northumberland Ferries marine terminal and continues for 4.1 km. The effluent pipeline will be buried and weighted down using concrete collars. The effluent transmission pipeline will continue through Caribou Harbor to the Northumberland Strait, where it eventually terminates at an engineered marine outfall northeast of the Northumberland Ferries marine terminal (Figure 1). It is proposed that the effluent pipeline will end at a 50 m long diffuser with three outlets spaced 25 m apart. The proposed outfall will be capable of discharging up to 85,000 m^3 of treated effluent per day, with a peak discharge velocity of 4.6 m/s from each port. The Proponent predicts that the proposed outfall design will result in an approximate dilution ration of 144:1.

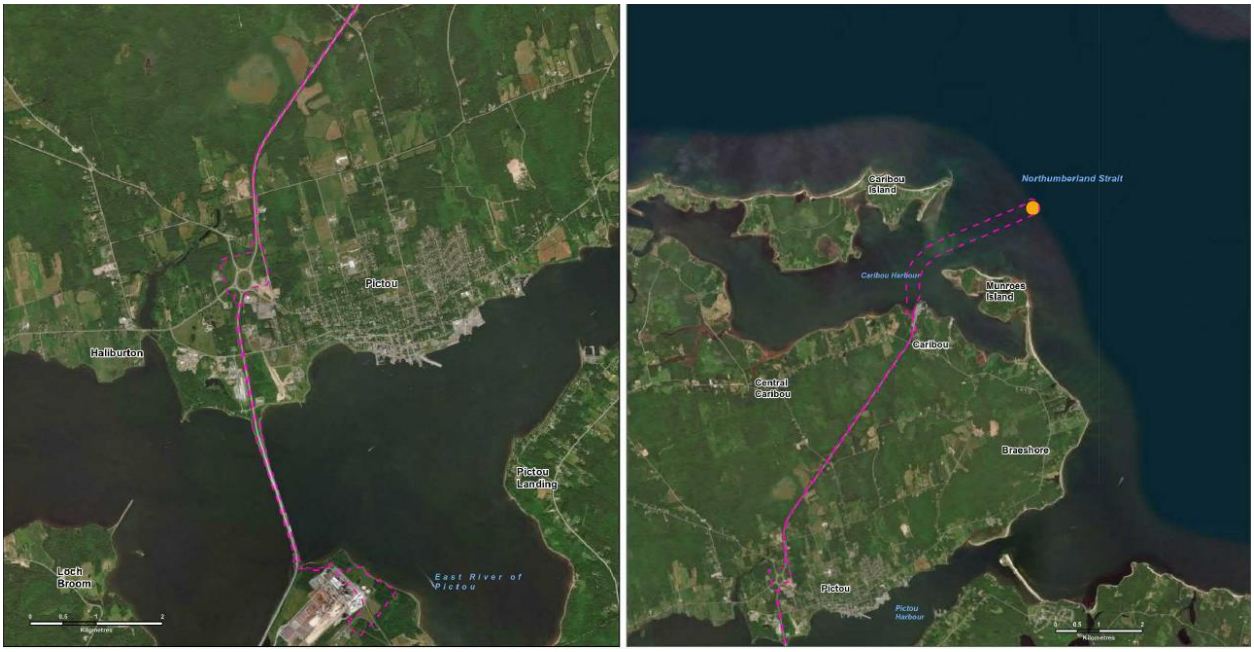

Figure 1. Proposed Project Route and Outfall Location (Based on Figure 1.1-2 of Dillon Consulting, 2019)

Should the Project receive all necessary approvals through the EA review process, it is anticipated that construction will occur for approximately 21 months, commencing after all applicable permits and approvals have been obtained. The Proponent is anticipating construction to start in the second quarter of 2019 but has noted that this will be weather dependent. The operation and maintenance phase of the proposed Project will start immediately after the construction phase, assumed to begin in the fourth quarter of 2020, and is anticipated to continue for several decades.

1.3 Regulatory Context

The NPNS proposed Replacement Effluent Treatment Facility ("the Project") is regulated under the Government of Nova Scotia's Environmental Assessment Branch and is being assessed through a Class 1 Environmental Assessment by the province.

The Government of Nova Scotia defines environmental assessment as the following:

> *"Environmental Assessment (EA) is a decision-making tool used to promote sustainable development by evaluating the potential environmental effects of major developments before they proceed. This is accomplished by involving the public along with various government departments and agencies during the environmental assessment.*
>
> *Environmental assessment also promotes better project planning by identifying and addressing environmental effects at the earliest stages of project development and can save proponents time and money" (Nova Scotia Environment, 2018).*

Projects classified as Class 1 undertakings are deemed to be smaller in scale and the level of concern to the public is considered unknown or uncertain (Nova Scotia Environment, 2018). This uncertainty means that the initial submission made by the proponent in Class 1 EA undertakings is subject to a public review period. Following the public review period, the Nova Scotia Minister of Environment will decide if a more comprehensive review and/ or public hearing process is required (Nova Scotia Environment, 2018).

In addition, following the review period, the Environmental Assessment Branch of Nova Scotia Environment will review all information received during the review. Based on the information received, the branch will proceed to provide the Minister with a report summarizing the issues received. The report will also include a recommendation for the Minister's decision (Nova Scotia Environment, 2018). The Minister has one of five options for a decision, as set out in section 13(1) of the Environmental Assessment Regulations made under Section 49 of the *Environment Act:*

(a) The registration information is insufficient to allow the Minister to make a decision and additional information is required;

(b) A review of the information indicates that there are no adverse effects or significant environmental effects which may be caused by the undertaking or that such effects are mitigable and the undertaking is approved subject to specified terms and conditions and any other approvals required by statute or regulation;

(c) A review of the information indicates that the adverse effects or significant environmental effects which may be caused by the undertaking are limited and that a focus report is required;

(d) A review of the information indicates that there may be adverse effects or significant environmental effects caused by the undertaking and an environmental-assessment report is required; or

(e) A review of the information indicates that there is a likelihood that the undertaking will cause adverse effects or significant environmental effects which are unacceptable and the undertaking is rejected.

In order to reach this decision, the Minister must demonstrate the all of the following pieces of information were considered in formulating her decision as set out in Section 34(1) of the *Environment Act:*

- *The location of the proposed undertaking and the nature and sensitivity of the surrounding area;*
- *The size, scope and complexity of the proposed undertaking;*
- *Concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking;*
- *Steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people;*
- *Whether environmental baseline information submitted under subclause 9(1A)(b)(x) [of the Environmental Assessment Regulations, which states "Environmental baseline information"] for the undertaking is sufficient for predicting adverse effects or environmental effects related to the undertaking;*
- *Potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitat;*
- *Project schedules where applicable;*
- *Planned or existing land use in the area of the undertaking;*
- *Other undertakings in the area;*
- *Whether compliance with licences, certificates, permits, approvals or other documents of authorization required by law will mitigate the environmental effects;*
- *Such other information as the Minister may require*

The following figure outlines all of the steps within a Class 1 Environmental Assessment.

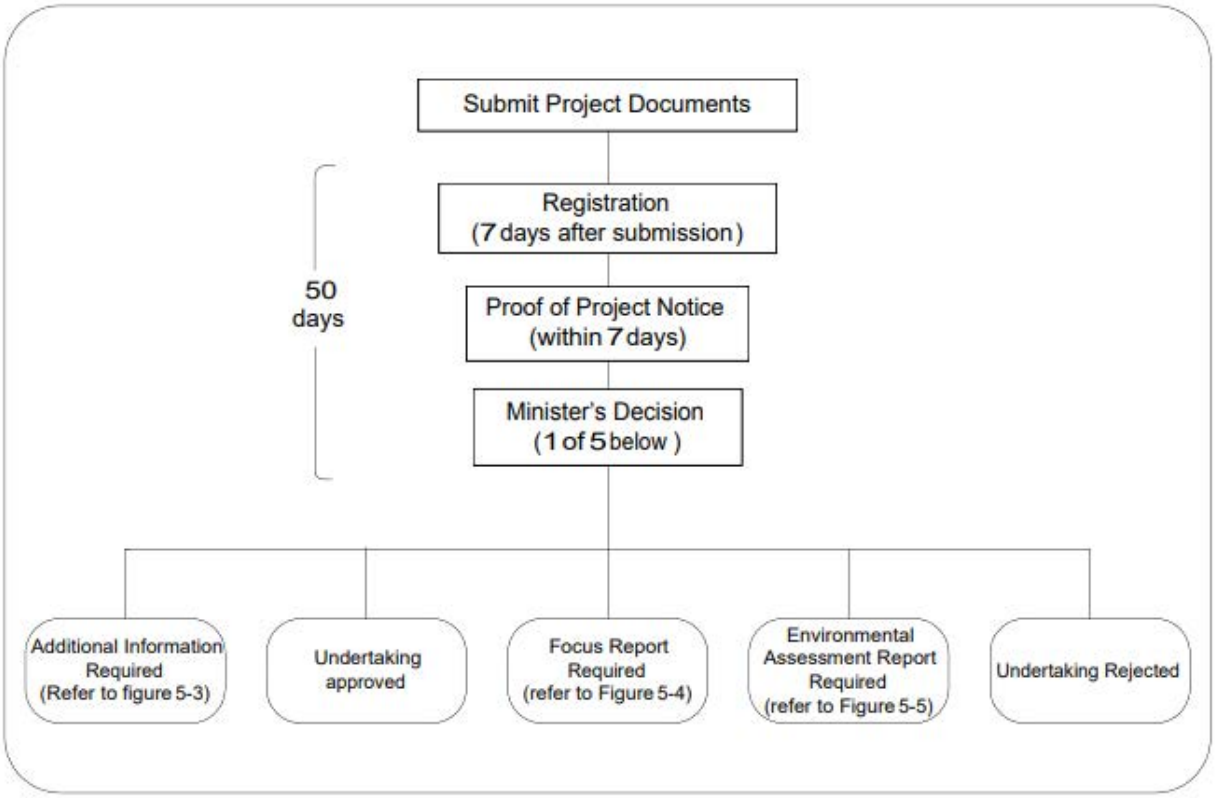

Figure 2. Class 1 Environmental Assessment Process Diagram (Source: Nova Scotia Environment, 2018)

In the context of a Class 1 EA in Nova Scotia, the most rigorous outcome possible is the completion of an environmental assessment report for the Project. The process steps for the completion of an EA report are identified in Figure 3 below.

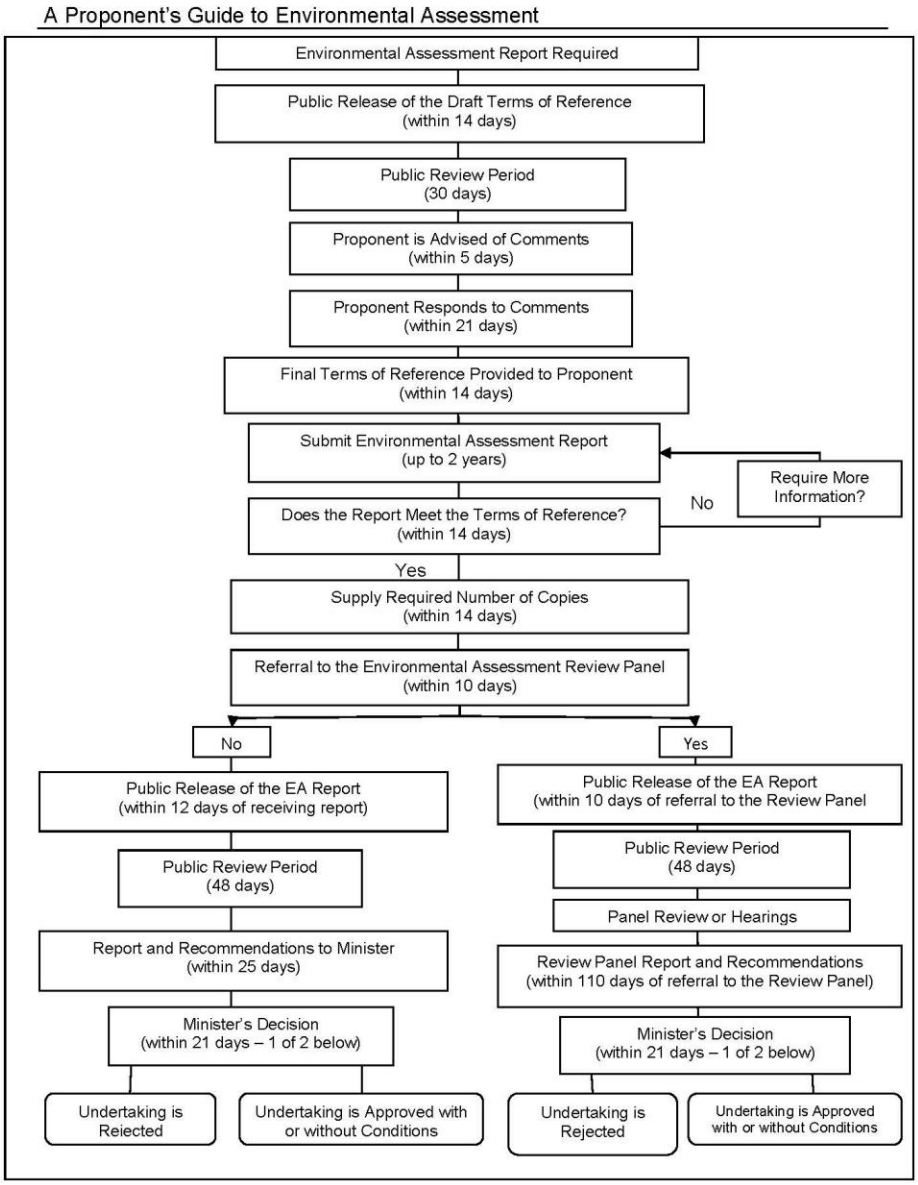

Figure 3. Class 1 EA - Environmental Assessment Report Required (Source: Nova Scotia Environment, 2017)

2.0 Summary of Technical Review of the Receiving Water Study

In preparation for, and to inform, the technical review of the EA Registration Documents, a review of Addendum Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement Project – Additional Outfall Location CH-B, Caribou Point, Nova Scotia dated December 19, 2018, was completed by Dr. Bernard Lebeau. A summary of the identified issues and concerns from the ARWS is provided below (Section 2.1).

Background

The *Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement in Pictou Harbour* dated August 11, 2017, had identified the discharge location Alt-D as the preferred option, however further studies have provided evidence for seabed ice scour at a water depth of 11 m. This new information deemed the preferred location Alt-D not technically feasible for the outfall. Consequently, Stantec conducted additional modelling and prepared the 'Addendum Receiving Water Study' (ARWS) to investigate other potential outfall locations. The computational domain and boundaries for far-field modelling used in the ARWS are shown in the following figure.

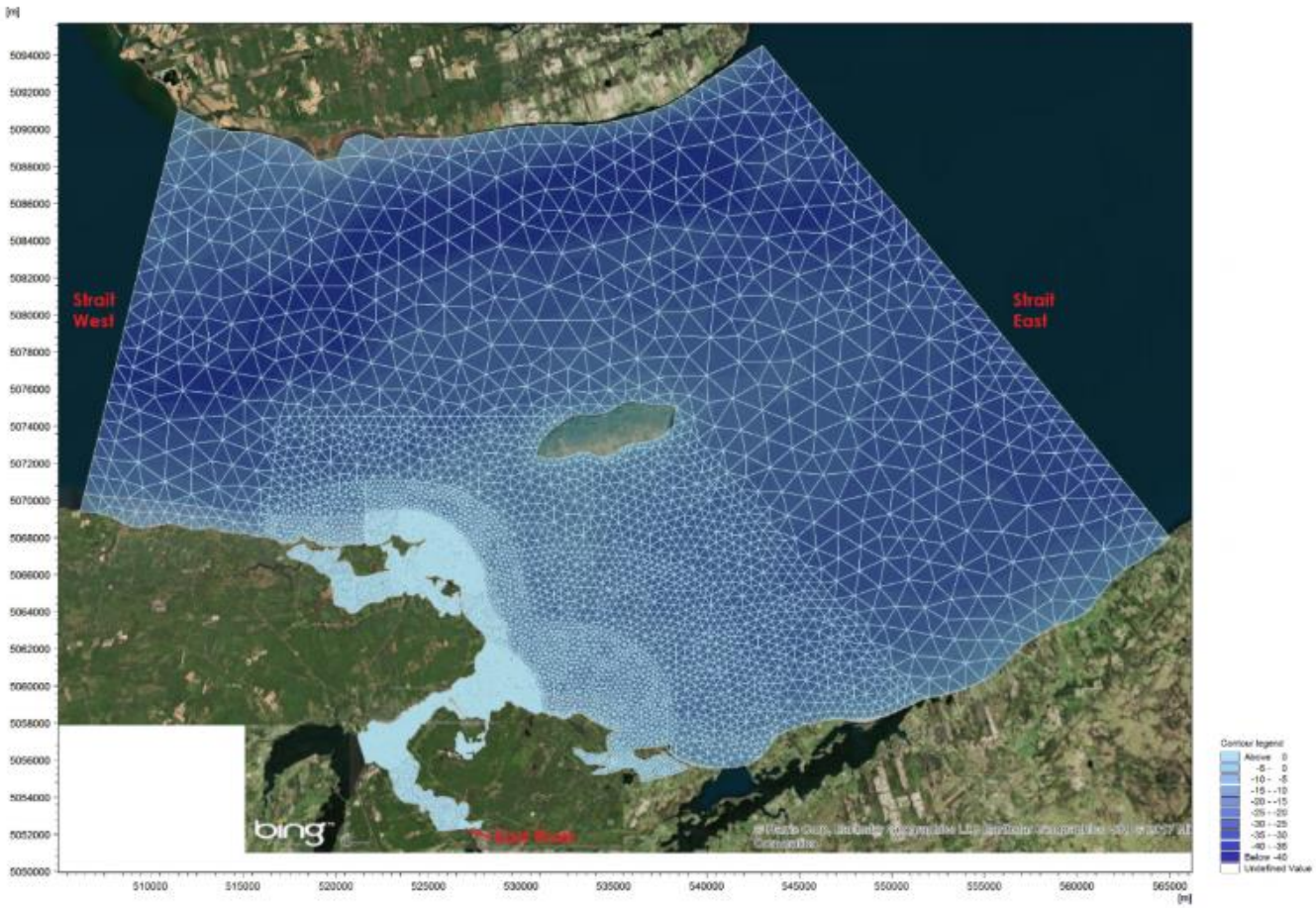

Figure 4. Computational Domain Boundaries for Far-Field Modelling (Source: Stantec, 2018)

The far-field modelling conducted for the ARWS identified two alternate discharge outlet locations, CH-A and CH-B off Caribou Point (see figure below). The two alternate discharge outlet locations are 540 m apart, and in 25 m (CH-A) and 20 m (CH-B) water depths. Further analysis determined that CH-B was the preferred location of the two alternate options, with a preferred diffuser design of three ports, each with a 0.3 m opening, horizontal angle of 0˚, and a vertical angle of 20˚. Outfall CH-B was further analyzed in the near-field modelling portion of the ARWS as the preferred outfall location.

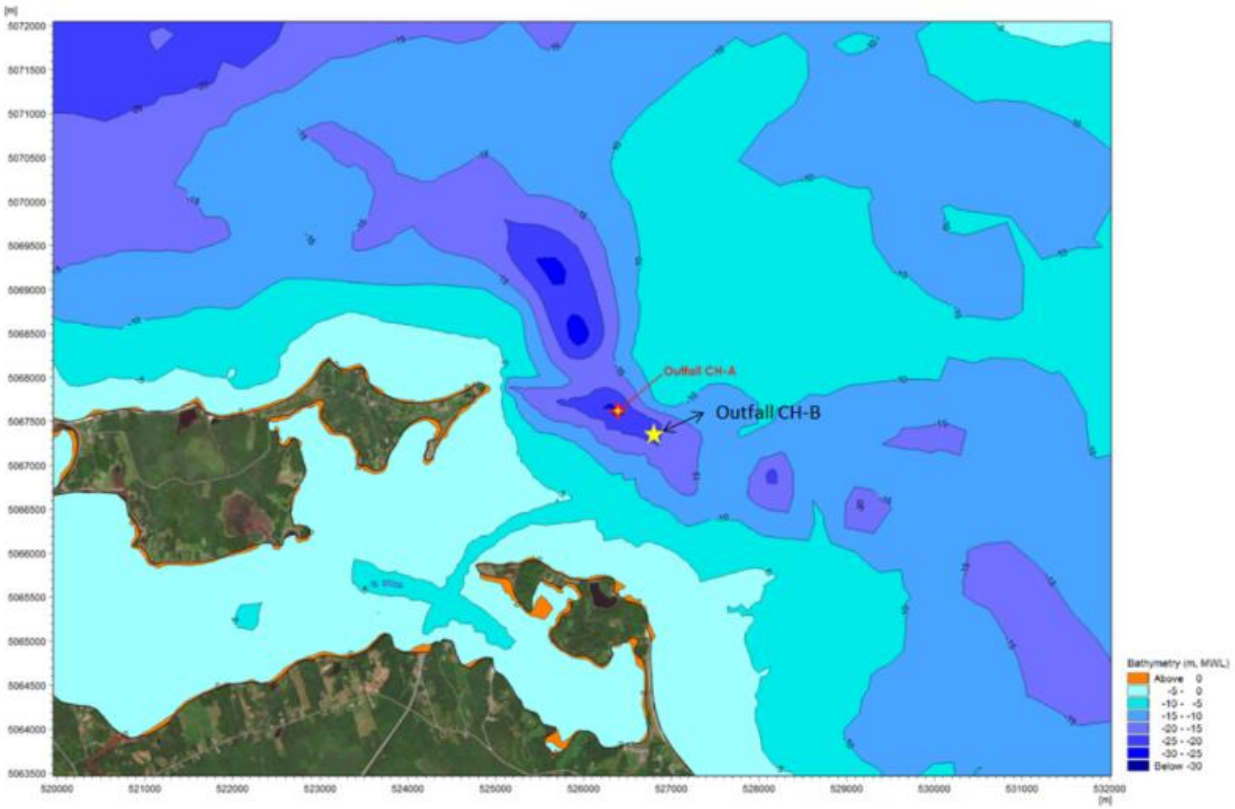

Figure 5. Outfall Locations for CH-A and CH-B

2.1.2 Far-Field Modelling

A two-dimensional (2D) model was used to simulate far-field effluent dispersion at two alternative potential discharge locations (CH-A and CH-B). The MIKE 21 model was used in the assessment.

Issue 2.1: There are no results from the dispersion modelling presented for the effluent discharge at the CH-A outfall location; results from only the CH-B outfall location were presented (Section 2.2, Page 5). How can the reader conclude that the "Dispersion modelling results from effluent discharges from CH-A and CH-B outfall locations indicate that the CH-B discharge provides relatively higher dilution and less potential effluent impact on Caribou Harbour water" without seeing results from the dispersion modelling from the CH-A location? Furthermore, the CH-A location is in 25 m depth, while CH-B location is in 20 m depth. There is ice scouring evidence on the sea floor to suggest that the CH-B location may not be deep enough and that the CH-A may be found to be a more appropriate location. It is of note that divers have reported ice scouring as deep as 20 m (MacCarthy and Egilsson, 2019).

> **Recommendation 2.1:** NPNS must provide modelling results for the proposed CH-A effluent discharge location.

Issue 2.2: "Outfall depth is often a bigger driver than exact position of the outfall" (Page 6). In our professional opinion, the most important driver in this type of study is "ice scouring" (See Section 1.3

Engineering Consideration). If ice scouring exists at or around the CH-B location, that location will not be suitable at the outset.

> **Recommendation 2.2:** NPNS must provide a study on sea floor ice scouring at, and near, the proposed outfalls CH-A and CH-B and make recommendations on the best location for an effluent outfall diffuser.

Issue 2.3: The following comment applies to the PRWS as well as the ARWS. For modelling purposes with both Mike21 and CORMIX, it is important to determine whether a stratification is present in the water column. With stratification of the water column (pycnocline), the effluent plume stops rising and becomes "trapped" at an intermediate depth, therefore reducing dilution. In this case, the effluent plume is expected to be building up and be (much) larger than expected. Therefore, field data must be provided to determine whether stratification exists at or near the effluent outfall. This stratification of the water column is particularly important in estuarine environments, such as the proposed outfall location. The water of the Northumberland Strait is primarily derived from the surface layer of the Gulf of St. Lawrence (AMEC 2007), which means it has more freshwater than ocean water, but also has the deep saline flow from the Gulf Stream that enters through the Cabot Strait. The data available for Pictou Harbour indicates that a stratification of the water column occurs there and yet this phenomenon was not addressed by Stantec (2017). It seems that stratification may be potentially occurring over the entire Strait. Again, field verification of the water column stratification is required at the CH-B location for modelling purposes; otherwise the modelling results presented in the ARWS cannot be assumed to be representative of the future effluent plume.

> **Recommendation 2.3:** NPNS must provide field verification of the water column stratification and these measurements, taken at the CH-A and CH-B locations, and other areas should be part of a water quality survey.

2.1.3 Near-field Modelling

Near-field monitoring was completed to analyse effluent dispersion for the CH-B location, the proposed discharge location which was determined as a result of the far-field modelling results. The Cornell Mixing Zone Expert System (CORMIX, Version 11.0), a three-dimensional model, was used to analyze and assess near-field mixing. Issues and data gaps related to Section 3.0 of the ARWS are as follows:

Issue 2.4: "No historical water quality data are available for Northumberland Strait around the CH-B location. Data from neighboring Pictou Road (Stantec 2017) located about 6 km southeast were used" (Page 16, 2nd paragraph). In this statement, no additional descriptions of the Pictou Road data are provided. The PRWS (Stantec 2017) described the Pictou Road data as background water quality measurements from various studies (data that are between 10 to 29 years old), that were not even within range between sampling years and/or relative locations. The background water quality data needed for the CH-B location must be from that specific area, rather than from other locations, or from an assemblage of other locations, as is the case for the Pictou Road data. It is difficult to base this important study on poor background water quality data that cannot be reconciled in the first place. The background data used are certainly of historical importance, but should not be considered in the

modelling work for establishing background values for water quality parameters and effluent discharge objectives (EDO) to meet applicable water quality standards or environmental quality objectives (EQO) at the mixing zone boundary. Both winter and summer data should have been collected, and the water column at CH-B should have been measured as well to confirm a non-stratification, rather than being simply assumed as non-stratified. The characterization of water quality in the mixing zone (Section 3.2, pages 20 to 26) is only a temporary presentation of cursory information since the available background water quality data are poor. A water quality study for the specific area of the proposed CH-B effluent outfall location is required.

> **Recommendation 2.4:** Provide a water quality study for the CH-A and CH-B locations and other related areas, including Caribou Harbour and the surroundings of Pictou Island based on numerous sampling stations. As part of this study, one or two reference areas should be considered with several sampling stations.

Issue 2.5: The Mike 21 model was run for a full month from July 1 to 31, 2016. To run CORMIX, the "Hydrodynamic information at the CH-B outfall location were obtained from Mike 21" (Page 16, last paragraph). However, as provided in the PRWS (Stantec 2017), "The CORMIX simulations were conducted for "August-September" only." How do we reconcile the input of Mike 21 July data for use in CORMIX simulations for August–September, as assumed (information is unclear and not found in the ARWS)?

> **Recommendation 2.5:** Provide an explanation as to how we reconcile the input of MIKE 21 July data for use in CORMIX simulations for August–September.

Issue 2.6: Within the Environmental Effects Monitoring (EEM) Program, CORMIX model simulations are typically conducted for both winter and summer conditions, using the ambient characteristics at the study locations, etc. With the objective of gaining a more complete understanding of the dynamic processes that occur at the discharge and to obtain accurate estimates of the dilution potential that can be applied to effluent concentrations, the CORMIX model is (most often) used for simulations with varied discharges and ambient conditions. It is unclear if the work by Stantec (2017, 2018) was designed for effluent outfall siting purposes. A rationale for the delay in complete characterisation of the effluent plume at CH-A or CH-B performed under the EEM program, must be presented.

> **Recommendation 2.6:** A rationale for not completing an industry-standard characterisation of the effluent plume at CH-A or CH-B must be presented.

2.1.4 Engineering Considerations

A preliminary description of engineering considerations, and the installation methodology, that could be undertaken as part of the construction of the CH-B outfall option is not provided in the ARWS. This aspect had been provided in the PRWS (Stantec 2017), with a follow up provided briefly in the *Introduction* section of the ARWS.

Issue 2.7: In the PRWS produced by Stantec (2017), marine geophysical and geotechnical notes for Alt-D, located outside Pictou Road in Northumberland Strait, were provided. It was noted that little was

known of the marine sediments that would be encountered along the proposed outfall pipe alignment. In the ARWS Section 1.0 (Page 1), it is reported that subsequent marine geophysical and geotechnical field investigations of the Alt-D location show evidence for seabed ice scour, indicating that this location, with a water depth of 11 m, was not suitable for an effluent outfall. In the ARWS, there are no indications as to whether there is adequate knowledge of the marine geophysical and geotechnical aspects for the new "preferred" CH-B location which is in a water depth of 20 m. The deeper location "might help avoid issues of ice scour" (Page 1, 2nd paragraph). Real data are needed on how far offshore and how deep ice scouring is occurring on the seabed of the Northumberland Strait. Observations by divers have indicated that seabed ice scouring is occurring at 20 m depth (MacCarthy and Egilsson 2019). Therefore, is the proposed depth of 20 m suitable and deep enough to avoid ice scouring? Is the CH-A location at 25 m depth more appropriate? Bottom ice scouring is a most important issue in deciding the location and depth of the future effluent outfall in the Strait. A marine geophysical and geotechnical assessment of the CH-B location may yield similar results as the Alt-D location, and thus the ARWS may not be of use. Consequently, we do not know whether CH-B is an appropriate location for an effluent outfall.

> **Recommendation 2.7:** Provide a study on sea floor ice scouring at and near the proposed outfalls CH-A and CH-B. Make recommendations on the best location for an effluent outfall diffuser.

2.1.5 Summary

In summary, the MIKE 21 and CORMIX modelling work contained in the PRWS and ARWS requires new water quality data with field verifications of water column non-stratification in winter and summer, as well the inclusion of the non-tidal ocean flow that is a counter-clock gyre around Pictou Island. As such, only limited confidence can be given to the modelling results by either MIKE 21 or CORMIX in the PRWS and ARWS. Furthermore, since seabed ice scouring is occurring at a 20 m depth as per diver observations, and yearly maintenance of an effluent diffusor would preferably be kept to a minimum, a focus on the CH-A location may be more appropriate as the preferred option. Future modelling work should present information for both locations, CH-A and CH-B.

3.0 Northern Pulp EA Review Findings

3.1 Effluent Treatment Facility Design

3.1.1 Summary of EA Content

The proposed Effluent Treatment Facility (ETF) for the NPNS pulp mill is an AnoxKaldnes BAS™ process that will be purchased from Veolia Water Technologies. The proposed ETF facility will be designed to treat maximum wastewater flow of 85 MLD (62 MLD avg). The BAS™ technology is based on combination of traditional activated sludge treatment (AST) process with moving bed bioreactors (MBBR) for wastewater treatment. The use of AST is common in Canada and the United States for the

treatment of Kraft pulp mill wastewater. The integration of MBBR with AST for Kraft pulp mill wastewater treatment is not currently employed in North American Kraft pulp mills. However, there are many installations of the BAS™ technology world-wide in the pulping sector, and including, specifically, softwood Kraft pulp mill wastewater systems.

Overall, within the EA, it is indicated that the proposed plant design offers a more modern, high rate treatment option than the current wastewater facility design based on aerated stabilization basin (ASB) technology primarily using natural basins and poorly designed "release" (i.e., discharge) into the Northumberland Strait. The proposed design appears to offers increased capability to control operations and optimize treatment performance within a modern wastewater treatment plant than the current infrastructure. Waste solids management and closed loop design for clarifier sludge is an added benefit of the proposed design.

A 35,000 m^3 capacity spill basin is proposed which would be able to provide 10 to 13–hour storage of mill effluent at full production rates. This basin would be designed with a high-density polyethylene (HDPE) impermeable barrier liner.

3.1.2 Evaluation & Recommendations

Issue 3.1: The purpose of the *Pulp and Paper Effluent Regulations* (PPER) is to manage threats from all pulp and paper mills in Canada to fish, fish habitat, and human health originating from fish consumption (ECCC, 2017). The PPER prohibit the deposition of effluents that are acutely lethal to fish, set limits on suspended solids (SS) and biochemical oxygen demand (BOD), and require pulp and paper mills to carry out environmental effects monitoring (EEM) studies. Environment and Climate Change Canada has proposed updates to the PPER, which came into effect in 1992, to reflect upcoming changes to the pulp and paper industry and to address findings from EEM studies that indicate the PPER do not adequately protect fish, fish habitat, and the environment.

Despite the fact that effluent quality from pulp and paper mills has improved substantially and the level of compliance with PPER has been high, pulp and paper mill effluent has been shown to pose a risk to fish, fish habitat, and the environment. For example, 99.9 percent of BOD and SS samples from the 77 mills directly depositing effluent to water bodies were compliant with the PPER in 2015. However, EEM studies demonstrated that effluent from 70% of pulp and paper mills are impacting fish and/or fish habitat, and 55% of these effluent deposits pose a higher risk to the environment (ECCC, 2017). To address these findings, the proposed updates to the PPER include:

- Reductions to BOD and SS discharge limits;
- Setting limits for phosphorous and nitrogen discharge to reduce nutrient enrichment;
- Setting effluent temperature limits to protect fish-bearing waters;
- Setting discharge limits for chemical oxygen demand (COD); and

- Setting pH range limits (ECCC, 2017).

The PPER are also being updated because the pulp and paper industry is diversifying to include bio-products (e.g. bio-fuels, bio-chemicals, and nanomaterials derived from wood) and the PPER only apply to traditional pulp and paper products. Stand-alone bio-product facilities would instead be subject to the *Fisheries Act*, which could create regulatory uncertainty in the industry (ECCC, 2017). Proposed updates to the PPER to manage bio-product impacts to the environment include setting limits for new deleterious substances (e.g. nitrogen and phosphorus) and lowering BOD and SS limits (ECCC, 2017).

> **Recommendation 3.1:** Environment and Climate Change Canada has proposed updates to the PPER, to account for changes in the pulp and paper industry, as well as to address findings from EEM studies indicating that the PPER do not adequately protect fish, fish habitat, and the environment (ECCC, 2017). NPNC must address whether or not the effluent from the Project will meet the requirements of the proposed updates to the PPER.

Issue 3.2: It is unclear in the EA document if the proposed ETF plant design using BAS™ technology will be able to meet more stringent discharge regulations being considered in proposed revisions to the *Pulp and Paper Effluent Regulations* which have a target publication date of 2021. Changes being considered in the revised PPER include reductions to current BOD and SS discharge limits in addition to setting allowable discharge limits for phosphorus, nitrogen and chemical oxygen demand (COD) that are not within the current PPER regulation.

The EA outlined that visits to two pulp mills in Sweden that operate Veola BAS™ wastewater treatment plants *"confirmed that the proposed Veolia BAS™ treatment system will provide the required treatment needs for NPNS to meet current and anticipated future regulations." (Section 4.2.1, p.29).* No further information was provided in terms of effluent quality at these mills, or regulatory requirements for discharge water quality at these locations.

In Section 5.2.2, p.40, it is stated *"The ETF is designed to treat the NPNS effluent to meet the Pulp and Paper Effluent Regulations before entering the transmission pipeline and exiting NPNS property."* No reference is made here to potentially more stringent water quality objectives that will have to be met under a revised PPER in 2021.

> **Recommendation 3.2:** More information should be provided on the data collected in the lab trails conducted in Fall 2018 on the NPNS effluent and site visits to the two Kraft mills in Sweden using BAS™ technology in terms of specific water quality data (BOD, TSS, P, N & COD) and relevant regulations (current and proposed).

Issue 3.3: The proposed ETF with BAS™ technology is outlined in the EA to be able to "*provide a more reliable facility by protecting the AS system from upset conditions, reduce nutrient consumption, and allow for low effluent total phosphorus (TP) and total nitrogen (TN), and improve the AS effluent sludge settling characteristics*." (Section 5.2.2.1, p.40). There is no consideration given within the treatment technology assessment and selection related to the non-biodegradable organic fraction within the pulp mill effluent that would be tied to COD discharge limits that may be proposed in modernized PPER.

Recommendation 3.3: Consideration of the non-biodegradable organic fraction within the effluent should be given, with more specific information on components in effluent that contribute to non-biodegradable fraction of COD, and any other efforts that could be considered in the pulp mill process design to lower COD in the mill effluent prior to biological wastewater treatment.

Issue 3.4: There is no information provided in the EA regarding expectant metal concentrations in the AST effluent. There is metal data provided in Appendix M4 on samples collected in December 2018 and analysis done by Maxxam Laboratories. However, each water quality test report is tied to a sample ID placed by analytical lab; there is no information provided on where these samples were taken.

Recommendation 3.4: More information needs to be provided on metal concentrations in the current ASB effluent (Point C) and metal concentrations expected to be found in the effluent of the proposed ETF.

Issue 3.5: Within the section on Accidents, Malfunctions and Unplanned Events (Section 10), mitigation strategies are proposed that would prevent accidental release of off-specification effluent to the receiving environment. Focus of mitigation would be on identification of potential deviation from standard quality of the mill effluent into the ETF. Daily monitoring of key performance indicators of the ETF is also highlighted to provide response and management to changes of the influent to the ETF.

Recommendation 3.5: More detail should be supplied on (1) what "key performance indicators" will be monitored on daily basis, and (2) what monitoring/testing will be conducted on the influent into the ETF; specifically, what water quality and/or operational parameters will be part of this monitoring/testing framework.

Issue 3.6: Historical effluent impacts from the Boat Harbour Treatment Facility, have been described in the Environmental Effects Monitoring (EEM) Cycle 7 Interpretive Report (Ecometrix, 2016). It is understood that the new treatment facility process differs from that of the Boat Harbour Facility. However, it is unclear if NPNS has assessed the potential (if any) for similar ecological impacts to occur from the proposed treatment facility.

Recommendation 3.6: Historical impacts of the Boat Harbour Treatment Facility are of major concern. NPNS must clearly outline how the proposed effluent treatment facility will be designed and operated in a way that will mitigate the potential for similar environmental impacts to occur.

3.2 Effluent Modelling

3.2.1 Summary of EA Content

The EA document does not convey a description of the effluent modelling methodologies or studies through the main text. The effluent modelling work is referred to in the text in very few sections and for the most part often referred to as Appendix E. This Summary of EA Content section provides the limited EA content main text related to the effluent modelling. The effluent modelling studies for Northern Pulp

Effluent Treatment Facility Replacement Project (i.e., Preliminary Receiving Water Study [Stantec 2017] and the Addendum Receiving Water Study [Stantec 2018]) were reprinted as Appendix E3 and Appendix E1 respectively in the whole EA document.

What is known from the effluent modelling work in the entire main text is mostly contained in the Executive Summary. "Water quality has been assessed through modelling of the treated effluent discharge. Through the analysis it has been determined that under 'worst case' conditions water quality at the end of the mixing zone for the three-port diffuser will reach ambient conditions within less than 2 m from the diffuser in terms of total nitrogen, total phosphorous, TSS, DO, pH, and salinity. Colour will return to baseline conditions within 5 m of the diffuser. Temperature will be within 0.1 °C of background at the end of the 100-m mixing zone." The same text is reprinted in Response to Key Issues identified Section 6.7, Table 6.7-1, 9th page.

The Effluent Quality section (5.2.2.9) briefly mentions that a maximum rate of 85,000 m^3/day was used in the analysis of effluent plume dispersion, representing a worst-case scenario. The annual average flow is predicted to be 63,600 m^3/day. Table 5.2-1 provides the anticipated daily maximum effluent quality and is reprinted from Appendix E3. (The same table is repeated as Table 5.6-1).

Also, the Outfall and Diffuser section (5.2.4) briefly mentions that the "diffuser pipe will be 50 m long, with three outlets ('port') spaced 25 m apart. Each port will be 0.3 m diameter connected to a 1.0 m tall riser pipe with an elastometric duckbill check valve opening at the end. The outfall will be capable of conveying discharge up to 85,000 m^3." (Note: m^3 is in fact m^3/day). It is reported that "The spacing and sizing of ports for the diffuser will achieve an approximate 144:1 dilution ratio". It does not say that the 144:1 dilution ratio is at a 100 m distance from the diffuser (important modelling constrain and CCME requirement). Overall, there was no mention that the above engineering/marine sciences, in regard to the outfall diffuser, was calculated from the effluent modelling studies presented in Appendix E.

The Valued Environmental Component (VEC); Harbour Physical Environment, Water Quality and Sediment Quality section (7.2) is presented in Table 7.4-1, which is of interest to regulatory agencies, the public, stakeholders and First Nations. Also, it is noted that no field work was conducted in this study and that all the information used for this VEC (and the effluent modelling work) was derived from the available literature and other studies. Therefore, all the information is from different perspectives, locations, years, seasons, months, etc.

In the Harbour Physical Environment, Water Quality and Sediment Quality section (8.11), potential effects are provided with an overview of existing environmental conditions in the Northumberland Strait and Caribou Harbour (the location of the effluent outfall), as well as Pictou Harbour. The latter location is used for its existing studies on water quality "in the absence of water quality data for Caribou Harbour" (section 8.11.1). Effluent modelling results are presented in the Characterization of Residual Effects section (8.11.3.3), under Operation and Maintenance (Page 350). The text in this section is repeated from the Executive Summary paragraph mentioned above. It concludes that "Any effects due to the discharge of treated effluent would be localized at the diffuser as the three-port diffuser and the high currents present in Northumberland Strait will aid in dispersion of treated effluent. Thus, significant

residual effects to water quality or sediment quality … are not likely." While these conclusions are based on the CORMIX modelling for near- and far-fields, it is not mentioned other than referring to Appendix E. The same applies for the Mike 21 far-field modelling results, which are the cumulative effects after a one-month simulation period of effluent discharge from the outfall location CH-B off Caribou Point. However, "results indicate that there are few traces of relatively high diluted effluent after a period of 30 days." The last paragraph reads "The modelling of the plume dispersion used very conservative assumptions, including maximum daily effluent flow rate for 30 days, summer conditions with lower wind speeds, waves and warmer ambient temperatures that are not favourable for plume mixing, and no decay of effluent quality, which represent an exaggerated condition where normally some decay is expected to occur."

Under the Follow-up and Monitoring section (8.11.5), it is noted that NPNS will conduct an EEM program for future effluent outfall in Caribou Harbour and is referenced to Appendix G only.

In brief, the above paragraphs are the extent of the EA main text content regarding effluent modelling, with annotations.

3.2.2 Evaluation & Recommendations

Issue 3.7: Appendices E1, E3, G and H, which relate to effluent modelling are lacking integration with the EA main document. The content of the EA main document is difficult to accept because of the absence of this important information. Additionally, reference to this information are few to none. This is apparent from the Summary of EA Content provided above.

> **Recommendation 3.7:** Summary information should be provided in the main EA text on both the Preliminary Receiving Water Study and the Addendum Receiving Water Study. This information should be tied directly with the information provided in the main EA text. How Mike 21 and Cormix models were used should be clearly stated in the main EA text.

Issue 3.8: There is a lack of field work, particularly in obtaining new water quality data and a field verification of water column non-stratification in winter and summer, as input to customize the hydrodynamic models (Mike 21 and CORMIX) for the CH-B location of the future effluent outfall. It is understood that the modelling aspect was performed with considerable professional judgment. However, the use of the water quality information available from Pictou Harbour (taken from several sources published in different years and from different locations), as a proxy to the Caribou Harbour data, brings considerable doubt to the validity of the studies and main EA text (e.g.,Table 5.2-1 or 5.6-1). To have a so-called "conservative approach" is important, nonetheless a reliable and convincing data set on water quality for the study is essential.

> **Recommendation 3.8:** NPNS must rovide a water quality study for the CH-A and CH-B locations and other related areas, including Caribou Harbour and the surroundings of Pictou Island based on numerous sampling stations. As part of this study, one or two reference areas should be considered with several sampling stations.

Issue 3.9: In view of the issues above (Issues 1 and 2), there is no mention in the EA main text that future field work and data collection will be performed to verify the hydrodynamic modelling results of the effluent mixing and dispersion. Under the Follow-up and Monitoring section (8.11.5), it is only noted that NPNS will conduct an EEM program at the effluent outfall diffuser, with reference to Appendix G. Once again, the main text does not convey a brief description of what the follow-up and monitoring entails. It entails a full EEM characterization of effluent plume which will be performed using the CORMIX model during summer and winter conditions, flood and ebb currents and slack tides, with field confirmation using Rhodamine WT. It is of great interest to regulatory agencies, the public, stakeholders and Indigenous Communities to be aware of the up-coming work. In addition, NPNS states that biological monitoring will be performed to include water and sediment quality sampling, as well as benthic invertebrate community and fish population sampling to assess conditions and health over time.

> **Recommendation 3.9:** Provide a brief description in Section 8.11.5 of what the Follow-up and Monitoring Program entails.

3.3 Marine Fish and Aquatic Habitat

3.3.1 Summary of EA Content

The EA describes marine fish and fish habitat in the context of consideration of the ecological value provided to marine ecosystems, the socio-economic importance of fisheries resources and potential interactions with the Project and project activities on marine fish populations. Marine fish are protected under the federal *Fisheries Act*, which includes provisions to protect the productivity of, and prevent "serious harm" to, commercial, recreational, and Aboriginal (CRA) fisheries.

Marine fish, and their habitat, are closely linked to the surrounding physical environment, as well as water and sediment quality, all of which could be impacted by the proposed Project. The main fisheries of importance, as described in the EA, include lobster, sea scallop, herring and rock crab, among other lesser species fished. The Northumberland Strait is a known migration corridor for many species (Rondeau et al. 2016). Commercially important species known to occur in the marine local assessment area (LAA) include rock crab, lobster, sea scallop, herring, mackerel, and tuna.

American Lobster, *Homarus americanus,* is caught throughout the central and eastern portions of the Northumberland Strait. Lobster habitat overlaps with both the proposed route of the effluent pipeline and the location of the marine outfall. American Lobster stock status reports provided by DFO (2013) in the southern Gulf of St. Lawrence show that the Northumberland Strait is a secluded system based on larval recruitment compared to the rest of the southern Gulf of St. Lawrence. With respect to lobster larval transport, eggs that are released are reliant on the current within the Northumberland Strait for transport and have a period between 3- 12 weeks in which the larvae's destination is a result of the direction of the current (Chasse and Miller, 2010). Lobster larvae are retained in the Northumberland Strait for up to 120 days, with some individuals actually settling west of where they were released rather than east. These locations indicate specific circumstances where there are east-to-west currents, some of which have been known to last days to weeks in duration (Hanson and Comeau 2017). The complexity

of larval transport within the Strait highlights the relationship that exists between the provinces in relation to the lobster fishery.

Herring is caught along the shoreline of New Brunswick and Nova Scotia in the Northumberland Strait,

including the Pictou area. There is overlap with herring fishing and the location of the marine outfall. Concern has also been raised about the effects of the marine effluent pipeline on herring spawning from the commercial fishing industry (PEI Standing Committee on Agriculture and Fisheries, 2018). Herring stocks are currently of concern to DFO, and attempts are being made to manage this fishery to avoid becoming at risk in the area (PEI Standing Committee on Agriculture and Fisheries, 2018).

Marine fish can be affected by activities and components of the Project during construction, operation and maintenance phases. The Project has the potential to impact marine fish populations and fish habitat (e.g., adult fish, juveniles, eggs and larvae, invertebrates and marine plants) directly through injury and mortality, or indirectly through the alteration or destruction of their habitat. The current environmental assessment of marine fish is focused on changes in marine fish populations, which includes any physical injury or mortality on fish that is attributable to the Project, and any destruction or alteration of habitat from disturbance of the marine environment.

The EA states that project-related construction, operation and maintenance activities may result in adverse environmental effects such as changes to marine fish habitat and fish populations in the PFA. The proponent claims that it is not anticipated that changes would extend beyond the PFA and that any changes in fish habitat would persist only over the life of the Project and not beyond. The potential change in fish populations is attributable to direct and indirect disturbance/change of habitat and increased mortality risk.

3.3.2 Evaluation & Recommendations

Issue 3.10: The *Fisheries Act* focuses on protecting the productivity of CRA fisheries including a prohibition against causing “serious harm” to fish that are part of or support a Commercial, Recreational, Aboriginal (CRA) fishery (Section 35 of the *Fisheries Act*) and proponents of projects that cause serious harm to fish are required to offset that harm to maintain and enhance the productivity of the fishery. The deposition of a deleterious substance is also prohibited under Section 36(3) of the *Fisheries Act*.

Overall, the EA approaches the assessment of impacts to fish and fish habitat with very limited analysis and examines project activities in the context of “Serious Harm” as described in the Fisheries Act, as opposed to going beyond the limited provisions of the current version of the Fisheries Act. The provision of Serious Harm has been widely regarded as providing limited protection to fish habitat and does not account for all impacts to fish or fish habitat.

> **Recommendation 3.10:** In the interest of assessing the impacts to fish with the highest level of scrutiny and precaution, in our professional opinion, it is recommended that the Proponent should approach the EA with an analysis that goes beyond the provision of Serious Harm to a

shift in focus on avoiding harmful alteration, disruption or destruction (HADD) of fish and fish habitat. This approach is being contemplated proposed *Fisheries Act* amendments under Bill C-68. Given the high level of concern from fisheries groups regarding harmful alteration, disruption or destruction (HADD) of fish and fish habitat of the Northumberland Strait, and the potential adverse effects of the Project, NPNS must assess the proposed activities and design of the Project in the context of HADD avoidance. This approach enhances the measures described within the EA.

Issue 3.11: *Section 5.2.3.1 – Land-based Pipeline Portion:* The land-based pipeline portion extending from NPNS property to the edge of shore at Caribou Harbour will be approximately 11.4 km in length. The pipeline will be buried for the majority of the route. Based on the proposed design, there will be one area where the pipeline will be exposed and will cross the spillway of the Pictou Causeway, where it will be suspended and attached to the exterior of the bridge due to limited roadway width. The exposed area will be protected from damage by existing guide rails.

The EA does not describe the protections or safeguards that will go into an aerial or exposed stretch of pipeline along the causeway. It does not appear that NPNS has considered the impacts of effluent release spills that do not reach the diffuser. Very limited information is provided in terms of spill response or emergency planning. Should a spill event occur at the aerial location, effluent could be released into the harbour prior to reaching the diffuser and could cause adverse impacts to fish and fish habitat.

> **Recommendation 3.11:** NPNS needs to provide more detail on spill response and safeguards against potential accidents or malfunctions along the terrestrial portion of the pipeline. Without this information, it is unclear how the Minister can make an informed decision regarding whether adverse effects or significant environmental effects may be caused by the undertaking and whether these effects can be mitigated.

Issue 3.12: The EA states that a significant adverse residual environmental effect on marine fish and fish habitat is one where project related activities cause a significant decline in abundance or change in distribution of a marine fish population within the Northumberland Strait. One such change would be that natural recruitment may not re-establish the population to its original level within one generation. However, NPNS also states that no field work was conducted as part of this EA. Without understanding the current larval lobster population, there could be five to seven years of impacts that would go undetected until the current cohort reaches maturity.

> **Recommendation 3.12:** In our professional opinion, A comprehensive multi-year baseline study on all marine species present within the Northumberland Strait must be completed in order to understand potential adverse impacts that may result from project activities. Robust studies are required to better understand each species, and the potential impacts the Project could have on each. This type of baseline study is the foundation of an EA, especially one focused on a project that has the potential to cause serious environmental impacts.

Issue 3.13: The EA states that the main commercial, recreational and aboriginal fisheries are lobster, sea scallop, herring, mackerel and tuna. Beyond those species identified in the EA, the Northern Pulp EA

failed to mention Atlantic halibut, soft shell crab, American eel, gaspereau and silver sides. A complete list of species fished should have been composed with actual field-based studies and research concluded on their tolerance ranges, sensitivities and how different contaminants in the effluent could negatively affect that species. Each individual species has a different mechanism for expelling toxins from their body, thus comparing one species to another does not provide and accurate assessment of impacts.

> **Recommendation 3.13:** In our professional opinion, a more detailed environmental assessment that considers all potential fisheries in the Northumberland Strait needs to be completed to adequately assess project impacts. The EA should consider every species fished commercially in the area and should look at sensitivities of all of those fish to changes in water quality and negative health effects of contaminants

Issue 3.14: *Section 5.3.1 – Construction Phase:* The EA states that throughout project construction, environmental monitors will enforce construction specifications and site-specific environmental mitigation measures that are proposed for the Project's Environmental Management Plan (EMP). The EA states that a series of plans and guidance documents such as an Waste Management Plan (WMP), an Environmental Protection Plan (EPP), and an Emergency Response and Contingency Plan (ERCP) will be incorporated into the EMP. Applicable best practices, restrictions and details from the EMP will be included in the construction drawings so that construction methodology is in compliance with the EMP. The Proponent has not adequately addressed many construction-related issues in the EA that may have significant consequence to the aquatic environment. A robust Environmental Protection Plan will be imperative to minimize and address an impacts from construction.

> **Recommendation 3.14:** The Environmental Management Plan and the Environmental Protection Plan must be completed and circulated for review and consultation with stakeholders prior to the Project being approved. The Project should not be approved until all stakeholders have been consulted on all environmental protection measures within the Environmental Management Plan.

Issue 3.15: *Section 5.3.1 – Construction Phase*: As part of construction of the proposed Project, the effluent pipeline will "cross" watercourses and wetlands. The proposed Project does not intend to include in-watercourse or in-wetland crossings. Rather, at potential "crossing" locations of watercourses or wetlands, those sensitive environments will be avoided, where technically feasible, by adjusting the alignment toward the center of the road. In some cases, an alternate approach may be used to go under the watercourse/wetland. There are a number of freshwater fish species that occupy or use the watercourses along the pipeline route. Atlantic salmon, spawn in a number of the watercourses crossed by the pipe. It is unclear in the EA how the Proponent intends to complete these watercourse crossings along the terrestrial portion of the pipeline. The EA states that they will adjust the alignment of the pipe to "the centre of the road" to avoid instream work. This plan is not clear in the drawings provided within the EA Registration documents. The construction of the pipe over and around these watercourses is of major concern and must avoid disturbance and/or disruption of fish life cycle.

> **Recommendation 3.15:** The proponent must provide more detail on what is meant by moving the alignment to the centre of the road, and on which watercourses, in particular, they intend to carry this out.

Issue 3.16: *Section 5.3.1 – Construction Phase*: For watercourse crossings along the pipeline route, the option of using a Horizontal Directional Drill (HDD) is proposed to avoid in-water works. It is stated in the EA that the technical feasibility of an HDD installation is determined by the distance to be drilled, the diameter of the pipeline, and the subsurface conditions. However, it is also stated in the EA, that geotechnical information has not be gathered in order to determine whether HDD is feasible at the various crossing locations. Inconsistent bedrock and overburden conditions present impediments to the use of HDD technology. Without a comprehensive geotechnical assessment of the crossing locations that are proposed to be drilled, issues can arise when carrying out the HDD. In particular, without understanding the substrate that is to be drilled, the possibility of an inadvertent release of drilling fluid (frac) may occur. Fracs are highly impactful to fish and fish habitat as they may result in the release of large plumes of drilling fluid that can kill fish and can cover or destroy fish habitat both in the watercourse and in the marine environment.

> **Recommendation 3.16:** In our professional opinion, geotechnical assessments must be completed and reviewed by project stakeholders. This information is required before the Minister can make an informed decision on all potential impacts of the Project.

In addition, the Environmental Protection Plan must address prevention and emergency response related to horizontal directional drilling.

Issue 3.17: *Table 8.12-7: Mitigation Measures to Reduce or Avoid a Change in Marine Fish Populations:* There is no description of how negative impacts resulting from the laying of pipe will be mitigated during the Construction Phase. The mitigation tables merely provide standard measures that have no site-specific relevance on minimizing the impacts of pipe construction in open water. The table states that the duration of in-water work will be managed to the shortest time that is practical. The proposed actions are very unclear and do not outline what is actually practical or feasible. The likelihood of impacting benthic species, as well as mobilizing sediment and increasing turbidity, is very high during construction. Its unclear how NPNS plans to mitigate these disturbances to fish habitat.

The EA does not include sufficient analysis of construction methodologies that would reduce the risk to benthic species, as well as fish species in the area. Elevated levels of sediment and turbidity can reduce the productivity of aquatic systems by decreasing primary productivity. Further, levels of suspended sediment have been determined to be acutely lethal to fish ranging in the thousands of mg/l of TSS while sublethal effects begin in the hundreds of mg/l sediment (Birtwell et al. 1999). The construction of the pipe could result in fish mortality if not adequately mitigated. The EA does not provide a detailed plan to minimize impacts of sedimentation to fish and fish habitat.

> **Recommendation 3.17a:** The EA must provide more details on mitigating benthic disturbance and subsequent TSS mobilization during pipe construction in the Northumberland Strait.
>
> **Recommendation 3.17b:** The EA should examine the possibility of HDD drilling to facilitate the placement of the pipe into the Northumberland straight. HDD could reduce the risks of in-water works that could significantly impact fish and benthic communities.

Issue 3.18: The EA states that routine effluent discharge from the effluent outfall diffuser will cause a project-related change in water quality. The treated effluent will contain water quality parameters of concern including absorbable organic halides (AOX), total nitrogen (TN), total phosphorus (TP), color, biochemical oxygen demand (BOD), total suspended solids (TSS), dissolved oxygen (DO), pH, and water temperature. Potential effects of the effluent, as presented in the EA, could result from an increase in temperature, nutrients (nitrogen and phosphorus), and/or TSS, a change in color, chemical and BOD, DO, and/or pH; and/or a reduction in salinity from the discharge of relatively freshwater effluent into the Northumberland Strait.

The discharge of effluent containing elevated levels of TSS could also cause a change in sediment quality near the diffuser due to settlement of suspended sediment. A change to any of these parameters can have detrimental effects on the fisheries. The EA does not provide a detailed analysis of species-specific limits and tolerances with respect changes in water and sediment quality as a result of effluent discharge.

Further, the Pulp and Paper Effluent Regulations only stipulate the monitoring of a few parameters and are not always protective of the aquatic environment (ECCC, 2017). In fact, Environment and Climate Change Canada is currently reviewing the regulations to address such issues (ECCC, 2017).

> **Recommendation 3.18a:** The EA must outline species-specific limits of tolerance with respect to the above parameters described as well as upper and lower limits for toxins specific to mill effluent. A robust assessment of how changes to the marine environment, and the discharge of effluent contaminants, impact species inhabiting the area must be completed in order to understand impacts of the proposed Project.
>
> **Recommendation 3.18b:** The proposed changes to the PPER must be considered when addressing the species-specific effects including a quantitative evaluation of the impact of the proposed changes on the assumptions and conclusions of the EA.

Issue 3.19: The description of the existing physical environment conditions of water and sediment quality within the LSA is based on the results of previous research and existing scientific literature and environmental assessments. No field work was conducted as part of this EA Registration. This is a major data gap identified in the EA. It is unclear how potential impacts related to the Project will be characterized without a robust understanding of current baseline conditions.

> **Recommendation 3.19:** In our professional opinion, a project of this magnitude warrants comprehensive field work investigations to be completed. NPNS should conduct a comprehensive baseline assessment to characterize current conditions of the marine environment within the project assessment area, including sediment and water quality.

Issue 3.20: Pictou Harbour was used as a proxy for Caribou Harbour with respect to evaluating water quality, in the absence of available water quality data for Caribou Harbour. The EA only provides an overview of water quality sampling in Pictou Harbour in 1990, 1995 and 1998 (Dalziel et al. 1993; JWEL 1996) with no actual current or historical data from the proposed location at Caribou Harbour. The EA relies on data that are roughly 30 years old to make assumptions on the potential impacts to marine life

from the current Project. The EA registration documents lack of representative and current water quality data is a major gap.

> **Recommendation 3.20:** The proponent should collect and analyze current water quality data, from the proposed outfall location, in order for the EA to adequately assess impacts to the water quality from the Project, and to adequately plan for preventing or mitigating those potential impacts.

Issue 3.21: NPNS did not undertake field work to gather relevant data for sediment characterization at the proposed outfall location. NPNS relied, instead, on sediment data that are roughly 30 years old. As well, the EA presents metal concentrations in sediment samples collected in Pictou Harbour in 1993. Without current baseline information to inform the EA, it is not possible to understand the potential impact of the Project on sediment quality. Not having representative and current sediment quality data to inform the EA is considered to be a major data gap in the assessment.

> **Recommendation 3.21:** NPNS must collect current and relevant data on sediment characterization at the proposed outfall location.

Issue 3.22: *Section 8.12 Marine Fish and Fish Habitat:* Herring stocks are currently of concern to DFO, and attempts are being made to manage this fishery to avoid becoming at risk in the area (PEI Standing Committee on Agriculture and Fisheries 2018). Herring spawn between August and October in the southern Gulf of St. Lawrence, and DFO has identified fall spawning grounds for herring in the eastern Northumberland Strait. Currently, the fall spawning stock is in the critical zone and the spring spawning stock is in the cautious zone (DFO, 2018a). The EA states that concern has been raised about the effects of the effluent on herring spawn, however, the main fisheries in the LAA considered in the assessment are scallop and rock crab. There is no mention of what NPNS is doing to mitigate the potential risks to herring spawn due to the project. In addition, field or lab work has not been completed to address this potential risk and concern.

> **Recommendation 3.22:** Proper research needs to be completed to understand possible effects of the effluent on herring spawn, including sub-lethal effects. A rebuilding plan for herring is currently being developed to ensure the regrowth of the stock, and therefore any potential impacts to herring spawn must be fully considered in the EA.

Issue 3.23: *Section 8.12 Marine Fish and Fish Habitat:* The EA reports that mackerel is caught along the coast near the LAA, although most fishing occurs in the central and western portions of the Northumberland Strait. There is only one comment about mackerel in the EA, thereby demonstrating a lack of robust analysis regarding impacts. There is no mention of mackerel life stages or occurrence in the LAA. Data shows that the only key spawning area in Canada is the Southern Gulf of St. Lawrence and that surveys conducted on mackerel eggs are present in the East end of the Northumberland Strait (DFO, 2017) (Figure 6).

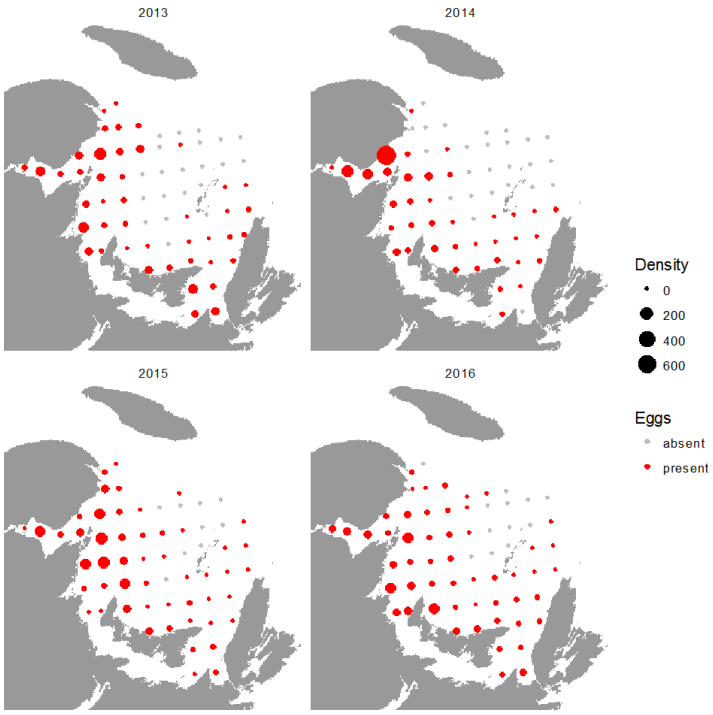

Figure 6. Distribution of Mackerel Egg (Stages 1 and 5) Densities (n/m2) Measured in Surveys in the Southern Gulf of St. Lawrence from 2013 to 2016 (DFO, 2017)

> **Recommendation 3.23:** Research must to be completed to understand possible sub-lethal effects of the effluent on mackerel eggs. Currently, the stock is in the critical zone (DFO, 2017) and a rebuilding plan is being developed to ensure the regrowth of the stock. The EA must clearly assess how potential impacts from the Project could affect stock regrowth.

Issue 3.24: *Section 8.12 Marine Fish and Fish Habitat:* Table 8.12-6 of the EA lists marine fish Species at Risk and Species of Conservation Concern with potential to occur in the LAA. This EA table lists American eel, American plaice, Atlantic bluefin tuna, Atlantic cod, Atlantic salmon, lumpfish, porbeagle, spiny dogfish, striped bass, and white hake, but does not list Atlantic sturgeon. This is another significant data gap in NPNS EA. There are two species of Atlantic sturgeon in Canada and both are listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and are known to exist within the Northumberland Strait (COSEWIC, 2011).

> **Recommendation 3.24:** Atlantic sturgeon must be considered in the assessment, and potential impacts to the species identified. Once again, the Minister must consider '*potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitat'* (Nova Scotia Environment, 2018).

Issue 3.25: The Gulf of St. Lawrence (GSL) American lobster is of high value in the region, with 33,000 mt of lobster worth $445 million landed in 2016, and abundance indices still increasing throughout the Gulf (DFO, 2019a). The value of American lobster is not mentioned in the environmental assessment

submission. Lobster biomass is increasing as efforts have been taken toward voluntary management changes. It should also be noted that conditions like water temperature can impact the distribution of lobster and their catches (DFO, 2013). This is extremely important to the fishers in the area of the outfall considering the temperature being released will be above the average background water temperature when released to the Strait.

At this time, there have been no field trials or lab tests by NPNS to prove that they will not be jeopardizing the lobster fishery. Considering the significant value of lobster in the Gulf (worth $445 million in 2016), proper scientific research needs to be conducted on the potential impacts to the lobster and lobster fishery. The EA relies on desk top research and literature based on dated, 40 year old research.

> **Recommendation 3.25:** As stated in Appendix R of NPNS's EA Registration documents, it is recommended that more research be completed on the effect of the effluent on lobster in each life stage. It is important to highlight that the recommendation given in Appendix R regarding more research on the effect of effluent on lobster must be followed through and completed. It is unclear how the Minister will determine if the following has been addressed in the EA (as outlined in Nova Scotia Environment, 2018), given the lack of a robust consideration of lobster in the assessment:

Issue 3.26: *Section 8.12 Marine Fish and Fish Habitat:* Figure 8.12-5 of the EA presents scallop catch weights from 2010-2014 in the Northumberland Strait, where there is an overlap of the route of the pipeline and at the outfall location. Since 2014, a Scallop Buffer Zone in Scallop Fishing Area (SFA) 24 prevents scallop fishing in this area, except potentially at the location of the outfall. Sea scallops will normally grow in water between 8°C and 18°C; ideal temperature for growth is 13.5°C. Ideal salinity is between 30 to 32 ppt but they can tolerate salinities as low as 25 ppt. Sea scallops are prone to being stressed in environments outside of their normal ranges. They can get stressed at temperatures between 20°C and 23°C and mortality will occur at temperatures of 23.5°C and greater. Water temperatures will be affected by the effluent and will not reach background levels until 100 m from the outfall site. The proposed effluent release will be 26°C in the winter and 37°C in the summer. These temperatures are much higher than mortality-causing temperatures for the sea scallop.

> **Recommendation 3.26:** Detailed field assessment on the sea scallops that inhabit the area near the proposed outfall location must be completed prior to the release of the proposed effluent to ensure there will be no negative effects on the sea scallops. Otherwise, it is unclear how the Minister will be able to determine if adverse effects or significant environmental effects are likely to occur.

Issue 3.27: *Section 8.12.2.5:* NPNS have not completed any scientific field work or a comprehensive assessment of the impacts of the effluent on lobster larvae. NPNS has merely relied on a literature review (Appendix R), in the EA, to make an assumption on the "limited impacts" to lobster and lobster larvae. Further, the review of scientific literature related to the effect of BKME on American lobster (*Homarus americanus*) is mainly related to a small number of lab studies conducted in the 1960's (Sprague and McLees, 1968a 1968b). The limited literature on the subject, coupled with the lack of field

assessments, or detailed analysis of the impacts, indicates that NPNS is unable to conclude what the potential impacts will be to lobster and lobster larvae. A few studies suggest that sublethal effects of chemicals on lobster energetics may occur under laboratory exposure conditions (i.e., concentrations and duration) considered environmentally relevant, that might not be detected through the standard toxicology approaches (alive/dead animal as the only output measured). These physiological changes could result in great impairment under natural conditions (Sprague and McLees, 1968a 1968b). The information provided in the EA is insufficient to conclude whether or not adverse effects will occur to lobster larvae should the Project proceed.

> **Recommendation 3.27:** Detailed field and lab work must be carried out as part of a comprehensive EA that assesses and quantifies sublethal, chronic and cumulative effects on lobster larvae. The level of stakeholder concern regarding lobsters warrants the need for increased scientific understandings and fulsome assessment of impacts, in order for the Minister to make an informed decision regarding potential impacts of the Project to lobster.

Issue 3.28: NPNS has stated that they have attempted to engage commercial and Pictou Landing First Nation (PLFN) fish harvesters to obtain fisheries data in the area of the marine outfall; however they suggest that there was little interest from the fish harvesters to participate or provide any data. This comment is of concern to local harvesters as they did engage in discussions surrounding fishing grounds and it was made clear to NPNS that if there is water, there is fishing. Harvesters maintain their traditional grounds, but they consistently explore other areas outside as well.

> **Recommendation 3.28:** Individual species cannot be pinpointed to specific locations within the Northumberland Strait. Again, they do have traditional habitat and areas they are commonly found, but individuals are not restricted to these areas only. The ability, and likelihood, of each species to move throughout the Northumberland Strait must be considered and accounted for in a robust environmental assessment.

Issue 3.29: *Section 8.12 Marine Fish and Fish Habitat:* Rock crab is another species of extreme importance in the Northumberland Strait, both for its commercial value and its position in the food chain. According to the DFO, American lobster is largely carnivorous and decapods are the principal prey (57% to 84% of prey biomass), with rock crab being the single most important component of the lobster diet (45% to 78%) (DFO, 2019a). As such, a decline in the rock crab biomass could also be detrimental to the lobster biomass. While the majority of the commercial fishery for rock crab occurs in the central and western portions of the Northumberland Strait, there are areas in the eastern portion where rock crab is harvested, including Caribou Harbour where there is overlap with the proposed marine route of the effluent pipeline. The current EA does not consider how a potential decline in a prey species such as rock crab may have a detrimental impact on other commercially important species like lobster.

> **Recommendation 3.29:** The Northumberland Strait must be also assessed as an interwoven and interdependent ecosystem, not only on an individual species by species basis. NPNS must consider these ecosystem impacts in a more comprehensive and robust environmental assessment. Otherwise, it is unclear how the Minister will be provided with sufficient information to make an informed decision about the likelihood of adverse impacts.

Issue 3.30: *Section 8.12.5 Marine fish and fish Habitat Follow-up and Monitoring, Appendix H and G:* As stated in the Environmental Effects Monitoring Program Proposed in Appendix H, completed by Ecometrix and according to the PPER, biological field monitoring studies are recommended to consist of evaluations of benthic invertebrate community condition, fish population health, and dioxins and furans levels in fish tissues. For benthic invertebrates and fish health, the requirements to conduct field studies are only conditional on the spatial extent of the effluent plume in the receiving environment:

A study respecting the benthic invertebrate community, if the concentration of effluent in the exposure area is greater than 1% in the area located within 100 m of a point of deposit of the effluent in water.

A study respecting the fish population, if the concentration of effluent in the exposure area is greater than 1% in the area located within 250 m of a point of deposit of the effluent in water.

In the EA. a statement is made that the mill is only required to implement the field survey programs once it has begun to discharge effluent from the new proposed outfall location and that there is no statutory obligation as defined in the PPER to complete field surveys prior to this time.

> **Recommendation 3.30:** Despite the PPER regulations, given the high level of concern expressed by the public and harvesters, a biological monitoring program should be implemented prior to final commissioning of the proposed treatment plant and effluent outfall. The collection of this baseline information will significantly strengthen the interpretive power of the biological monitoring program as a whole. This baseline information will allow the biological monitoring program data to be analysed in a BACI (Before-After-Control-Impact) framework so that potential effluent related effects can be considered both spatially (i.e., exposure vs. reference) and temporally (i.e., pre-discharge vs post-discharge) .

Issue 3.31: *Section 8.12.5 Marine fish and fish Habitat Follow-up and Monitoring, Appendix H and G:* With respect to the scheduling of monitoring, the Benthic Invertebrate Community Assessment and Fish Population Health Assessment are not required through PPER to be completed in a pre-discharge survey. Further, post-discharge surveys are only being recommended to be performed within 24 months of the initiation of discharge from the new outfall location.

> **Recommendation 3.31:** Again, despite the PPER regulations, in our professional opinion, and due to the high level of concern expressed by the public and harvesters, the biological monitoring program should be implemented and remain continuous as soon as effluent is released to the Strait. Considering the level of concern from stakeholders in the region and coupled with the uncertainty of the effluent composition and the limited collection of existing environmental condition data, it is imperative that NPNS implement a robust continual biological monitoring program prior to effluent discharge and that continues through operations.

Issue 3.32: *Section 8.12.5 Marine fish and fish Habitat Follow-up and Monitoring;* As part of the Pictou Harbour Environmental Effect Monitoring (EEM), sublethal toxicity testing was completed on effluent from the stabilization basin that indicated sea urchin fertilization was affected at stabilization effluent concentrations of greater than 12%. The EA does not mention the results of the EEM or to assess the

potential impacts of the new Caribou Harbour project in the context of what has occurred at Pictou Harbour over the operational period of the mill.

Acknowledging that NPNS has stated that the new effluent will be "different" than the old Pictou Harbour effluent, it is still in the interest of all stakeholders to assess the proposed Caribou Harbour Project using a higher-level scientific scrutiny, due to the legacy impacts of the mill over time, such as the sublethal impacts discussed in the EEM. Currently the EA is lacking in the assessment of sublethal effects. The results of lethal and sublethal effects tests can not be directly correlated between species, because different marine species exhibit different degrees of sensitivity to pulp effluent (Sprague and McLeese, 1968).

> **Recommendation 3.32a:** The EA must consider both lethal and sublethal effects of the Project and must go beyond the provision of "serious harm" to incorporate how effects, other then direct mortality, could negatively impact the fisheries of the Strait.
>
> **Recommendation 3.32b:** In addition, analysis and monitoring of lethal and sublethal effects should be carried out independently of one another on locally important species such as lobster, crab, herring and Atlantic salmon.

3.4 Marine Mammals

3.4.1 Summary of EA Content

The NPNS proposed Replacement Effluent Treatment Facility has the potential to adversely affect marine mammals and because of this, they were scoped into the Project consideration through the Marine Mammals, Sea Turtles, and Marine Birds Valued Ecosystem Component (VEC). The spatial boundaries for this VEC include the Marine Project Footprint Area (PFA), which consists of a corridor of approximately 15m-wide and 4.1km-long that begins at the ordinary high-water mark and extends seaward into the Northumberland Strait until the pipelines terminates at the effluent outfall diffuser, and the Marine Local Assessment Area (LAA), which is an approximately 300m-wide and 4.1km-long corridor. The temporal boundaries for this VEC include the construction (estimated to take approximately 21 months following potential EA approval), operation and maintenance (estimated to occur for several decades), and decommissioning phases of the Project.

The description of the existing environment for this VEC was based on the results of previous research and existing scientific literature and environmental assessments, with a significant emphasis on the Environmental Impact Assessment (EIA) for the Prince Edward Island-New Brunswick Cable Interconnection Upgrade Project. For baseline information on marine mammals, in particular, NPNS relies upon data obtained from the Atlantic Canada Conservation Data Centre (ACCDC), Department of Fisheries and Oceans (DFO) and the Ocean Biogeographic Information System (OBIS).

According to the Project EA, the Gulf of St. Lawrence is known to provide habitat for 13 recorded species of cetaceans (e.g. whales and dolphins) and four species of pinnipeds (e.g. seals), ten of which have

been recorded within the Northumberland Strait and the Project LAA. The species of cetaceans known to occur in the Northumberland Strait include Atlantic white-sided dolphins (Gulf of St. Lawrence population), fin whale (Atlantic population), harbour porpoise (Northwest Atlantic population), long-finned pilot whales, minke whales (Atlantic subspecies), sperm whales; and the species of pinnipeds include grey seal, harbour seal (Atlantic subspecies), harp seal, and hooded seal. These species of pinnipeds are determined to occur in the area either frequently or occasionally, whereas most cetaceans are occasional or rare visitors. At-risk species include fin whale, harbour porpoise, and long-finned pilot whale. According to NPNS's EA, North Atlantic Right Whales are not known to occur in the vicinity of the LAA and there is no record of historical observations in the Northumberland Strait, as shown in Figure 7 below.

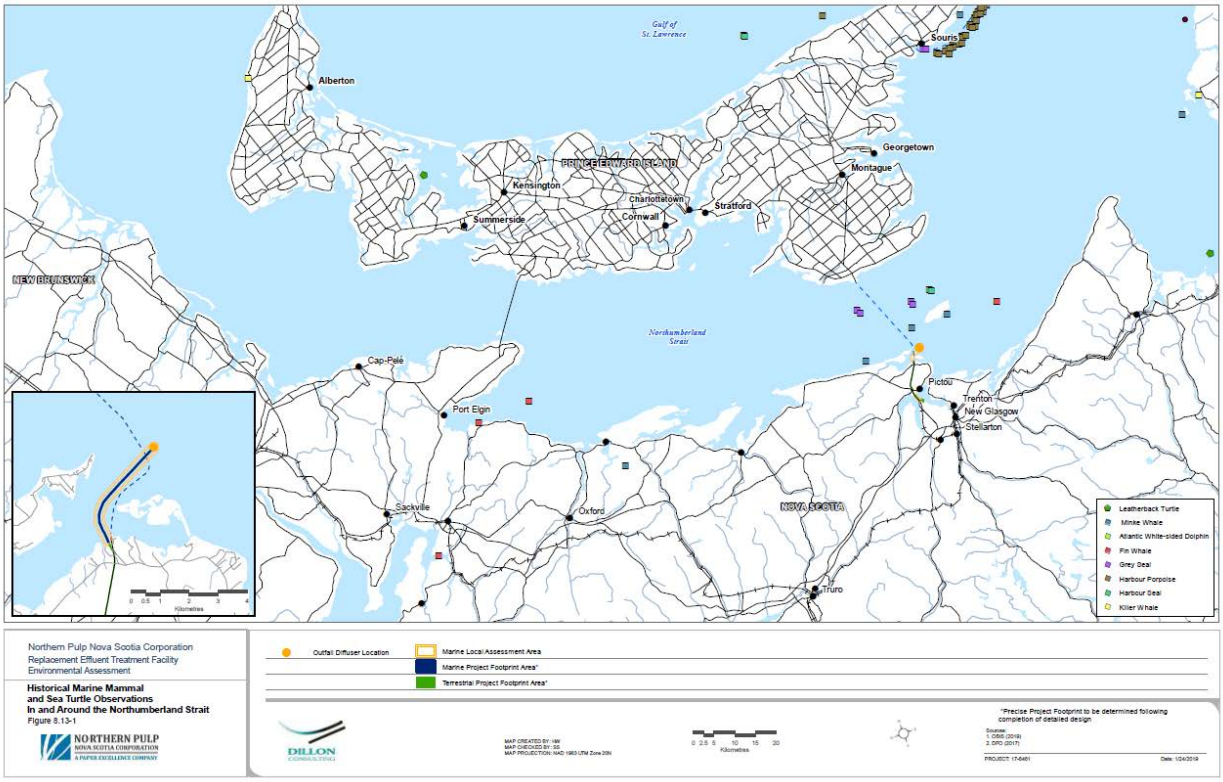

Figure 7. Map of Historical Marine Mammal and Sea Turtle Observations in and around the Northumberland Strait (Source: NPNS Replacement Effluent Treatment Facility EA Figure 8.13-1)

Despite, NPNS's assertion that North Atlantic Right Whales are highly unlikely to be present in the LAA, potential impacts to this species are discussed briefly throughout the effects assessment and considered to a certain extent in mitigation.

NPNS has determined that there is the potential for Project-related activities to result in a change in risk of injury or mortality and a change in habitat quality and use during both the construction and operations and maintenance phases of the Project. Specifically, marine mammals are at risk of injury of mortality due to potential collisions with Project vessels and equipment, potential entanglement in

anchor lines, and potential physical damage due to harmful levels of underwater sound and vibration during marine blasting. Marine mammals could also experience changes in habitat quality and use due to sediment resuspension from seabed disturbance during pipeline trenching and installation, underwater acoustic emissions, and changes in water quality caused by routine effluent discharge from the effluent outfall diffuser.

In order to mitigate these potential adverse effects, NPNS intends to undertake a number of measures including: requiring project vessels to operate a slow maneuvering speeds (e.g. maximum of 10 knots), employing marine mammal observers (MMOs) to monitor and report on marine mammals during marine blasting operations, requiring project vessels to adhere to the general guidelines for vessels operating near marine mammals as outlined in DFO's 2018 Notice to Mariners, minimizing risk of anchor line entanglement by promptly removing them after use and keeping them as taught as possible during use, maintaining buffer distances in the event marine mammals are present near operating Project vessels, and treating effluent in compliance with regulatory guidelines for effluent discharge quality.

Considering the implementation of these mitigation measures, NPNS has determined that significant adverse residual environmental effects on marine mammals are not anticipated.

North Atlantic Right Whale

There was no targeted assessment of the potential adverse effects of the Project on North Atlantic Right Whales, which are listed as endangered by both SARA (Schedule 1) and COSEWIC. They occur in the northwest Atlantic, ranging from Florida to Newfoundland and in the Gulf of St. Lawrence (COSEWIC, 2013). Their wintering and calving grounds are generally located off the coast of Florida and Georgia, however, not all individuals will occupy these areas and the whereabouts of adult males, in particular, is largely unknown (COSEWIC, 2013). Researchers have also recently found a possible breeding ground located in the middle of the Gulf of Maine (COSEWIC, 2013). Female whales will use calving grounds during the early winter then migrate north in the winter and spring to feed in the Great South Channel and Massachusetts Bay areas. During the summer and fall, North Atlantic Right Whales can be found congregating and feeding in the lower Bay of Fundy and in the Roseway Basin on the western Scotian Shelf. However, since 2010 there has been a noticeable shift in the distribution of North Atlantic Right Whales, particularly in their summer foraging range which has led to increasing uncertainty regarding their use of north Atlantic waters (Brillant et al., 2015; Davis et al., 2016; Plourde et al., 2016; Meyer-Gutbrod & Greene, 2018). These changes in distribution are thought to be driven by the changing abundance of North Atlantic Right Whales' primary prey species, *Calanus finmarchius*, which have been shown to be declining in the Bay of Fundy and Roseway Basin, but present in the Gulf of St. Lawrence (Plourde et al., 2016).

The primary threats facing this species are ship strikes and entanglement in fishing gear, both of which have contributed to its endangered status and limited population recovery (COSEWIC, 2013). Most notably, an unusual mortality event was declared in 2017 due to the discovery of 12 North Atlantic Right Whale carcasses in the Gulf of St. Lawrence and 5 near the Gulf of Maine. In most of these cases, causes of death we determined to be blunt force trauma due to ship strikes or entanglement in snow crab

fishing gear (Daoust et al., 2017). Since this time, DFO has worked with industries (e.g. fishing, shipping) to drastically change its management measures to protect North Atlantic Right Whales. Mitigation measures that have been implemented include mandatory vessel speed restrictions, snow crab and lobster fishing closures, and experimentation with new fishing gear technologies (DFO, 2018c; DFO, 2018d).

Underwater noise from increased ship traffic, wind or tidal power projects, and offshore oil and gas exploration also threatens North Atlantic Right Whales by causing acoustic disturbance (COSEWIC, 2013), affecting feeding, migration, care for calves and defense against threats (e.g. vessel traffic). Finally, activities that reduce the quantity or quality of prey (e.g. copepods) are also known threats to the North Atlantic Right Whale habitat.

3.4.2 Evaluation & Recommendations

Issue 3.33: General Comment on EA Scope: An ecological risk assessment (ERA) should be completed to quantify potential risks to the health of marine mammals. This requires detailed information on the chemical characterization of the mill effluent including which chemical parameters are present in the effluent and at what concentrations. If chemicals of potential concern to environmental health are identified as being bioaccumulative, this must be fully considered in the assessment of risks to marine mammals. In particular, we are concerned about North Atlantic Right Whale exposure to contaminants, including but not limited to organochlorines that have the potential to be found in pulp effluent, through vector prey species such as *Calanus finmarchius*. Exposure to bioaccumulating chemicals may influence reproduction and population growth (Weisbrod et al., 2000; Durbin et al., 2002) and exacerbate their current endangered status.

> **Recommendation 3.33:** An ERA is required that considers ecological receptors, including marine mammals such as North Atlantic Right Whales, who may be exposed to chemicals of potential concern from the proposed Project.

Issue 3.34: EA Section Reference: EA Section 8.13.2.1 (p. 400): The description of the existing environment for marine mammals, which forms the basis of the Project effects assessment, is limited in many ways. We are therefore concerned that NPNS's conclusion that the Project is unlikely to cause adverse effects on North Atlantic Right Whales (*Eubalaena glacialis)* is inaccurate. Specifically, there is a lack of transparency and certainty regarding baseline data used, a lack of field studies undertaken, and growing uncertainty regarding the distribution of North Atlantic Right Whales in their summer foraging range.

First, there is a lack of transparency and certainty regarding the baseline data that was considered by NPNS. In Section 8.13.2.1, NPNS states that North Atlantic Right Whales are not known to occur in the vicinity of the LAA and that there have been no historical observations recorded in the Northumberland Strait, citing data obtained from the Atlantic Canada Data Conservation Centre (ACCDC) as of 2018, the Department of Fisheries and Oceans (DFO) as of 2017, and the Ocean Biogeographic Information System (OBIS) as of 2018. However, only the raw data from the ACCDC, and not DFO or OBIS, is provided in EA

Appendices for verification. Further, it is unclear whether these data were obtained from systematic surveys or represent incidental observation records.

Based on our own review of existing marine mammal data from the National Oceanographic and Atmospheric Association's (NOAA) Right Whale Sighting Advisory System, it is clear that NARW have been reported in the Northumberland Strait in the past, most recently in 2015 when a female and her calf were spotted in St. George's Bay (Figure 8).

Second, no field work was conducted as part of this EA registration for the marine mammals, sea turtles, and marine birds VEC. Instead, this section relied substantially on the EIA registration for the PEI-NB Cable interconnection upgrade project.

Third, there is growing uncertainty regarding the distribution of North Atlantic Right Whales in their summer foraging range; it is therefore inappropriate to determine they will not occur in the Northumberland Strait. Since 2010, there has been a noticeable shift in the distribution of North Atlantic Right Whales, particularly in their summer foraging range, which has created uncertainty regarding their use and occupancy of habitat in the north Atlantic (Brillant et al., 2015; Davis et al., 2016; Plourde et al., 2016; Meyer-Gutbrod & Greene, 2017). For example, approximately one third of the North Atlantic Right Whale population is not observed in its traditional or known summering habitats, and in some years, they will abandon these areas altogether (Plourde et al., 2016). Additionally, survey efforts for North Atlantic Right Whales within their summering ranges are concentrated around known critical foraging habitats such as the Bay of Fundy and Roseway Basin (Brillant et al., 2015), despite the fact that in recent years they have been concentrating in the Gulf of St. Lawrence (Plourde et al., 2016; Meyer-Gutbrod & Greene, 2018; Meyer-Gutbrod et al., 2018). This northward shift is distribution is driven in part by the changing relative abundance of their primary prey species *Calanus finmarchius*, and recent studies have shown potential new suitable foraging habitat in areas of the southern Gulf of St. Lawrence (Plourde et al., 2016), which is in close proximity to the Northumberland Strait.

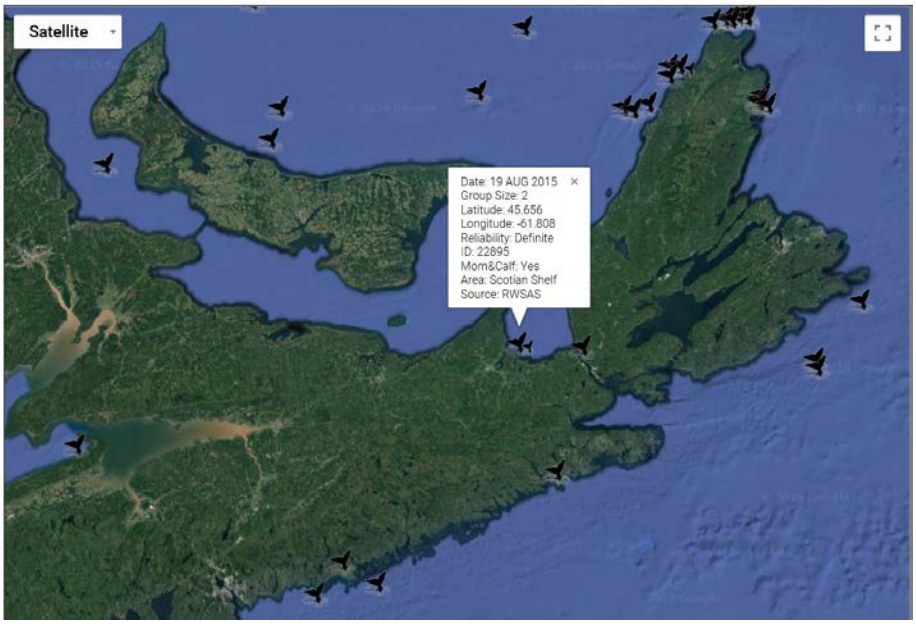

Figure 8. Sighting of North Atlantic Right Whale in the Northumberland Strait in 2015 along with Calf (Source: https://www.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html)

> **Recommendation 3.34:** The assessment of project effects on marine mammals, sea turtles, and marine birds VEC (Section 8.13) is considered to be incomplete and underscores the need for NPNS to conduct field studies for this Project, especially given growing uncertainty regarding the distribution of North Atlantic Right Whales in their summer foraging range.

Issue 3.35: EA Section Reference: EA Section 8.13.3.2 (p. 417-420): Section 8.13.3.2 does not provide enough information on the methodologies that will be employed by Marine Mammal Observers (MMOs). It is assumed that visual surveying methodologies will be employed based on the specification that MMOs will be equipped with 7x35-power binoculars, but no further details are provided. Visual surveys are known to be limited by a number of factors including daylight, weather conditions, and the availability of suitable monitoring platforms at appropriate times and appropriate locations (Brillant et al., 2015). By contrast, other methods such as passive acoustic monitoring (PAM) can provide continuous coverage of areas that are otherwise difficult to observe visually. Additionally, a rationale was not provided as to why marine mammal monitoring would likely only be undertaken during blasting activities and not all project vessel traffic.

There is also very little information on MMOs reporting requirements and the circumstances under which marine mammal monitoring will be required.

Without these further details on marine mammal monitoring, it is not clear that measures to mitigate the potential adverse effects of the Project on North Atlantic Right Whales will actually be effective.

> **Recommendation 3.35a:** NPNS must provide more detailed information on visual surveying methods and consider completing these in combination with other marine mammal monitoring

methods such as the deployment of passive acoustic monitors or aerial (helicopter or drone) surveys.

Recommendation 3.35b: NPNS must provide more information on MMO monitoring requirements, including information on reporting intervals, accessibility of reports to stakeholders, and whether reporting will trigger any adaptive management measures.

Recommendation 3.35c: NPNS should also consider requiring marine mammal monitoring during all project activities that require vessel travel.

Issue 3.36: EA Section Reference: EA Section 5.3 (p. 49-81); EA Appendix F (p. 1-91); EA Section 8.13.3 (p. 415-424) NPNS acknowledges that marine mammals could be adversely affected by a project-related change in risk of injury or mortality by way of potential collisions with project vessels and equipment (Sect. 8.13.3.1, p. 415). However, there is very little information on the vessel traffic that will be required to complete Project activities (e.g. marine portion of pipeline installation, marine surveying for pipeline route planning, marine outfall construction, pipeline maintenance and inspection, etc.), specifically regarding vessel types, sizes, routes, speeds, and schedules. NPNS does state that "project vessels used for construction and for potential maintenance and repairs during operation will be relatively small in size and draft and will not be present in large numbers" (Sect. 8.13.3.1, p. 417), and that 'Project vessels may operate up to 24 hours a day, 7 days a week during construction" (Sect. 8.13.3.3, p. 420), but this information is not clearly summarized in Section 5.3 or Appendix F in detailed or definitive terms. Subsequently, it is unclear how NPNS came to the conclusion that Project vessels are unlikely to harm North Atlantic Right Whales without providing clear, detailed information on vessel activity.

Additionally, NPNS intends to prevent injury or harm to marine mammals by adhering to general guidelines for vessels operating near marine mammals, as specified in section A2 of the annual edition of Notices to Mariners (DFO, 2018d). This includes measures such as approaching areas of known or suspected wildlife activity with extreme caution, reducing vessel speeds and avoiding approaches within certain distances (e.g. 400m and 100m). However, NPNS has not provided any information on how they intend to detect marine mammal while navigating Project vessels and has stated that they will likely only employ MMOs during blasting activities. This is an information gap that must be addressed.

Recommendation 3.36a: More detailed and definitive information on the vessel traffic (including vessel type, size, route, speed, schedules) that will be required to complete Project activities must be provided and considered in the EA, given potential impacts to marine mammals.

Recommendation 3.36b: NPNS should ensure that observers are present on all Project vessels to identify the presence and location of marine mammals and to ensure appropriate mitigation measures outlined in EA Section 8.13.3.2 are adequately triggered and implemented.

3.5 Cumulative Effects

3.5.1 Summary of EA Content

Cumulative environmental effects are described in the EA as residual environmental effects that are likely to result from a project in combination with the environmental effects of other projects or activities that have been or will be carried out and also referred to as past, present, and reasonably foreseeable future projects or activities (CEA Agency 2014).

The EA claims that the existing environment conditions described in the report reflect the cumulative environmental effects of past and present project activities; however, there is also a need to assess the potential for additional project-related cumulative environmental effects, particularly with respect to potential interactions with other pending projects that are in advanced planning stages, or existing ones that may be subject to modifications or expansion.

The cumulative environmental effects assessment methodology undertaken for the Project is only a high-level approach which is said to have been recommended by the Canadian Environmental Assessment Agency's (CEA Agency) publication titled "Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012* – Interim Technical Guidance" (CEA Agency 2018).

According to CEAA's guidance document, a cumulative environmental effects assessment should accomplish the following:

- determine if the Project will have a residual environmental effect on a valued component;
- determine if the incremental effect acts cumulatively with the effects of other past, existing, or future actions; and
- determine if, after mitigation, the combined environmental effects may cause a significant change in the VEC.

NPNS acknowledges that there is a high level of existing disturbance in the Northumberland Strait associated with the Northumberland Ferries service, commercial shipping, and commercial fishing in Caribou Harbour and the Northumberland Strait, but that there are few other likely projects or activities in the marine portion of the RAA.

Key cumulative activities that may adversely affect a number of important marine fish and mammal species include increased acoustic emissions, impacts to habitat associated with future dredging activities in Caribou Harbour in support of Transport Canada shipping lane maintenance, potential collisions with other vessels, pollution from bilge water and the accidental release of hydrocarbons.

However, it was determined that most marine fish and mammals are likely to avoid construction activities, and the PFA overall, due to noise and activities. Subsequently, it was predicted that the

residual cumulative effects on marine mammals are not likely to be substantive overall, and that they are not anticipated to extend beyond the PFA.

3.5.2 Evaluation & Recommendations

Issue 3.37: The Gulf of St. Lawrence has been identified as an area of rapid coastal deoxygenation by Claret, M. et. al (2018). Their analysis notes increases in surface water temperature and salinity, as well as decreases in oxygen saturation. This must be accounted for the in the assessment of cumulative effects of the Project, within the EA.

> **Recommendation 3.37:** The EA must assess cumulative effects of the proposed Project on the marine environment, in light of current stressors that have already been identified, including increases in surface water temperature and salinity, as well as decreases in oxygen saturation.

Issue 3.38: In Section 8.14.3.6 (Employment and Economy), within the *Commercial Marine – Harbours, Ferries, and Other Infrastructure* sub-section, the EA describes Northumberland Ferries' operations and traffic and carrying capacity. Yet in the socio-economic section of the EA, there is no analysis or discussion regarding how the potential marine related potential risks may interact as cumulative effects.

> **Recommendation 3.38:** Discussion is required around the interactions between potential impacts from the new ETF discharges from the outfall, and ferry discharges within the harbour and Strait, and in turn the implications for ecological and human health risks, from a cumulative effects assessment standpoint.

3.6 Human Health

3.6.1 Summary of EA Content

A human health risk assessment (HHRA) was not completed as part of the Environmental Assessment Registration Document submission. Rather, NPNS completed a Human Health Evaluation (HHE), intended to prepare for the potential completion of an HHRA, which could be required as part of the conditions of approval for the Project (as stated in the EA). The HHE followed guidance from Health Canada.

The Human Health Evaluation focused on two primary sources of emissions or discharges that have the potential to result in exposure of humans to project-associated chemicals, namely (1) treated effluent released to the marine environment and (2) air emissions from the replacement effluent treatment facility and the existing NPNS mill. As such, the following human health exposure pathways were considered in the HHE for infants, toddlers, children, teens and adults:

- Incidental direct contact with sea water and/or marine sediments;
- Ingestion of marine food items, including those that are part of the commercial fishery and aquaculture;

- Inhalation of air contaminants during construction, operation and maintenance phases of the Project; and

- Ingestion of potentially impacted drinking water.

A quantitative assessment of potential exposures to project-associated chemicals of potential concern (COPC), and any resulting human health risks was not completed in the EA. This is, in part, due to the project-specific effluent chemistry not being fully known (because the chemical process engineering design work has not been completed). As such, the chemical composition of the effluent, including chemical concentrations, has not been fully characterized. Eventually, in the HHRA, it is expected that COPCs will be chosen based on an evaluation of baseline data, chemical toxicity, amount released, chemical fate and behaviour, and the resulting environmental concentrations.

As part of the HHE, NPNS completed a review of published reports (i.e., reports from Toxikos, 2006; Hewitt et al., 2006 as referenced in the EA) to inform the prediction of COPCs. It is stated, within the EA Registration Document, that the list of COPCs for the Project is expected to be relatively small and may include metals/metalloids (including mercury), polycyclic aromatic hydrocarbons (PAH), polychlorinated dibenzo(*p*)dioxins and furans, resin acid compounds, chlorophenolic compounds, non-chlorinated phenolic compounds and chlorinated volatile organic compounds (VOC).

3.6.2 Evaluation & Recommendations

Issue 3.39: A Class 1 Environmental Assessment does not specifically require the completion of an HHRA prior to the registration of the Project EA. However, the "Proponent's Guide to Environmental Assessment, September 2017" issued by Nova Scotia Environment, states that the registration document for a Class 1 undertaking should include any effects on environmental health, such as contaminants that may affect human health that will be released into the atmosphere, water or land. In addition, it is stated that the information included in the registration document needs to be sufficient for the Minister to make a decision on the undertaking. Without a complete HHRA that clearly quantifies potential exposures and risks (if any) to project-associated chemicals of potential concern, it is unclear how this stipulation will have been met through the provision of the HHE. Given the potential for risks to human health to occur as a result of exposure to chemicals of potential concern related to the proposed Project, the Human Health Evaluation, as presented, is not considered to be an adequate assessment of health risks.

> **Recommendation 3.39:** A robust and comprehensive assessment of potential health risks (i.e., through the completion of a Human Health Risk Assessment) is required in order to determine if adverse health effects from the Project are likely.

Issue 3.40: Overall, within the EA Registration Documents, numerous assumptions are made regarding potential impacts to the receiving environment. It is unclear if an adaptive management plan or strategy has been developed should some of these assessment predictions differ from what is observed when the Project commences.

Recommendation 3.40: An adaptive management plan should be provided to address discrepancies between project assumptions and predictions, and what is found to occur in the environment once the Project begins. This plan should include an assessment of changes to predicted risks to human health, should the Project assumptions not hold true.

Issue 3.41: Section 9.2 - It is noted that Pictou Landing First Nation members traditionally harvest various species including lobster, rock crab, herring and American eel; however, the extent and details of their harvesting and consumption patterns are not known. It is also stated that possible local harvesting and consumption of bivalve shellfish may occur along shoreline areas around Caribou and Munroes Island. There appears to be uncertainty regarding fish consumption activities for both Indigenous and non-Indigenous people within the assessment area. This is a significant data gap in understanding the potential human health impacts related to the proposed Project.

Recommendation 3.41: The assessment of potential risks (if any) to human health associated with the Project requires a fulsome understanding of both the exposure concentrations of Contaminants of Potential Concern in the marine environment, and the exposure pathways identified as being of concern to human health (i.e., the consumption of fish and shellfish).

Issue 3.42: Section 9.1 – It is stated that effluent chemistry (i.e., chemicals present and their associated concentrations) is not known and won't be known until the Project is operational. In addition, other areas of uncertainty listed in the Project documents include limited (recent or current) environmental baseline data and food item chemistry data, and limited data on traditional harvesting and consumption patterns. As such, the Human Health Evaluation, as presented in the assessment, is based only on data and study results currently available. Again, the data gaps, as described by NPNS, are significant barriers to properly assessing potential risks to human health. It is unclear when a more robust set of baseline environmental data will be obtained and why this was not completed prior to the Project being registered. Baseline data is of extreme importance to the EA process, and specifically to the identification of Contaminants of Potential Concern in the assessment of health risks. In fact, within the EA, it is stated that consultation with Health Canada in relation to the HHE and potential HHRA resulted in a stated expectation by Health Canada to include both baseline and future conditions exposures scenarios.

Recommendation 3.42: A more robust assessment of baseline conditions (such as water quality, sediment quality, land use patterns, fish consumption rates and other relevant environmental attributes) must be completed prior to project approval, to understand potential risks to human health related to the Project.

Issue 3.43: Section 9.3 - With respect to air emissions, it is anticipated that a pilot study of the combustion of hog fuel and sludge in the power boiler will be conducted. Can NPNS confirm that this will be completed? It should be noted that Health Canada, in consultation with NPNS regarding potential health risks, outlined expectations regarding the need for an evaluation of potential changes in local air quality due to co-burning of sludge in the power boiler.

Recommendation 3.43: NPNS must confirm that the pilot study will be completed to evaluate the potential impacts to air quality due to the combustion of hog fuel and sludge in the power

boiler and must outline adaptive management strategies should the results of the air monitoring and pilot study not align with the assumptions and predictions of the current assessment.

Issue 3.44: Section 9.2.4.1 – Stantec (2019) reported that ambient air monitoring data for 2015, 2016, and 2017 showed no exceedances of the applicable Nova Scotia regulatory Air Quality Criteria for monitored air contaminants. It is unclear if 2018 data are available.

> **Recommendation 3.44:** If 2018 air monitoring data are available from Stantec (2019), they should be included in the assessment.

Issue 3.45: Section 9.2.4.1 – It is stated that based on modeling results, predicted concentrations of the air contaminants of concern—namely CO, NO_2, SO_2, TSP, $PM_{2.5}$ and H_2S—from the operation of the existing and future mill are expected to be in compliance with the reference criteria at the representative off-property discrete receptors. Modelled exceedances of H_2S were estimated to occur less than 0.05% of the time and believed to be an artifact of model inputs. However, it was reported that some odour occurrences were found that were associated with H_2S. A more fulsome discussion of what is meant by an artifact of model inputs is required. The EA does not discuss which adaptive management measures will be put in place to manage non-compliance issues should actual air emissions differ from predicted air emissions.

> **Recommendation 3.45:** Details are required regarding adaptive management measures, to address the potential for actual air emissions to be greater than predicted emissions (based on modelling exercises). In addition, further discussion in the EA is needed regarding what is meant by an artifact of model inputs related to modelled exceedances of H_2S (Section 9.2.4.1).

Issue 3.46: Section 9 and Table 12.1-2 – The Human Health Evaluation did not acknowledge or address the potential for cumulative effects to impact overall human health. Surrounding land uses, including agricultural areas, may contribute to the overall contaminant load in the receiving water, and subsequently marine food items.

> **Recommendation 3.46:** The potential risks to human health associated with cumulative impacts of the Project and current stressors must be considered in the assessment.

3.7 Socio-Economics

3.7.1 Summary of EA Content

Within NPNS's EA for its new effluent treatment facility, the socio-economic environment was considered for its "potential interaction with local communities, how land and water is used in the vicinity of the Project, and the potential interaction between the Project and the economic well-being of these communities" (Section 8.14).

The socio-economic environment's LAA is represented by the communities whose activities

intersect with the PFA and includes: Pictou Landing First Nation, local residents, and local industries located in the Municipality of Pictou County or the towns of New Glasgow, Stellarton, Pictou, Westville, and Trenton.

Within the EA socio-economic section introduction, NPNS describes the interdependencies of other VECs that need to be considered to assess impacts to the social and economic values, including health of communities, accidents and malfunctions, noise, air quality, heritage resources, drinking water, fishing, connection to the water and land (i.e., recreational enjoyment). The mitigations described for addressing the potential socio-economic effects that NPNS has identified within its Project's EA involve:

a) Mitigations and assessment results within other EA sections (i.e., Section 8.11 - Effects on harbour physical environment, water quality, and sediment quality; and Section 8.12 - Marine Fish and Fish Habitat);

b) A communication plan (i.e., notifications to surrounding communities during construction)

c) Ongoing engagement and information exchanges with the Community Liaison Committee;

d) Noise and dust management through the EPP;

e) Scheduling work to avoid or minimize interactions with other VECs (e.g., ferries, fisheries)

f) Possible future mitigations should DFO or TC deem it necessarily as a result of their review.

During construction, the Proponent has identified the following potential effects that could occur on various aspects of the Socio-economic environment:

- Potential localized impact to commercial fisheries in the area due to construction interactions with target species;
- Short-term interruption to Jitney Trail use while construction occurs in that vicinity;
- Potential for periodic, short-term but planned delays to marine traffic including the NS-PEI Ferry and commercial fisheries leaving the marinas east of Northumberland Ferries marine terminal during construction stage where the pipeline route is anticipation to cross the navigational channel;
- Potential short-term traffic delays; and
- Potential for short-term nuisance (e.g., noise, dust) to local residents from construction activities, particularly in the vicinity of Caribou where residences are along Highway 106.

The Proponent states that with mitigation measures applied, the residual environmental effects of the Project on the socio-economic environment during construction will be temporary and not significant in nature.

During operation, NPNS states that "[A]s a result of the design and mitigation measures proposed, residual environmental effects are not expected to the socio-economic environment during operation and maintenance" (Section 8.14.4.3 Characterization of Residual Environmental Effects). The rationale provided is based on the following points or mitigations:

- The measures outlined in the EPP and the mitigation measures identified for other VECs will mitigate interactions with the socio-economic environment;
- Follow up and monitoring will be completed to monitor the environmental effects of the Project and mitigation any (socio-economic) impacts;
- Communications and Compensation Plan for Commercial Fisheries and Aquaculture, in coordination with NSE, DFO, and potentially impacted stakeholders;
- Anyone with concerns about the Project and its interactions with the environment may contact NSE's Area office in Granton; and
- The Community Liaison Committee will continue to facilitate two-way communication and advice to NPNS

Follow up and monitoring related to socio-economic value components will entail the mitigations listed within other VECs and ongoing meetings with the Community Liaison Committee.

3.7.2 Evaluation & Recommendations

Issue 3.47: In Section 8.14.1 (Boundaries), the EA states that "once the ETF or pipeline is nearing the end of a useful service life, a decommissioning plan will be developed and will be submitted for a separate review requiring NSE approval". It is unknown what the pipeline's anticipated lifecycle will be before land disturbance will be required again for its decommissioning, upgrading or replacing.

> **Recommendation 3.47:** Provide information on the pipeline's lifecycle length and anticipated activities for its decommissioning (i.e., expansion, upgrades, replacement etc.)

Issue 3.48: In Section 8.14.2 (Interdependency with Other VECs), NPNS identifies the environmental VECs and impacts that the socio-economic environment relies on to identify impacts including: health of communities, accidents and malfunctions, noise, air quality, heritage resources, drinking water, fishing, connection to the water and land (i.e., recreational enjoyment). Although briefly discussed in the baseline section, missing in the EA are VECs and associated potential effects that reflect the economic and social factors triggered by the Project such as impacts to the local and regional economy, employment, and dynamics during construction phase (e.g., construction activities, workforce and social issues; direct, indirect and induced positive and adverse economic impacts).

NPNS must include VEC, and more importantly, a robust and consistent effects assessment on indicators related on the acknowledged VEC "health of communities" to capture missing elements of health and wellbeing, including the protection of a resilient fishery and associated economies including harvesting

and processing plants; employment, analysis of economic risks and/or benefits at community, regional and provincial level; description for, and management plans for anticipated workforce at both construction and operation phases.

Issue 3.49: In Section 8.14.3.4 (River and Marine Based Uses), NPNS states that "The lobster fishery has for many years been the largest fishery in the area by landing value (DFO 2008 and DFO 2017). However, the assessment of socio-economic effects will not place the importance of this fishery above others. An 'ecosystem approach' for impact assessment that looks at the health and resilience of the Strait as a whole was put forward and confirmed during discussions with all stakeholders, fishermen, and Pictou Landing First Nation." Later in the assessment however, there is no evidence of how stakeholder, fishermen and Pictou First Nation's concerns regarding direct and indirect impacts on the health of the marine eco-system nor fishing economy have been considered into the EA, let alone an ecosystem approach to the effects assessment (e.g., inclusion of eco-systemic interdependencies; species lifecycle differences; food chain dependency ripple effects across species etc.); there is no acknowledgement of industry and conservation efforts to maintain the integrity of commercial fisheries; there is no indication of understanding or indication of interest to understand the direct adverse economic and social impacts any disruption in fishing will have on harvesters – both Indigenous and non-indigenous, in the region; nor indication of how individuals within the lobster fishery or other fisheries (or their children as future participants in the fisheries sector) will be compensated or accommodated for losses as a result of the Project's construction and/or operations activities - missing just a *few days* of the fishing season is a *serious impact to fisheries*. Moreover, an analysis of the risks to a province and region whose economy is primarily dependent on its fisheries sector is absent from the socio-economic section altogether.

> **Recommendation 3.49a:** Apply an actual ecosystem and integrated approach for the effects assessment that considers VEC interdependencies and an economic risk analysis to other economic sectors in the region – fisheries in particular;
>
> **Recommendation 3.49b:** Provide a detailed description of the region's economic reliance on commercial fisheries, including individual harvester economic baselines and dependencies as they relate to fishing.
>
> **Recommendation 3.49c:** Provide analysis of the Project's construction and operation phase effect mechanisms and interactions with harvesters' ability to fish (in terms of access); as well as potential risks to fishing economy due to risks to species' habitat, spawning area integrity and health.
>
> **Recommendation 3.49d:** Describe how individuals within the lobster fishery (and other fisheries) will be compensated or accommodated for losses as a result of the Project's construction and/or operations activities. An explicit acknowledgement of the adverse economic impacts (and in turn social impacts on regional and community wellbeing and health) for fishers when even just a few days of fishing are interrupted is critical for a balanced effects assessment.

Issue 3.50: In Section 8.14.3.6 (Employment and Economy), within the *Manufacturing* sub-section, the EA describes how "…NPNS directly employs over 330 residents of Northern Nova Scotia; provides indirect and induced employment to Pictou County and the province of Nova Scotia in general; and that

NPNS' operations' maintain and create well over 2,000 jobs across the province in the forestry sector". This is appropriate baseline information, however the baseline information for employment and economy has a glaring, inappropriate and unacceptable omission of information to describe the how the region's socio-economic resilience is uniquely and primarily dependent on the health of the Northumberland Straight ecosystem to maintain the Province's primary economic sector: fisheries.

For instance, according to the Nova Scotia Department of Fisheries and Aquaculture, there are over 18,000 people working in the fishing sector within the Province; Lobster is the most valuable seafood export ($947 Million in 2017); followed by crab ($314 Million); scallops ($144 Million); and shrimp ($126 Million) (Nova Scotia Department of Fisheries and Aquaculture, https://novascotia.ca/fish/). In 2012, the lobster fishing industry in the Gulf Region consisted of 2,966 commercial lobster licence holders which included 215 communal commercial licences held by 18 Aboriginal organizations. Each of these commercial enterprises employs numerous people, bringing the total to about 7,100 individuals involved in the harvesting sector in the Gulf Region. In addition, there were nine Indigenous organizations which received communal lobster fishing licences for food, social and ceremonial (FSC) purposes (Fisheries and Oceans Canada, 2014).

The baseline neglects to acknowledge the Province's primary economy altogether: Of Nova Scotia's 5.4 billion export economy, seafood amounted to $2 billion in 2017. Lobster and crab account for $1.26 billion (Nova Scotia Department of Fisheries and Aquaculture; Government of Canada, n.d.). The baseline does not mention Government of Nova Scotia and fishing industry efforts and plans for the region such a legislated mandate to promote, support and develop the fishing, aquaculture, seafood processing and sportfishing industries that contribute to the economic, environmental and social prosperity of Nova Scotia's coastal and rural communities (Government of Nova Scotia, 2018).

Despite a hasty mention of these value components, 'economy' or 'employment' are not actually described in a way that reflects the region's socio-economic reality and are not carried forward at all into the socio-economic impact assessment. No analysis has been conducted of the risks that the Project's short- and long-term activities will pose to the existing, heavily relied upon, commercial fishing sector. This is unacceptable. A more comprehensive baseline is required to demonstrate the unique socio-economic regional context surrounding the proposed Project so that potential effects can be more accurately considered and in turn avoided or mitigated. As referenced in AMEC's *Northumberland Strait Ecosystem Overview Report* (2007), "[L]obster provides the largest share of total landed values for the main species (approximately 85%), and declines in this species alone are cause for concern"…"…the magnitude and longevity of the decline in commercial fisheries for highly dependent communities is more problematic than cyclical patterns experienced elsewhere or in the past (AMEC, 2007. Accessed from: https://docs.wixstatic.com/ugd/b61814_1639a02cebd94db4ba24787ad9a4cac7.pdf.)

Moreover, there has not been any consideration of other facets of the commercial fishing sector such as processing plants in Pictou County, and potential project interactions (e.g., between the plant's water intake pipes and NPNS's effluent discharge areas; such interactions could have devastating human health and economic impacts to the sector and product consumers).

Recommendation 3.50: NPNS must provide a balanced and accurate description of the existing regional socio-economic context, including regional health and wellbeing dependencies on the fish harvesting and fish processing sectors. Using complete baseline information, an economic effects assessment is required that carries forward information referred to within the baseline section including: Project effect mechanisms and interactions with existing fisheries economic sector, at a granular level i.e., net losses anticipated due to forecasted days of interruptions due to construction and operations); human health effect mechanisms and interactions with economic risks related to fish processing plant operation requirements and interactions with effluent discharges; project workforce requirements; wages and salaries, and supply chain procurement needs during both construction and operations.

Issue 3.51: In Section 8.14.3.6 (Employment and Economy), within the *Tourism* sub-section, the EA describes how tourism in the county and region is heavily relied upon for its revenues. Given the level of priority this is for the LAA, the EA would have benefited from more relevant information within its baseline and EA analysis.

Recommendation 3.51: Provide more baseline information describing the specific aspects of the tourism sector within the LAA that have inter-connections with water – either from recreational usage or from drinking and/or other water uses. These details would be relevant within an eco-system approach to the socio-economic impact assessment**.**

Issue 3.52: In Section 8.14.4.1 (Potential Environmental Effects), NPNS identifies the following (8) potential socio-economic related effects that may occur as a result of construction:

1. Temporary delays to Nova Scotia – Prince Edward Island ferry due to marine construction;
2. Temporary delay or access distribution to marine areas (commercial or recreational) due to marine construction;
3. Traffic delays could occur on Highway 106 during construction;
4. Traffic delays (vehicular and ferry) discouraging tourists from entering the area or using the ferry;
5. Local road network could deteriorate from additional vehicular use due to traffic detouring;
6. Temporary nuisance (noise, dust) could be perceived by local residents during construction;
7. Temporary property access disruption to properties adjacent to construction may occur, particularly in vicinity to residents along Highway 106 at Caribou Harbour; and
8. Temporary access disruption to section of Trans Canada Trail or other recreational uses on land during construction of the effluent pipeline

These effects list access and disruption issues to various economic sectors and related activities, which in turn would negatively impact the local economy. However, the potential risk of these adverse effects are minimized if not completely ignored; they are not discussed nor analyzed. Mitigations from other VECs are referred to as the solution and in turn no effects of consequence are predicted. Unfortunately, as this technical review report demonstrates, the EA is riddled with data gaps and generic mitigations that simply do not provide confidence in their ability to address the potential risks as a result of the Project's construction and operations activities.

There is also mention of noise and dust nuisance, which is related to human health. Missing from this list of project effect mechanisms and interactions is the consideration of:

- Adverse social impacts to individuals and families who rely on uninterrupted or disturbed access to the fisheries;
- Cumulative effect of effluent discharge and ferry related discharges in the harbour and straight; which in turn have implications for human and eco-systemic health;
- Increased health and safety risks from an increase in traffic along Hwy 106 (i.e., vehicular/human accidents)
- Socio-economic impacts related to employment and supply chain procurement during construction and operations; and
- Potential social impacts related to the temporary construction workforce.

Recommendation 3.52: NPNS must provide information and analysis of the following:

a) Discussion and analysis of risks and in turn, potential adverse social impacts to individuals and families who rely on uninterrupted or undisturbed access to the fisheries; including mitigations for avoiding this adverse impact.

b) Identification of positive socio-economic effects from employment during the 21-month construction period as well as operations and maintenance. It is acknowledged that the Project description states that no additional jobs would be created during operations as existing personnel would be retrained for the new facility. Both phases of the Project need to be discussed in terms of what economic benefits would occur (even if no change during operations) within the socio-economic effects assessment. This allows the impact evaluation to demonstrate both the potential negative as well as the potential positive socio-economic impacts that would be predicted as a result of the Project's various activities, including employment generation and associated indirect and induced impacts during the 21 months' construction.

c) A description of human and ecological health pathways, project interactions and effect mechanisms within the socio-economic effects assessment including a human health

risk assessment (i.e., drinking water within the LAA's wells; recreational water usage; Indigenous community members' land uses, water and wild foods consumption).

d) A discussion and demonstrated planning for health and safety considerations of the surrounding communities as related to construction, should there be a temporary, non-resident workforce hired for construction. Include whether the construction workforce will be housed in surrounding local communities and/or within temporary workcamps. How many workers are anticipated to be hired for the construction phase?

Issue 3.53: In Section 8.14.4.1. (Potential Environmental Effects), within the *Operations and Maintenance* sub-section, NPNS identifies the following (2) potential socio-economic related effects that may occur as a result of operations:

1. Interference with resources harvested for cultural, commercial, and recreational uses (e.g., if Project introduces odour, or negatively affects fisheries); and

2. The project impacts could negatively affect the local economy by interfering with resources needed for goods production, or transportation of those goods

Similar to the issues identified with the potential effects mentioned for construction, there is little acknowledgement (if not dismissal) of the risks the long term effects the operations will have on the local and regional fisheries. And based on the review of the fisheries, water and other aspects of the Project's design within the EA's registration documents, there are too many gaps in data and modelling to dismiss the potential for long term effects on the health of species; their habitat and/or migration due to effluent discharge and/or temperature change from the outfall.

Also missing from this assessment is consideration of impacts on tourism due to visual impacts and/or human health risks and/or perceived fear of recreational marine use; nor is there consideration of effects from pipeline integrity management activities (e.g., integrity digs and associated land disturbances).

Recommendation 3.53a: NPNS must provide discussion and analysis of potential effects to the health and integrity of the region's commercial fisheries based on results of more comprehensive effluent modelling, data upgrades and effects analysis as per the results of this EA's technical review of these inter-dependent VECs.

Recommendation 3.53b: NPNS must provide discussion and analysis of tourism impacts and human health risks related to Indigenous land and resources, and non-Indigenous lands and resources (i.e., drinking water and marine based recreation)

Recommendation 3.53c: NPNS must provide discussion and analysis of potential impacts of pipeline operations and maintenance (specifically integrity digs) on land and resource use for both Indigenous and non-Indigenous citizens.

Issue 3.54: In Section 18.4.2 (Mitigation), under the *Construction* sub-section, NPNS puts forth the following recommended mitigations to address the identified socio-economic impacts during construction:

"Standard construction best practices" for…

1. Communication;
2. equipment operation;
3. construction staging; and
4. Roads which are travelled regularly by construction vehicles will be repaired.

The suggested mitigations are seemingly abstract plans without details nor commitments. In some cases, they are simply referred to as discussions to occur with various government agencies such as DFO. And all is deferred to mitigations within other VEC sections such as water and fisheries (8.11 and 8.12). The results of the review of these sections, however, point to limited or outdated data from which assumptions have been made in regards to impacts. And mitigations for water and fisheries are relatively general. There is not enough information, nor solid enough mitigations in place to provide assurance for the minimization and dismissal of the socio-economic effects.

> **Recommendation 3.54:** NPNS must provide more fulsome consideration, description and commitment for specific mitigation, management and monitoring measure to address both the ecological and social factors related to the Project's activities at construction and operations as listed in previous comments.

Issue 3.55: In Section 8.14.3.6 (Employment and Economy), within the Manufacturing sub-section, the EA describes how "…NPNS directly employs over 330 residents of Northern Nova Scotia; provides indirect and induced employment to Pictou County and the province of Nova Scotia in general; and that NPNS' operations' maintain and create well over 2,000 jobs across the province in the forestry sector". This is appropriate baseline information, however the baseline information for employment and economy has a glaring, inappropriate and unacceptable omission of information to describe the how the region's socio-economic resilience is uniquely and primarily dependent on the health of the Northumberland Straight ecosystem to maintain the Province's primary economic sector: fisheries.

For instance, according to the Nova Scotia Department of Fisheries and Aquaculture, there are over 18,000 people working in the fishing sector within the Province; Lobster is the most valuable seafood export ($947 Million in 2017); followed by crab ($314 Million); scallops ($144 Million); and shrimp ($126 Million) (Nova Scotia Department of Fisheries and Aquaculture, https://novascotia.ca/fish/). In 2012, the lobster fishing industry in the Gulf Region consisted of 2,966 commercial lobster licence holders which included 215 communal commercial licences held by 18 Aboriginal organizations. Each of these commercial enterprises employs numerous people, bringing the total to about 7,100 individuals involved in the harvesting sector in the Gulf Region. In addition, there were nine Indigenous

organizations which received communal lobster fishing licences for food, social and ceremonial (FSC) purposes (Fisheries and Oceans Canada, 2014).

The baseline neglects to acknowledge the Province's primary economy altogether: Of Nova Scotia's 5.4 billion export economy, seafood amounted to $2 billion in 2017. Lobster and crab account for $1.26 billion (Nova Scotia Department of Fisheries and Aquaculture; Government of Canada, n.d.). The baseline does not mention Government of Nova Scotia and fishing industry efforts and plans for the region such a legislated mandate to promote, support and develop the fishing, aquaculture, seafood processing and sportfishing industries that contribute to the economic, environmental and social prosperity of Nova Scotia's coastal and rural communities (Government of Nova Scotia, 2018)

Despite a hasty mention of these value components, 'economy' or 'employment' are not actually described in a way that reflects the region's socio-economic reality and are not carried forward at all into the socio-economic impact assessment. No analysis has been conducted of the risks that the Project's short- and long-term activities will pose to the existing, heavily relied upon, commercial fishing sector. This is unacceptable. A more comprehensive baseline is required to demonstrate the unique socio-economic regional context surrounding the proposed Project so that potential effects can be more accurately considered and in turn avoided or mitigated. As referenced in AMEC's Northumberland Strait Ecosystem Overview Report (2007), "[L]obster provides the largest share of total landed values for the main species (approximately 85%), and declines in this species alone are cause for concern"…"…the magnitude and longevity of the decline in commercial fisheries for highly dependent communities is more problematic than cyclical patterns experienced elsewhere or in the past (AMEC, 2007).

Moreover, there has not been any consideration of other facets of the commercial fishing sector such as processing plants in Pictou County, and potential project interactions between the plant's water intake pipes and Northern Pulp's effluent discharge areas. Such interactions could have devastating human health and economic impacts to the sector; product consumers; and workforce employed by the plants:

For instance, there is no mention within the baseline section of the North Nova Seafoods Processing Plant in Pictou County, a fish processing plant in very close proximity to the proposed effluent outfall. The plant operates year-round processing a variety of species and employs over 150 people in Pictou County amounting to over $Million in wages. Approximately 60 of the employees are fishermen that operate from NNS's private wharf in Caribou in front of the processing plant. In addition, the plant supports fishermen from 10 other wharfs on the Northumberland Strait and an additional 50 wharfs in Cape Breton to Yarmouth and into PEI and NB (Paul Logan, North Nova Seafoods).

Critical to the processing plant's operations is its use of an intake pipe in the harbour that uses water for the plant's cleaning process. The water is tested regularly to ensure that it is cleared to use. This is a very sensitive issue as the plant is making a ready to eat product and there are strict CFIA guidelines that are followed. The plant's intake pipe will be a few kilometers away from where the proposed effluent pipe is going to be located. With a proposed discharge of 70-90 million litres of treated effluent from a bleached kraft mill every day, it will prevent the plant from using the intake pipe for the necessary water to operation (Paul Logan, North Nova Seafoods). This will have substantial adverse ecological, and in

turn socio-economic impacts by way of possible human health issues from product contamination and may result in the closure of the processing plant which would have devastating economic impacts to the region.

Figure 9. Location of Nova North Seafood Processing Plant in Relation to Northern Pulp's Proposed Outfall Location

Recommendation 3.55: Provide a balanced and accurate description of the existing regional socio-economic context, included regional health and wellbeing dependencies on the fish harvesting and fish processing sectors. Using complete baseline information, an economic effects assessment is required that carries forward information referred to within the baseline section including: project effect mechanisms and interactions with existing fisheries economic sector, at a granular level (i.e., net losses anticipated due to forecasted days of interruptions due to construction and operations); human health effect mechanisms and interactions with economic risks related to fish processing plant operation requirements and interactions with effluent discharges; project workforce requirements; wages and salaries, and supply chain procurement needs during both construction and operations.

4.0 Conclusion

As outlined above, numerous issues and concerns related to ETF design, effluent modelling, impacts to the marine environment, socio-economics, as well as risks to human and ecological health have been identified in the review of the Project EA Registration Documents.

Given the significant information and data gaps outlined in this technical review, it is apparent that the Minister has not been provided with the appropriate data and information required to make an informed decision regarding the Project. A lack of baseline environmental data, effluent chemical composition data, quantified risks to human health and marine life, and a detailed socio-economic assessment, indicates that the potential for 'adverse effects or environmental effects' of the proposed undertaking has not been adequately characterized. The EA does not acknowledge or address the magnitude of potential adverse effects on the region's commercial fisheries and the thousands of (Indigenous and non-Indigenous) citizens who are dependent on a resilient fishery.

As such, in our professional opinion, the Project cannot be approved as currently registered. Given the numerous issues, data gaps and information gaps identified in the EA, we recommend that the Minister, as per Section 13 of the Environmental Assessment Regulations made under Section 49 of the Environment Act, determine either that

- the registration information is insufficient to allow the Minister to make a decision and additional information is required (Section 13(1) (a)), or

- a review of the information indicates that there may be adverse effects or significant environmental effects caused by the undertaking and an environmental-assessment report is required (Section 13(1) (d)).

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Project Team Curricula Vitae

53 pages Redacted under Section 20 of the FOIPOP Act.

From:
To: Environment Assessment Web Account
Subject: Proposed project for affluent disposal from Northern Pulp
Date: March 8, 2019 3:10:32 PM

A Federal Assessment is needed.
There is a conflict of interest in having the Nova Scotia Government approve, regulate and manage the treatment facility. I own wood lots in Pictou County.
I live at Waterside on the shore of Northumberland Strait. Our family, all three generations of us, swim in this water from the first of July till the first of October. My cousins and neighbours fish lobsters, herring, scallops and tuna from Toney River and Caribou in this water. This is the richest fishing grounds in the Strait.
Clear cut forestry practices are not sustainable. Northern Pulp can not depend on continuous supply of a diminishing resource. It is not sustainable or desirable. Forestry practices have to be implemented that will enhance a more natural forest flora and fona with a more diverse species mix. Saw mills will continue to have lumber sales and the mill in Port Hawkesberry and others want to purchase chips. Larger logs make more lumber and have more value. The Layhee report makes recommendations on the future of forestry practices.
Tourism and the sales of seafood depend on a clean and un contaminated environment. Health needs to be our top priority for ourselves, our children and grandchildren. There are unknown substances in the water effluent and the air pollution. A Federal Assessment is needed.

gmail.com

From: @gmail.com>
Sent: March 8, 2019 3:12 PM
To: Environment Assessment Web Account
Subject: Northern Pulp Assessment
Attachments: Hon M Miller - Env Assessment.doc

Dear Minister Miller;

Attached and below please find our concerns re:

Northern Pulp's Replacement Effluent Treatment Facility Project.

Thanks for your consideration,

on behalf of the North Shore Nova Scotia Chapter, Council of Canadians

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March 6, 2018

Honourable Margaret Miller
Minister of Environment
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Submitted via email ea@novascotia.ca

Dear Minister Miller,

On behalf of the North Shore Council of Canadians, I am writing to you with respect to **Northern Pulp's Replacement Effluent Treatment Facility Project.**

Founded in 1985, the Council of Canadians is Canada's leading social action organization, mobilizing a network of 60 chapters across the country, including the NORTH SHORE NOVA SCOTIA chapter covering the north shore from Pictou to Pugwash.

Through our campaigns we advocate for clean water, fair trade, green energy, public health care, and a vibrant democracy. The Council of Canadians is a registered non-profit organization and does not accept money from corporations or governments.

In making your decision under subsection 34(1) of the *Environment Act* and with respect to Section 12 of the Environment Assessment Regulations, we urge you to consider the following points:

1. **Concerns expressed by aboriginal people**

On January 31, 2018, members of the North Shore Council of Canadians travelled to Pictou Landing First Nation (PLFN) to take part in the community's official one year countdown of the Boat Harbour Treatment Facility.

Member after member of the PLFN, from school children to elected leaders, spoke passionately about the many losses they have suffered since the pulp mill effluent was first piped into the nearby estuary of Boat Harbour in 1967. These losses include a valuable fishery, medicinal plants, recreational use of the water and use of surrounding land for traditional cultural practices. In 2014, a break in the pipe leaked 47 million litres of pulp effluent onto PLFN land damaging much infrastructure.

There is no question that the community of PLFN expects the province to honour the *Boat Harbour Act* and close the current effluent treatment plant on schedule in 2020.

We urge the Minister not to grant Northern Pulp's last minute request to delay the closure and remediation of Boat Harbour. There have been too many broken promises to the PLFN community.

2. **Risk to Pictou watershed**

Northern Pulp's route for their new effluent pipe to the Northumberland Strait crosses the town of Pictou's watershed and the Caribou wellfield, a source of domestic drinking water for the town and some people in the area.

The Council of Canadians is a leader in fights to protect Canada's freshwater sources. Maude Barlow, Honorary Chairperson of the Council of Canadians, served as Senior Advisor on Water to the 63rd President of the United Nations General Assembly and was a leader in the campaign to have water recognized as a human right by the UN.

Communities and governments must not ignore threats to water security such as the threat posed by an effluent pipe leak from Northern Pulp.

There is a documented history of leaks from Northern Pulp's effluent pipe. This suggests that there is a very good probability of leaks from an effluent pipe in the future.

The consequences of an effluent leak into the Pictou watershed could be catastrophic. Such an event would not be easily or cheaply reversed, if indeed mitigation was even possible.

We urge the Minister not to put the drinking water of the town of Pictou at risk.

3. **Inadequate community consultation and time for meaningful response**

The public consultations failed to include all of the communities affected by the Northern Pulp Replacement Effluent Treatment Facility Project.

Communities outside of the immediate geographic areas of the PLFN and town of Pictou were not afforded public consultation opportunities, despite the fact that air emissions travel to these communities. People know the air emissions travel because on some days, there is an obvious smell from the mill.

Furthermore, the proposed treatment system runs the risk of harming sustainable industries all along the North Shore. The tourism industry prides itself on warm, clean water and world class sandy

beaches. The commercial fisheries relies on sustainable wild shellfish that is shipped all across the world. Communities such as Wallace, Tatamagouche and River John, for example, are all identified as sharing in the Northumberland Strait "brand". Even if only one part of the Northumberland Strait suffers environmental damage from Northern Pulp's effluent pipe, it will be impossible for other communities and their tourism and seafood businesses to disassociate themselves from that negative image.

Additionally, the 30-day period for public response to some 2,000 pages of technical documents does not permit meaningful citizen review and input.

We urge the Minister to ensure meaningful public consultations in all Nova Scotian communities along the Northumberland Strait.

To conclude, we urge you to respect the precautionary principle in weighing the information before you. The risks to our health, environment and community well being are high.

Given all that is at stake, we are calling on you to reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project.

Sincerely,

for Shore Nova Scotia Chapter, Council of Canadians
@gmail.com

From: nsthrc@tourism.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 3:15:16 PM

Project: replacement_effluent_treatment_facility_project Comments: Tourism Industry Association of Nova Scotia TIANS RESPONSE to Environmental Assessment from Northern Pulp Tourism in Everybodyâ?Ts Business and occurs in every community and every corner of Nova Scotia yet the topic of Tourism only warranted one page 483 in the NP Environmental Assessment that the Tourism Industry Association of Nova Scotia TIANS addresses with this communication. The release of Northern Pulpâ?T s Environmental Assessment was extremely disappointing in relation to their analysis of the tourism economy and the potential impact of treated effluent. The Business of Tourism cumulatively is big business in Nova Scotia, constantly growing in contribution to the Nova Scotia economy and generating $2.7 Billion in 2017. This translates to over $300 million in tax revenue for all levels of government revenue which is invested by governments to pay for social services like health care, education and infrastructure. Tourism employs over 40,000 people and generates $3.2 for every $1 invested the largest multiplier effect of all sectors. Along with creating jobs and driving tax revenue, tourism enhances the social condition of our communities and supports a healthy and sustainable natural environment. Nova Scotia is blessed with incredible natural beauty and our enviable location by the sea makes Nova Scotia a much sought-after destination. This strategic location on the Atlantic Coast has provided us with tremendous opportunities, as we utilize our seacoast location to build our brand and develop products and services which provide unique experiences and access to the sea. Recreation/Adventure Tourism and Culinary Tourism are two of the fastest growing segments and all of the new products rely on a healthy and sustainable marine environment. The business drivers are the environment and quality experiences. The perception and demand are pristine areas â?" beaches, water and landscapes. With the warmest waters north of the Carolinas, there is an anticipation of a beach experience and uncontaminated waters. Toxic waste diverted to the Northumberland Strait will affect visitor perception and experience. According to the latest tourism statistics, tourism revenue in the Northumberland Shore Region is 7.8 of the total tourism revenues translating to $210.6 Million . The NP EA states 8.3 and $215 Million. Pictou County estimates are 3 or $81 Million. However, the length of stay in the Town of Pictou has declined from 2010, an average of 3.3 days to 2017 at 2.5 days. Tourism Operators explain the decline in visitor stay is a direct result of the various factors emanating from the effect of the Northern Pulp Mill. The reference to Tourism, on page 438, does a disservice to the importance that tourism plays in the region and the significant economic damage from the environmental risks proposed by Northern Pulpâ?Ts plan. TIANS is extremely concerned about the socio-economic effect on the Tourism Industry. Not only does this threaten the marine environment, it puts at risk other important economic sectors, including fisheries. Culinary Tourism, presently enjoying tremendous growth and recognition, is directly dependant on a healthy fishery. Nova Scotia lobster is widely marketed as a prominent feature of the Nova Scotia experience. The health of their larvae is essential to its sustainability both as a domestic and international product. The Indigenous Tourism product is also a significant growth opportunity. In fact, the Conference Board of Canada just released the latest data and noted Indigenous Tourism growth is outpacing Canadian tourism activity overall. The research shows the direct economic benefits GDP attributed to the Indigenous Tourism sector in Canada rose 23.2 per cent between 2014 and 2017, going from $1.4 billion to $1.7 billion. The Nova Scotia Indigenous product has tremendous potential for growth. Nova Scotia has a history of looking at short term economic vs. long term sustainable growth and pitting one sector against another. The deference to the

Pictou Mill in spite of the strength and importance of Tourism and Fisheries is an example of this. The legacy of Northern Pulp is Boat Harbour, an example of extreme environmental damage that is supported by Health Canada statistics within the Pictou region. With an environmental cleanup worse than the Sydney Tar Ponds, now the responsibly of the Nova Scotia government, it is incredulous that any consideration would be given to research commissioned by this Company that purports no negative impact of other economic sectors. In 2017, Dalhousie released a study on the health of the Gulf of St. Lawrence and noted increasing dead zones as a result of commercial and industrial activity and effluent. The Northumberland Strait connects and empties into to the Gulf of St. Lawrence and the Laurentian Channel within the Gulf. Another study by Brennan, Blanchard and Fennell published in December 2016 discusses the stresses already endured in the Gulf of St. Lawrence and the Scotian Shelf and purports the concept of temperature and oxygen in this area and devastating effect on marine life. The Northumberland Strait therefore is facing threats to the fisheries. The vision for Environmental Goals and Sustainability Act was to have Nova Scotia recognized as one of the cleanest, greenest jurisdictions in the world by 2020 , plans such as this totally contradict this effort. Recently, Destination Canada - Canadaâ?Ts national marketing organization - announced a second consecutive record-breaking year with 21.13 million travellers to Canada in 2018. Tourism generates 745,300 jobs in communities across Canada and contributes an estimated $102.5 billion to the economy. Tourism is transforming the Atlantic Canada economy and continued success will be reliant on a healthy environment. FACT: Tourisms Impact Tourism Employs 40,000 Nova Scotians Forestry Employs 11,500 Tourism Contributes $300 Million to NSs Tax System Forestry Contributes $79 Million Endnotes i. Source: NS Tourism .The NP EA states 8.3 and $215 Million ii. Conference Board of Canada and TIAC, February 2019 https://indigenoustourism.ca/corporate/conference-board-of-canada-research/ iii. Media Release Faculty of Science, Dalhousie University June 7, 2018. http://memg.ocean.dal.ca/news/2018forecast.html iv. https://doi.org/10.1371/journal.pone.0167411 v. EGSPA quote: NS Department of Environment website: Nova Scotians have a cleaner, greener and more economically stable province because of commitments government has made to become one of the most environmentally and economically sustainable places in the world by 2020 Name: Tourism Industry Association of Nova Scotia TIANS Email: nsthrc@tourism.ca Address: 2089 Maitland Street Municipality: Halifax, NS Postal-Code: B3K 2Z8 Phone: 902 423 - 4480 Fax: 902 422 - 0184 email_message: Privacy-Statement: agree x: 71 y: 17

From:
To: Environment Assessment Web Account
Subject: Request for Federal Assessment
Date: March 8, 2019 3:25:59 PM
Attachments: Request for Fed. Assess..pdf

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March 8, 2019

The Hon. Margaret Miller
Minister of Environment

Dear Minister Miller:

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project.

My name and I grew up and live on the Sunrise Trail along the Northumberland Strait. I have lived there for 61 years and have been fishing for 36 years on the beautiful Northumberland Strait.

When the bridge was built from Nova Scotia to P.E.I. in 1997 it had affected the fishing industry where it took years for the lobster to start coming back to that area. It has just been the last few years that the fishermen in that area have seen an increase in lobster catches. During the building of that bridge the fishermen along the Northumberland Strait had seen a huge built up of silt in the traps that caused some concern. It took a few years for that to settle down so if you can try to imagine putting a pipe into the Strait with thousands of liters of effluent spewing into it, is just an environmental disaster.

Every year there are more and more regulations put in place to protect the fisheries carried out on the Strait. The Department of Fisheries is changing mesh sizes, escape mechanics and the number of lobster traps have been reduced from 300 to 280 to protect the lobster fishery. DFO has created a zone in lobster area 26A which includes Eastern PEI and a large portion of Nova Scotia where fishermen are only allowed to fish 1 m from land. The fishermen know how important it is to protect fish habitat and juvenile lobsters. The Federal Government calls this area a marine refuge. The fishermen are not allowed to drag scallops in this closed zone but Northern Pulp would be allowed to dredge, lay a rock mattress, lay a pipe, backfill, and have diffusers releasing a substance into an area the fishermen have been protecting for 30 years. An identical proposal for a pipe into the Northumberland Strait has been rejected twice before by the Federal Government for environmental reasons. The Fisheries is regulated by the Federal Government, fishermen are licensed by the Federal Dept. of Fisheries and fish in Federal waters so how can a foreign company place an effluent pipe in the these waters and only have to pass a Provincial Assessment.

Boat Harbour is being shut down in January, 2020 and Northern Pulp is looking for an extension. They had 5 years to plan what to do with their waste (solid and effluent) so what did they come up with? Let's pump it into the Northumberland Strait right through the marine ecosystem and it is also important to note Northern Pulp has no Plan B. Just the idea of running a pipe out into the Northumberland Strait that is Federal waters is an environmental disaster so it should trigger a Federal Environmental Assessment.

Northern Pulp has said it does not know what is in the effluent except they cannot run it through their boilers and pipes because it will corrode them. This makes a person question what it will do to the ecosystems in the Northumberland Strait. The consultants were asked what solids are coming out of the pipe and they could not answer the question so this is not an acceptable answer. Northern Pulp expects the PLFN, fishermen and

residents to not question the effluent that is being piped into the middle of a marine ecosystem. We do not know what is in the effluent and the amount of warm water that is being piped into salt water where the lobsters lay their eggs is the most absurd idea that I have ever heard. It is hard to imagine that thousands of liters of water is going to be pumped into the Northumberland Strait daily and we are expected to believe this will have no adverse effects on the marine environment. It is very insulting that a foreign company does not have to justify and provide facts that it will not harm the environment. Northern Pulp says it is **highly unlikely** it will be hurt the marine environment. Pulp & Paper regulations are geared for fresh water discharges and will sacrifice a river before it is discharged into the ocean.

The herring spawning beds are only ½ m from the outfall of the proposed pipe and there is also a rock crab nursery in the Strait that is the main food supplier for the lobster. Northern Pulp intends to excavate a trench through this ecosystem which will threaten the lobster industry. Northern Pulp has never assessed the impact on lobsters before the pipe goes into the Strait so if the pipe goes in there will never be any assessment.

The Northumberland Strait has a very shallow channel so there is a concern the water is just not deep enough for a pipe. The Nova Scotia/PEI ferry travels this route so what effect will this pipe and effluent have on this service provided to residents and tourists during the summer months. There are numerous tourists that come to Nova Scotia for our delicious lobster and to experience it firsthand. We have experienced divers that are continually getting calls from fishermen who have problems with their propellers. These divers know the waters in the Northumberland Strait from their firsthand experience over the years. They know the tides and where the water is shallow as well as the problems this creates. Both Caribou and Toney River have to be dredged because of the ice scours changing the course of the sea bottom. The weather plays a big factor in the shifting of the Strait's sea bottom that continually fills in at both wharfs most fishing seasons. Dredging occurs in the spring before the lobster season begins and there are truckloads of this material removed around each wharf.

It wasn't too many years ago that the beef industry suffered drastically because of the mad cow disease. All it took was 1 cow and the entire beef industry suffered so all it will take is 1 lobster to effect the entire country. So why are we putting the fishery at risk for a project that was already denied twice and they cannot provide facts but expect us to accept assumptions that no harm will come to the fishery.

When the fishermen met with Northern Pulp and its consultants the question was asked, "What happens to the effluent when it leaves the pipe, the response, "it goes away". So in other words Northern Pulp and the consultants did not know the answer which makes a person question why they would put any faith in a company that does not have answers to a proposed project that will have a great environmental impact for years to come. I have been fishing for 36 years and know the tides, how strong they are and have seen what destruction they can do. Northern Pulp thinks the solids that come out of the pipe will only affect a small area but they are wrong. The tide rises and falls so each time Northern Pulp's waste will spread a bit further.

In Section 12 of the Environment Assessment Regulations there are 4 considerations that the Minister should consider in making her decision as follows:

1. The location of the proposed undertaking and the nature and sensitivity of the surrounding area.

   The Northumberland Strait is under the jurisdiction of the Federal Government so putting a pipe into the Strait now involves the Federal Department of Fisheries and Ocean.

2. Concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking.

   The Pictou Landing First Nations and the public have many concerns and unanswered questions about this project since it has been proposed. The destruction of a fish habitat and the environment is of the utmost importance and critical. Once the environment and marine ecosystem is damaged it will create a negative ripple effect throughout the area that may never be repaired or take years to restore.

3. Steps by the proponents to address environmental concerns expressed by the public and aboriginal people.

   Northern Pulp has never assessed the impact on lobsters before a pipe goes into the Strait so it may not be addressed for years once the pipe is in the Strait. Northern Pulp does not know the long term effects on Caribou Harbour if a pipe goes into the Strait.

4. Potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitats.

   There are species at risk where the pipe is proposed to go through a rock crab nursery that provides food for the lobster fishery. There is also a herring spawning bed in close proximity to the proposed pipe.

5. Northern Pulp's proposed project for the pipe to go into the Northumberland Strait will not only affect Nova Scotia but it will also involve P.E.I. and New Brunswick. (Act, n.d.)

It is hard to believe that in this day in age the toxicity test that Northern Pulp performs is a number of fish are put in a bucket of treated effluent and if half of the fish die after 96 hours the test is fine. A 50% mortality rate with a toxicity test is unacceptable and meeting 25 year old PPER is certainly not good enough.

As a fishermen I love my job and all fishermen have worked very hard throughout the years to sustain the fishery because we all know how vital it is for our livelihood and for the future. The fishery and the environment go hand in hand and we know there is a balance that has to be maintained. The fishery can change from year to year as it has done for centuries so when the ecosystem is affected we take appropriate measures to

make it sustainable for future years. If a pipe is put into the Northumberland Strait the marine ecosystem will be negatively affected for years.

It is not always about **'good paying jobs",** it is about doing the right thing for the environment. Our main concern should be about looking after the air we breathe, the marine ecosystems, and the forests. We have strayed so far away from doing the right thing for 50+ years by letting a company destroy what we should value the most.

There is much uncertainty regarding so many environmental issues with Northern Pulp's proposed project that have not been addressed. In conclusion the only appropriate way to move forward is to do a Federal Assessment.

Regards,

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 3:28:55 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

From:	@hotmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 8, 2019 3:38:20 PM

Project: replacement_effluent_treatment_facility_project Comments: Very supportive of northern pulps replacement effluent treatment system.Nice to see a company investing in not only Pictou County but also the entire province of Nova Scotia to grow our economy and improve their environmental footprint for the region as a whole.The registration documents show how much time and scientific evidence was put in to this project.The proposed project has been proven to work very successfully in many other parts of the world and can be done here as well.Recent upgrades to Northern Pulp such as the new participator to improve their environmental performance and maintain good environmental practices is just one example of their long term committment to Nova Scotia.The replacement effluent treatment facility project is yet another huge example to improve and sustain a future for decades to follow.As mentioned previously,science has proven that this type of replacement effluent treatment facilityETF is used elsewhere with huge success.Very imp ressed with Northern Pulps committment to improve their industry and their desire to do things right for a long future here.So much more can be said,but ultimately science has and will prove that this is a project that will be very successful for all stake holders and everyone else involved.Thank you Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 68 y: 34

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s proposed Replacement Effluent Treatment Facility Project
Date: March 8, 2019 3:43:00 PM
Attachments: Request for NS Env..pdf

Please review my attached submission.

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Environmental Assessment Branch

Nova Scotia Environment

PO Box 442

Halifax, NS, B3J 2P8

Submitted via email: ea@novascotia.ca

08 March 2019

Dear Minister Miller

I write to you as a lifetime resident of Pictou County, to protect the Northumberland Strait and to end the half century of environmental racism that continues to this day in Boat Harbour.

Please reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project due to the following:

Northern Pulp's Environmental documents use as an example a pulp mill in Tasmania, Australia which does not exist! How can this document be considered, in any way credible, on this fallacy alone? There is no mention of the amount of mercury that will be present in the effluent they propose to dump into the Northumberland Strait. The Northumberland Strait has economically provided for Nova Scotia, Prince Edward Island and New Brunswick, fisheries industries, tourism industry, transportation (Northumberland Ferries Ltd.) along with numerous small business along this beautiful coast. Our license plates states we are: "Canada's Ocean Playground".

Northern Pulp claims that damage will be minimal, how can they make such a claim when the Northumberland Strait is home to a very delicate ecosystem, it is Governments and citizens' responsibility to protect this ecosystem and the sustainable industries that it provides to the Maritime Provinces.

I have lived in Pictou County my entire life, leaving for education and work opportunities for 4 years and then returning to stay. My family summered on Caribou Island, and when I was between 4 and 6 years old my Mother, Aunts, cousins and myself would pick wild heather along the rocky shores of Caribou Island. By the age of 7 there was no more heather to be found along Caribou Island. I realize this may be a coincidence, but as I was born in 1962 and Scott Paper opened in 1967, I have often wondered if the air/water emissions from this industry contributed to the demise of the wild shrub, possibly making the air or the soil to acidic for the plant to continue to thrive. How will the effluent from Northern Pulp effect marshlands, and rivers and brooks? Once these are destroyed can they be remedied? What adverse effects will this have on all wildlife that have already lost their habitat to the clear-cutting, forestry industry here in Nova Scotia?

I respectfully request that this project be subject to a Federal Assessment as the Northumberland Strait is under the jurisdiction of the Federal Government and the *Fisheries Act* is Federal Legislation, not provincial. This proposed project by Northern Pulp, is not worth the risk and the precautionary principle means it is incumbent on the Nova Scotia government to err on the side of caution.

The Northumberland Strait has a delicate ecosystem which must be protected.

There has been no consideration given to the Town of Pictou Watershed, where the pipe will be put through.

The Pictou Landing First Nations, the Northumberland Fisheries Association and the public have raised many concerns which are not being properly addressed by Northern Pulp regarding this project. There has been no public consultations on this newly proposed site.

The potential effects on species at risk has been ignored, the proposed site of the pipe goes through a rock crab nursery which feeds the lobsters; there is a herring spawning bed in close proximity to the site of the pipe; not to mention other protected species such as piping plover, hawks and eagles How will these protected species be affected by not just the effluent, but the construction of this pipe?

I work in by-law enforcement for the County of Pictou, one of the aspects of my position is to remove, seal, whale, shark, porpoise carcasses from the coastline of the county. Has any thought been given to the protection of these incredible sea creatures? How many more species will die from exposure to these chemicals that will spill from this pipe?

As the tax payers have paid for this company for the past 52 years how much more are we going to pay for the pollution we have been subjected to, along with the rape our forestry, and now are we to pay for Northern Pulp to destroy "Canada's Ocean Playground" and the century old industries it has provided? How in 2019 can this be condoned in a leading country of the world?

Please right the wrongs of the past half century, please hold this company to a higher standard and protect our province, our children, and their future by calling for a full Environmental Assessment Report on this proposal; and close the effluent treatment facility in Boat Harbour on January 31, 2020 as scheduled.

Respectfully submitted

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 3:47:45 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

There has been some (truly) wonderful activism in support of our local environment that I encourage to be heard. However, as members of your department will surely know, much of the inner workings of industrial activity is complex and fraught with constant decision-making around finding the right balance. In the case of Northern Pulp, I strongly encourage the Department to adhere to the Act as Unifor has highlighted in its submission and proceed with studies and testing to protect our water, while encouraging the development of our forestry sector - a cornerstone of which is the Northern Pulp mill.

Signed by:

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 3:48:43 PM

Project: replacement_effluent_treatment_facility_project Comments: I think it is an astonishing step backward to still consider that the solution to pollution is dilution. Some of the most deadly compounds known to man are released in pulp mill effluents Dioxins, PCBs, heavy metals etc.These chemicals are known to preferentially bioaccumulate in the marine food chain fish, lobsters, tuna etc After 50 years of condoning one of the worst mills in N. America, we have the chance to redesign an efficient replacement mill. I personally think this is truly a Canadian issue and that a thorough federal environmental revue is necessary. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 63 y: 21

From:
To: Environment Assessment Web Account
Subject: Northern Pulp 's Replacement Effluent Treatment Facility Project
Date: March 8, 2019 3:57:29 PM

Dear Minister

I am writing this note in regards to Northern Pulp's Replacement Effluent Treatment Facility Project.

Our family are proud Nova Scotians with strong connections to Pictou and Pictou Island for many generations. I am one of four children raised in beautiful Nova Scotia. My Parents and my three siblings, are currently raising families in this wonderful province. I am currently living in Alberta were I fear some decisions are not in the environments favour for the future generations of our people.

How can a daily dump of nearly 100 million litres of effluent, of unknown composition, not have a negative impact? How could any additional toxins in our environment and food chain be deemed safe in a globally warming environment? What is the risk assessment associated with constructing and maintaining a 15.5 km pipeline going overland and then through Caribou Harbour? Why do we as a province continue contributing to the all the questionable decisions that have allowed the Northern Pulp Mill to begin and continue operations ?

Coming form a family of Fishers, has any study or monitoring effects on lobster larvae or any other species in the area even though it was strongly recommended internally and by multiple fisherman associations?

The proposed treatment facility on Abercrombie Point is very close to both the de-commissioned Canso Chemical plant site, and the secure landfill both of which have tested positive to high concentrations of Mercury (Baxter, 2019). Mercury, along with other dioxins were not mentioned in the EA even though there is a high risk of them being disturbed by the construction phase

Please give me a reason to continue to be proud Nova Scotians who encourages to sustain our fisher heritage, protect our natural resources and support sustainable industries that protect our future. Please allow us to be proud of the principles and values of this government that become evident in your decision making process.

Please see the attached of my Grandfather who is no longer with us, make him proud PLEASE.

Thank you for your consideration.

Daughter of a fisher
Sister of a fisher
Friend of many fishers and pulp mill workers

Proud Nova Scotian from afar who adores the beautiful shores of the Northumberland Strait every summer.

Picture removed as per Section 20 of FOIPO Act

From:
To: Environment Assessment Web Account
Subject: Concerns
Date: March 8, 2019 3:59:11 PM

To who it may concern;
I am a 17 year old who is very scared for what could happen if this pipeline is allowed. I believe that putting a pipe in the northumberland straight will be a devastating mistake. It could be destroyed by ice or other factors or if is not monitored daily it will be to late and catastrophic. We will never truly know what it will do to our gorgeous straight and how it would affect the fishing industry. We have a cottage along the straight and I want me, my cousins and eventually my kids to be able to keep swimming, fishing, catching hermit crabs and playing in the ocean without being concerned about contaminated waters. We already have to breathe in all the toxic air and smell the fumes. It turns people away from even being able to tour Pictou. Fifty years of environmental racism is shameful and it is time to resolve this issue. Honour the Boat Harbour act. We need to get a Federal Assessment too not just a Provincial assessment. No more extensions. Please take all the facts from all your emails your receiving and think long and hard about this matter. Enough is enough and more needs to be done to prevent this toxic waste pipeline from going in our ocean.
Thank you,

Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: Class 1 Environmental Review Northern Pulp
Date: March 8, 2019 4:35:17 PM

The body responsible for caring for the well-being of Nova Scotians is the government. Of greatest importance in exercising these responsibilities is prioritizing them in the best possible order. Pundits on very different sides of an issue will suggest they are bringing a balanced approach and the decider will promote their decision as carefully weighed and well balanced. This is the reality of the debating and deciding game.

This submission is from a retired Math and Physics teacher. One of my sons has a PhD in Land Resource Management with a focus on waste water management and air quality. Although I have some understanding of the issues under consideration, I would speak under the Dunning Kruger effect if I were to get into the weeds on this issue. With all due respect most politicians, and for that matter jurists, operate under the danger of Dunning Kruger and must seek to carefully and objectively weigh the evidence in order to make the best decision. I will rather concentrate here on your willingness to ask some of the relevant questions and honestly seek their answers.

The significant human well-being elements related to the pulp mill include jobs, economic activity, air quality, water quality and the environment. These must be examined looking at impact and sustainability. In your deliberations it would be wise to keep in mind the old adage; “In theory, theory and practice are the same, but in practice, they are not”.

I have a good friend who is a retired lawyer and who has been a back-room boy in politics for many years. He believes that accepting environmental degradation is necessary for human progress. As a good lawyer, he tends to look at the outcome he wants and argue the points that support that decision. He also regularly advocates for a balanced approach, but his balance is very different than mine, and I believe the majority on Nova Scotians.

Stephen McNeil and the Liberal Government have undertaken a number of bold initiatives since taking power. I was impressed that, without delay, he put the cleanup of the MV Miner behind us. Creating the NSHA and doing away with local school boards was even more bold. There is also a big decision coming on whether to proceed with OPOR. And now, there is a huge decision to be made related to Northern Pulp.

Legislation was passed that Boat Harbour would be closed as a site for Northern Pulp by January 2020. Northern Pulp was given a five year window to propose, design and and build a new effluent processing system. That wealthy corporation had the resources to make all that happen within the generous time frame provided. Pictou Landing First Nation was placed in the economic and social crosshairs if Northern Pulp needed more time. It is my belief that Northern Pulp, as did its ancestors, dragged its feet so that the government would be under the gun to make a hasty decision. Their five year strategy is playing out exactly as they planned.
As I pointed out, the right questions and their honest answers are important. Here are some of mine, but certainly not all that should be asked.

1. Given the legislation, regulations and magnitude of this project why was a Class 1 rather than a Class 2 EA deemed to be adequate?
2. A Federal EA is considered necessary for the cleanup of Boat Harbour, which was deemed to have undergone careful study when put in place in the late sixties. There have been significant toxic impacts by Northern Pulp’s effluent on Boat Harbour, in spite of the assurances of politicians. Why should anyone believe an extensive EA either under Provincial

or Federal oversight is not currently necessary?

3. Given the reports of considerable existing pollution, is it possible the proposed effluent treatment facility can be safely built and operated on the Northern Pulp's site?
4. If legislation requires decisions on environmental impact to shade toward the cautious side, how can it be known, without doubt, if a continuous flow of a huge amount of effluent will not have long term impacts?
5. I have spent many years sailing and boating at Amherst Shore, far from Pictou. With an easterly wind I can smell the airborne effluent from the Northern Pulp Mill. Although this is not science, is it not evidence that either air borne and/or liquid effluent affects a significantly large part of Northern Nova Scotia?
6. Has the government honestly examined the historical records of actions and promises made by the corporation and governments versus the results that occurred? I have heard it said that history repeats itself.
7. Given the reported impact the closure of the Northern Pulp would have on the forestry industry, has the government done a comprehensive study of how that industry could transition to new uses of their products if Northern Pulp closes?
8. Regardless of whether the mill closes the port of Halifax will survive. Has the export potential for forestry products, in the event that the mill closes, been adequately studied?
9. Has an impartial financial analysis of the tax payer's obligation to Northern Pulp and for environmental remediation been completed, both short and long term?
10. Has the impact on human health of those living close to the pulp mill been properly considered?
11. There is some evidence that current levels of pollutants acceptable under federal guidelines may not be inadequate now and going forward. The legislation is slow to catch up. Is it OK to just meet current standards?
12. The government and Northern Pulp have had a lot of points of contact on this file. Has there been an adequate effort by the province to engage with groups opposed to the project to ensure a level playing field?

I have concerns that the government's acceptance of a Class 1 EA suggests that the decision on the the mill may already been made. It suggests that Northern Pulp has, once again, put the province in a tough position. It has created the conditions that bring the minimum amount of scrutiny on the project. I believe that history shows that the Pictou Pulp mill has, on a number of occasions, manoeuvred the province into both a financial and environmental corner and that may well be happening again.

Hopefully a fulsome examination of all aspects of this issue, including all stakeholders, will be examined, weighed and contribute to the best possible decision. I put some effort into being reasonably well informed about the issues that are important to Nova Scotia. It is my belief that an informed and reasoned decision on the future of the Northern Pulp Mill would be to bite the bullet and allow the mill to close. I also believe that the majority of Nova Scotians would, not only support, but applaud you for doing so.

Respectfully submitted,

Sent from my iPad

From: @yahoo.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 5:16:41 PM

Project: replacement_effluent_treatment_facility_project Comments: I do not agree with sending partially treated effluent into Northumberland Strait, where it can potentially pollute the waters of five provinces, and risk the destruction of the lucrative fisheries. Boat Harbour must close, and possible also the mill. Name: Email: @yahoo.ca Address:

: Privacy-Statement: agree x: 52 y: 29

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 5:18:43 PM

Project: replacement_effluent_treatment_facility_project Comments: I have lived most of my life in Pictor and surrounding area. My family has always love living on the Northumberland Strait, spending a lot of time on beaches, swimming and walking, and boating. My husband and I have sailed for 50 years using both the Pictou and Caribou Harbours. We have sailed north and west to Shediac, NB and many ports in PEI and east to the Brasâ?Tdor Lakes. In the Northern Pulp report on page 440, they discussed the Odour reduction was a priority. They have stated that the new Effuent treatment plant will reduce the odour to a non issue. Then we should have an independent company travel to Sweden or Germany to one of the plants that as comparable to Northern Pulp and get samples of their effluent. 2 samples. First before leaving the treatment plant and again at the output or diffuser. Then we would have proof of what we would smell and what toxins were in the effluent and the quantities of each. Because of the fact that many people cannot believe the information given by NP I believe this would give actual results. Also I want to point out that the closest weather station is actual at the end of Caribou Island and should have been used in the report about the water temperatures, Air temperatures, and wind. I donâ?Tt understand why NP would use Lyons Brook weather station. Thank you for reading my thoughts on this very important project. Name:
Email: @gmail.com Address:

Privacy-Statement: agree x: 51 y: 27

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 5:30:33 PM

Project: replacement_effluent_treatment_facility_project Comments: I am a family physician who lives and works in Pictou County. I have no direct connection with Northern Pulp, the fishing industry, or the woodlot industry. I care deeply about Pictou County and the health of its citizens, which is my motivation for writing this submission. I am in support of the Pipeline project, assuming it meets current environmental standards. Employment status is one of the most important social determinants of health. Over my 28 years of medical practice in Pictou County, I have witnessed the ups and downs of many of our industries, and have seen firsthand the detrimental effect that unemployment has on the health of individuals and the community as a whole. If Northern Pulp ceases to operate, it will have a significant negative health impact on many of our fellow citizens. I also care deeply about the environment and do my best to live a â?ogreenâ? lifestyle. Despite my attempts, however, I am aware that every time I hop in my car or cut my lawn, I am having a negative effect on the environment. It would not be realistic to for me to have zero impact. Likewise, it is unrealistic to insist that an industrial project have zero impact on the environment. The practical approach is to determine to the best of our current scientific knowledge what the environmental impacts of a given project are likely to be, and if they fall within currently acceptable parameters. If the project falls within our accepted guidelines, it should be permitted to proceed. There are many individuals on both sides of the pipeline debate who feel angry and threatened for various reasons. Debates are often understandably emotional and biased. That is why I feel that this project should be judged on the science as we know it and todayâ?Ts environmental standards, and not on the fears and mistrusts of various stakeholders based on decisions made in a different time. I trust the committee will do this and I am hoping that this project will go ahead. Name: Email: @ns.sympatico.ca Address:

Privacy-Statement: agree x: 67 y: 23

From:
To: Environment Assessment Web Account
Subject: Northumberland Strait
Date: March 8, 2019 5:47:32 PM

I’m writing in support of a Federal Environmental Assessment of Northern Pulps proposal to put a pipe discharging effluent into the Northumberland Strait.

The Northumberland Strait is where My family spend our summers. My mother, sister, brother, aunts, uncle, cousins and friends all enjoy the clean beaches and water of the Northumberland Strait. More importantly, we eat fish from the Strait. The potential environmental impact along with the loss of the fishery and tourism should be enough for this government to order the federal assessment.

Regards,

Sent from my iPhone

From:	
To:	Environment Assessment Web Account
Cc:	
Subject:	Submissions of the Friends of the Northumberland Strait in Response to the call for Public Comments on the Environmental Assessment of the Replacement Effluent Treatment Facility Project
Date:	March 8, 2019 5:55:13 PM

Good afternoon,

Please see the attached link enclosing comments in regard to the Replacement Effluent Treatment Facility Project proposed by Northern Pulp Nova Scotia Corporation.

https://ln.sync.com/dl/9f1fb53a0/vkf5tuqc-ke3dmtqa-tv9y46ia-eu8hc9sg

Please confirm that this link has been accepted by the Environmental Assessment Branch at your earliest convenience. If there should be a technical difficulty, we shall arrange for alternate submission.

Best regards,

Legal Administrative Assistant/Office Administrator | Ecojustice
520-1801 Hollis Street, Halifax, NS B3J 3N4
1-800-926-7744
F: 902-417-1701

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Submissions of the Friends of the Northumberland Strait in Response to the call for Public Comments on the Environmental Assessment of the Replacement Effluent Treatment Facility Project

James Gunvaldsen Klaassen
and Sarah McDonald
Ecojustice
1801 Hollis Street, Suite 520
Halifax, NS B3J 3N4

March 8, 2019

ecojustice

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1. Overview

1. This submission is filed on behalf of our client, the Friends of the Northumberland Strait, a society registered under Nova Scotia's Society Act with a membership of Pictou residents and the Pictou County area community.

2. Northern Pulp Nova Scotia (NPNS) proposes a project to build a new Effluent Treatment Facility (ETF or the "project"). Please consider these submissions, and the accompanying appendices, as the comments of the Friends of the Northumberland Strait in relation to the Environmental Assessment (EA) process for the ETF.

3. The NPNS ETF is ill-conceived and is designed to externalize to the environment the costs of NPNS's enterprise. NPNS rejects the significant and viable alternative of installing a closed-loop system on the basis that it cannot make the same level of profits as it does with its current process.

4. The risks to the environment are too great to permit this project to proceed. Further, the application is a paper exercise rather than an in-depth investigation of an important ecosystem, and is missing crucial information. The application is based on inadequate and second-hand and often out-dated research and investigation, and relies on inappropriate methodology to make defective predictions. No significant effort was expended to measure and determine the actual conditions in the affected ecosystems. NPNS does not understand the environment in which it seeks to operate, it understates the risks of the project, and overstates the effectiveness of its proposed mitigation measures.

5. The risks are significant and NPNS has failed to discharge its burden to show that the project will not cause significant environmental effects or adverse effects, or that any such effects can be mitigated. The project proposes to discharge a daily average of 62,000,000 litres, and up to a maximum of 85,000,000 litres, of pulp mill effluent every day into the middle of the only herring spawning area in the southern Gulf of St. Lawrence. It will discharge effluent directly into lobster fishing grounds for as many as 82 local fishers, and could affect the lobster fishery for as many as 1800 lobster fishers from Nova Scotia and Prince Edward Island in the Strait.

It could have significant effects on the marine ecosystem and foundational species of the ecosystem, such as planktonic species, invertebrate and fish larvae, subtidal and intertidal invertebrates and plants, forage species and other marine organisms. There could also be significant human health impacts from air emissions, from contamination of freshwater, drinking water and soils, and from contamination and bioaccumulation of toxic substances in marine species and marine foods.

6. Further, the Minister has selected an EA process under the *Environment Act*[1] that does not permit sufficient time for the public and other affected groups and individuals to assess the voluminous materials filed by NPNS. NPNS has had four years to prepare this set of materials, but the public is given 30 days to respond. Provincial officials have worked closely with NPNS to develop the reports appended to NPNS's submission, but NPNS has chosen not to release them to the public until the last minute. Significant taxpayer funding has been provided to NPNS to develop the submission, but no corresponding funding has been made available to the public to hire their own scientific experts to review this submission. The Minister has acknowledged the unfairness of this process to the public[2], but appears content to push the matter to a quick conclusion.

7. As discussed in detail below, ample evidence is before the Minister to allow her to conclude that the project should be rejected, as it is likely that it will cause adverse effects or significant environmental effects that cannot be mitigated. Consequently the project should be rejected pursuant to section 34(1)(f) of the *Environment Act.*

8. In the alternative, the NPNS EA fails to provide information on many crucial aspects of the project. The Minister therefore does not have sufficient information and analysis before her to permit her to allow the project to proceed. Evidence of potential adverse effects or significant environmental effects that cannot be mitigated have been presented to the Minister from many sources within this EA process. Due to the multiple information gaps, lack of examination of significant issues, and lack of scientific support for the premises put forward by NPNS, as well as failure to provide evidence of mitigation measures and their effectiveness,

[1] *Environment Act*, S.N.S. 1994-1995, c. 1, and Part IV.
[2] Jean Laroche, "Northern Pulp's plans for pipeline, effluent treatment plant now public," CBC, February 7, 2019 [Appendix H-9].

the Minister must order a full environmental assessment report pursuant to section 34(1)(c)[3]. This is the only means by which the Minister or a Panel can comprehensively and objectively assess project impacts and permit full and informed public participation in this process, given the potential for harm posed by this project.

2. Introduction

a) Friends of the Northumberland Strait

9. The Friends of the Northumberland Strait (FONS) are community members from Pictou and surrounding area with a deep connection to Pictou County and the Northumberland Strait. Some have lived in Pictou County for their whole lives, and their families have lived here for generations. Others are drawn here to live or summer in the Strait area. They are business people, professionals and fishing families united by their love for this area and for the beautiful and sensitive ecosystem of the Northumberland Strait.

10. FONS began in 2017, and was formally incorporated as a society in 2018. Its members came together as it became clear that NPNS planned to solve its need for a new effluent treatment facility by discharging its treated effluent directly into the Northumberland Strait. Since the *Boat Harbour Act* prohibits NPNS from using Boat Harbour past January 31, 2020, it was easiest, and cheapest, for NPNS to get rid of its pulp mill effluent by treating it on-site, then piping it off its property and discharging it into the Northumberland Strait. FONS members were appalled by the prospect of up to 85,000,000 litres of hot treated effluent containing harmful chemicals, being pumped directly and continuously into the Strait every day. They are very concerned about the potential for serious and irreversible damage to Pictou County's air, soil, freshwater, wetlands and wildlife, and to the Strait ecosystem and the local economy it supports, including fisheries and tourism.

11. Since its formation, FONS has made substantial efforts to promote public awareness of these issues and provide opportunities to debate them, and to empower the public to communicate their concerns. FONS has hosted and supported public meetings, public rallies, media releases and briefings, and has operated a website and a dedicated Facebook page, in an attempt to

[3] *Environment Act*, S.N.S. 1994-1995, c. 1, s. 34(1)(c).

increase understanding of the project, and to better understand the community's concerns. FONS has also made presentations to local municipal councils, various political parties, community groups, and the Prince Edward Island Legislature's Standing Committee on Agriculture and Fisheries.

12. FONS' concerns will be set out in detail below. In summary, FONS submits that:

(i) The registration materials filed by NPNS are incomplete and do not comply with the requirements of section 9(1A) of the *Environmental Assessment Regulations*. The Project is therefore improperly registered and the current EA process is a nullity.

(ii) The ongoing EA process is inadequate and unfair, as it does not allow the public to assess the large amount of scientific documentation and conduct a comprehensive review of the information contained in NPNS's EA submission. NPNS failed to hold promised public information sessions, and held back from the public the majority of the scientific studies until registration;

(iii) The EA submission, although lengthy, lacks critical information, or sufficient detail, in crucial areas such as:

(a) The composition of the effluent to be discharged into the Northumberland Strait;
(b) Studies showing actual composition of raw effluent produced at the NPNS facility;
(c) Studies showing the nature and frequency of process interruptions and disruptions, leaks and spills at the NPNS facility and the impacts of same on effluent composition;
(d) Studies showing that the proposed ETF, which is not yet constructed, can and will in fact reliably and consistently discharge effluent which will meet any particular parameter, or whether it will meet the parameters which form the basis of the discussion in the EA submission;
(e) Studies and analyses regarding mercury issues associated with the project, including methylmercury, mercury and other metals in effluent, and mercury contamination of the NPNS/Canso site;
(f) Baseline data specific to either Caribou Harbour or Caribou Channel;
(g) Professional ecosystem studies in relation to the marine and terrestrial environments;
(h) Thorough and accurate modelling to determine mixing capabilities in Caribou Channel and how the effluent will fare as it circulates in the Strait;
(i) Analysis or engineering study of the impacts of ice scour on buried HDPE pipe or diffusers;
(j) Drawings or mapping/chart coordinates showing the precise pipeline route on the shore, in Caribou Harbour, and in Caribou Channel;
(k) Air emissions data from current operations from all stacks and vents; and
(l) Clear, effective and comprehensive mitigation plans, with substance and that take into account actual conditions in the local environment.

The above defects, individually and collectively, show that the NPNS EA is incomplete, based on inaccurate information and unproven assumptions, and is not supported by credible scientific studies in relevant disciplines.

(iv) Once the above defects are noted, the self-serving summary table in NPNS's Executive Summary, which provides a uniform assessment of the project as having no "significant residual environmental effects" clearly strains credibility. The conclusion fails to take proper account of the nature of pulp mill effluent, the gaps in the information presented by NPNS, and the sensitive environments into which it may be discharged. It is demonstrable proof of a failure to provide a balanced and objective submission of environmental impacts for the Minister's review.

b) Reasonable Apprehension of Bias

13. On February 12, 2019, on behalf of FONS, we submitted a package both to the Minister and to the Environmental Assessment Branch, at the address given for submission of public comments on this EA. That submission asked the Minister to recuse herself from the NPNS ETF EA process due to a significant conflict of interest. On March 6, 2019 we received a letter dated March 5, 2019 from the Minister, advising that the Minister would not be recusing herself from this EA process. We maintain the position, set out in our letter of February 12, 2019, that the Minister's involvement in the EA process gives rise to a reasonable apprehension of bias. As a result, the Minister must recuse herself in order to maintain public confidence and to ensure the integrity of the process.

c) Context of NPNS ETF EA

(i) Boat Harbour and past effluent discharges

14. A central premise of the NPNS' submission, and its public statements about the impacts of its operations on the Northumberland Strait, is the following:

> Since effluent has been discharging into the Strait for the past 50 years, it will cause no change to the ecosystem by discharging effluent in a new location.[4]

[4] Email string Nov. 15-17, 2017, NP response to media questions, (Appendix H-8).

15. The environmental cost of discharging effluent into a living ecosystem has, to date, been borne largely by the Boat Harbour Basin and by the residents of Pictou Landing First Nation. The environmental damage to Boat Harbour from continuous effluent discharge is an environmental disaster, which cannot be truly quantified in monetary terms.[5] However, using Boat Harbour as the effluent dump for 50 years has resulted in an estimated clean-up cost of over $200 Million. Fortunately, the abuse of Boat Harbour is scheduled to end on January 31, 2020.

16. Now, the proposed plan will dump effluent into the marine environment at outfall location CH-B in the Caribou Channel, just outside Caribou Harbour.

17. KSH Solutions Inc., pulp and paper engineering consultants advising NPNS, have touted the benefits of Boat Harbour Basin in reducing the harmfulness of NPNS effluent currently discharged at Point C.[6] In a KSH power point obtained via the *Freedom of Information and Protection of Privacy Act*, KSH describes Boat Harbour Basin as "[a] large, natural final polishing/stabilization basin [which] follows prior to release to the Northumberland Straight [sic]."[7] This "final polishing/stabilization basin" provides a "settling effect…prior to Point D, so the impact on marine environments is even less pronounced."[8] The slow flushing time in Boat Harbour Basin allows for settling of solids, cooling of effluent, and performs other useful filtering functions. By the time the effluent enters the Strait, it has already dumped a lot of its toxic cargo in Boat Harbour Basin. Nova Scotia taxpayers will be paying over $200 Million to clean that up.

18. The contribution of Boat Harbour Basin in the effluent discharge process is also acknowledged by NPNS officials. The Mill's Technical Manager said in an email dated November 29, 2017:

[5] Boat Harbour Remediation Project Handout, (Appendix H-11).
[6] Point C is the point at which effluent leaves the current treatment facility and enters Boat Harbour Basin. After it cools and polishes, it flows out of the Basin at Point D. The locations of Points C and D are shown on the aerial photo at p. 10, Figure 2.1-1 NPNS EA Submission.
[7] KSH Power point, excerpt (Appendix H-4).
[8] KSH Power point, excerpt (Appendix H-4).

> Some say effluent quality [with new ETF] will be worse than today because of all the polishing that is happening across the [Boat Harbour] basin – and they are correct to some extent.[9]

19. In the same email, the Technical Manager goes on to say:

> Effluent temperature [of new ETF] – hotter than now [Boat Harbour] big basin provides a lot of natural cooling today[10]

20. As acknowledged by engineering consultants and by NPNS, Boat Harbour has taken the brunt of the effluent discharge to date and there will be no comparable "buffer zone" effect on the effluent when discharged at CH-B. The only thing standing between the raw effluent from the mill and the fish spawning grounds, active fishing grounds, and marine ecosystem, is the proposed ETF, which remains largely a mystery, both in terms of what it is capable of doing, and what it will actually be used for by NPNS.

21. The NPNS EA does not answer the question of what will happen to the substances currently settling out in Boat Harbour. The EA does not provide objective scientific evidence as to the likelihood that the proposed ETF will, or can, actually change the effluent into a harmless and benign substance, or that it will meet any standard or will in fact be "better quality" than what is currently discharged into in Boat Harbour. The Minister is given only assumptions as to water quality characteristics, with no proof that these are realistically achievable or that NPNS actually intends to achieve them. The NPNS proposal is based on the premise that the effluent discharge into the Strait should simply be allowed to proceed, and that monitoring will be conducted to verify its safety at some vague point in the future. In perhaps two years after effluent discharge begins, someone will assess whether it has caused any problems. This approach is a recipe for environmental harm, and runs contrary to an underlying principle of the *Environment Act*, which requires that:

> the precautionary principle will be used in decision making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation…[11]

---

[9] Email dated Nov. 29, 2017 from NPNS Technical Manager to NS TIR, p. 4 of 5 (Appendix H-10).
[10] Email dated Nov. 29, 2017 from NPNS Technical Manager to NS TIR, p. 4 of 5 (Appendix H-10).
[11] *Environment Act, supra*, ss2(a), b(ii); *Sorflaten v Nova Scotia (Minister of Environment),* 2018 NSSC 55 at para 38.

22. As discussed below, no testing or test results have been provided to show the effluent's composition. Most of the substances contained in raw effluent are not discussed, and their impacts on the marine, freshwater, terrestrial and atmospheric environments are not analysed. Likewise, as will be discussed further below, the Stantec modelling used to predict the effluent mixing and transport in the marine environment has fundamental flaws, and must be disregarded.

(ii) EA enforcement and compliance issues

23. In 2017, Nova Scotia's Auditor General issued a report in relation to environmental assessments conducted under the *Environment Act*.[12] From 2013 to 2016, of the 54 environmental assessments conducted, 53 were approved, amounting to an approval rate of over 98%.[13] This figure is of great concern, as it suggests that the environmental assessment process in Nova Scotia is a process by which projects receive a rubber stamp rather than a thorough and objective environmental review.

24. The Auditor General went on to conclude that, where environmental assessments are approved on conditions, it is likely that Nova Scotia Environment (NSE) does not monitor compliance or verify that the required conditions have been satisfied. Within a sample of 53 EA conditions examined by the Auditor General, 23 were not verified or monitored for compliance. As the Auditor General says:

> "Without monitoring, Nova Scotia Environment does not know if the terms and conditions of approved projects are effective in reducing impacts on the environment."[14]

25. Where there is a failure to monitor compliance with EA approval conditions, a failure to enforce conditions, or a failure to monitor whether an approved project is actually causing environmental harm, the risks of harm from such projects increases dramatically.

[12] Report of the Auditor General, November 2017, Chapter 4 Environmental Assessments, pp. 43-53 (Appendix H-12)
[13] Report of the Auditor General, para. 4.2, p. 45 (Appendix H-12)
[14] Report of the Auditor General, para. 4.5, p. 46 (Appendix H-12)

(iii) The Province's agreements with NPNS cannot fetter the Minister's discretion in making a decision on the EA

26. As set out in our February 12, 2019 submission, NPNS has stated publicly that its various contracts with the Province should be determinative of the results of administrative approval processes. In its 2015 appeal of the Industrial Approval issued by the Province, NPNS stated that "[g]overnment cannot arbitrarily revoke Northern Pulp's contractual rights under the Agreements with the Province by way of an administrative approval process."[15] Acceding to such an argument would constitute an unlawful fettering of the Minister's discretion in this matter. The Minister must consider contractual arrangements with NPNS to be an irrelevant consideration in this process, and make her decision under section 34(1) of the *Environment Act* without regard to such agreements.

(iv) The Minister must consider all possible outcomes under section 34(1) of the *Environment Act*, including rejection of the project

27. The Minister must consider all possible outcomes under section 34(1) of the *Environment Act*, including whether to reject the project outright.[16] Correspondence between NPNS and the NSE demonstrates a predisposition to approve the project, and shows that rejection of the proposal is not being considered by provincial officials.

28. For instance, by email dated November 14, 2017, NPNS wrote to the Deputy Minister of NSE requesting it be granted "regulatory certainty" by engaging in negotiations on a future IA [Industrial Approval] prior to the EA.[17] By letter of November 30, 2017, 14 months before the EA application was even submitted, NSE's Eastern Regional Director agreed to begin negotiations as to the terms of the Industrial Approval that would follow the EA.[18] The correspondence further shows that both parties appear to assume that the purpose of the EA is

[15] Letter from Ms. Terri Fraser, Technical Manager Northern Pulp Nova Scotia Corporation, to the Honourable Randy Delorey, Minister of Environment, 9 April 2015 (Appendix H-21).
[16] *Environment Act*, S.N.S. 1994-1995, c. 1, s. 34(1)(c).
[17] Email from Bruce Chapman to Deputy Minister Frances Martin, November 14, 2017 (redacted as provided by FOIPOP) (Appendix H-23)
[18] Letter to Bruce Chapman, Northern Pulp, from Paul Keats, Eastern Regional Director NSE, dated 30 November 2017 (Appendix H-20)

to establish effluent discharge levels[19], and not to determine whether the project will cause adverse effects or significant environmental effects that cannot be mitigated. The NSE letter agrees to negotiate those Industrial Approval items that "are not impacted by the future environmental assessment process".[20] The NSE official fails to recognize that all items in an Industrial Approval would potentially be impacted by the EA, since all terms are contingent upon EA approval, and all terms would be unnecessary should the ETF project be rejected.

29. If rejection of the project were actually under consideration by NSE, this would have been reflected in the correspondence. Taking a closed-minded approach is contrary to the Minister's duty in coming to a decision in this matter.

3. The environmental assessment scheme: the *Environment Act* and the *Environmental Assessment Regulations*

30. The current review of NPNS's proposed ETF is proceeding as a Class 1 environmental assessment. The review and decision-making process is governed by the *Environment Act* and the *Environmental Assessment Regulations* ["*EA Regs*"].

31. NPNS's proposed ETF was registered for EA on February 7, 2019. As per s 34(1) of the *Environment Act* and s 13(1) of the *EA Regs,* the Minister has 50 days from the registration date to determine whether:

(1) additional information is required;
(2) a focus report is required;
(3) an environmental-assessment report is required;
(4) all or part of the undertaking will be referred to alternate dispute resolution;
(5) a focus report or an environmental-assessment report is not required, and the undertaking may proceed; or
(6) the undertaking is rejected because of the likelihood that it will cause adverse effects or significant environmental effects that cannot be mitigated.[21]

[19] NSE letter to Bruce Chapman of 30 Nov 2017, *supra*, at page 1: "The upcoming environmental assessment will also be used to establish those [effluent discharge concentration] limits." (Appendix H-20)
[20] NSE letter to Bruce Chapman of 30 Nov 2017, *supra*, at page 2. (Appendix H-20)
[21] *Environment Act,* SNS 1994-95, c 1 at s 34(1).

32. The *EA Regs* provide additional details on the parameters of the Minister's decision. Section 13(1) of the *Regs* specifies the circumstances in which the Minister may select each of the options listed in s 34(1) of the *Environment Act* as follows:

> 13(1) No later than 50 days following the date of registration, the Minister shall advise the proponent in writing of the decision under subsection 34(2) of the Act
>
> (a) that the registration is insufficient to allow the Minister to make a decision and additional information is required;
> (b) that a review of the information indicates that there are no adverse effects or significant environmental effects which may be caused by the undertaking or that such effects are mitigable and the undertaking is approved subject to specified terms and conditions and any other approvals required by statute or regulation;
> (c) that a review of the information indicates that the adverse effects or significant environmental effects which may be caused by the undertaking are limited and that a focus report is required;
> (d) that a review of the information indicates that there may be adverse effects or significant environmental effects caused by the undertaking and an environmental-assessment report is required; or
> (e) that a review of the information indicates that there is a likelihood that the undertaking will cause adverse effects or significant environmental effects which are unacceptable and the undertaking is rejected.[22]

33. As per s 13(1)(b), the Minister can only approve an undertaking under s 34(1) of the *Environment Act* if she concludes that it *would not cause any* adverse effects or significant environmental effects, or that any such effects would be mitigable.

34. In order for an adverse effect or a significant environmental effect to be adequately mitigated for the purposes of s 13(1)(b) of the *EA Regs,* the effect in question must be mitigable to the point that its impact is less than "limited". This is based on the combined effect of subsections 13(1)(b) and (c) – as per subsection 13(1)(c), if the undertaking may cause even "limited" adverse effects or significant environmental effects, the Minister must order a focus report.

35. As a result, the Minister is only authorized to approve NPNS's proposed ETF under s 34(1) of the *Environment Act* if she is certain that there will be no adverse effects or significant environmental effects, or that such effects can be mitigated to the extent that they all but

[22] *Environmental Assessment Regulations,* NS Reg 26/95 ["*EA Regs*"].

disappear. This is consistent with the purposes of the *Environment Act,* including upholding the precautionary principle and maintaining environmental protection.[23]

36. NPNS employs various definitions of what it terms a "significant adverse residual environmental effect" when evaluating the proposed ETF's potential impact on "Valued Environmental Components" ("VECs"). These definitions do not appear anywhere in the *Environment Act* or the *EA Regs,* and the Minister should exercise due caution in relying on them when determining whether the proposed ETF will cause significant environmental effects. NPNS does not propose a definition of "adverse effect" or any similar term when evaluating the project's potential impacts on human health.

37. As will be outlined in detail in the following sections, NPNS's EA registration materials are far from sufficient to allow the Minister to approve the proposed ETF. The Minister cannot, and should not, rely on NPNS's "vague assurances" of mitigation and further studies to approve a project that could have widespread and devastating impacts on the Province's environment, economy, and rural communities.[24]

4. Procedural Issues

38. It is trite to state that, as a general rule, there is "[…] a duty of procedural fairness lying on every public authority making an administrative decision which is not of a legislative nature and which affects the rights, privileges or interests of an individual."[25]

39. The current EA process has been marred by numerous procedural defects, which have resulted in a violation of the duty of procedural fairness. These procedural defects have undermined the public's ability to fully engage in the EA, contrary to the *Environment Act*'s explicit goal of "providing access to information and facilitating effective public participation in the formulation of decisions affecting the environment […]".[26]

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[23] *Environment Act, supra*, ss2(a), b(ii); *Sorflaten v Nova Scotia (Minister of Environment),* 2018 NSSC 55 at para 38.
[24] *Taseko Mines Ltd v Canada (Minister of the Environment),* 2017 FC 1099 at paras 123-124.
[25] *Cardinal v Kent Institution,* [1985] 2 SCR 643 at 653.
[26] *Environment Act, supra*, ss2(h).

40. The procedural flaws impacting the ongoing EA are examined in detail in the following sections.

a) Barriers to public participation

41. NPNS has submitted a 614-page Registration Document to the Province, along with 18 Appendices. In total, there are almost 1,700 pages of materials for the public to review. Many of the documents included with NPNS's materials contain dense scientific and technical information which can be time consuming for a layperson to digest.

42. The ongoing Class 1 EA process provides only 30 days for the public to review and comment on NPNS's materials. This is far from an adequate comment period. Minister Miller herself has acknowledged that this process is defective, stating "I don't know that the public is really going to be able to fully digest everything that's been submitted."[27]

43. The impacts of this inadequate comment period on the public's ability to review and understand the EA materials are further aggravated by NPNS's failure to engage with the public in a thorough and transparent manner prior to registering its project for EA.

44. Both the *EA Regs* and NSE policy documents explicitly contemplate a proponent's responsibility to engage with members of the public who may be impacted by a proposed project, and to attempt to understand and address their concerns. For instance, when formulating a decision under s 34(1) of the *Environment Act,* the Minister must consider "[…] concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking."[28] Furthermore, in its "Citizen's Guide to Environmental Assessment," NSE declares that "[p]ublic participation is vital to the success of environmental assessment."[29]

45. NPNS and/or its representatives made numerous promises with respect to public engagement prior to registering its EA materials, many (if not most) of which went unfulfilled. NPNS held

[27] Jean Laroche, "Northern Pulp's plans for pipeline, effluent treatment plant now public," CBC, February 7, 2019 [Appendix H-9].
[28] *EA Regs, supra,* at s 12(c).
[29] Nova Scotia Environment, *A Citizen's Guide to Environmental Assessment* (Halifax, NS: Nova Scotia Environment, 2017) at p 4. Link to: https://novascotia.ca/nse/ea/docs/EA.Guide-Citizens.pdf

two public "Open House" sessions, one in December 2017 and the other in January 2018.[30] Following the January 2018 Open House, Dillon Consulting (a consulting firm retained by NPNS to conduct the EA) committed in writing to conducting another series of Open House sessions in the spring of 2018.[31] Similarly, in July 2018 Dillon Consulting committed to holding another Open House session in the fall of 2018.[32] To the best of FONS' knowledge, neither of these commitments were upheld. As a result, the most recent public engagement session conducted by NPNS was over a full year before its EA materials were registered with the Province.

46. This failure to uphold explicit commitments made to members of the public is all the more egregious in light of the significant changes made to the ETF project beginning in October 2018. In July, 2018, NPNS announced that the pipeline route it had originally contemplated was not feasible. The planned route and outfall were therefore altered dramatically. We have been informed that Bruce Chapman, General Manager of the NPNS mill, made a verbal commitment to Krista Fulton of FONS on August 31, 2018 in a phone call at 11:34 a.m. that additional Open House sessions would be held regarding the new pipe route and outfall location. Mr. Chapman advised Ms. Fulton that: "Yes, we will have another Open House because that is what we promised."[33] However, despite this promise and NPNS's previous commitments, there were no public meetings held between the time the new route was selected and the date on which the EA materials were submitted to the Province.[34] A public information session has therefore never been held with respect to the new Caribou route and the CH-B outfall.

47. In addition, NPNS and/or its representatives committed on numerous occasions to releasing specialist studies completed as part of the EA to the public upon their completion.[35] These

[30] NPNS website Project Materials page, accessed January 31, 2019 (Appendix H-25).
[31] Letter from Annamarie Burgess to Jill Scanlan, dated January 22, 2018 (Appendix H-24)
[32] Letter from Annamarie Burgess to Jill Scanlan, dated July 9, 2018 (Appendix H-25).
[33] Personal conversation between Bruce Chapman and Krista Fulton, August 31, 2018.
[34] Brendan Ahern, "Lack of public consultation ahead of Northern Pulp's submission of Environmental assessment sparks backlash," The News, January 16, 2019 [Appendix H-6].
[35] Letters from Annamarie Burgess to Jill Scanlan, appendices H-24 and H-25; Northern Pulp, "Replacement Effluent Treatment Facility" webpage, accessed January 10, 2019 [Appendix H-28].

studies were to be made available on the ETF project website.[36] However, as of the date of its EA registration NPNS had only made a small portion of its specialist studies available to the public. Specifically, of the 18 Appendices included with its EA materials, NPNS only made two full appendices and three partial appendices available on its website prior to registration.[37]

48. NPNS's failure to make the vast majority of its specialist studies available to the public prior to the EA registration would be understandable if the studies in question had not been completed until the registration date (February 7, 2019). However, this is far from the case. The chart below lists all of the studies included in NPNS's EA materials and the dates on which they were completed.

Appendix	Title of study	Date	Posted on NPNS project website?
A	Joint Stock Record	November 8, 2018	**No**
B	NPNS Market Profile	January 26, 2018	Yes
C	Technology Selection Report	July 1, 2017	Yes
D	Veolia AnoxKaldnes Reference List	January 1, 2018	**No**
E	E1 – Stantec Final Caribou Discharge Receiving Water Study	December 19, 2018	Yes – this addendum was finalized on December 19, 2018, but not posted until mid-January 2019
	E2 – Stantec Response to Questions	January 5, 2018	Yes
	E3 – Stantec Preliminary Receiving Water Study Effluent Treatment Plant Replacement	August 11, 2018	Yes
F	Description of Marine Pipeline Construction	January 25, 2019	**No**

[36] The website address, at the time, was www.northernpulpeffluenttreatmentfacility.ca – This website still exists but you are redirected to another address.
[37] Northern Pulp, "Project Materials" webpage, accessed January 31, 2019 [Appendix H-26].

Appendix	Title of study	Date	Posted on NPNS project website?
G	Proposed EEM Program	January 2019 (date not specified)	**No**
H	Proposed Follow Up and Monitoring Program	January 2019 (date not specified)	**No**
I	I1 – Public Engagement Materials	December 2017; January 2018 (dates not specified)	Yes
	I2 – What We've Heard Summary Report	March 2018 (date not specified)	Yes
	I3 – Record of Project Website	January 16, 2019	**No**
	I4 – Stakeholder Meeting Minutes	December 21, 2017; February 8, 2018; February 20, 2018; October 22, 2018	**No**
J	J1 – 2016 EEM with Appendices	March 2016 (date not specified)	Yes
	J2 – What is Environmental Effects Monitoring	Undated	**No**
K	K1 – Stantec Air Dispersion Modeling Study of Replacement Effluent Treatment Facility	January 21, 2019	**No**
	K2 – Stantec Memo re Hoffman Report	June 15, 2018	**No**
L	L1 – Summary of Baseline Noise Monitoring	Undated	**No**
	L2 – Baseline Noise Monitoring Results for R1 – Maritime Oddfellows Home	December 18, 2017	**No**
	L3 – Baseline Noise Monitoring Results for R2 – 12 Birch Lane	December 17, 2017	**No**
	L4 – Baseline Noise Monitoring Results for R3 – 1220 Loch Broom Loop	December 18, 2017	**No**

Appendix	Title of study	Date	Posted on NPNS project website?
	L5 – Baseline Noise Monitoring Results for R4 – 108 Grant Abercrombie Branch Road	December 17, 2017	**No**
	L6 – Temperatures During Noise Monitoring Event	December 17, 2017	**No**
M	M1 – Watercourse Fish and Habitat Field Data Sheets	June 12, 2018	**No**
	M2 – Watercourses in the Vicinity of the Project Footprint Area Photo Plate	December 3, 2018	**No**
	M3 – Summary of General Physical Characteristics of Predicted Watercourse Crossings	December 3, 2018	**No**
	M4 – Maxxam Laboratory Certificates	December 17, 2018	**No**
	M5 – Middle River of Pictou Water Availability – Final Report	December 17, 2015	Yes
N	N1 – Potential Priority Animal Species	November 15, 2018	**No**
	N2 – Potential Priority Plant Species	November 15, 2018	**No**
O	O1 – Wetland Delineation Data Forms	June 12, 2018	**No**
	O2 – WESP_AC Functional Assessment Result Scores	Undated	**No**
P	Plant Data	Undated	**No**
Q	Q1 – Avian Survey Locations	June 30, 2018	**No**

Appendix	Title of study	Date	Posted on NPNS project website?
	Q2 – Map of MBBA Square 20NR25	April 13, 2006	**No**
	Q3 – MBBA Data Summary for Square 20NR25	November 22, 2018	**No**
	Q4 – Map of MBBA Square 20NR26	April 13, 2006	**No**
	Q5 – MBBA Data Summary for Square 20NR26	November 22, 2018	**No**
	Q6 – Results of all Avian Survey Efforts	June 20, 2018	**No**
R	Scientific Literature BKME Effects on Lobster	August 27, 2018 (amended January 25, 2019)	**No**

49. Most, if not all, of the listed studies could easily have been posted on the ETF project website prior to the project's registration for EA on February 7, 2019. Indeed, most of the studies were completed months before the registration date. It is unclear why NPNS chose not to post these studies on its website for public review upon their completion, as per its previous commitment. NPNS's failure to do so has unquestionably undermined the public's ability to review, understand, and provide thoughtful and fulsome comments on the EA materials.

50. In FONS's respectful submission, these clear procedural defects have resulted in violations of the duty of procedural fairness. Furthermore, as per subsection 12(d) of the *EA Regs,* when formulating a decision under subsection 34(1) of the *Environment Act,* the Minister is required to take into account "steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people." NPNS's failure to uphold even its most basic commitments to engage the public illustrates that it has not listened to the public's concerns, let alone taken steps to address them. In light of this fundamental procedural flaw, the Minister cannot approve the proposed ETF.

b) Incomplete Registration Document

51. Subsection 9(1A)(b) of the *EA Regs* require that an EA registration document must include certain basic information. As detailed below, NPNS's Registration Document does not fulfill the requirements of subsections 9(1A)(b)(ix), (x) or (xii).

(i) Section 9(1A)(b)(ix): A description of the proposed undertaking

NPNS describes the proposed ETF at Section 5.0 of its Registration Document. However, its project description fails entirely to address at least one significant component.

KSH Consulting's *Technology Selection Summary,* at Appendix C to NPNS's Registration Document, speaks to the inclusion of an oxygen delignification system as part of the new ETF. However, there is no mention of oxygen delignification anywhere in the Registration Document. Furthermore, NPNS has previously stated that oxygen delignification would not be installed as part of the new ETF, but would be an "anticipated future upgrade" that would occur sometime after the new ETF became operational.[38]

If an oxygen delignification system will be included as part of the new ETF, then NPNS must address this component as part of its project description as per subsection 9(1A)(b)(ix) of the *EA Regs.* If not, then NPNS must clarify that the KSH *Technology Selection Summary* does not accurately reflect the components of the proposed ETF.

(ii) Section 9(1A)(b)(x) Environmental Baseline Information

NPNS's materials contain no environmental baseline information specific to the receiving environment, i.e.: Caribou Harbour and Caribou Channel.[39] And, as listed below in section 8, a large number of other baseline studies are noted as necessary but have not been completed. This baseline information is fundamental for an understanding of the receiving environments and for meaningful environmental effects monitoring.[40] NPNS has failed to satisfy this requirement.

[38] Dillon Consulting, *Northern Pulp Nova Scotia – Replacement Effluent Treatment Facility – Information Submission to CEAA*, April 2018, excerpt [Appendix H-22].
[39] This is acknowledged in the NPNS EA submission at **Section 8.11.2, p 337**
[40] MacKay, A.A., *Northern Pulp's Effluent Disposal Plans – Issues and Answers*, February 2019 (MacKay commentary)(Appendix C-1), regarding the necessity of conducting species and chemical composition baseline surveys.

(iii) Section 9(1A)(b)(xii): All sources of any public funding for the proposed undertaking

> NPNS purports to fulfill this requirement at page 1 of its Registration Document, where it states as follows: "[a]t the date of Registration, the Province of Nova Scotia has made contributions to the cost planning and design of the project."
>
> This meagre description clearly does not identify all sources of any public funding for NPNS's proposed ETF. NPNS fails to even specify which provincial Departments provided the funds to which it refers. This cannot, and does not, fulfill the requirements of subsection 9(1A)(b)(xii).

52. In light of the above, the ETF project should not have been registered for EA. In the alternative, these omissions demonstrate that the Minister does not have sufficient information to approve the proposed ETF.

5. Closed Loop is a Viable Alternative to the ETF

53. At section 4.1 of its EA materials, NPNS briefly discusses alternatives to the project. FONS is of the view that a closed-loop system remains a viable choice compared to the proposed ETF, from an economic and environmental perspective.

54. A closed-loop effluent system is the only environmentally viable solution in this situation. A closed loop system would not discharge effluent into the environment and would allow the Mill to continue to produce pulp for the market.

55. NPNS retained Brian McClay and Associates to prepare a Global Market Profile[41] to look at whether NPNS could change from its current Northern Bleached Softwood Kraft production ("NBSK"), which produces effluent discharges into the environment, to a closed loop system. NPNS says that the Market Profile concludes that changing its production process to a closed loop system would mean that the mill would not "remain competitive", and that "NPNS must continue to operate by producing NBSK to be economically viable."[42]

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[41] Brian McClay and Associates, Global Market Profiles: NBSK, UKP & BCTMP, NPNS EA Submission, at Appendix B (the "Market Profile"). The terms of the retainer are not disclosed, and there is no indication of what information came directly from NPNS and the degree of independent analysis performed by Brian McClay and Associates.

[42] NPNS EA Submission, Registration Document, section 4.1, p. 26.

56. In fact, the Market Profile does not reach such conclusions, and states only that the current process is "the most competitively viable option by far".[43] Presumably, this means that the current process yields the highest profits.

57. The Market Profile does not say that changing production to a closed loop system would be unprofitable for NPNS. Rather, the Market Profile says simply that NPNS would have to compete in new markets and, in the case of Bleached Chemi-Thermo-Mechanical Pulp production, would require new equipment and would need to address electricity demand issues.[44] Whether this would be a real obstacle remains to be seen, but the Market Profile does not mention that, at present, NPNS produces its own power to satisfy 90% of its current electricity requirements[45] and that it is "almost self-sufficient in energy."[46] NPNS does not wish to make such an investment to modernize its operations and eliminate its effluent discharges. NPNS wants to characterize the solution as a stark choice between NPNS continuing to make its current profits and offloading the environmental problems to the Northumberland Strait, or closing the Mill entirely. This is a false choice and an oversimplification of the market and the choices facing NPNS. The Market Profile demonstrates that other options exist which are more environmentally acceptable and may also be economically viable.

58. It is also noted that the Market Profile provides no assessment of the economic costs to the taxpayers in relation to construction of the proposed ETF, or the economic cost to the community, or the environment, of current operations and the ETF. The Market Profile limits its scope solely and unquestioningly to NPNS profit margins and ignores the question of the economic/environmental burden externalized by NPNS operations.

59. Other potential alternatives or treatments, including evaporation, were never examined in any meaningful way. Discharge of effluent into the Strait was the only alternative given any serious consideration.

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[43] Market Profile, at page 2 "summary".
[44] Market Profile, at page 9.
[45] NPNS webpage, NPNS Operations Today, "Facts", at http://www.paperexcellence.com/npns-operations-today , accessed 28 Feb. 2019.
[46] NPNS webpage, NPNS Environment, at http://www.paperexcellence.com/npns-environment , accessed 28 Feb. 2019.

60. The arguments against a closed-loop system are not compelling, and can be answered via a change in product line. Given the environmental risks posed by this project, a closed-loop system is the best choice for the environment, the mill and the region.

6. Effluent composition

61. Possibly the most significant gap in the materials filed by NPNS and its consultants, is the complete lack of objective scientific reporting and test results regarding the composition of the effluent that is to be discharged from the proposed ETF into the herring spawning grounds and Caribou Channel. The Minister must have reliable and precise information about the actual effluent that will be entering the environment, in order to assess the impacts it will have on the environment. Without this information, an assessment of environmental impacts cannot proceed as it is impossible and absurd to assess the impacts of an unknown substance.

62. The only information about the characteristics and composition of the effluent that will flow out of the proposed ETF is described as "expected water quality characteristics". It appears in tables set out in the Receiving Water Studies.[47] As well, no explanation is provided as to why the data in these tables differs from one table to another: the expected water quality value for Total Nitrogen (TN) is listed as 3.0 mg/L in the August 2017 Preliminary Study, but 6.0 mg/L in the December 2018 Addendum.

63. In a letter dated October 5, 2017, an NSE official wrote to the NPNS General Manager, agreeing that NPNS could use the water quality characteristic numbers (as reproduced in Table 3-2 of the August 2017 Receiving Water Study) for "the design of the project" but that this agreement did "not encumber the Minister's decision following the EA process". The official went on to say:

> NSE is aware that current data from the facility indicates possible exceedances at point C for many of the parameters. **As part of the EA, Northern Pulp must demonstrate that the new treatment facility can achieve the numbers highlighted… above**. If any of the parameters, including maximum flow, require modifications to the mill itself to achieve the volumes and concentrations modelled in the study, Northern Pulp must also

[47] Stantec, Preliminary Receiving Water Study, August 17, 2017, p. 3.54 Table 3-2, NPNS EA Submission, Appendix E3; and Stantec, Addendum Receiving Water Study, December 19, 2019, p. 17, Table 3.2, NPNS EA Submission, Appendix E1.

> submit a plan to the Department indicating what changes are required to the Mill to achieve the maximum concentrations. [emphasis added][48]

64. The NPNS materials contain no assessment or studies done to demonstrate that the new treatment facility can achieve the assumed water quality characteristics. The Minister is asked to approve a project to construct a facility without being shown that it will work.

65. The Receiving Water Studies say that the expected water quality characteristics of the treated effluent were provided by KSH.[49] There are references to a KSH "brief" and report, and other KSH communications throughout the submission.[50] However, no report from KSH on the predicted effluent is provided. The only KSH-authored document is found at Appendix C, which is a Technology Selection Report. That report contains no information about the parameters of the effluent that will flow out of the diffusers into the marine environment, or that could leak out of breaks or ruptures in the pipe or at the ETF facility itself. There is an oblique reference to testing conducted in Sweden, but no results or report is provided.[51] NPNS has chosen not to provide any hard evidence that the effluent will achieve the parameters set out in its submission to the Minister, relying instead on hypothetical assumed parameters. This is a fundamental problem with the EA and is grounds for rejection of the entire submission.

66. NPNS's registration document expressly concedes that the information on which they rely is speculative and the assumptions untested.

> Due to uncertainty regarding effluent composition and approximate concentrations of substances present in the future treated effluent (which will not be verified until the project is operational), the identified candidate COPCs [chemicals of particular concern] in effluent are considered preliminary at this time.[52]

67. The EA registration demonstrates just how vague and speculative the information about the composition/characteristics of the effluent is, in the following statement:

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[48] Letter to General Manager, NPNS, from Supervisor of Environmental Assessment, NSE, dated October 5, 2017, p. 2 (Appendix H-15).
[49] Stantec, Preliminary Receiving Water Study, August 17, 2017, p. 3.54 Table 3-2, NPNS EA Submission, Appendix E3; and Stantec, Addendum Receiving Water Study, December 19, 2019, p. 17, Table 3.2, NPNS EA Submission, Appendix E1.
[50] NPNS EA Submission, Appendix E3, Stantec, Preliminary Receiving Water Study, August 17, 2017, section 2.1.3, p. 2.22 and "References" at p. 6.92; NPNS EA Submission, Section 9.2.4.2, p. 510.
[51] NPNS EA Submission, Section 4.2.1, p. 29. If testing was done, and was successful, one would assume that the results would be provided.
[52] NPNS EA Registration Document, Section 9.2.4.2, p. 506.

> While there are some uncertainties associated with the representativeness of the effluent chemistry characterization presented in Toxikos (2006) to the proposed future NPNS project effluent (as noted above), it is believed that there are sufficient similarities to state that the Toxikos (2006) information can serve as an indication of what may be expected in relation to NPNS project effluent composition/characteristics (KSH Consulting, personal communication).[53]

68. It is unusual to rely on a report from a mill which process different wood products and which discharges effluent into an entirely different ocean on the other side of the world, with different dynamics, temperatures etc., but not to provide a report summarizing and analyzing data from the actual mill that will be producing the effluent. As well, as has been noted elsewhere,[54] the mill being analysed by the Toxikos report was never built[55], so there is no way to compare those predictions with later actual results to determine the degree of accuracy of the predicted outcomes.

69. No attempt is made to explain the lack of data from NPNS or KSH regarding the precise effect of the ETF on the mill's effluent, despite the onus on NPNS to provide a complete set of information so the Minister can make a decision on the environmental impacts of the proposal.

70. The water quality characteristics assume that the components of the mill's effluent output will be more or less constant and stable. However, no evidence is provided for this. No information is provided about how the effluent composition may vary due to system disruptions, black liquor spills, equipment failures or a failure of the proposed ETF itself. Due to the age of this mill, it is possible that it will not be able to maintain a constant and predictable effluent flow and composition, and the chemistry of the effluent may vary considerably from time to time. As per the letter from Nova Scotia Environment of October 5, 2017, exceedances have been recorded at Point C where the effluent discharges into Boat Harbour Basin.[56] The fact that exceedances can occur demonstrates that the effluent flow is not constant or necessarily stable. The Minister should obtain a report regarding the nature and frequency of process

[53] NPNS EA Registration Document, Section 9.2.4.2, p. 507. While this statement is made in relation to a human health analysis, it demonstrates the lack of any certainty as to the actual effluent composition.
[54] Sweeney, E. *Comments on File No 1003, Environmental Assessment of NP's Proposed ETF*, Report, p. 2 Executive Summary (Appendix G-1).
[55] Timberbiz: Gunn's pulp mill permit lapses so land now for sale (Appendix H-14)
[56] Letter to General Manager, NPNS, from Supervisor of Environmental Assessment, NSE, dated October 5, 2017, p. 2 (Appendix H-15).

interruptions, disruptions, leaks and spills at the NPNS facility, and the impacts of such events on effluent composition.

71. The lack of any hard, provable data on the effluent that will come out of the end of the pipe ensures that the NPNS EA remains a hypothetical exercise. It is impossible to assess the impacts of an unknown substance. All the discussions regarding modelling and impacts are theoretical, as the assessment is not based in fact. The absence of scientific studies leads to the conclusion that NPNS is unable to prove the most fundamental component of their EA proposal, which is: "what is the composition of the effluent that NPNS proposes to discharge?" It would be an error for the Minister to accept an EA based on assumed effluent composition, rather than on proof of actual composition. This lack of basic information, despite its obvious centrality to the EA, must invalidate the submission.

7. Other effluent characteristics

72. Pulp mill effluent can contain many other components beyond those listed by NPNS as "expected water quality characteristics". Many of these are described in the context of human health impacts, but there is no discussion as to how they will fare in the receiving environment, whether that be the diffuser into the Caribou Channel, or via a leak or spill.[57]

73. Pulp mill effluent contains, or can contain, many toxic, bio-accumulative and carcinogenic components. Testing of raw effluent[58] from the Mill by the Boat Harbour Remediation Project reveals the presence of many compounds, including cadmium and mercury, which are problematic and bio-accumulative.[59] Mercury is often associated with pulp and paper operations.[60] The impacts of mercury and cadmium are not assessed in any meaningful way in the EA submission, yet they are clearly present in the effluent from the Mill and in the sediments in Boat Harbour Basin.[61] The long-term effects of discharging such substances into

[57] NPNS EA Submission, Section 9.2.4.2, p. 516 refers to a long list of substances, including mercury
[58] This relates to raw untreated effluent, which is different from the effluent which will be discharged after treatment in the proposed new ETF. The test results were provided by Ken Swain of the Boat Harbour Remediation Project in relation to raw effluent testing done in 2017 (Appendix H-1).
[59] Dr. Margaret Sears, *Comments regarding the Northern Pulp Nova Scotia Environmental Assessment Registration Document, Replacement Treatment Facility*, March 8, 2019, pp. 3 and 5, (Appendix F-1);
[60] Dr. Sears Report, at pp. 3 and 5 (Appendix F-1).
[61] Boat Harbour Remediation Project Handout, Appendix H-11.

the marine environment are not addressed in the NPNS submission, despite the potential impacts on the marine ecosystem and marine species and human health, as well on air quality via burning sludge. The impacts of these substances, being bio-accumulative, must be analyzed.

74. In an email from 2017 from NPNS to a provincial official, NPNS admitted it could not meet the CCME standard for certain metals, such as mercury, lead, aluminum, cadmium, iron, selenium and zinc.[62]

75. As mercury has been detected in raw effluent from the mill as recently as 2017[63], it requires assessment against mercury specific guidelines. The main route of exposure for wildlife in aquatic ecosystems is the consumption of contaminated aquatic prey species such as fish. To address this route of exposure there is a methylmercury CCME tissue residue guideline for protection of wildlife consumers of aquatic biota.[64] As the effluent will contain mercury, an assessment against the guideline should be conducted. Existing mercury levels in aquatic biota near the outfall should be measured, and the bio-accumulation that may occur from the exposure to the mercury in the effluent should be compared to the guideline. There is no indication that this guideline was reviewed and taken into account within the NPNS studies.

76. In a letter to NPNS dated June 14, 2017, NSE advised NPNS that "a receiving water study should address all potential substances of concern, not limited to those outlined in the Pulp and Paper Effluent Regulations."[65] No such list of all potential substances of concern appear in the receiving water study despite the express requirement that a list be provided and addressed.

77. The June 14, 2017 letter went on to say that "[t]he information provided to the Department should include one year's worth of effluent characterization data." Partial test results are referred to but not provided from several years, including 2002, 2003 and 1999, although it is not explained why it is necessary to go so far back in time to obtain test results. In any event,

[62] Email dated April 7, 2017, NP to Gary Porter, TIR with attached table (Appendix H-5)
[63] Test results were provided by Ken Swain of the Boat Harbour Remediation Project in relation to raw effluent testing done in 2017 (Appendix H-1).
[64] Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Biota – Methylmercury, CCME 2000. http://ceqg-rcqe.ccme.ca/download/en/294?redir=1551877575
[65] Letter to the NPNS General Manager, from Nova Scotia Environment, Engineering Specialist, dated 14 June 2017, p. 1 (Appendix H-6).

it does not appear that effluent characterization data for one full year appears in the materials filed by NPNS within this EA. These are glaring omissions, and without such information, the environmental impacts of harmful substances on receiving waters cannot be addressed.

8. Canso chemical site and mercury contamination

78. Dr. Meg Sears has prepared comments on the NPNS EA. The report from Dr. Sears speaks for itself and we present this report to the Minister for her consideration on this EA.[66]

79. As stated in Dr. Sears' report, serious mercury contamination issues are associated with the former Canso chemical chloro-alkali plant at the NPNS site.[67] This site is very close to, or immediately adjacent to, the site proposed for the new ETF.

80. The dangers presented by mercury and methylmercury are discussed above. It is a serious omission in this NPNS EA that there be no discussion of any environmental effects, or any discussion at all, in the NPNS materials in relation to the Canso site, and the mercury contamination. Likewise, there is no discussion about how construction of the ETF would affect the mercury contamination present in the bedrock and on the site. As Dr. Sears says, such information and analysis should be an essential component of any EA process.[68]

9. Failure to conduct primary studies and obtain baseline data

81. Section 8 of NPNS's EA materials, which is titled "Environmental Effects Assessment," focuses on 17 identified "Valued Environmental Components" (VECs). For over 50% (9/17) of the VECs examined in this section, NPNS failed to conduct its own primary research to determine baseline conditions. The following list identifies the VECs for which NPNS did not complete primary studies:

a) VEC: Freshwater Fish and Fish Habitat

EA Registration Document, Section 8.6.2.1, p 205: "It is noted that fall 2017 to summer 2018 field investigations were undertaken at the replacement ETF site, but an

[66] Dr. Margaret Sears, *Comments regarding the Northern Pulp Nova Scotia Environmental Assessment Registration Document, Replacement Treatment Facility*, March 8, 2019 (Appendix F-1).
[67] Dr. Sears' report, at p. 4 (Appendix F-1) . Partial decommissioning report for Canso site (Appendix H-2).
[68] Dr. Sears' report, at p. 4 (Appendix F-1).

alternate pipeline route was selected in the fall of 2018 […] and due to the timing of route selection, only a preliminary reconnaissance site visit was undertaken."

b) VEC: Wetlands

EA Registration Document, Section 8.7.2.3, p 224-225: "It should be noted that fall 2017 to summer 2018 field investigations were undertaken at the replacement ETF footprint area and surrounding area, but as an alternate pipeline route was selected in the fall of 2018 […] and due to the fall/winter timing of route selection, only a preliminary reconnaissance visit of the pipeline footprint area was undertaken."

c) VEC: Flora/Floral Priority Species

EA Registration Document, Section 8.8.2, p 245: "It is noted that fall 2017 to summer 2018 field investigations were undertaken at the replacement ETF footprint site, but an alternate pipeline route was only selected in the fall of 2018 […] and due to the fall/winter timing of route selection, only a preliminary reconnaissance visit was undertaken."

d) VEC: Terrestrial Wildlife/Priority Species

EA Registration Document, Section 8.9.2, p 269: "It is noted that fall 2017 to summer 2018 field investigations were undertaken at the replacement ETF site, but an alternate pipeline route was selected in the fall of 2018 […] and due to the timing of route selection, only a preliminary reconnaissance visit was undertaken."

e) VEC: Migratory Birds and Priority Bird Species/Habitat

EA Registration Document, Section 8.10.2.2, p 290: "[…] the proposed location of the pipeline changed following the completion of the avian program. As such, a significant portion of the [Project Footprint Area] (in the pipeline corridor) has not been surveyed for avian [Species of Conservation Concern] and/or [Species At Risk]."

f) VEC: Harbour Physical Environment, Water Quality, and Sediment Quality

EA Registration Document, Section 8.11.2, p 337: "The description of the existing conditions for the harbour physical environment, water quality, and sediment quality in the Northumberland Strait, Caribou Harbour, and Pictou Harbour is based on the results of previous research and existing scientific literature and environmental assessments; no field work was conducted as part of this EA Registration."

g) VEC: Marine Fish and Fish Habitat

EA Registration Document, Section 8.12.2, p 358: "The description of existing conditions is based on the results of previous research and existing scientific literature and environmental assessments; no field work was conducted as part of this EA Registration."

h) VEC: Marine Mammals, Sea Turtles and Marine Birds

EA Registration Document, Section 8.13.2, p 387: "The description of existing conditions for marine mammals, sea turtles, and marine birds in the Northumberland Strait is based on the results of previous research and existing scientific literature and environmental assessments; no field work was conducted as part of this EA Registration."

i) VEC: Marine Archaeological Resources

EA Registration Document, Section 8.16.2, p 458-459: "The assessment of effects on marine archaeological resources is based on background research and analysis of relevant geophysical and remote sensing data. […] An [Archaeological Resource Impact Assessment] of the marine environment has not been completed for this project but will be completed prior to construction."

82. The absence of this basic baseline research means that NPNS cannot accurately identify or describe the environment into which it proposes to introduce unknown toxic substances. In other words, NPNS cannot name the mammals, birds, fish, or plants, or describe the wetlands or harbour environment that will be impacted by its ETF with any certainty because it has not done the research.[69]

83. Instead of conducting its own primary research, NPNS purports to rely on previous research and existing scientific literature to support its assessment and its conclusion that there will be "no significant adverse residual environmental effects" on any of its identified VECs. However, this is highly problematic because the primary research cited by NPNS (or cited in the literature upon which NPNS relies) in many cases dates back decades.

84. For example, the Atlantic Canada Conservation Data Centre (AC CDC) report relied on by NPNS in support of its evaluation of the potential impacts on various species (including birds,

[69] MacKay, A.A., *Northern Pulp's Effluent Disposal Plans – Issues and Answers*, February 2019 (MacKay report)(Appendix C-1), regarding the necessity of conducting baseline surveys

terrestrial wildlife, marine mammals, fish, sea turtles, and others) purports to identify the species "known to occur" in the vicinity of the ETF project.[70] However, the majority of the data relied upon by AC CDC is over a decade old – and in some cases dates back over 50 years.[71] It is trite to state that the species residing in any particular area change over time. In the absence of current research, NPNS cannot purport to identify the species that may be affected by its project, much less evaluate the potential impacts on those species.

85. Similar conclusions can be drawn with respect to the non-species related VECs listed above (with the exception of the "wetlands" VEC, for which NPNS cites no research whatsoever in relation to the wetlands impacted by the new pipe route[72]).

86. It is particularly important to note once more that NPNS has not conducted baseline studies for over half of the environmental components that it purports to evaluate. In the absence of this critical information, it is impossible to understand how NPNS can conclude that its project will have "no significant adverse residual environmental effects" on any of the identified VECs. In our respectful submission, as a result of this glaring gap in NPNS's EA materials, the Minister cannot conclude with any certainty that the proposed ETF will have no significant environmental effects that cannot be mitigated. As a result, she cannot legally approve the proposed project.

87. Arthur MacKay has authored a commentary on aspects of the NPNS EA, and on behalf of FONS we hereby submit it to the Minister for consideration.[73] Mr. MacKay is an experienced fisheries biologist and consultant.[74] He co-authored an extensive study on the long-term effects of a pulp and paper mill, along with other industrial activity, on the St. Croix estuary in New Brunswick.[75]

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[70] NPNS Registration Document, Appendix N, p 1.
[71] NPNS Registration Document, Appendix N, p 18-21.
[72] NPNS Registration Document, Appendix O3.
[73] MacKay, A.A., *Northern Pulp's Effluent Disposal Plans – Issues and Answers*, February 2019 (MacKay report)(Appendix C-1)
[74] Art MacKay cv (Appendix C-1).
[75] Arthur MacKay, et al., 2010, "The St. Croix Estuary 1604 – 2004". It can be found at: https://issuu.com/artmackay/docs/healthofstcroixestuary

88. Mr. MacKay notes that NPNS has done few if any primary surveys to determine the vital ecosystem components of the target areas. He notes that the NP submission discusses mainly commercial fish species. While such species are important, it is not the full picture. He writes:

> …the foundational species of the ecosystem such as planktonic species, invertebrate and fish larvae, subtidal and intertidal invertebrates and plants, forage species, etc are not considered. Seasonality is an important issue and to truly understand ecosystem dynamics, at least 12 monthly surveys must be undertaken that include records for plankton, fish and invertebrate larvae, forage species, fish, bird, and mammals.[76]

89. His report provides some parameters that ought to have been followed in conducting baseline surveys for local species, as well as to obtain baseline chemical analyses.

90. Mr. MacKay warns that, in the absence of this basic information, the impact of the effluent from the proposed outfall pipe at Caribou Harbour or the proposed cleanup in Boat Harbour cannot be measured in the short term or long term.[77]

91. He concludes as follows:

> Frankly, in relation to the proposed pipeline, no work should begin until professional ecosystem surveys are undertaken at Caribou Harbour, Northumberland Strait at Caribou Harbour and Northumberland Strait at the Boat Harbour outfall (vital for comparison purposes). **In the absence of these necessary surveys, the Minister must be made aware that there can be no confidence in the purported lack of impacts stated and implied in the Northern Pulp environmental submission**. …[78]

j) Other missing studies

92. In addition to the missing studies identified above, the following are also absent:

(i) Baseline studies on Caribou Harbour and Caribou Channel. NPNS instead uses Pictou Harbour as a proxy (although no baseline study was conducted for Pictou Harbour either);[79]

(ii) Baseline data for the larger Strait area, regarding water quality and other municipal, industrial and agricultural discharges into the waters of the Strait;

[76] MacKay report, p. 3 (Appendix C-1).
[77] MacKay report, at p. 3 (Appendix C-1).
[78] MacKay report, p. 5 (Appendix C-1).
[79] NPNS EA Submission, Section 8.11.1, p. 336.

(iii) Studies regarding impacts of effluent from kraft pulp mills (without delignification) on species present in the Strait, including lobster, crab, herring and foundational ecosystem species;[80]
(iv) Engineering reports or drawings regarding the construction of the shoreline and marine portions of the pipeline, the route it will follow and how deeply it can be buried;
(v) Analysis or engineering study of the impacts of ice scour on buried HDPE pipe;
(vi) Modelling of effluent transport and dispersion from pipeline breaks, ruptures and leaks in marine, shoreline and terrestrial environments;
(vii) Air emissions data from current operations from all stacks and vents;
(viii) Studies showing the nature and frequency of process interruptions and disruptions, leaks and spills at the NPNS facility and the impacts of same on effluent composition;
(ix) Report and analysis on the Canso chemical site and mercury contamination and how it may be impacted by the construction and operation proposed ETF, and/or how it may impact effluent composition and risks of mercury contamination to the environment and human health, and
(x) Baseline data and cumulative effects of the project on the larger Northumberland Strait, taking into account other discharges and activities already affecting the Strait as a whole.

10. Long-term effects

93. A discussion of potential long term effects of the ETF project is noticeably absent from the NPNS EA submission as all impacts are deemed not to be residual. However, as identified throughout this submission, there are many potential and likely long-term effects that have not been meaningfully assessed. As per the Fringer Report, discussed below, had Stantec correctly used the models that were available, they would have discovered that it is likely that effluent will accumulate in Pictou and Caribou Harbours[81], and solids will settle out of the discharged effluent and onto the seabed.[82] Likewise, the long-term impacts of bio-accumulation of metals requires assessment for long term impacts on human and ecosystem health, and on the economics of the fishery.[83] Without it, the Minister cannot make a decision on the EA.

94. Arthur MacKay, in his report discussed above, notes the longer term impacts that should be expected due to exposure to effluent on an ongoing basis. This would include biological

[80] MacKay report, p. 3, discussion of "foundational species of the ecosystem" (Appendix C-1).
[81] Fringer report, p. 1 (Appendix A-1)
[82] Fringer report, pp. 4-5. (Appendix A-1)
[83] Discussed below. See also report by Dr. Sears, Appendix F-1.

magnification of toxins in the Harbour and Strait, and impacts on a broad range of marine organisms, including plankton, fish larvae, fish, birds, marine mammals and humans. He also notes creation of anoxic "dead zones," declines in marine invertebrates, fish, and some birds and mammals, and fishery closures due to the presence of toxic chemicals in fish caught for human consumption. All these effects, and many others, were observed and documented in his St. Croix study.[84]

11. Cumulative effects

95. The NPNS EA materials contain almost no discussion of the larger environment of the Strait and the southern Gulf, and the role of Caribou Channel and Caribou Harbour within that context. The discussion of cumulative effects in section 12 of the NPNS EA materials sets an artificially small area within which cumulative effects are examined. Even within that boundary, effects of agricultural activity are not discussed, and the impacts of existing municipal wastewater discharges are not taken into account. Further, due to the boundary in the EA submission, there is no discussion of the macro conditions in the Strait. No effort was made to take baseline measurements or to assess the carrying capacity of the Strait's Ecosystem overall and how it may be able to handle the proposed effluent discharge, or how that discharge may affect more distant parts of the Strait due to overall flows, currents and dynamics. The entire EA package and the discussion regarding cumulative effects are based on the findings of the Stantec modelling exercise, which is fundamentally flawed[85] and which fails to take into account what will happen to the effluent trail once it passes out of the immediate vicinity of Caribou Channel.

96. The cumulative impacts of current discharges of from agricultural activities, and from industrial and municipal wastewaters, emanating from Nova Scotia, New Brunswick and Prince Edward Island, are not examined. The role of climate change, and how it might interact with the project and impact consultant predictions, is likewise absent from the discussion.

[84] MacKay report, at pp 4-5. (Appendix C-1)
[85] See Dr. Fringer's report (Appendix A-1) and the discussion below regarding the Stantec modelling exercise.

Despite the presence of section 12 of the submission, the NPNS EA materials provide no comprehensive analysis of cumulative environmental effects.

12. Pulp and Paper Effluent Regulations

97. The *Fisheries Act*, coupled with the *Pulp and Paper Effluent Regulations* (*PPER*) permit discharge of pulp and paper effluent, up to certain measurable limits for certain characteristics.[86] However, mere compliance with the *PPER* does not prevent adverse effects or significant environmental effects that cannot be mitigated.

98. It is noted that the *PPER* are currently under review, with the goal of tightening them up, as up to 70% of pulp and paper mills still are considered to be harming the environment despite alleged compliance with the *PPER*. On February 1, 2019, Environment and Climate Change Canada officials appeared before the Standing Committee on Agriculture and Fisheries of the Prince Edward Island Legislature. In that appearance, an ECCC official stated, in part:

> Despite this high level of compliance with the existing effluent standard, the environmental effect studies have shown that the effluents from 70% of the pulp and paper mills across the country are having an effect on fish and/or, depending, fish habitat.[87]

99. The official also confirmed that the NPNS mill was included in the 70% of mills whose effluents are having an "impact on fish habitat".[88]

100. It is noted that the current conditions within Boat Harbour Basin have occurred, and continue to occur, despite ostensible regulatory compliance with the *PPER* over several decades.

13. Source of Mixing Zone Concept

101. The NPNS Submission and the receiving water studies on which it relies are based, in large part, on the misapplication of the concept of a 100 metre "standard mixing zone", within which

[86] *Pulp and Paper Effluent Regulations*, SOR/92-269 (*PPER*). The *PPER* are made under the *Fisheries* Act, R.S.C. 1985, c. F-14. See also the *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations*, SOR/92-267 made under the *Canadian Environmental Protection Act, 1999*, S.C. 1999, c. 33.
[87] Standing Committee Minutes, 1 Feb. 2019, p. 3 (Appendix H-13).
[88] Standing Committee Minutes, 1 Feb. 2019, p. 5 (Appendix H-13).

effluent components are projected to dilute to "background levels." In reality, the mixing zone that is proposed completely fails to comply with the basic requirements of a mixing zone, no matter what standard is applied. A mixing zone is entirely inappropriate given the realities of the receiving environment of Caribou Channel and Caribou Harbour.

102. The NPNS EA Submission states:

> Additionally, the project is designed with key established water quality guidelines and/or will meet ambient water quality (current background) at the edge of a standard mixing zone (CCME 2009 - Canada-wide Strategy for the Management of Municipal Wastewater Effluent)..[89]
> …
> The mixing zone for the discharged effluent was defined as the 100-m distance from the outfall pipe as per the Canadian Council of Ministers of the Environment (CCME) guidelines.[90]

103. NPNS cites CCME 2009 (Canada-wide Strategy for the Management of Municipal Wastewater Effluent) and the Atlantic Canada Wastewater Guidelines Manual as authority for its use of a mixing zone.[91] However, CCME 2009 is a municipal waste water guideline, which applies to government or public owners[92], not to private industrial pulp and paper mills like NPNS. Similarly, the Atlantic Canada Wastewater Guidelines Manual addresses municipal sewage, and not pulp and paper effluent.[93]

104. The significant differences between municipal waste water and pulp and paper effluent are underscored by the reality that they are regulated by two mutually exclusive sets of regulations made under the Fisheries Act. Municipal waste water is regulated via the *Wastewater Systems Effluent Regulations*[94], whereas pulp and paper effluent is governed by the PPER, as discussed

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[89] NPNS EA Submission, Registration Document, Section 5.6.1, p. 84.
[90] Stantec, Addendum Receiving Water Study, December 19, 2019, p. i, Executive Summary, NPNS EA Submission, Appendix E1.
[91] Stantec, Addendum Receiving Water Study, December 19, 2019, Section 3.1.2, p. 3.52, NPNS EA Submission, Appendix E1.
[92] *Canada-wide Strategy for the Management of Municipal Wastewater Effluent*, Canadian Council of Ministers of the Environment (CCME 2009). See definitions of "Municipal Wastewater Effluent" and "Owner" which do not include a private industrial operator like NPNS. Accessible at the following link: https://www.ccme.ca/files/Resources/municipal_wastewater_efflent/cda_wide_strategy_mwwe_final_e.pdf
[93] Atlantic Canada Wastewater Guidelines Manual, Environment Canada, 2006. The manual is an update of the former *Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage,* 2000 edition. https://novascotia.ca/nse/water/docs/AtlCanStdGuideSewage.pdf
[94] *Wastewater Systems Effluent Regulations* SOR/2012-139 (*WSER*). Subsection 2(5) of the *WSER* provides that the waste water regulations do not apply in respect of pulp and paper mills.

above. It is therefore in doubt whether CCME 2009 has any application to pulp and paper effluent and this EA.

105. It is questionable whether the CCME 2009 guidelines even continue to apply in relation to municipal wastewater, as they may have been superseded by the *Wastewater Systems Effluent Regulations*[95]. Under those regulations, made in 2012, the only 100 m mixing zone contemplated relates to discharge of municipal wastewater containing un-ionized ammonia. No comparable mixing zone is employed in the Fisheries Act or PPER relation to any pulp and paper effluent constituents.

14. Mixing zone does not apply in the context of outfall CH-B

106. Further, and more importantly, a mixing zone may not be used <u>at all</u> unless it satisfies important preconditions or requirements. These requirements are not discussed in NPNS's EA Submission. When they are considered, it becomes apparent that the proposed, or any, mixing zone is not appropriate at the outfall location proposed by NPNS and does not comply with CCME or NSE direction.

107. Nova Scotia Environment discussed the requirements for a mixing zone in correspondence to NPNS dated June 14, 2017.[96] The letter says, in part:

> A mixing zone is defined as an area of water contiguous to a point source discharge. A mixing zone is, under no circumstances, to be used as an alternative to reasonable and practical treatment….it is only one factor to be considered in establishing effluent requirements.
>
> …As a general principle, the use of mixing zones should be minimized and limited to conventional pollutants. The mixing zone principle does not apply to hazardous wastes…. Mixing zones also do not apply to bio-accumulative or persistence [sic] substances and despite the allowance of a mixing zone, effluent shall not be acutely toxic.
>
> …Mixing zones cannot interfere with other water uses such as…active fisheries… .[97]

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[95] *Wastewater Systems Effluent Regulations* SOR/2012-139 (*WSER*). Subsection 2(5) of the *WSER* provides that the waste water regulations do not apply in respect of pulp and paper mills.

[96] Letter to the NPNS General Manager, from Nova Scotia Environment, Engineering Specialist, dated 14 June 2017 (Appendix H-6).

[97] Letter to the NPNS General Manager, from Nova Scotia Environment, Engineering Specialist, dated 14 June 2017, p. 1 (Appendix H-6). The requirements for a mixing zone set out in this letter are similar to those found in the

108. Contrary to the directions in the June 14, 2017 letter, the mixing zone proposed by NPNS in this EA does not consider meaningfully, or in some cases even note the existence of, biotic communities and spawning areas, and the information provided about spawning areas is not accurate.[98] As well, given the presence of mercury and other bio-accumulative metals and compounds, the proposal does not comply with the requirement that no such substances be discharged within a mixing zone. Further, as CH-B is positioned within one of the last remaining herring spawning areas in the Strait, and within an important lobster fishing area,[99] it violates the express requirement that "mixing zones should not impinge upon…important fish spawning and/or fishing areas". [100] The Caribou Channel is in the middle of an extremely active fishery, yet this is not mentioned by the consultants who purport to apply the "CCME guidelines" that require such factors to be considered.

109. The NPNS submission fails to conduct any analysis of whether a mixing zone can actually be used at CH-B. There is no actual application of the NSE or CCME guidance. When the criteria are reviewed, NPNS fails most of them. The mixing zone concept cannot be applied to CH-B, and consequently, it is irrelevant how soon the substances within the effluent meet background conditions. The diffuser would be discharging harmful substances, including metals and solids, directly into a living ecosystem and spawning grounds, which supports an active fishery.

110. Caribou Channel is not an artificial 100 m dead zone which can be continuously loaded with effluent without consequence. The NP submission is based on an incorrect standard. In reality there is no water quality guideline which permits discharge of effluent into a spawning and active fishing area.

Guidelines on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives, CCME 2003. http://ceqg-rcqe.ccme.ca/download/en/221

[98] For more accurate information about herring spawning zones, see Egilsson, G., and MacCarthy, A., Caribou Harbour and Caribou Channel - dynamics, tides, ice, marine species and fisheries, February 21, 2019 (Appendix B-1).

[99] Egilsson, G and MacCarthy, A. (Appendix B-1).

[100] Letter to the NPNS General Manager, from Nova Scotia Environment, Engineering Specialist, dated 14 June 2017, p. 1 (Appendix H-6)..

15. Receiving environment – receiving water studies and near and far field modelling

111. The Stantec Receiving Water Studies, on which much of the NPNS EA is founded, are unreliable and the modelling exercise undertaken was not appropriate for the receiving environment. FONS submits that the Receiving Water Studies, and other materials based on the conclusions of those studies, must be disregarded and new, properly conducted studies must be included in an EA report.

112. A critique of the Stantec Receiving Water Studies has been prepared by Dr. Oliver Fringer of Stanford University, Stanford California USA and is appended to this submission.[101]

113. Dr. Fringer is an Associate Professor (with tenure), Department of Civil and Environmental Engineering, Stanford University. He is an oceanographer with expertise in numerical modelling of coastal dynamics.[102]

114. Dr. Fringer's report speaks for itself and we hereby submit it to the Minister for a detailed and thorough review. In summary, Dr. Fringer concludes that Stantec did not implement the MIKE 21 far-field model and the CORMIX near-field model appropriately. In this case, Stantec's implementation problems are significant. Dr. Fringer concludes that they lead:

> … to the incorrect conclusion that the environmental impacts will be negligible because the effluent concentrations are predicted to be unphysically low. **Instead, correct implementation of the models with more conservative and physically realistic scenarios would show that effluent concentrations in the region could be much larger and that effluent accumulation in Pictou and Caribou Harbours is likely.**[103] [emphasis added]

115. In this regard, Dr. Fringer states that Stantec's use of the two-dimensional MIKE 21 model is inappropriate as it fails to take into account local dynamics caused by wind, river inflows, offshore currents, ice, waves and storm surge. Due to the highly three-dimensional circulation in the region, a three-dimensional model (MIKE 3) should have been used to model the

[101] Fringer, O.B., *Review of near- and far-field modeling studies by Stantec Consulting for the Northern Pulp effluent treatment facility replacement project*, 7 March 2019 (Appendix A-1) (Fringer report)
[102] Oliver Fringer, CV, (Appendix A-2)
[103] Fringer Report, p. 1. (Appendix A-1)

behaviour of the effluent in the receiving water environment in relation to the outfall at CH-B, and the surrounding area.[104]

116. In this regard, we note that in May 2017 KSH recommended 3-D modelling be done in relation to alternative outfall locations D and D2.[105] Whether or not this recommendation was implemented, no 3-D far field modelling results have been provided within any reports filed within this EA despite the necessity of using 3-D far field modelling in generating accurate and reliable results.

117. Likewise, Dr. Fringer concludes that significant implementation issues in using the CORMIX near-field model have created unreliable results in the Receiving Water Studies. The ambient tidal current used to drive the CORMIX model is modelled by Stantec as much stronger than it would actually be during a neap tidal period. Tidal currents are even weaker during winter when ice cover decreases the strength of the tides. The CORMIX model also overestimates salinity as it does not take into account potential river inflow, which in turn leads to an overestimation of buoyancy and dilution.[106]

118. Dr. Fringer further notes that the Receiving Water Studies do not take into account settling of suspended solids during slack tides within 100m of the outfall, despite the potential for settling of such solids.[107]

119. Dr. Fringer notes:

> During each one-hour slack tide period, 173 kg of suspended solids would be discharged into the ocean from outfall CH-B. The solids that were discharged 30 minutes before slack tide would find themselves just 45 meters from the outfall, only to be transported back over the outfall again at the end of the next 30 minutes to be re-entrained into the outfall plume.
>
> … Furthermore, owing to the reduction in vertical turbulent mixing because of the weak currents during slack tides, there is a strong potential for the suspended solids in the effluent to settle out of the water column and onto the bed in the vicinity of the outfall.

[104] Fringer Report, p. 7 (Appendix A-1)
[105] Email May 29, 2017, KSH to NPNS and TIR, Alt D 2D modelling results (Appendix H-3).
[106] Fringer report at pp. 2 and 18-20 (Appendix A-1)
[107] Fringer Report, pp 4-5 and 21 (Appendix A-1)

> The effects of slack tides and the potential for settling of suspended solids is not discussed in the Stantec studies.[108]

120. Based on this clear and expert critique, FONS submits that the Receiving Water Studies do not provide sound information and data to the Minister that would permit the Minister to accept the conclusions of those Studies, or to conclude that discharge of effluent at the outfall will not cause adverse effects or significant environmental effects that cannot be mitigated. Rather, the critique requires the conclusion that the Receiving Water Studies cannot reliably determine the likelihood that adverse impacts or significant environmental effects will occur that cannot be mitigated in the receiving environment. As these studies form the backbone of the NPNS submission, NPNS has failed to discharge its onus to demonstrate that its proposal to discharge effluent into the Strait will not cause harm.

121. In addition, as discussed above regarding the mixing zone concept, NPNS has failed to provide and analyze certain types of information, within the Receiving Water Studies.

122. For all these reasons, the Receiving Water Studies must be rejected and their conclusions disregarded.

16. Local knowledge

123. We submit for the Minister's consideration three local knowledge summaries from individuals who have particular and detailed knowledge about local conditions.

1. Egilsson, G., and MacCarthy, A., Caribou Harbour and Caribou Channel - Dynamics, tides, ice, marine species and fisheries, February 21, 2019 (Appendix B-1);
2. Letter from Rob MacKay, Master Diver, dated March 5, 2019 (Appendix B-2); and
3. Letter from Barry Sutherland, dated March 4, 2019 (Appendix B-3).

124. Allan MacCarthy and Greg Egilsson are experienced fisherman who have fished in the immediate vicinity of the proposed outfall CH-B in Caribou Channel. Rob MacKay is a Master Diver with experience over three decades of diving in the Pictou area. Barry Sutherland has

[108] Fringer Report, pp 4-5 (Appendix A-1)

been fishing the Caribou area for 27 years. Between them they have lifetimes of observations about local conditions, including winds, currents, tides, ice and marine species.

125. Their summaries and letters speak for themselves.

126. Mr. Sutherland, Mr. MacCarthy and Mr. Egilsson are three of about eighty-two lobster fishers who fish in that area, including fishers from the Pictou Landing First Nation.

127. The three submissions listed above contain a wealth of information that was never gathered by any of NPNS's consultants. The actual observations described in these submissions provide real information which often contradicts the assumptions made within the NPNS materials, including the Stantec Receiving Water Studies.

128. Notably, the Receiving Water Studies fail to take into account crucial local conditions when they assess how the effluent would behave after discharge at CH-B. Mr. MacCarthy and Mr. Egilsson describe local currents, such as the Pictou Island counter clockwise gyre current. These submissions demonstrate that the Studies, and the NPNS submission generally, vastly underestimate the effects of ice, wind, tide and other dynamics, and demonstrate the vulnerability of a plastic pipe placed on, or buried in, the floor of Caribou Harbour and the Caribou Channel.

129. Among other things, Mr. Egilsson and Mr. MacCarthy note that the proposed outfall CH-B would be positioned within Mr. Egilsson's current lobster fishing area, very near to where he places his first traps of the day in lobster season. Mr. MacCarthy's lobster fishing area is immediately adjacent to CH-B and the entire area is a very active fishing zone. Many species are fished there, over the course of each year. Mr. Egilsson and Mr. MacCarthy also note that:

> **The proposed outfall CH-B is located in the middle of the last major active spawning area for Area 16F herring. Herring spawning grounds have compressed in the past few years as the stock has declined. Very little herring spawning occurs anywhere else in the Eastern Gulf.**[109] [emphasis added]

[109] Egilsson, G., and MacCarthy, A., Caribou Harbour and Caribou Channel - dynamics, tides, ice, marine species and fisheries, February 21, 2019 (Appendix B-1), at page 3 (Appendix B-1).

130. Likewise, Mr. MacKay has had a unique opportunity to observe the sea bottom in the Caribou area over the past several decades. He provides detailed information regarding the power and reach of ice and ice scour and how it can move extremely heavy items, as well as the soft shifting sea bottom in the area, and how these conditions could affect the effluent pipe that NPNS proposes to run through that area:

> The channel shifts from time to time mostly due to storms. Ice and tide also move sand around as it is very shallow in this area. Storms can pile ice up to 30 feet high which can dig deep into the soft bottom. This could damage the buried pipe.
>
> ...If the pipe is covered in armour stone, the sand on either side will be undermined by wind and wave action exposing the pipe to the full force of the ice in winter. If no armour stone is used, those same fall storms could easily expose the pipe, as anyone living near a beach knows how easily sand is shifted by storm winds and waves. Either way the pipe is unlikely to survive extreme conditions in this area.
>
> …The sea bottom in the area of the proposed pipe is very fragile. It's mostly sand and in the inner harbour, mud and eel grass. The eel grass is very fine and important to juveniles and larvae of lobster and crab.

131. Mr. Sutherland has shown that Caribou Harbour is a rock crab nursery. Rock crab are plentiful in that area, and are a food species which support lobster stocks. He writes, in part:

> Caribou Harbour is home to the largest commercial fishing fleet in the Northumberland Strait. The strong lobster catches in this area are the result of the continuous food supply from the rock crab nursery. The potential destruction of this crab habitat will have devastating consequences on the lobster industry in this area.[110]

132. He also expresses his concerns regarding the impact of noise and disruption from the installation and operation of the effluent pipeline and diffuser in this area.

133. These studies must inform any assessment of actual conditions in the area. Unfortunately, NPNS has failed to consider these issues in any significant way in its EA materials.

17. Monitoring and Accident Prevention

134. Throughout the lengthy period leading up to the current EA, members of the public expressed numerous concerns with respect to NPNS's ability to adequately monitor the proposed ETF

[110] Sutherland, at page 2 (Appendix B-3)

and to respond to accidents that could result in the unplanned release of treated or untreated effluent or other hazardous substances into the environment. NPNS has utterly failed to respond to these concerns in its EA materials. As a result, the Minister does not have enough information to make an informed decision as to whether spills from the proposed ETF may result in significant environmental effects and/or adverse effects.

135. In its EA materials, NPNS refers to an Environmental Protection Plan (EPP) and an Emergency Response and Contingency Plan (ERCP) that will be developed to address various aspects of its monitoring and accident response requirements. These plans will form part of an umbrella document known as an Environmental Management Plan (EMP).[111]

136. NPNS states that both the EPP and the ERCP will be prepared after it receives its EA approval.[112] In other words, neither the public nor the Minister will be given the information required to fully understand how NPNS intends to respond to spills, or monitor its ETF and mitigate the potential for accidents, until the project is well on its way to operation. Until that time, we are left only with vague statements indicating what the ERCP is "anticipated" to include[113] - and are told only that the EPP will address management and prevention of "accidents, malfunctions, or unplanned events".[114]

137. This lack of information is all the more problematic in light of the significant risks posed by ice coverage in Caribou Harbour and the Northumberland Strait. As per the MacCarthy and Egilsson submission, "[i]ce is typically present in the Caribou area from the end of December through April, but can set in earlier and remain later if temperatures are cooler than normal."[115] At a minimum, then, ice will be present in and around the NPNS pipe route for over 1/3 of the year. This ice includes "fast ice," which freezes to the bottom of the Harbour in shallower inshore areas.[116]

138. Common sense dictates that the ice, storms and other unpredictable marine conditions will hinder NPNS's ability to monitor its pipe and diffuser for damage and leaks, and to investigate

[111] NPNS Registration Document, section 5.3.1, p 49.
[112] *Ibid,* section 5.7.3, p 97 & section 10.5, p 533.
[113] *Ibid,* section 5.7.3, p 98.
[114] *Ibid,* s 10.5, p 533.
[115] MacCarthy & Egilsson, Appendix B-1, p 9.
[116] *Ibid.*

and repair spills in the marine environment. NPNS does not explain how it will conduct its monitoring and spill response activities in the presence of ice – in fact, its EA materials do not even acknowledge that ice may be an issue when it comes to monitoring and responding to spills. Likewise, the EA materials do not contain an examination of the particular effects of a prolonged and inaccessible effluent spill, at any point along the pipeline, or within the marine area under ice cover. Despite the lengthy ice-bound periods during the winter, and the significant possibility of damage by ice or other forces during the winter, NPNS provides no explanation of what could be done to protect the marine environment of Caribou Harbour or the Caribou Channel, before an opportunity arises to access and repair the damaged infrastructure. This is an obvious issue and a serious oversight that must be addressed prior to any EA approval.

18. Receiving environment – air quality

139. The ETF proposal includes the burning of sludge generated from effluent treatment. Like the effluent discussed above, the chemical composition of the sludge is largely unknown, and no studies have been provided analyzing the sludge composition and the impacts to air quality and human and environmental health from emissions arising from burning sludge.

140. Significant concerns exist in respect of burning sludge in the mill's power boiler, especially in combination with existing emissions at the mill. As noted by Dr. Sears, too little is known and provided about the composition of the sludge to provide any certainty as to whether air emissions will be problematic.[117] There is likewise a lack of information regarding toxic metals and polyaromatic hydrocarbons (PAHs) in air emissions.

141. Dr. Sears notes concerns regarding dioxins and furans associated with pulp mills.[118] She also notes an inaccuracy in the information provided by NPNS on this EA:

> It is stated in the EA Registration document (e.g., Table 6.7-1), "In fact, dioxins and furans testing for the last 5 years has consistently shown that all of the compounds required to be tested under the regulations have not been detected in NPNS' effluent (non-detect)." The dioxin-free message is not consistent with reports from Northern Pulp that are posted on the Nova Scotia government website,

[117] Dr. Sears' report, at p. 3 (Appendix F-1)
[118] Dr. Sears' report at pp. 10-12 (Appendix F-1)

> nor the data reported to the National Pollutant Release Inventory (NPRI).[17] NPRI data indicates that on average 3.6 tonnes of PAHs have been emitted to the air annually since 2006, and 8 mg TEQ dioxins/furans have been emitted annually since 2011.[119]

142. The NPRI data cited by Dr. Sears is appended to this submission.[120]

143. Dr. Sears also notes exceedances in air emissions of hydrogen sulphide associated with the mill.[121]

144. With respect to air quality, again actual testing of co-combustion of hog fuel and sludge in the power boiler has not occurred, but a "pilot study" is contemplated.[122] No explanation was provided as to why such testing could not have been done prior to the EA.

145. Air emission studies and information remain at best incomplete, and therefore an insufficient basis for any conclusion as to project environmental or health impacts. At worst, they show issues with emissions of dioxins and furans, and PAHs being emitted by the mill.

a) Hoffman report and rebuttal to Stantec critique

146. In a report in 2017, Emma Hoffman and co-researchers conducted a pilot study of air quality issues in the Pictou area.[123] The study investigated prioritized air toxic ambient VOC concentrations to determine whether these correlated with wind directions and whether there was an indication that toxic ambient VOCs were linked to the NPNS mill. The study acknowledged its limitations, but concluded that elevated levels of certain toxins were apparent when prevailing winds came from the direction of the mill.

147. At appendix K2, Stantec challenged these findings, and argued they should be disregarded. Ms. Hoffman answered the Stantec criticisms with an effective rebuttal, dated February 23, 2019 and attached to this package.[124] Ms. Hoffman described the Stantec article as containing

[119] Dr. Sears' report, at p. 11 (Appendix F-1)
[120] National Pollutant Release Inventory spreadsheet for NPNS, Appendix H-27.
[121] Dr. Sears' report, at p. 8 (Appendix F-1)
[122] NP EA Registration Document, Section 9.3, p. 519.
[123] Hoffman, E, et. al., *Pilot Study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia*, June 2017, Environ Sci Pollut Res 24(25):20685–20698 (Appendix E-1).
[124] Memo Hoffman, E., to Gunning, D. (Hoffman rebuttal), (Appendix E-1)

misrepresentations put forth by NPNS's EA of the scientific contributions her 2017 study provides. Ms. Hoffman's 2017 report, and her rebuttal speak for themselves, and we submit them to the Minister for consideration in this EA process.

148. Ms. Hoffman's rebuttal confirms the potential that toxic ambient VOCs are emanating from the mill:

> Compared to all other wind directions, prevailing winds from the northeast and the mill typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations; however (as stated in the study), the origin(s) of VOCs are "*inconclusive*", and "*other local sources likely contribute to air toxics emissions*".[125]

149. Ms. Hoffman concludes as follows:

> In summary, the intent of this pilot study was to address local air quality conditions in a Nova Scotia rural community, which clearly indicates the need for further investigation. Moreover, this pilot study serves as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of all citizens is safeguarded and prioritized.[126]

150. We ask that the Minister likewise examine closely the data provided by NPNS in respect of air emissions, and the other aspects of this EA, and employ the precautionary approach when determining whether adverse effects or non-mitigable significant environmental effects will occur.

19. Human Health effects

a) Expert – Ellen Sweeney report

151. At Section 9.0 of NPNS's EA materials, we are provided with a "Human Health Evaluation". In theory, this section is intended to provide the Minister with the information she needs to evaluate whether the proposed ETF will cause "adverse effects" – which are defined in the

[125] Hoffman rebuttal, p. 2 (Appendix E-1)
[126] Hoffman rebuttal, p. 4. (Appendix E-1)

Environment Act as effects that impair or damage the environment, or change the environment in a manner that negatively affects "aspects of human health."[127]

152. Dr. Ellen Sweeney, Director of Strategic Research Initiatives at the Atlantic Partnership for Tomorrow's Health,[128] has reviewed and critiqued NPNS's Human Health Evaluation.[129] Dr. Sweeney's comments are appended to this submission for the Minister's review.

153. Overall, Dr. Sweeney concludes that the information provided by NPNS is far from sufficient to accurately assess the true impacts of the proposed ETF on the health of the surrounding communities.

154. Dr. Sweeney identifies numerous critical gaps in NPNS's Human Health Evaluation. For instance, NPNS states that specific effluent chemistry characteristics "will not be known with certainty until the project is operational."[130] As Dr. Sweeney notes, without detailed information identifying precisely what will be coming out of NPNS's proposed outfall, the Minister cannot possibly evaluate the risks and potential hazards with any degree of certainty.[131]

155. Additional flaws identified by Dr. Sweeney include the following: (1) a failure to provide supporting evidence relating to pulp and paper mill projects NPNS claims to be similar to its proposed ETF;[132] (2) a heavy reliance on a single study (the Toxikos report) pertaining to a project that was never built;[133] (3) a failure to examine potential fetal exposure to carcinogenic and endocrine disrupting chemicals;[134](4) a failure to evaluate the health risks associated with potential spills on land or in watersheds;[135] and (5) a failure to evaluate the potential health

[127] *Environment Act, supra* at s. 3(c).
[128] Dr. Sweeney, cv (Appendix G-2).
[129] Sweeney, E., *Comments on File No: 1003 – Environmental Assessment of Northern Pulp's Proposed Effluent Treatment Facility,* February 2019 (Appendix G-1) (Sweeney report).
[130] NPNS EA Submission, Registration Document, section 9.1, p 489.
[131] Sweeney report, Appendix G-1, p 4.
[132] *Ibid,* p 4.
[133] *Ibid,* p 4-5.
[134] *Ibid,* p 5.
[135] *Ibid,* p 10.

impacts of low dose cumulative exposures to toxic substances associated with the proposed ETF.[136]

156. Dr. Sweeney's report raises significant concerns with the quality and sufficiency of the Human Health Evaluation provided by NPNS. Given these critical flaws, the Minister cannot conclude with any certainty that the proposed ETF will not cause "adverse effects" that cannot be mitigated.

b) Expert - Daniel Rainham comments

157. Dr. Daniel Rainham of Dalhousie University has also critiqued various parts of NPNS's Human Health Evaluation.[137] Dr. Rainham is an Associate Professor and Director of Dalhousie's Environmental Science Department. He is also the Elizabeth May Chair in Sustainability and Environmental Health.[138] Dr. Rainham's report is appended to this submission for the Minister's review.

158. Dr. Rainham identifies similar concerns to those raised by Dr. Sweeney. For instance, he notes that NP did not provide detailed information with respect to the chemical composition of its effluent – although it was well within NPNS's capacity to do so.[139]

159. Additional information gaps identified by Dr. Rainham include the risks of exposure to emissions through methods such as the consumption of fish exposed to toxic substances,[140] and the chemical composition of the fine particulate pollution associated with the ETF project.[141] As a result of these and other flaws in NP's Human Health Evaluation, the Minister cannot accept NPNS's conclusion that there will be no significant impact on the health of the affected communities.

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[136] *Ibid*, p 8-9.
[137] Rainham, D., *Comments on the document "Replacement Effluent Treatment Facility Project,* 5 March 2019 (Appendix D-1) (Rainham report).
[138] Dr. Rainham's CV (Appendix D-1).
[139] *Ibid*, p 2.
[140] *Ibid*, p 4.
[141] *Ibid*, p 5.

20. Conclusion

160. As stated in the first paragraphs of this submission, NPNS's Executive Summary advises that, on all aspects of the project, there will be no "significant residual environmental effects". As per the material submitted above, and the expert reports from qualified experts, this conclusion cannot stand. FONS submits that the information and analysis provided in this submission show that there is a very real possibility that adverse effects and non-mitigable significant environmental effects will occur in respect of the ETF project.

21. Decision Requested –ss 34(1) and 34(2) of the *Environmental Assessment Act* and ss. 13(1) of the *Environmental Assessment Regulations*

161. FONS submits that this submission and the accompanying Appendices have established that it is likely that the ETF project will cause adverse effects or significant environmental effects that cannot be mitigated. FONS therefore requests that the Minister reject the proposed undertaking pursuant to subsection 34(1)(f) of the *Environment Act* and subsection 13(1)(e) of the *Environmental Assessment Regulations.*

In the alternative, FONS submits that the evidence before the Minister establishes that there may be adverse effects or significant environmental effects caused by the undertaking that cannot be mitigated, and that an environmental-assessment report is therefore required, pursuant to subsection 34(1)(c) of the *Environment Act*, and subsection 13(1)(d) of the *Environmental Assessment Regulations.*

162. Further and in any event of the above, FONS requests that it be provided with a written statement of the decision rendered by the Minister in relation to the environmental assessment of the undertaking, setting out the findings of fact upon which it is based and the reasons for the decision, pursuant to subsection 10(4) of the *Environment Act.*

Dated March 8, 2019, at Halifax Nova Scotia

APPENDICES

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Art MacKay - *Concerns with Northern Pulp Nova Scotia Corporation's effluent disposal plans*	Appendix C-1
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Hoffman et al., 2017, *Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County.*	Appendix E-2
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Jean Laroche, "Northern Pulp's plans for pipeline, effluent treatment plant now public," CBC, February 7, 2019	Appendix H-9
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APPENDIX A-1

Review of near- and far-field modeling studies by Stantec Consulting for the Northern Pulp effluent treatment facility replacement project

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March 7, 2019

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1. Executive Summary

This report provides a review of computer modeling of the fate and transport of effluent from proposed discharge locations in and around Pictou Harbour and offshore of Caribou Harbour near Pictou, Nova Scotia. The modeling work was carried out by Stantec Consulting for assessment of the Replacement Effluent Treatment Facility Project registered by Northern Pulp Nova Scotia Corporation. Simulations were conducted with accepted industry-standard models including the near-field CORMIX model and the far-field MIKE 21 model.

Owing to several problems related to the implementation of the CORMIX and MIKE 21 models, they overestimate the near- and far-field mixing and dilution of the effluent from the proposed outfalls, including the final outfall at site CH-B offshore of Caribou Harbour. This leads to the incorrect conclusion that the environmental impacts will be negligible because the effluent concentrations are predicted to be unphysically low. Instead, correct implementation of the models with more conservative and physically realistic scenarios would show that effluent concentrations in the region could be much larger and that effluent accumulation in Pictou and Caribou Harbours is likely.

The principle problems related to the far-field MIKE 21 modeling include:

1) Agreement between the model simulated currents and water levels and observed currents and water levels in Pictou Harbour is poor. Therefore, we can have no confidence that the model accurately predicts the far-field fate and transport of the effluent at any of the proposed outfall locations.

2) Use of the two-dimensional MIKE 21 model is inappropriate given the potentially strong vertical variability of currents driven by winds and river inflows in the region. These three-dimensional effects can significantly impact the far-field transport by exaggerating accumulation in Pictou and Caribou Harbours.

3) The far-field model scenarios using MIKE 21 omit or incorrectly simulate the impacts of winds, river inflows, offshore currents in the Northumberland Strait, ice, waves, and storm surge. These processes may significantly impact far-field mixing and dilution of effluent and lead to higher effluent concentrations throughout the region.

4) The figures showing maps of low effluent concentrations offshore of Caribou Harbour are misleading because the far-field model artificially dilutes the effluent. Nevertheless, the dilution factors are reported to be over 100 in most of the region surrounding the CH-B outfall, which is an overly optimistic result.

The principle problems related to the near-field CORMIX modeling include:

1) The ambient tidal current used to drive the CORMIX model offshore of Caribou Harbour is much stronger than the expected current during a neap tidal period. Tidal currents are even weaker during winter when there is ice cover which decreases the strength of the tides. Overestimation of the tidal currents gives an unrealistic overprediction of the near-field mixing and dilution of effluent, particularly during slack tides.

2) The ambient density employed in the CORMIX model is too saline because it does not take into account potential effects of river inflows. This makes the receiving waters too dense and leads to too much buoyancy-driven mixing of the effluent plume, thus leading to an overestimate of the near-field mixing and dilution. The CORMIX modeling also ignores the effect of vertical variability in salinity, which could be strong during periods of high river inflows and reduce the near-field mixing and dilution because fresh water layers near the surface may trap the effluent beneath them.

It should be noted that these problems are related to the implementation and choice of models, not to the models themselves. When implemented correctly, CORMIX and far-field models like MIKE 21 or its three-dimensional counterpart, MIKE 3, yield very reliable near- and far-field predictions of effluent transport.

2. Introduction

2.1. Overview

In this report I review the near- and far-field modeling studies conducted by Stantec Consulting to understand the fate of effluent from proposed outfalls located in and around Pictou and Caribou Harbours which are connected to the Northumberland Strait in Pictou County, Nova Scotia, Canada. These studies are part of the Environmental Assessment of the Replacement Effluent Treatment Facility Project registered by Northern Pulp Nova Scotia Corporation (Northern Pulp). Specifically, in this report I analyze the modeling studies contained in the following appendices included in the Environmental Assessment:

1) Appendix E1 – Stantec final Caribou discharge receiving water study (The final study)
2) Appendix E2 – Stantec response to questions
3) Appendix E3 – Stantec receiving water study effluent treatment plant replacement (The preliminary study)

In the preliminary study (Appendix E3), scenarios were conducted to study the effluent transport from two outfalls in (sites Alt-A and Alt-B) and offshore of (sites Alt-C and Alt-D) Pictou Harbour. It was deemed that the suggested outfall location Alt-D was not appropriate because of the potential for ice scour of the outfall in the relatively shallow water (11 m). The final study (Appendix E1) was then undertaken to assess the effluent transport from outfalls located offshore of Caribou Harbour in 20 m of water at sites CH-A and CH-B. Site CH-B was recommended as the location with the least environmental impact. In what follows, I will refer to these appendices as the "final study", the "response to questions", and the "preliminary study". Collectively, they will be referred to as "the studies" or "the Stantec studies".

Simulating the transport and fate of effluent from a coastal wastewater outfall requires two kinds of models. Roughly within 100 m of the outfall, effluent is diluted relatively rapidly by mixing with ambient ocean waters. This mixing is due to strong turbulence related to jet-like flow from the outfall ports and buoyancy arising from the difference in density between relatively warm and fresh effluent and colder and saltier receiving waters. In the studies reviewed here, this dilution process is simulated with CORMIX (Jirka et al. 1996), an industry standard near-field model that takes into account diffuser geometry and properties of the effluent and receiving waters. After the near-field turbulence and buoyant mechanisms have decayed, the fate and transport of the effluent is dictated by the larger-scale circulation in the coastal region surrounding the outfall. The far-field currents, salinity, and temperature are obtained with a hydrodynamic model that computes circulation in response to winds, tides, river inflows, and other relevant coastal processes. These currents are then used to compute the far-field transport and fate of the effluent. In the studies reviewed here, the MIKE 21 model (DHI 2017) was used to compute the far-field circulation and transport. This model is also an industry standard that has been applied extensively to study circulation and transport in coastal regions. While the CORMIX model is an appropriate choice for the near-field modeling, the MIKE 21 model is not appropriate for this study because it is a two-dimensional model, as discussed in Section 3.1 below.

It is common practice to use far-field models to supply ambient currents and environmental parameters like temperature and salinity to the near-field model. The near-field dilution results including the near-field concentration and vertical distribution of the effluent plume can be supplied to the far-field model. In the Stantec studies, the ambient currents needed

for the CORMIX model are taken from the MIKE 21 model, while the ambient density field for CORMIX is taken from measurements of temperature and salinity. The far-field MIKE 21 model does not use results from CORMIX. This is common given that only relative concentrations are needed to assess the far-field dilution when using a two-dimensional model like MIKE 21. As will be discussed in this report, however, a three-dimensional far-field model is needed, and this model requires information about the vertical distribution of the effluent plume from the near-field model.

2.2. Currents and dispersion in the coastal ocean

In coastal areas like the regions in and around Pictou and Caribou Harbours, the currents arise from a multitude of processes, although a simple categorization is to distinguish between the tides and all other non-tidal processes, such as wind-driven, river-driven, and large-scale ocean currents in the Northumberland Strait. A prevailing and misleading theme in the Stantec studies is the suggestion that, although some non-tidal processes are included in the modeling (albeit incorrectly), these non-tidal processes are not important because the tidal currents dominate the near- and far-field effluent transport. However, as discussed throughout this review, the non-tidal processes are extremely important for predicting the fate of the effluent in both the near-field and far-field.

Because of their oscillatory motion in time, tides transport effluent back and forth over an outfall, and with each oscillation the effluent is dispersed, leading to horizontal spreading of the effluent plume. This so-called tidal dispersion is strongest in regions where the tidal currents are both large and vary strongly in space, such as at the mouths of Caribou and Pictou Harbours. Although an outfall plume will spread due to tidal dispersion, there will not be much dilution of the effluent after many tidal cycles unless there are non-tidal currents that can transport the effluent away from the outfall. Without non-tidal currents, effluent would simply accumulate around outfall location CH-B and in nearby Caribou Harbour.

Accumulation of effluent in the vicinity of an outfall is strongest during slack tides, periods of low or negligible currents that occur twice during every tidal period, which is approximately 12 hours (the tidal period due to the moon is 12.42 hours and that due to the sun is 12 hours). The effects of slack tides are most pronounced during neap tides when tidal currents are weakest. For example, the maximum neap tidal current is approximately 10 cm/s at outfall location CH-B (based on the discussion presented in Section 4.2 below). With this tide, the tidal currents will be weaker than 2.5 cm/s for the one-hour period surrounding slack, or for approximately two hours (17%) of the entire tidal cycle. During each one-hour slack tide period, 173 kg[1] of suspended solids would be discharged into the ocean from outfall CH-B. The solids that were discharged 30 minutes before slack tide would find themselves just 45 meters from the outfall, only to be transported back over the outfall again at the end of the next 30 minutes to be re-entrained into the outfall plume. This demonstrates the importance of slack tide in the accumulation of effluent over an outfall diffuser due to the prolonged periods of relatively weak currents, particularly during the neap period of the spring-neap tidal cycle. Furthermore, owing to the reduction in vertical turbulent mixing because of the weak currents during slack tides, there is a strong potential for the suspended solids in the effluent to settle out of the water

[1] Based on a concentration of 48 mg/L and effluent flow rate of 1 m^3/s, from Table 3.2 of the final study.

column and onto the bed in the vicinity of the outfall. The effects of slack tides and the potential for settling of suspended solids is not discussed in the Stantec studies.

Fortunately for the health of coastal ecosystems, non-tidal currents exist to varying degrees in all coastal regions. In fact, the tides themselves produce non-tidal currents, much like ocean swell waves produce rip currents that have no wave-like signature. Non-tidal currents that are produced by the tides are generally smaller than other non-tidal currents in the region, such as wind-driven, river-driven, and large-scale ocean currents. While river flows and winds are included in the far-field modeling, these effects are not accurately simulated, as discussed in Section 3.1 below. There are large-scale ocean currents that are predominantly from the west to east in the Northumberland Strait at speeds ranging from 6-9 cm/s (Lauzier 1965). Another non-tidal current in the region is the counterclockwise circulation around Pictou Island that has been observed by local fisherman (MacCarthy and Egilsson 2019). This non-tidal current is likely driven by a combination of winds and tides. Although they are important in dictating the far-field transport of effluent, these non-tidal currents are regarded as not important and not included in the Stantec studies.

3. Review of the far-field modeling

3.1. Two- vs. three-dimensional modeling

The MIKE 21 model employed in the far-field simulations is not appropriate because it is two-dimensional and does not represent important three-dimensional processes in the region, such as wind-driven circulation and density effects arising from freshwater flows from rivers. A more appropriate model like MIKE 3 would need to be used to account for these effects.

The MIKE 21 model employed by Stantec is a two-dimensional model in that it computes the depth-averaged currents at each grid cell in the computational domain. Therefore, it assumes that the currents are constant with height above the bed in each grid cell. The three-dimensional equivalent of MIKE 21 is the MIKE 3 model (also by DHI), which computes the variability in currents as a function of height above the bed. The principal advantage of two-dimensional, depth-averaged models is that they are computationally efficient because three-dimensional models require addition of grid cells in the vertical direction. In the case of the Stantec simulations, a three-dimensional model would require at least 20 layers in the vertical which would increase the model runtime by at least a factor of 20.

Despite its computational efficiency, a two-dimensional model is not appropriate to simulate the far-field effluent transport because of the importance of three-dimensional processes in the coastal region around Pictou and Caribou Harbours arising from variations in salinity and temperature, which affects the density stratification. Density stratification due to salinity arises along coastlines where river inflows bring fresh water into the ocean. Because the river water is fresh, it is less dense than the salty ocean, thus inducing vertical variations in the salinity field in which the denser, salty water lies beneath the lighter, fresher water above. Temperature stratification also exists throughout the oceans since the upper layers tend to be heated by the sun, leaving warmer and lighter waters above colder and denser waters. Temperature stratification is weakest in winter months when incoming heat is weakest.

Salinity stratification is more important than temperature stratification in coastal waters where river effects can be important. For example, the top and bottom salinities in the Pictou

Road region in July 1995 were 23.7 and 31.2 ppt (parts per thousand by mass), respectively, while the top and bottom temperatures were 13.5°C and 14°C, respectively (Preliminary study, p. 2.21). This translates to a top-bottom difference in density of 5.8 kg/m^3 due to the salinity and 0.1 kg/m^3 due to temperature, using the UNESCO equation of state calculator (UNESCO 1981). In December 1998, the salinity stratification at the same location was weaker (top-bottom salinity difference of 2 ppt) although the temperature stratification was slightly stronger (top-bottom temperature difference of 2°C). The salinity stratification generally increases with increasing river flow and decreases with tidal flow strength, since tidal currents generate turbulence that tends to mix the salinity and temperature field and weaken the vertical density stratification. Measurements indicate that the surface salinity near the East River in the Pictou Harbour region varied from 20 ppt during low-flow periods to just 5 ppt during high-flow periods (Preliminary study, p. 2.21).

Ocean water is generally stratified in the vertical because density increases with depth, with lighter, less dense waters overlying heavier, denser waters. However, in the coastal ocean there is also horizontal variability in the salinity-induced density. At a river mouth, the water is fresh and there is no vertical salinity stratification, while in the ocean far from the river mouth the salinity is high, yet there is also weak vertical salinity stratification. The most important effect of this horizontal variability in density is to induce a three-dimensional circulation in which fresh, river waters flow seaward over denser ocean waters which flow landward. In addition to the implications for the near-field transport (See Section 4.2 below), the implication for far-field transport is that effluent may be transported into the harbours with the landward-flowing denser currents. This effect is accentuated in deeper waters, implying that it will be stronger in Pictou Harbour (which also has higher freshwater flows), although the shipping channel in Caribou Harbour can act as a conduit to transport effluent-rich ocean waters into the harbour.

A second three-dimensional effect that cannot be captured by a two-dimensional model is related to the winds. When aligned with the main axes of Pictou or Caribou Harbours, winds will drive currents downwind along the shallow edges while the flow in the central, deeper portions will be driven upwind. Since the dominant westerly winds (August-April[2]) in the region are generally aligned with the main axes of the harbours, they have the potential to drive surface effluent seaward and that at depth into the harbours. Wind-driven circulation is typically not as strong as that driven by the rivers or tides, although it can be important during periods with neap tides and low river inflows.

A two-dimensional model also cannot capture the variability of the effluent with depth. The assumption of two-dimensionality in the effluent field is reasonable when the three-dimensional effects in the flow field are relatively weak. In fact it is possible to approximate some three-dimensional processes quite well with a two-dimensional model, such as a process known as shear-flow dispersion. Because of bottom friction, currents are slower near the bed, and if there is wind-driven circulation, the currents may be stronger near the surface. Therefore, tracers[3] that are in regions of the water column with slower-moving currents will be transported more slowly in the horizontal than those in the faster-moving regions of the water column. This process can be thought of as horizontal dispersion of the tracer field because it is spreading horizontally, and can be approximated reasonably well in a two-dimensional model with a shear-

[2] https://weatherspark.com/y/28559/Average-Weather-in-Pictou-Canada-Year-Round

[3] A tracer is a substance that is transported passively with the flow without buoyancy effects.

flow dispersion coefficient. The MIKE 21 model includes many approximations like this to account for three-dimensional effects in the two-dimensional transport module, although these were not employed in the Stantec studies (Preliminary study Table 2-1; Final study Table 2-11: "No decay and no dispersion in the particle tracking module"). Indeed, these approximations are not suitable for estuarine environments given that they work best in riverine environments that are weakly stratified, weakly wind-driven, and lack tidal influence.

Regardless of the influence of dispersion on the two-dimensional transport, the lack of vertical variability in the modeled tracer prevents simulation of an effluent that in reality can vary quite strongly in the vertical. The proposed effluent will typically be less dense than the receiving waters (it is both fresher with a total dissolved solids concentration, or salinity, of 1-4 kg/m^3, and warmer, with a winter temperature of 25^{o}C and summer temperature of 37^{o}C; Preliminary report p. 3.54). Therefore, if the receiving waters are sufficiently salty and cold (See Section 4.2 below) the effluent is expected to rise to the surface and propagate as a surface plume that is just 1-2 m thick based on the CORMIX near-field results in the Stantec studies. Furthermore, the depth at which the plume propagates is not necessarily at the surface, particularly under high flow conditions in which the effluent may be more dense than the receiving waters (See Section 4.2 below). Therefore, it is possible that the effluent could be driven in a direction that is opposite to that in a two-dimensional model if a three-dimensional model were used.

In summary, while three-dimensional effects may not be important during some periods of the year, such as during periods of low river flows and weak winds, in general a three-dimensional model is needed to accurately simulate the far-field fate and transport of effluent from the proposed discharge locations. Indeed, the MIKE 21 manual (Page 2 of DHI 2017) states, "In water bodies with stratification, either by density or by species (ecology), a 3D model should be used. This is also the case for enclosed or semi-enclosed waters where wind-driven circulation occurs." One might argue that three-dimensional models take too much time to run because of the need to include many grid points in the vertical. However, the Stantec final study employed a computational mesh with 24,645 grid cells (15,872 were employed in the preliminary study). Three-dimensional effects would be resolved with reasonable confidence using 20 or more grid cells in the vertical, which would result in 492,900 grid cells in three dimensions. This problem size is well within the reaches of a model like MIKE 3 using modern desktop computers and is relatively low compared to the problem size in other modeling studies in which three-dimensionality is important, both for consulting and academic projects (see, e.g. MacWilliams et al. 2008). Therefore, Stantec should have used a three-dimensional model like MIKE 3 because the circulation in the region is highly three-dimensional and the computational overhead is not restrictive.

3.2. Model setup and forcing

Although rivers and winds are included in the MIKE 21 model, these have no bearing on the far-field results because the effects of winds and rivers are not correctly reproduced with a two-dimensional model. Other processes like waves, storm surges, and large-scale currents were also not included in the MIKE 21 model even though they are important. Finally, the MIKE 21 simulations were conducted over a one-month period which is not long enough to assess the potential for effluent to accumulate in the harbours over much longer periods.

Data from tidal, wind, and river inflow measurements were supplied to the MIKE 21 model using standard practices in coastal ocean modeling. However, owing to the two-dimensional nature of the model, the winds and river inflows have little to no bearing on the far-field results in the studies. Wind and river inflow data could be supplied to a three-dimensional model in a similar manner as it was supplied to the MIKE 21 model in the studies, although estimates for flows in all rivers and streams would need to be included (only the East River was included). As suggested in the Stantec studies, river inflows should be based on stream gauges when available, and based on approximations using the relative catchment area when unavailable (the East River inflow was inferred from measured flows in the Middle River at the Rocklin hydrometric station). With regard to tidal forcing, the standard practice was performed in which the observed tides at Wood Islands were reconstructed based on superposition of the most important components of the tides (using software such as T_TIDE; Pawlowicz 2002). However, the reduction in tidal amplitudes due to large-scale ice cover was not included in the tidal forcing (See Section 3.4 below).

The influence of wind-generated waves and swells were not included in the MIKE 21 model which is a reasonable assumption, although waves should be included during storms, as should the effect of storm surges (See Section 3.4 below). Finally, the west-to-east currents in the Northumberland Strait at speeds ranging from 6-9 cm/s (Lauzier 1965) should be included. These large-scale currents can have an important impact on transport by flushing a region that might otherwise accumulate with effluent without river flows or winds. While this will contribute to flushing of the proposed outfall at location CH-B near Caribou Harbour, it will drive the effluent southward with the potential to be entrained into Pictou and Boat Harbours. This effect is likely to be pronounced with three-dimensional modeling.

To evaluate the far-field dilution characteristics of effluent discharged from the proposed outfall locations, the MIKE 21 model was run over a total simulation time of one month during July 2016 for each outfall. This length of time is not sufficient to evaluate the effects of the effluent plumes given that the flow of effluent is not yet in equilibrium over such a short time period. The appropriate time period is dictated by the flushing time of the estuaries which can take days to months depending on the tides, river flows, winds, and large-scale circulation in Northumberland Strait. It is impossible to determine equilibrium from the spatial distributions of the effluent dilution factors (such as Figure 2.13 in the final study, showing the spatial distribution of the effluent dilution factor from the CH-B discharge location in the vicinity of Caribou Harbour after one month), since the effluent may still be accumulating in one of the harbours at the end of the month. A quantitative measure would need to be computed to demonstrate that the model is in equilibrium. For example, the total effluent mass in each harbour would need to be relatively constant in time, at least when averaged over a tidal cycle. Variations in forcing from processes that act over intervals that are longer than the tides (e.g. the spring-neap cycle, rainfall and associated river flow events, seasonal variations in winds), lead to associated slow variations in the effluent transport, and so these would need to be accounted for when assessing whether the total mass in the harbours is in equilibrium (see, e.g. Rayson et al. 2016).

In summary, the tides are the only component of the forcing in the far-field simulations that have any significant impact on the far-field dilution results. The other components of the forcing, including wind, river inflows, waves, storm surges, and large-scale currents are either not included or have little to no impact. Accurate representation of all of these effects would

need a three-dimensional model that is run for much longer than one month to account for possible accumulation in the harbours.

3.3. Model validation

Model validation is an important step in coastal ocean modeling because it demonstrates that the far-field model accurately predicts realistic currents, water levels, and other parameters. Not only is there no quantitative model validation in the studies, but the comparisons of water levels and currents to observations in Pictou Harbour demonstrate that the MIKE 21 model performs poorly. Therefore, the MIKE 21 model cannot be used to assess, with any level of confidence, the far-field behavior of the effluent discharged from the proposed outfall locations.

Validation is the most important step in coastal ocean modeling because it proves that the model is a faithful representation of what is happening in the real world. This gives the user confidence to use the model to analyze results obtained during the validation period, but more importantly during periods when there is no data so that predictions under a wide variety of scenarios can be made. An important component of validation is the availability of appropriate observational datasets. For two-dimensional modeling, these datasets should include time series of observations of sea-surface height and the east and west components of depth-averaged currents. Depending on the instrument, depth-averaged currents can be computed if the instrument measures currents throughout the water column (such as an acoustic Doppler current profiler, or ADCP), since these measurements can be averaged to produce an accurate representation of the depth-averaged currents. However, it is more common to measure currents at a point above the bed. If three-dimensional effects are weak, then the depth-averaged model result can be validated with the point measurement. Strong three-dimensionality makes it difficult to compare a point measurement to the result from a two-dimensional model, which should not be expected to produce the correct currents when three-dimensional effects are important. Three-dimensional models should be validated with velocity data at different heights above the bed in the water column and with time series of salinity and temperature near the bed and free-surface (to assess model ability to reproduce the stratification). Since three-dimensional models compute the vertical distribution of turbulent mixing, then it is desirable to obtain measurements of turbulence to validate the turbulence models. Ideally, models could validate the results of effluent transport, although such observational datasets are rare and so this is not common.

A common step that is often performed in coastal ocean model validation is what is referred to as calibration, in which model parameters that cannot be measured are varied to improve the results. Despite the availability of accurate bathymetry datasets, the bed roughness is rarely measured although it plays an important role in dictating the resistance by the bed on the flow. For example, beds covered with sands or gravels are rougher than beds that are covered with silts or muds, and so the resistance over sands and gravels should be higher. Sometimes, the roughness may be very large if there are bedforms like sand ripples or dunes. Even the drag by vegetation, corals, and kelp is modeled with an effective roughness (Fringer et al. 2019). In some cases, the roughness is approximated with knowledge of the distribution of sediments (this was accounted for in the near-field CORMIX modeling). However, the bottom roughness is more commonly used as a calibration or tuning parameter and varied to give the best match between observations and simulations. In the MIKE 21 model, the roughness is represented specifically

by the Manning's roughness parameter, which is used to compute the drag in flows with a free surface with given bed roughness properties.

After performing the appropriate calibration, it is standard practice to compare observations to simulations with quantitative metrics. There are many metrics available in the literature, although the most common are the mean error (also known as the bias), root-mean-square error, the coefficient of determination ("r-squared") and the lag, which is a measure of the time error between the observations and predictions. Another common metric is the skill score, which is a measure of the simulation error normalized by a measure of the spread in the observations. It is generally agreed upon in the coastal modeling community that a skill score greater than 0.65 characterizes excellent agreement between the model and observations (Allen et al. 2007). For simulations with tides, it is common to compare the amplitudes and phases of observed and modeled tidal constituents of both currents and water levels. These are particularly important to show that the model correctly captures the directions and magnitudes of the tidal currents. Examples of comprehensive validation of three-dimensional estuarine modeling studies can be found in MacWilliams et al. (2008) and Wang et al. (2011).

The MIKE 21 validation presented in the preliminary study by Stantec indicates that the model performs poorly because there is weak agreement between the simulations and observations. The validation is performed by running the model over a period in April 1990 when observations of water levels and currents in Pictou Harbour are available. Some statistics are computed, such as minimum, maximum, mean, and standard deviation, yet these statistics are computed separately for the observations and simulations and provide no objective measures for comparison like those found in the literature and discussed above. Despite a lack of quantitative comparisons, the qualitative comparisons represented by the figures in the preliminary study clearly indicate that the agreement between simulations and observations is poor. For example, Figure 1 below shows a comparison between simulated and measured water levels in Pictou Harbour (Figure 2-8 from the preliminary study). While the agreement in timing of the water level is good, most of the high- or low-water levels (indicated by the horizontal blue lines) are visibly incorrect. This lack of agreement could be due to wind and river forcing that was omitted from the model because of a "…lack of the simultaneous records of wind and river discharge during the period of model calibration in April 1990" (Preliminary study, p. 2.27). However, wind or flow events would produce disagreement in the tides over the duration of these events (over a few days each, such as during April 17-21), not throughout the entire record. Furthermore, attributing errors to incorrect forcing implies that the validation period is inappropriate because it does not allow for a demonstration of model fidelity through proper validation. Comparison of observed and simulated currents in Pictou Harbour in Figure 2-9 of the preliminary study shows that the model underpredicts the current speeds by roughly 20% at Location #1 and roughly 50% at Location #2, and in some cases by 80%. This level of disagreement is unjustifiable. Furthermore, there is no indication that the model correctly simulates the direction or timing of the currents since only current speeds are compared.

The differences between observations and simulations is attributed to "the nature of stratified currents through the water column from surface to the seabed, as well as the difference in bathymetry between the existing condition and that in 1990" (Preliminary study, p 2.28). If the difference is indeed due to stratification effects, then this justifies the need for a three-dimensional model. Differences in bathymetry would indicate that the choice of the validation period is not suitable because the circulation in the region was fundamentally different in 1990 than it was when the bathymetry datasets were collected over the past decade. Of course, it is

always desirable to use more recent observations to ensure that the results are not contaminated by differences between the dates in which the bathymetry and flow measurements were made. However, a more careful validation procedure and use of an appropriate model should be able to indicate whether this is the case and if more recent data is needed. Regardless, the bottom line is that simply more observations are needed to prove that the model simulations are accurate. Even if the validation indicated that the simulations of currents and water levels in Pictou Harbour were excellent, it would be difficult to argue that the model also correctly reproduced currents in and around Caribou Harbour unless there were observations of water levels and currents from at least one station in that region.

In summary, the validation suggests that the model does not correctly predict the magnitude, direction, or timing of the currents. Therefore, in addition to a lack of validation in or near Caribou Harbour, the results provide no confidence that the model can accurately compute the currents and simulate the subsequent far-field fate and transport of the effluent from any of the proposed outfall locations. Furthermore, the validation provides no measure of confidence that can be ascribed to the predictions of ambient currents or directions at any of the six sites for use in the near-field modeling studies (See Section 4.2 below).

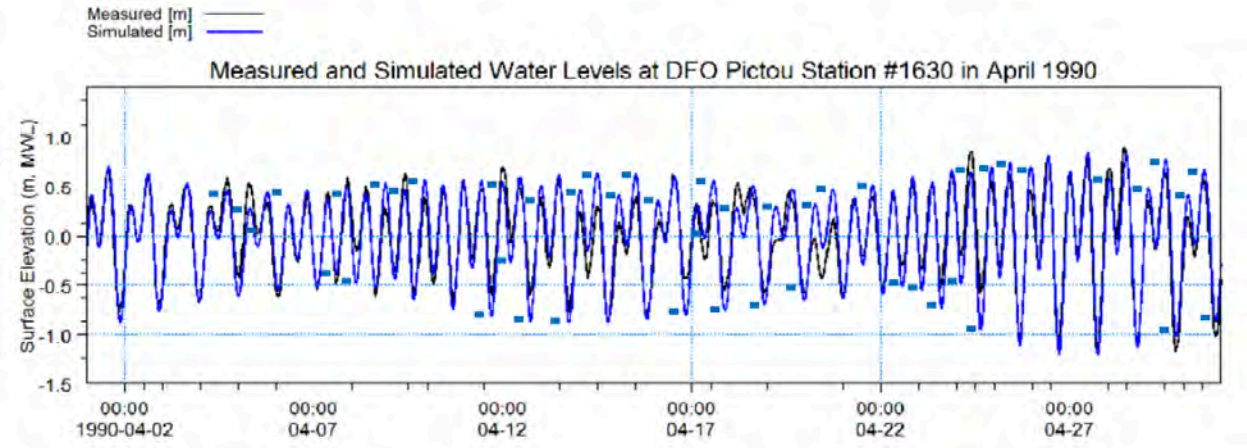

Figure 1: (Figure 2-8 from the preliminary study): Comparison of simulated to measured water levels in Pictou Harbour during April 1990. The blue horizontal lines were added to indicate incorrectly predicted low or high water levels.

3.4. Model scenarios

The scenarios that were conducted in the studies could only evaluate (unsuccessfully) the effect of the tides in a two-dimensional model. Many more scenarios are needed using a three-dimensional model to assess the potential impacts of winds, river inflows, large-scale currents in the Northumberland Strait, waves, storm surges, and ice during winter.

The far-field model scenarios in the studies were carried out with environmental conditions that are stated to minimize mixing of the effluent plume, thus producing conservative results. The conditions include use of "smaller tidal ranges, warmer ambient waters, less wind-driven surface currents, and lower freshwater flows from rivers" (Final report, p. 3). Warmer ambient waters during summer are conservative because, "in winter, mixing is effectively enhanced due to the larger difference in temperature and salinity (density) conditions" (Final report, p. 3). Wave and

storm surge conditions are not included in the model given that "surge tides generate turbulence and ultimately provide better and faster mixing conditions" (Answer #2, Response to questions).

While some of these conditions are indeed conservative, not all are relevant or necessarily conservative, particularly in a two-dimensional model. Because the far-field model is two-dimensional and there is no vertical density stratification, the far-field plume dynamics are insensitive to the density of the effluent plume. Therefore, two-dimensional results should be the same for ambient summer or winter temperature conditions. A difference between two-dimensional effluent transport results in summer and winter could, in principle, be based on different initial effluent concentrations derived from the near-field model while taking into account the different ambient conditions from observations. However, the discharged effluent concentration in the far-field model is arbitrary because the dilution factor is a ratio of the far-field to discharged effluent concentration, and thus the actual concentration discharged from the outfall is irrelevant. A reduction in tidal and wind-driven currents reduces the vertical mixing of the plume, although again this has no bearing on the far-field results because the plume is vertically well-mixed in the two-dimensional model. However, different tidal conditions affect the tidal dispersion in the two-dimensional model and thus the tides have a significant impact on the far-field results. Wind-driven currents also affect the far-field results, but these effects are weak in a two-dimensional model since it does not account for wind-driven recirculating currents. Smaller river inflows may also be more conservative because they would be less likely to flush effluent out of the harbours. However, wind and river inflow effects can only be correctly simulated with a three-dimensional model, since both winds and river inflows can transport effluent into the harbours (See Section 3.1 above). Finally, while waves and storm surges indeed provide more mixing and dilution in the near-field, the surge has the potential to transport offshore effluent into the harbours, thus it may potentially be less conservative in terms of far-field transport.

Ice plays a significant role in the circulation and far-field effluent transport in coastal areas like Pictou and Caribou Harbours, yet its effects were not incorporated into the MIKE 21 model in the Stantec studies. While there are frameworks that can couple a model for ice formation and melting to a model like MIKE 21 (e.g. Kusahara and Hasumi 2013), it is possible to approximate the effects of ice sheets by imposing friction at the ice-water interface in the circulation model that impedes the flow of water due to the friction from the ice (Georgas 2012). In smaller domains like those in the Stantec studies, in addition to friction from the ice, the tidal boundary conditions must be altered to account for the significant reduction in tidal amplitude due to ice cover over the Gulf of St. Lawrence (Smith et al. 2006). Alternatively, these boundary conditions must be obtained from data measured during winter when there is large-scale ice cover. In shallow areas, the flow may be completely blocked when ice freezes over the entire water column, in what is referred to as "fast ice" by fishermen in the Pictou area (MacCarthy and Egilsson 2019). In the final Stantec study (p. 3), it is indicated that a winter scenario and the associated effects of ice are not considered because "the presence of ice cover would increase turbulence at the ice/water interface by providing resistance to the ambient water currents, resulting in higher mixing and dilution". Indeed, higher mixing and dilution may take place and can be modeled in the near field with CORMIX, but turbulent mixing at the ice/water interface is not accounted for in the far-field model because it is two-dimensional. Instead, the effect of ice in the far-field model is to reduce the magnitude of the currents and reduce the potential for far-field dilution. Therefore, a winter model run with extensive ice cover and appropriate boundary

conditions is needed to represent a worst-case scenario for the far-field dispersion despite the substantial initial dilution of the strongly buoyant effluent during this period.

Overall, the scenarios in the Stantec reports do not reproduce the impact of different physical processes over the course of the year on the effluent transport in the region. In its current form, the far-field model can only be used to simulate the influence of tides on the far-field dispersion of the effluent plumes during low flow and low wind conditions in the absence of ice and large-scale currents. To obtain a good understanding of all of the possible scenarios that might impact the far-field transport, a three-dimensional model would need to be run under scenarios that demonstrated the effects of (1) strong/weak winds, (2) strong/weak river flows, (3) with/without ice cover (including the associated weaker tidal forcing and possibly fast ice), and (4) with/without large-scale currents through the Northumberland Strait. In each of these scenarios, the model would need to be run for at least as long as the flushing time to ensure that the far-field effluent field reaches equilibrium. If the flushing time is not much longer than a spring-neap tidal cycle, then additional scenarios would need to be run to understand the impact of strong (spring) vs. weak (neap) tides. The freshwater inflows would need to include all possible rivers and effluent from municipal wastewater treatment plants, given that the worst-case scenario may include freshening of the receiving waters to a point that significantly impacts the near-field dilution (See Section 4.2 below). Finally, storm surge scenarios would need to be studied given the possibility of strong waves and surges in the region, which could lead to significant accumulation in the harbours.

3.5. Results

The particle tracking module in MIKE 21 over-approximates the far-field mixing and dilution because of the assumption of uniformly distributed effluent mass throughout the volume of each grid cell. This gives the best-case scenario because it mixes the effluent from a point discharge completely over the water column, thus eliminating the possibility of higher concentrations confined to near-surface or mid-water layers of effluent. As a result, the assessment by Stantec that the far-field dilution factors for most of the region surrounding site CH-B are above 100 at the end of the one-month simulation period is overly optimistic. Accounting for vertical variability in the plume could lead to much smaller dilution factors but this would require a three-dimensional model. Dilution factors are also over-approximated in Caribou Harbour because the simulations are not run for long enough time to allow for accumulation of effluent in the harbour due to tidal dispersion.

As they are presented in the reports, the far-field modeling results provide only qualitative, and in some cases misleading, information about the far-field fate and transport of effluent from the proposed outfalls. The focus of this section is on Figures 2.5-2.13 in the final study, which depict extremely low concentrations of the effluent field around site CH-B. For example, in Figure 2.5 there is a small patch of effluent located over the outfall which appears to have a concentration of 2-3 mg/L. It is hard to imagine how the concentration of the effluent from the outfall could have diluted by nearly a factor of 50 (from 100 mg/L) even though this figure depicts the concentration field at slack tide during a neap tidal cycle. As discussed in Section 2.2 above, during slack tide we expect higher concentrations due to buildup of effluent because currents are too weak to induce any significant transport away from the outfall. Higher effluent concentrations are also expected because turbulent dispersion is ignored in the particle tracking

module of MIKE 21 to promote conservative dilution factors. It is possible that a diluted concentration from the outfall is imposed in the far-field model based on the near-field modeling results, although an arbitrary concentration of 100 mg/L is assumed given that the relative concentration is of interest.

The low concentrations in the figures can be explained by the particle tracking module that is used to transport effluent in MIKE 21. In the particle tracking module, the outfall is modeled as a point source from which particles with a given amount of mass are released at specified time intervals. After being released, the particles are transported by currents computed with the MIKE 21 hydrodynamic module. In the Stantec final study, the mass flow rate from the outfall is given by 0.1 kg/s, based on the assigned concentration of 100 mg/L and flow rate of 1 m^3/s. Therefore, if we assume that one particle is released from the outfall every hydrodynamic time step of 60 s (the details of how often particles are released are not provided, although this is a safe assumption), then it must be assigned a mass of 6 kg. It is possible to release particles at shorter intervals or multiple particles at each time step, with mass divided equally among the particles to ensure the same prescribed mass flow rate of 0.1 kg/s. However, there would be no difference between transport of a single particle and a group of particles because particles in a group do not spread over time due to a lack of turbulent dispersion, which is ignored by Stantec in the particle tracking simulations. In addition to a lack of dispersion, there is no decay assigned to the particles in the Stantec studies, and hence the mass of each particle remains fixed during the simulations.

To convert the distribution of particles to a concentration field on the hydrodynamic grid, the total mass in each grid cell (which is the sum of the masses of all of the particles in each cell) is divided by the volume of the grid cell. Assuming the grid resolution around site CH-B is approximately 25 m (based on the mesh shown in Figure 2.3 in the final study), then the volume of the prismatic grid cell containing the point release at the location of outfall CH-B is approximately 6000 m^3, based on a depth of 20 m and cross-sectional area of approximately 300 m^2. The minimum concentration in this cell can be estimated by assuming it is empty and then filled with 6 kg of effluent after one 60-s time step. Since it is assumed that this mass is uniformly distributed over the cell volume, the resulting effluent concentration will be 1 mg/L, implying a dilution factor of 100 relative to the assumed inflow concentration of 100 mg/L. This shows that conversion of the particle mass to a concentration field results in artificial mixing of the effluent, giving rise to effective mixing and dilution that depend to great extent on the mesh resolution, depth, and details of the particle release at the outfall (i.e. particle release time interval, mass per particle, number of particles per interval). Although these details are not provided in the Stantec studies, it is clear that much of the far-field dilution is an artifact of the way in which the concentration fields are calculated.

The artificial dilution arising from two-dimensional particle tracking simulations like that in the MIKE 21 model is a common feature of coastal ocean modeling. It is possible to reduce the dilution by increasing the particle release rate or by decreasing the grid size. However, decreasing the grid size is often difficult given computational constraints associated with far-field studies on grids that are finer than those in the Stantec studies. Regardless of grid resolution or the details of the particle tracking module, conclusions about far-field mixing and dilution derived from particle tracking results in a two-dimensional model should take the inherent overestimation of mixing and dilution factors into account. In this regard, Figures 2.5-2.13 in the final study cannot be used to conclude that the environmental impacts of the effluent from outfall CH-B are negligible simply because the dilution factor is at least 100 in most of the domain at

the end of the 1-month period. Instead, these dilution factors represent the best-case scenario in which the effluent is mixed over the water column instantaneously upon being released from the outfall. Owing to the buoyant nature of the near-field plume and other three-dimensional effects, the effluent could be confined to a layer much smaller than the depth (as discussed in Section 3.1). As indicated by the near-field modeling results in the final study, this layer can be as small as 1-2 m, which would lead to a reduction in the dilution factor in the region surrounding the CH-B outfall by a factor of 10 or more because the effluent is not completely mixed over the water column. A three-dimensional model would be able to account for the vertical variability of the effluent plume through use of the near-field model to inform the vertical variability in the vicinity of the outfall. This would reduce the artificial dilution associated with the assumption of complete mixing over the water column in a two-dimensional model.

An additional perplexing aspect of Figures 2.5-2.13 in the final study is that they appear to depict transport of patches created by pulses of effluent discharges rather than trails of effluent emanating from the continuous-in-time discharge at outfall CH-B. Examples of such an effluent field showing trails emanating from the outfall locations are depicted in Figures 2-20 and 2-21 from the preliminary study, which show the effluent concentration field surrounding sites Alt-C and Alt-D near Pictou Harbour. Effluent trails are not visible around site CH-B in Figures 2.5-2.13 from the final study because the overestimated dilution due to the particle tracking module produces concentrations in the trails that are too low to be visible with the given color scale. Instead, higher-concentration patches (that also have artificially low concentrations) oscillate with the tides while slowly propagating away from the outfall with the weak non-tidal flow produced by the tides (see Section 2.2 for a discussion of tidal vs. non-tidal flows). While these simulations indicate that there is some dilution of the effluent patches since their concentrations decay in time, the dilution is representative of the best-case scenario when compared to the effluent concentration at the outfall of 100 mg/L.

Another process that is likely reducing dilution factors but is not represented in the simulations is accumulation in Caribou Harbour. Figure 2.11 in the final study clearly shows a patch of effluent in the harbour at slack high tide, indicating that it was transported into the harbour during the previous flood tide. Although the patch appears to be leaving the harbour during the subsequent ebb tide (Figure 2.12 in the final study), tidal dispersion is expected to transport effluent into the harbour over many tidal cycles. Furthermore, although inclusion of turbulent dispersion in the particle tracking module would act to dilute the patches, it would accentuate the tidal dispersion and promote transport into the harbour, thereby reducing the dilution in the harbour after many tidal cycles. As discussed in Section 3.4, accumulation in Caribou Harbour would need to be quantified with simulations that were run for sufficient time to demonstrate that the effluent mass in the harbour was not changing in time.

In summary, when computing concentration fields from the particle tracking results, uniform and instantaneous mixing over the grid cell volumes leads to artificially low concentrations and high dilution factors associated with far-field effluent transport from site CH-B. While it is impossible to eliminate this effect, it can be thought of as the best-case scenario in which the outfall plume is uniformly mixed over the water column. As demonstrated by the near-field modeling results in the Stantec studies, this is clearly not the case. Instead, the plume is typically confined to a smaller region in the water column, which implies a much smaller dilution factor when compared to that arising from assuming a uniform effluent concentration over the depth. The artificially low concentrations and high dilution factors produce far-field effluent concentrations in the region surrounding the CH-B outfall after a month-long simulation

that are greater than 100, which is an overly optimistic result. The artificial dilution eliminates most of the visible effluent in the figures except for a few small patches that oscillate with the tides. Some of these are transported into Caribou Harbour, indicating the potential for accumulation in the harbour due to tidal dispersion, an effect that should be assessed with simulations over much longer time periods than the 31-day simulations conducted in the final study.

4. Review of the near-field modeling

4.1. Overview of CORMIX

The CORMIX model was used to compute the three-dimensional effluent concentration field in the near-field mixing zone, which is generally defined as the region within 100 m of the outfall. Near-field mixing involves detailed flow and turbulence processes over length scales that are much smaller than the grid in the far-field model. Therefore, they cannot be simulated with MIKE 21 and must be modeled with a near-field model like CORMIX. According to the CORMIX model, the "near-field" is defined as the region between the outfall and the point at which the buoyant plume interacts with a boundary, which can be the bed, the free surface or some intermediate layer in the water column. In this near-field region, the plume dynamics are initially dictated by the high velocity flow and turbulence emanating from the outfall ports which rapidly mix the effluent with ambient waters. Once the high momentum fluid has decelerated (typically within 5-10 meters of the outfall ports), buoyancy-driven turbulence and mixing take over as the plume rises to the surface or at some point in the water column where the plume density matches the density in the water. This could be the thermocline (a point below the surface that separates the warmer, surface waters from the colder, bottom waters) or the halocline (a point at which fresher river waters are separated from the denser, saltier ocean waters below). After reaching the surface or intermediate layer, subsequent dynamics are referred to as the "far-field" zone in CORMIX. In this zone, the plume is transported by the ambient currents while spreading laterally due to weaker buoyancy effects. Once the density of the plume mixes with that of its surroundings, it propagates as a passive plume (i.e. no longer spreading due to buoyancy) with the ambient currents while spreading laterally and horizontally due to the ambient turbulence. This stage of plume development is modeled in CORMIX in a way that is similar to how it would be modeled under similar ambient conditions in a three-dimensional circulation model like MIKE 3.

The CORMIX model predicts the shape of the near-field plume in three dimensions based on the relatively complex geometry of an outfall diffuser, including the ability to specify different numbers of ports and the specific geometry of how they are attached to the diffuser pipe resting on the bed. Because CORMIX solves for the plume characteristics in a much smaller area and over much shorter time periods when compared to those in the far-field model, the characteristics of the flow needed to drive CORMIX are much simpler than the boundary conditions needed to drive the MIKE 21 model. As a result, parameters in CORMIX are generally not tuned, unlike the far-field modeling which requires tuning of, for example, the bottom roughness to improve agreement between observed and simulated currents (See Section 3.3 above). Furthermore, validation of CORMIX results is generally not required given that, at least under the scenarios that can be simulated with the CORMIX package, we expect the model to produce a good approximation of the near-field dynamics. The downside to this simplicity is

that the results depend critically on choosing the effluent and ambient parameters that are representative of realistic worst-case conditions that would give the least amount of near-field dispersion and thus representative of the most conservative design scenario. As discussed in the next section, the receiving water conditions do not represent worst-case scenarios.

4.2. Near-field results at location CH-B

The receiving water current and ambient density field supplied to the CORMIX model to predict the near-field mixing and dilution at site CH-B are not representative of worst-case scenarios because the current is too strong and the ambient density is too high. This gives an over-prediction of the mixing and near-field dilution within the 100-m mixing zone surrounding site CH-B. The near-field effluent concentrations are expected to be higher, particularly during periods of high river inflows and when the tidal currents are weaker, such as during neap tides or when there is winter ice cover.

In the final study, two scenarios for the near-field mixing at site CH-B were conducted. The only difference between the two scenarios is the use of one port in the diffuser in the first scenario and three ports in the second. The dilution factor for the three-port design was roughly twice as large as that for the one-port design 100 m from the outfall (Table 3.4 in the final study). The three-port design at site CH-B had a dilution factor that was roughly 30% larger than the six-port design at site Alt-D (Table 4.1 in the final study shows results from site CH-B obtained in the final study and results from site Alt-D, which are repeated from the preliminary study). Despite the likely increase in the dilution factor at CH-B with six ports, it was concluded that the three-port design had a favorable seabed footprint with a lower potential to interact with the seabed than the six-port design, and hence the six-port design was not evaluated at site CH-B. Given the incorrect estimates of the worst-case currents and receiving water density discussed below, studies need to be conducted with three- and six-port designs to understand their characteristics under worst-case scenarios, particularly in the presence of vertical density stratification of the water column.

The inputs to the CORMIX model that have the most significant impact on the near-field mixing in the final study are the effluent flow rate and density and the ambient tidal currents and density. The effluent flow rate was fixed at the annual average rate of 0.98 m^3/s, while the effluent salinity was assumed to be 4 g/L = 4 kg/m^3, the densest value in the reported range of 1-4 g/L. The effluent temperature was reported to be 25°C in winter and 37°C in summer. The summer effluent temperature was chosen under the assumption that the plume would be least buoyant in summer when the receiving waters were at their warmest. The values chosen for the effluent salinity and temperature are stated to give an upper bound for its density, thus giving a conservative estimate for the dilution because more buoyancy-driven mixing is expected to take place if the effluent is less dense than the receiving waters. Using the UNESCO equation of state (UNESCO 1981), a salinity of 4 kg/m^3 and temperature of 37°C give an effluent density of 996 kg/m^3, the value used in the final study.

A key assumption in the CORMIX model is that the ambient currents are steady. Therefore, approximations are needed when applying CORMIX to tidal flows that are unsteady in that the ambient currents flowing past the outfall vary in magnitude and direction over the tidal cycle. When currents are weak, the effluent accumulates above the outfall and dilution is poor. However, the worst-case scenario occurs roughly one hour before or after slack tide when

currents are weak yet sufficient to re-entrain the effluent that was recently transported away from the discharge location in the opposite direction before slack tide. CORMIX requires information about the tidal period and peak currents and the magnitude of the ambient currents one hour before or after slack tide in order to provide an estimate of the worst-case scenario. The CORMIX manual (Page 33 of Jirka et al. 1996) also recommends that additional scenarios be conducted with tidal currents at intervals of one or two hours at different stages of the tidal cycle to ensure that all possible scenarios are analyzed.

Based on the information provided in the preliminary and final studies, the ambient current supplied to the CORMIX model does not represent the worst-case mixing scenario. The preliminary report mentions the use of tidal information in the CORMIX simulations, stating that, (p. 3.54) "The results are presented for a time step corresponding to 1 hour before slack tide conditions." However, in the final report only average (10 cm/s) and maximum (27 cm/s) tidal currents are supplied based on MIKE 21 simulations in July 2016 at site CH-B. There is no mention of the tidal current speed expected within one hour of slack tide, as needed for the worst-case calculation in CORMIX. Furthermore, simulations are not conducted during different phases of the tidal cycle as suggested in the CORMIX manual. These would demonstrate the impact of current speed and direction on the dilution factor. The direction, in particular, could impact the effect of the diffuser and port alignment relative to the oscillatory flow. An important implication of the worst-case slack tide is that suspended solids may settle onto the bed within 100 m of the outfall because of the weak currents, as discussed in Section 2.2 above. This possibility is not mentioned or modeled in the Stantec studies.

Regardless of whether the details of the tide are incorporated into CORMIX, the ambient currents applied to CORMIX in the final study are too large to represent a worst-case scenario. Based on Figure 2-14 in the preliminary report, which shows the Northumberland Strait water levels over the 31-day MIKE 21 simulation period, the weakest neap tide on July 14 has a tidal range of 0.6 m, which is more than three times smaller than the strongest spring tidal range of 2 m on July 5. Therefore, the average and maximum tidal currents used in the CORMIX scenarios are much larger than they would be in the worst-case scenario because they are impacted by the large spring tides. A more conservative, worst-case tide would be given by the weakest neap tide during the period, since the weaker currents would have significantly less near-field dilution than the average tide over the 31-day period. It is important to note that, given the insufficient far-field model validation presented in Section 3.3 above, the simulations of the currents at CH-B may not be representative of the actual currents. This implies that if the currents are underpredicted in Pictou Harbour, they will not necessarily be underpredicted at site CH-B, and therefore it is not valid to justify use of inaccurate far-field model results based on the notion that the errors would lead to a more conservative worst-case scenario.

The ambient density field supplied to the CORMIX model is equally as important as the ambient currents. Estimates of the ambient density of the receiving waters were based on observations because the far-field model is two-dimensional (See Section 3.1 above). However, because observations of temperature and salinity at site CH-B were not available, the ambient density was based on observations in the Pictou Road region in August 2014 and September 2006 (Appendix B, Preliminary study). In principle, this would provide a conservative receiving water density given the likelihood that the receiving water salinity, and hence its density, was lower in this region due to more inflows into Pictou Harbour than Caribou Harbour. However, as discussed below, this is not the case. Using data from Pictou Road region, the receiving water density was calculated as 1020 kg/m^3 based on a temperature of 17.6^oC and salinity of 28 ppt,

which are averages of the observations. With these salinities and temperatures, the effluent is (1020 kg/m^3 – 996 kg/m^3) = 24 kg/m^3 less dense than the receiving waters. According to Stantec, this provides sufficient buoyant mixing to produce far-field dilution factors computed by CORMIX that are within established water quality guidelines for the 100-m mixing zone. Owing to the strong near-field mixing by the three-port diffuser, the plume interacts with the bed up to 25 m away from the outfall. However, the dilution factor of 71 at 10 m indicates this should not be a source of concern for this value of the ambient density.

Rather than using average salinity and temperature values of observations for the ambient, a more conservative scenario for the near-field modeling would have been to use the freshest and warmest observations in the region, which should be 23 ppt instead of 28 ppt and 19.4^{o}C instead of 17.6^{o}C (Appendix B, Preliminary study). This would give a receiving water density that is 4 kg/m^3 less dense than the value used in the final study, yielding a less buoyant effluent plume and less near-field dilution. While it is unlikely that the water temperature would be much warmer than 20^{o}C in the region, waters warmer than 20^{o}C would contribute much less to potential reductions in ambient density than lower salinity values. This is because the density can vary by as much as 25 kg/m^3 due to the 0-31 ppt salinity range in the region (based on data from Galbraith et al. 2014), while it can only vary by 3 kg/m^3 due to the 0-20^{o}C temperature range. In fact, the salinity value of 28 ppt that was used for the scenario is close to the maximum observed salinity in the region of 31 ppt, thus reflecting close to the best- rather than worst-case salinity for buoyancy-driven near-field dilution at site CH-B. A worst-case salinity is likely much smaller given that salinity observations in the East River range from 20 ppt during low-flow periods to as low as 5 ppt during high-flow periods (Preliminary study, p. 2.21). Lower salinity values are also likely near Caribou Harbour, although perhaps not as low given that flows into Caribou Harbour are weaker than those into Pictou Harbour. Nevertheless, all inflows in the region are expected to lower the salinity of the receiving waters surrounding the proposed outfalls in the studies.

The effect of salinity on the near-field dilution is weakest in winter when inflows are at their lowest. Combined with the colder receiving waters, winter ambient density scenarios are not needed given their potential to drive more buoyancy-driven turbulence and near-field dilution. However, given the weaker tidal currents due to ice cover in winter, scenarios would need to be conducted with worst-case winter density values for the ambient and effluent combined with model-derived worst-case weak winter tides during the period of peak ice cover.

In addition to the potential for low salinities to impact the near-field dilution by reducing the effluent buoyancy at site CH-B, low salinities indicate the existence of vertical stratification in which fresher, river water overlies saltier, denser ocean water. For example, observations in the Pictou Road region indicate a top-bottom salinity difference in July 1995 of 7.5 ppt (Preliminary study, p. 2.21), which is the dominant driver of the top-bottom density difference of 5.8 kg/m^3 (See Section 3.1 above). The stratification can reduce near-field dilution by trapping the effluent in a layer beneath the ocean surface where the density of the effluent matches that of the water column. Additionally, the trapping leads to far-field transport at depth rather than at the surface, thus having the potential to propagate toward the fresh water source. In the case of site CH-B, this would mean transport of the effluent into Caribou Harbour (See Section 3.1 above for a more thorough discussion of three-dimensional far-field effects). The CORMIX model has the ability to simulate near-field dilution in the presence of vertically-stratified waters, and the manual suggests including these effects when the vertical variation in density is greater than 0.1 kg/m^3 (Page 33 of Jirka et al. 1996), significantly smaller than the observed top-bottom density

difference of 5.8 kg/m^3 mentioned above. Therefore, worst-case dilution scenarios at CH-B should be devised that take into account the potential for low salinity and stratification arising from high freshwater inflows in the region. These scenarios would need to be devised using results from three-dimensional, far-field modeling.

5. Summary

The MIKE 21 and CORMIX models were used to simulate the distribution of near- and far-field effluent discharged from proposed outfall locations in and near Pictou and Caribou Harbours. Although there are numerous metrics that are commonly used to validate far-field model results like those in the MIKE 21 simulations, these are not calculated in the study. Instead, only qualitative comparisons to observations are made, and these indicate that the far-field model is poorly reproducing the currents and water levels throughout the domain. Therefore, as it is implemented, the far-field model is inaccurate and cannot be trusted to faithfully represent actual circulation and transport dynamics in the region. Given the strong three-dimensional nature of the circulation and transport dynamics due to the winds and fresh water flows in the region, three-dimensional processes are expected to significantly impact the far-field transport. Therefore, the two-dimensional MIKE 21 model is not appropriate for use in this study.

In addition to the inaccurate nature of the far-field model, the scenarios that are presented are not representative of the multitude of processes that can impact the far-field circulation and effluent transport. While there is some qualitative evaluation of the impacts of tidal currents on the far-field fate of the effluent, the two-dimensional nature of the MIKE 21 model makes it impossible to predict the effects of strong winds or strong river inflows, effects that can significantly impact the far-field dynamics. For example, freshwater flows and wind-driven circulation can drive effluent into Caribou Harbour from site CH-B, leading to more accumulation than what might be predicted by the two-dimensional model. Furthermore, although near-field dilution may be accentuated in winter owing to the stronger temperature difference between the effluent and receiving waters, there is no assessment of the potential worst-case winter scenario in which reduced tidal currents due to ice cover may significantly reduce both near- and far-field dispersion. Similarly, while the turbulence and mixing due to storm surges and waves would likely increase near-field dilution, there are no simulations conducted to assess their impact on far-field transport, including the potential for accumulation of effluent in the harbours. Finally, the simulations are not conducted over sufficiently long time periods that are needed to ensure that the simulated far-field dilution factors are in equilibrium, making it impossible to assess the potential for accumulation of effluent in regions of the domain with weaker dispersion and flushing, such as the harbours.

Qualitative representation of the far-field dilution dynamics around site CH-B in the figures indicates fundamental inconsistencies with how the effluent concentrations are being computed and interpreted. The concentrations are unphysically low because the model assumes uniform effluent concentrations within each grid cell. This leads to an over-approximation of the far-field mixing and dilution and overly optimistic conclusions about the far-field dilution factors in the vicinity of the outfall at site CH-B, which are reported to be above 100 in most of the region after a one-month simulation. In reality, the effluent concentrations can vary significantly in the vertical, since effluent plumes can be confined to layers near the surface or mid-water, leading to higher concentrations and smaller, more realistic dilution factors. Due to the artificial dilution, trails of effluent emanating from the outfall are not visible in the figures because their

concentrations are too small to appear with the given color scale. Instead, small patches of effluent oscillate with the tides, with some propagating into Caribou Harbour. These indicate the potential for accumulation of effluent in Caribou Harbour by tidal dispersion, an effect that can only be captured with simulations that are run over much longer time periods.

Based on the near-field results obtained with the CORMIX model in the final study, Stantec concluded that the dilution factors near the outfall located at site CH-B are within established water quality guidelines for the 100-m mixing zone. However, the ambient currents and densities supplied to CORMIX are not representative of worst-case near-field dilution scenarios. The currents are based on the average and peak tidal currents at site CH-B over the 31-day simulation period, which are too high because the data include two spring tides. A worst-case tidal current would be better represented by a neap tide during this period, which has smaller currents and is therefore expected to induce less near-field dilution, particularly when accounting for accumulation during slack tide. Weaker tidal currents due to winter ice cover further reduce the potential for near-field dilution, although this scenario is also not investigated. Finally, despite the potential for settling of suspended solids during slack tides within 100 m of the outfall, this is not mentioned in the Stantec studies.

In addition to the overestimated tidal currents, the ambient density supplied to CORMIX is also not representative of a potential worst-case scenario. The salinity used to compute the receiving water density is more representative of the maximum salinity in the region, which gives an effluent that is far too buoyant and thus an overprediction of the near-field buoyancy-driven mixing and dilution. The worst-case salinity, and hence receiving water density, should be much lower given the potential for high river flows to reduce the salinity in the region. Furthermore, high river flows would produce vertical salinity stratification or layering in which fresh water overlies salt water, an effect that can be included in the CORMIX model and further acts to reduce near-field dilution.

6. References

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APPENDIX A-2

30 Pages redacted as per Section 20 of the FOIPOP Act

APPENDIX A-3

The **tidal period (PERIOD)** must be supplied; in most cases it is 12.4 hours, but in some locations it may vary slightly. The **maximum tidal velocity (UAmax)** for the location must be specified; this can usually be taken as the average of the absolute values of the two actual maxima, independent of their direction. A CORMIX design case consists then of an instantaneous ambient condition, before, at or after one of the two slack tides. Hence, the analyst must specify the **time** (in hours) **before, at, or after slack** that defines the design condition, followed by the actual **tidal ambient velocity (UA)** at that time. The ambient depth conditions are then those corresponding to that time.

In general, tidal simulations should be repeated for several time intervals (usually hourly or two-hourly intervals will suffice) before and after slack time to determine plume characteristics in unsteady ambient conditions.

Strongly unsteady conditions can also occur in other environments, such as in wind-induced current reversals in shallow lakes or coastal areas. In this case, any typical reversal period can be analyzed following an approach similar to the above.

4.3.4 Ambient Density Specification

Information about the density distribution in the ambient water body is very important for the correct prediction of effluent discharge plume behavior. CORMIX first inquires whether the ambient water is **fresh water** or **non-fresh** (i.e. brackish or saline). If the ambient water is fresh and above 4 ^{o}C, the system provides the option of entering ambient temperature data so that the ambient density values can be internally computed from an equation of state. This is the recommended option for specifying the density of fresh water, even though ambient temperature per se is not needed for the analysis of mixing conditions. In the case of salt water conditions, Figure 4.3 is included as a practical guide for specifying the density if "salinity values" in parts-per-thousand (ppt) are available for the water body. Typical open ocean salinities are in the range 33 - 35 ppt.

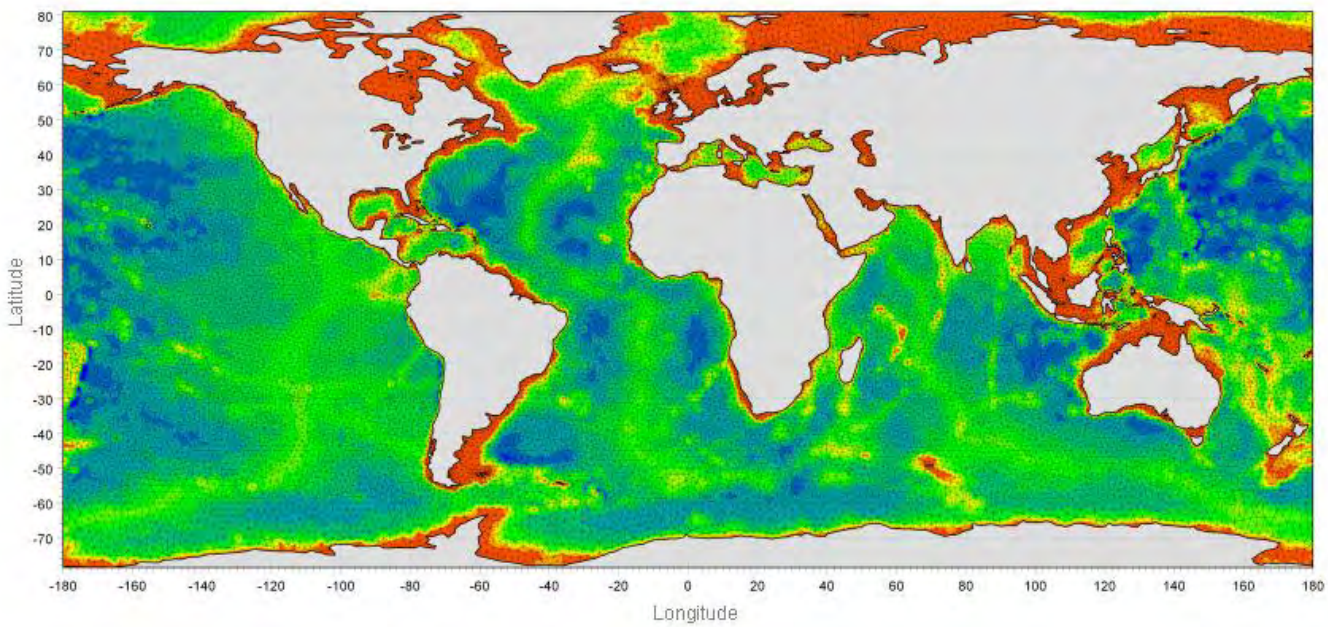
The user then specifies whether the ambient density (or temperature) can be considered as **uniform** or as **non-uniform** within the water body, and in particular within the expected plume regions. As a practical guide, vertical variation in density of less than 0.1 kg/m^3 or in temperature of less than 1 ^{o}C can be neglected. For uniform conditions, the **average ambient density** or **average temperature** must be specified.

When conditions are non-uniform, CORMIX requires that the actual measured vertical density distribution be approximated by one of three schematic stratification profile types illustrated in Figure 4.4. These are: Type A, linear density profile; Type B, two-layer system with constant densities and density jump; Type C, constant density surface layer with linear density profile in bottom layer separated by a density jump. Corresponding profile types exist for approximating a temperature distribution when it is used for specifying the density distribution.

Note: When in doubt about the specification of the ambient density values it is reasonable to first simplify as much as possible. The sensitivity of a given assumption can be explored in subsequent CORMIX simulations. Furthermore, if CORMIX indicates indeed a flow configuration (flow class) with near-field stability, additional studies with the post-processor option CORJET (see Section 6.1) can be performed to investigate *any arbitrary density distribution*.

After selecting the stratification approximation to be used, the user then enters all appropriate density (or temperature) values and **pycnocline heights (HINT)** to fully specify the profiles. The pycnocline is defined as zone or level of strong density change that separates the upper and lower layers of the water column. The program checks the density specification to insure that stable ambient stratification exists (i.e. the density at higher elevations must not exceed that at lower elevations).

Note that a dynamically correct approximation of the actua ldensity distribution should keep a balance between over-and under-estimationof the actual data similar to a best-fit in regression analysis. If simulation results indicate internal plume trapping, then it is



MIKE 21 & MIKE 3 FLOW MODEL FM supports both Cartesian and spherical coordinates. Spherical coordinates are usually applied for regional and global sea circulation applications. The chart shows the computational mesh and bathymetry for the planet Earth generated by the MIKE Zero Mesh Generator

MIKE 21 & MIKE 3 Flow Model FM - Hydrodynamic Module

The Hydrodynamic Module provides the basis for computations performed in many other modules, but can also be used alone. It simulates the water level variations and flows in response to a variety of forcing functions on flood plains, in lakes, estuaries and coastal areas.

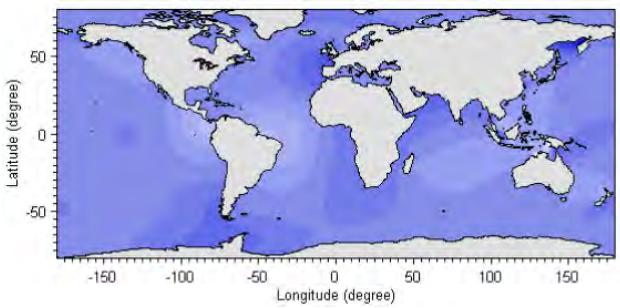
Application Areas

The Hydrodynamic Module included in MIKE 21 & MIKE 3 Flow Model FM simulates unsteady flow taking into account density variations, bathymetry and external forcings.

The choice between 2D and 3D model depends on a number of factors. For example, in shallow waters, wind and tidal current are often sufficient to keep the water column well-mixed, i.e. homogeneous in salinity and temperature. In such cases a 2D model can be used. In water bodies with stratification, either by density or by species (ecology), a 3D model should be used. This is also the case for enclosed or semi-enclosed waters where wind-driven circulation occurs.

Typical application areas are

- Assessment of hydrographic conditions for design, construction and operation of structures and plants in stratified and non-stratified waters
- Environmental impact assessment studies
- Coastal and oceanographic circulation studies
- Optimization of port and coastal protection infrastructures
- Lake and reservoir hydrodynamics
- Cooling water, recirculation and desalination
- Coastal flooding and storm surge
- Inland flooding and overland flow modelling
- Forecast and warning systems



Example of a global tide application of MIKE 21 Flow Model FM. Results from such a model can be used as boundary conditions for regional scale forecast or hindcast models

APPENDIX A-4

Drift Bottle Observations in Northumberland Strait, Gulf of St. Lawrence[1]

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ABSTRACT

Drift bottles have been released at fixed stations and during cruises in Northumberland Strait from 1960 to 1963. From the 2741 releases, there have been 1213 recoveries before the winter seasons. The overall high percentage recovery (44%) and the large number of returns not far from the point of release and within a short time after releases are featured.

The drift bottle recoveries suggest a surface non-tidal drift through Northumberland Strait from the northwest and west to the southeast and east. An outward drift into the Gulf of St. Lawrence, along the northwest coast of Prince Edward Island is inferred.

The speeds of the drift were generally greater than 3 miles a day on the average. They reached 5 miles a day (0.2 knot).

RÉSUMÉ

Plusieurs lancers de bouteilles dérivantes ont été faits dans le détroit de Northumberland, de 1960 à 1963, à de nombreux points échelonnés lors des croisières ainsi que quotidiennement à des points fixes. On a retrouvé, avant l'hiver, 1213 des 2741 bouteilles lancées. La grande moyenne du pourcentage des bouteilles retrouvées était élevée, 44%. Les nombreuses découvertes à une faible distance du lancement et la courte durée des dérives sont caractéristiques.

On peut déduire des trajets des bouteilles une dérive des eaux superficielles le long du détroit de Northumberland, du nord-ouest et de l'ouest, vers le sud-est et l'est. Un mouvement de sortie des eaux de surface du détroit dans le golfe Saint-Laurent semble aussi être une déduction logique.

Les vitesses de dérives sont habituellement plus grandes que 3 milles par jour, en moyenne. Elles peuvent atteindre 5 milles par jour (0.2 noeud).

INTRODUCTION

Northumberland strait, lying between the Prince Edward Island and New Brunswick–Nova Scotia coasts (Fig. 1), is an important commercial fisheries area for lobster and herring. Over the past 15 years a study of abundance and distribution of lobster larvae in the northern sector has been the main biological effort (Scarratt, 1964). The program included concurrent monitoring of oceanographic conditions and drift bottle experiments during 4 years, 1960–63. Earlier circulation studies in the Strait have been reported by Dawson (1913) and Farquharson (1959, 1962).

The purpose of the present study is to show seasonal and year-to-year changes of the non-tidal drift in the northern sector of Northumberland Strait and its relation to the drift in the central and eastern sectors of the Strait,

[1]Received for publication September 17, 1964.

as well as to that of the outside waters. The study was initiated to assist biologists interested in the circulation as it affects the biological content of the waters and the production of certain commercial species in the area. The results described here are pertinent to a very thin layer of surface waters. Work is being carried out to extend observations to a deeper layer and also along the bottom.

DRIFT BOTTLE RELEASES

Figure 1 shows the segmentation of Northumberland Strait referred to in this paper. The releases by segments were:

1. In northern Northumberland Strait (Northern and Egmont Bay segments).

   For 4 years, starting in 1960, regular releases of drift bottles were made repeatedly at one station from the end of May to October, and at two additional stations from June to September. The total number of releases every year at these stations in the northern segment varied from 116 to 206. This is called the *Pandalus* series. In June 1963, a large-scale release of 204 bottles was made at 32 positions covering both segments.

2. In central Northumberland Strait (Central segment).

   During 1961 and 1962, daily releases of drift bottles were made between Cape Tormentine, N.B., and Port Borden, P.E.I., from CNR

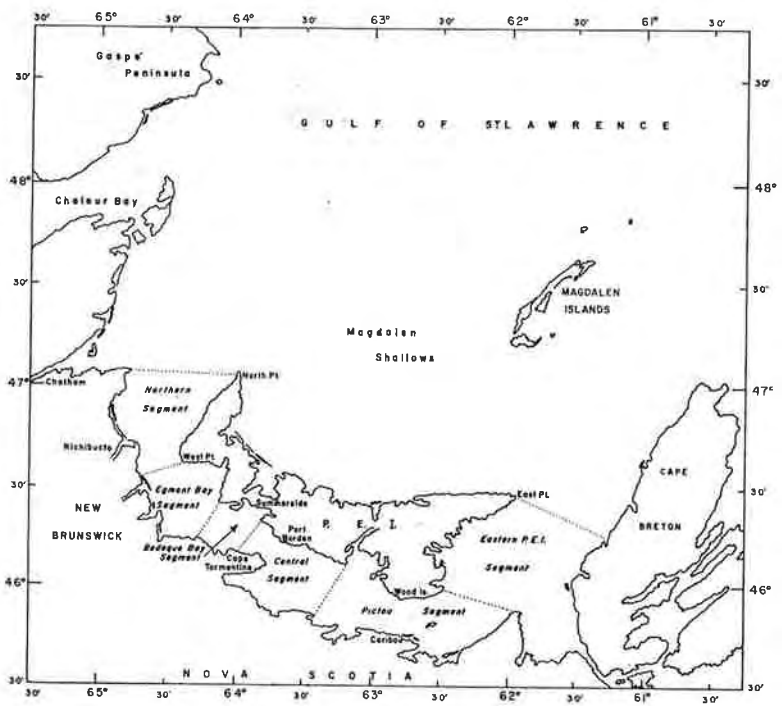

FIG. 1. Map of area showing the segmentation of Northumberland Strait used in this paper.

Abegweit (*Abegweit* series). From July to December 1961 and June to December 1962, 710 and 360 bottles were released, respectively.

3. In eastern Northumberland Strait (Pictou and Eastern P.E.I. segments).

From May to December 1962, daily releases of drift bottles in the Pictou segment between Caribou, N.S., and Wood Islands, P.E.I., totalled 780 (*Selkirk* series). In June 1963, 46 bottles were released at 7 stations covering the Eastern P.E.I. segment.

4. Outside Northumberland Strait.

During seven cruises, between 1959 and 1963, 974 bottles were released north of Northumberland Strait, along the New Brunswick coast, and at the entrance of Bay of Chaleur up to the Gaspé Peninsula in a strip 40–45 miles wide. A total of 99 and 90 bottles were released, respectively, in 1960 and 1963 between Prince Edward Island and the Magdalen Islands.

ANALYSIS OF RECOVERIES

Spatial Distribution and Inferred Drift

The overall percentage of the recoveries made in the same year as the releases was maximum for releases made in northern Northumberland Strait, at 54%. From releases made in central and eastern sectors of the Strait, recoveries were 46% and 27%, respectively. A certain number of recoveries was made after a winter season, approximating 3%, 7%, and 3% from the northern, central, and eastern sectors, respectively. Most of these bottles which were recovered in Northumberland Strait had been released in the last quarter of the year. Table I gives a summary of releases and recoveries from the fixed stations.

Table I. Summary of releases and recoveries of drift bottles from fixed stations in Northumberland Strait.

	Released	Recovered	
	No.	No.	%
Pandalus series			
1960 May–October	172	100	58
1961 May–November	206	108	52
1962 May–November	160	96	60
1963 April–October	116	51	44
Abegweit series			
1961 July–December	710	336	48
1962 June–December	360	154	43
Selkirk series			
1962 May–December	780	213	27

NORTHERN NORTHUMBERLAND STRAIT

The recoveries from the three fixed stations of the *Pandalus* series are illustrated in Fig. 2 and 3. These are seasonal recoveries totalled independently of the month of release. The distribution of recoveries by season of release would be very slightly different from that of Fig. 2 and 3, because of the short time between release and recovery.

More recoveries were made on the Prince Edward Island side than on the New Brunswick side of the Strait, indicating an easterly component of the drift of surface waters. Generally 50% or more of the recoveries — 61% on the average — are recorded in the area of release. Within the northern segment, the recoveries infer either a cyclonic eddy or a southerly drift along the New Brunswick coast and a northeasterly drift along the Prince Edward Island coast. This northeasterly movement of the surface waters is no doubt the main avenue for bottles drifting out of the northern Strait towards the Magdalen Islands, Newfoundland, Cape Breton, and the north coast of Prince Edward Island.

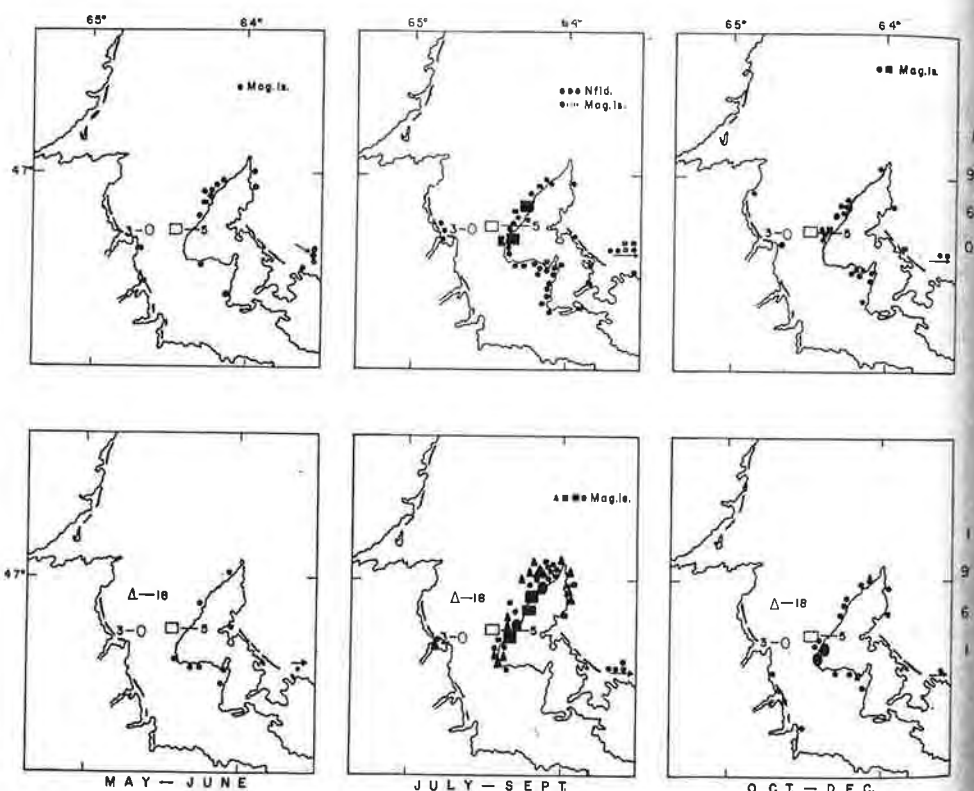

FIG. 2. Distribution of drift bottle recoveries, *Pandalus* series, from May to December 1960 and 1961. Open symbols: release stations 3, 5, and 18; closed symbols: recoveries. A small symbol represents one recovery, and a large symbol represents five recoveries.

From recoveries to the south, it is inferred that very few of the bottles that drifted into the Egmont Bay segment drifted further into the Bedeque Bay segment. The circulation in the Egmont Bay segment seems to be that of an eddy with inflow from the north along the New Brunswick coast and main outflow to the north along the Prince Edward Island coast. A predominant easterly drift is inferred from the large number of recoveries along the Prince Edward Island coast.

Even though the releases at fixed stations are few, the rates of recovery, 40–70%, are sufficient to show seasonal and year-to-year variations. The relative number of recoveries on the New Brunswick side of Northumberland Strait has a tendency to increase from summer to autumn. As shown in Table II, the percentage recovery from fixed station releases has a tendency to be minimum for July and maximum for September. The low percentage in July seems to be associated with a small proportion of recoveries within the area of releases, the northern segment, and a large proportion of recoveries away from it, either outside the Strait or in the Egmont Bay and Bedeque segments. However, a seasonal high percentage recovery is not necessarily associated

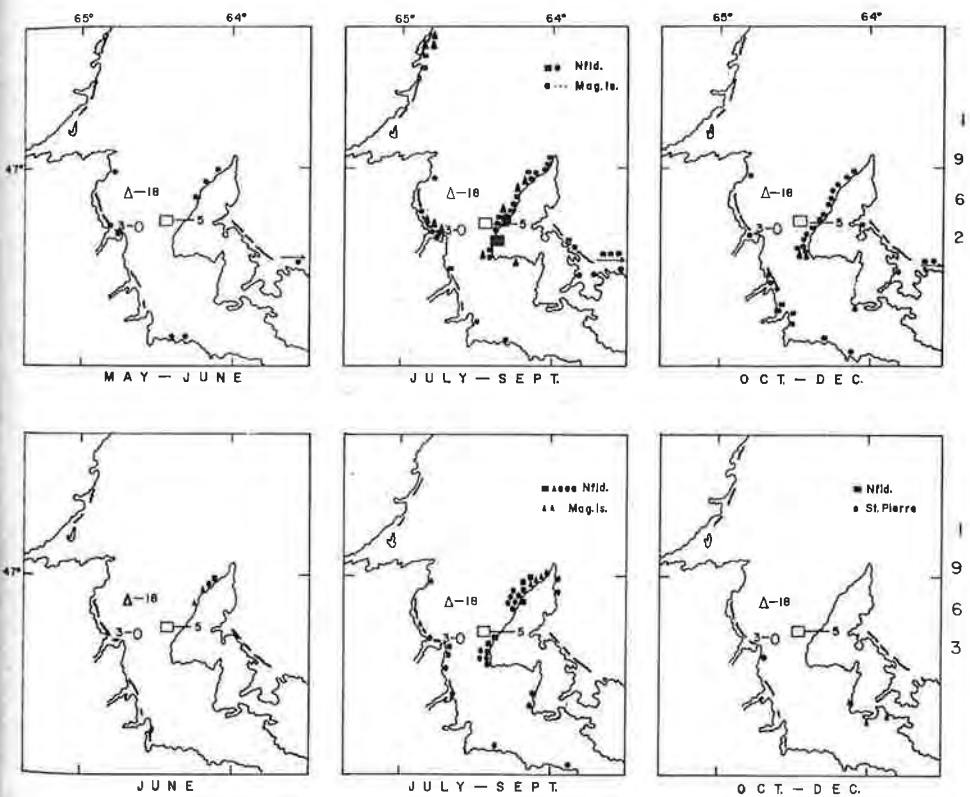

FIG. 3. Distribution of drift bottle recoveries, *Pandalus* series, from May to December 1962 and 1963. Open symbols: release stations 3, 5, and 18; closed symbols: recoveries. A small symbol represents one recovery, and a large symbol represents five recoveries.

TABLE II. Drift bottle recoveries from releases made during July and September in the northern segment, 1960–64.

	July	September
Number of releases:	128	86
Recoveries:		
in northern segment (area of release)	20	33
in Egmont Bay and Bedeque segments	13	18
outside Northumberland Strait	18	10
Total number	51	61
Percentage recoveries	40	71

with a large proportion of recoveries within the area of release. The conditions which seem to be prevalent in July are those of either divergence or dispersion from the area or rapid flushing of the area.

As shown in Fig. 2 and 3, during 1961 and 1963, a relatively high proportion of recoveries occurred in the northern segment, the area of release, associated with a relatively low proportion in the Egmont Bay segment and outside the Strait. Opposite conditions were predominant in 1960 and 1962. In 1963 the overall percentage recovery was the smallest in 4 years, and the July conditions described earlier still existed. Other contrasting conditions are also shown in the Magdalen Islands and Newfoundland recoveries; they amount to 16% of all the outside recoveries in 1962 and 80% in 1963. This could be an indication of stronger circulation over the Magdalen Shallows in 1963 than in 1962.

The recoveries from the releases made during June 1963 at several stations covering both northern and Egmont Bay segments are grouped in Table III. They infer a circulation pattern similar to that deduced from the fixed stations releases and recoveries; namely, a strong movement from west to east in the northern and Egmont Bay segments, and as an eddy in the northern segment confirming a northeasterly current along the Prince Edward Island coast. However, the inferred drift of surface waters towards the central segment of the Strait, and even east of it, is more definite than previously observed. For the bottles released in the northern segment, 31% of all the recoveries were made south of the Egmont Bay segment, as compared with the previous average of 2%. For the bottles released in the Egmont Bay segment, 86% followed a southeasterly direction towards the central and eastern sectors of the Strait. As a corollary, the inferred drift of surface waters to the east past North Point, P.E.I., was rather restricted, since only 10% of all the recoveries were recorded outside the Strait. The conditions in the second half of June 1963 were those

TABLE III. Drift bottle recoveries from releases made in June 1963 in northern and Egmont Bay segments.

	Northern segment	Egmont Bay segment
Number of releases	156	48
Number of recoveries in:		
Northern segment		
P.E.I. side	37	–
Mainland	–	–
Egmont Bay segment		
P.E.I. side	20	3
Mainland	3	1
Bedeque Bay segment		
P.E.I. side	3	–
Mainland	12	5
Central segment		
P.E.I. side	5	7
Mainland	8	5
Pictou and eastern P.E.I. segments		
P.E.I. side	4	2
Mainland	1	5
Outside	12	1

of relatively strong circulation through Northumberland Strait. This had not been observed before. It is not surprising that such differences should occur between recoveries from cruise-type releases involving a large number within a short time, and recoveries from fixed station-type releases involving repeated releases of a small number of bottles at regular intervals. The former gives inferences of the circulation over a short period of time, the latter of the average circulation over a wide range of conditions.

CENTRAL NORTHUMBERLAND STRAIT

A large number of drift bottles was released in the central part of Northumberland Strait between Cape Tormentine, N.B., and Port Borden, P.E.I. This was termed the *Abegweit* series. For the summer releases, 1961 and 1962, the percentage recovery (67%) was greater, on the average, than for the *Pandalus* series (52%). The percentage recovery decreased for those released during the autumn.

The seasonal recoveries in 1961 and 1962 are shown in Fig. 4 and 5, respectively. The salient features of the recoveries are: (1) their large proportions on the Prince Edward Island side in comparison with the New Brunswick side; (2) their concentrations at a short distance from the point of release; (3) their relative spread to the east and their absence in the Egmont Bay

segment. The inferred predominant drift from the mainland to Prince Edward Island was relatively stronger in 1961 than in 1962. This west–east drift seems to weaken during the autumn (October–December) as compared with the summer (July–September). The same variations were inferred from recoveries of the *Pandalus* series.

The *Abegweit* series, similar to the *Pandalus* series, inferred a somewhat restricted drift. However, there is an inference of a definite southeasterly drift from the central segment into the Pictou segment but only occasionally further to the east. The much less frequent westerly drift towards the Bedeque Bay segment seems to increase from summer to autumn.

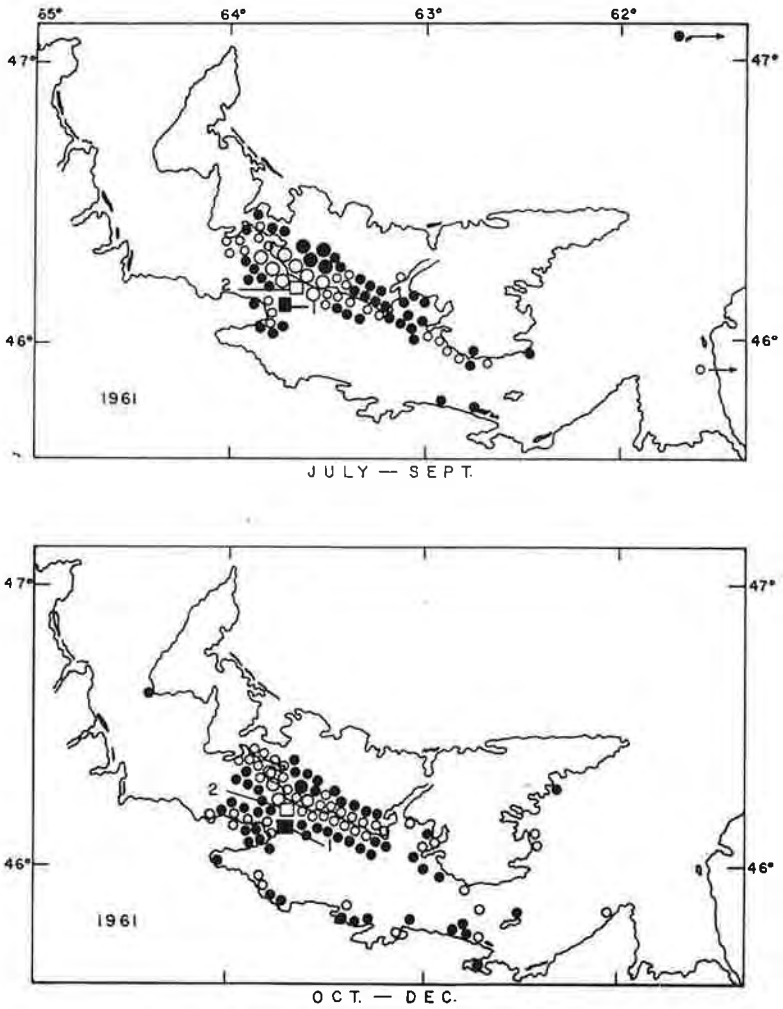

FIG. 4. Distribution of drift bottle recoveries, *Abegweit* series, from July to December 1961. Squares: release stations 1 and 2; circles: recoveries. A small circle represents one recovery, and a large circle represents ten recoveries.

EASTERN NORTHUMBERLAND STRAIT

In 1962 only, the eastern sector of Northumberland Strait was studied at the same time as the central and northern sectors. The overall percentage recovery from the *Selkirk* series released between Wood Islands, P.E.I., and Caribou, N.S., was 27%, the lowest of the three series in Northumberland Strait. It was 35% for summer month releases, still the lowest of the three series.

As inferred from the recoveries (Fig. 6), a predominant drift from the mainland to Prince Edward Island is one of the features of spring and summer seasons. There is almost a reverse of this drift during autumn. There is also

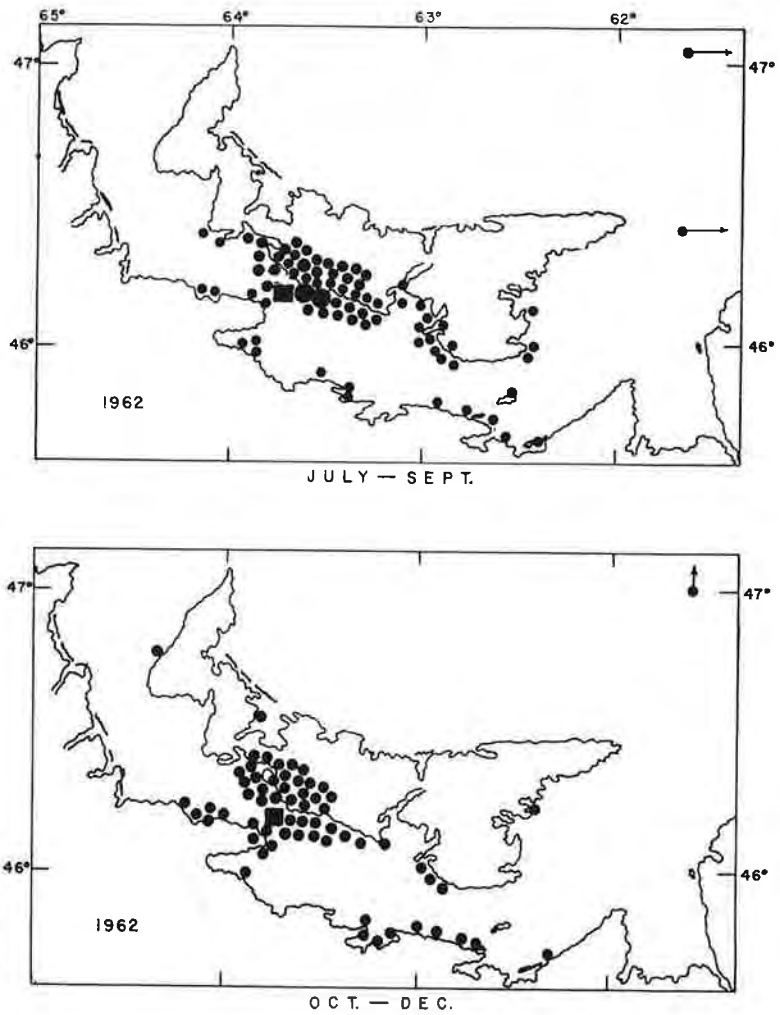

FIG. 5. Distribution of drift bottle recoveries, *Abegweit* series, from July to December 1962. Squares: release station; circles: recoveries. A small circle represents one recovery, and a large circle represents ten recoveries.

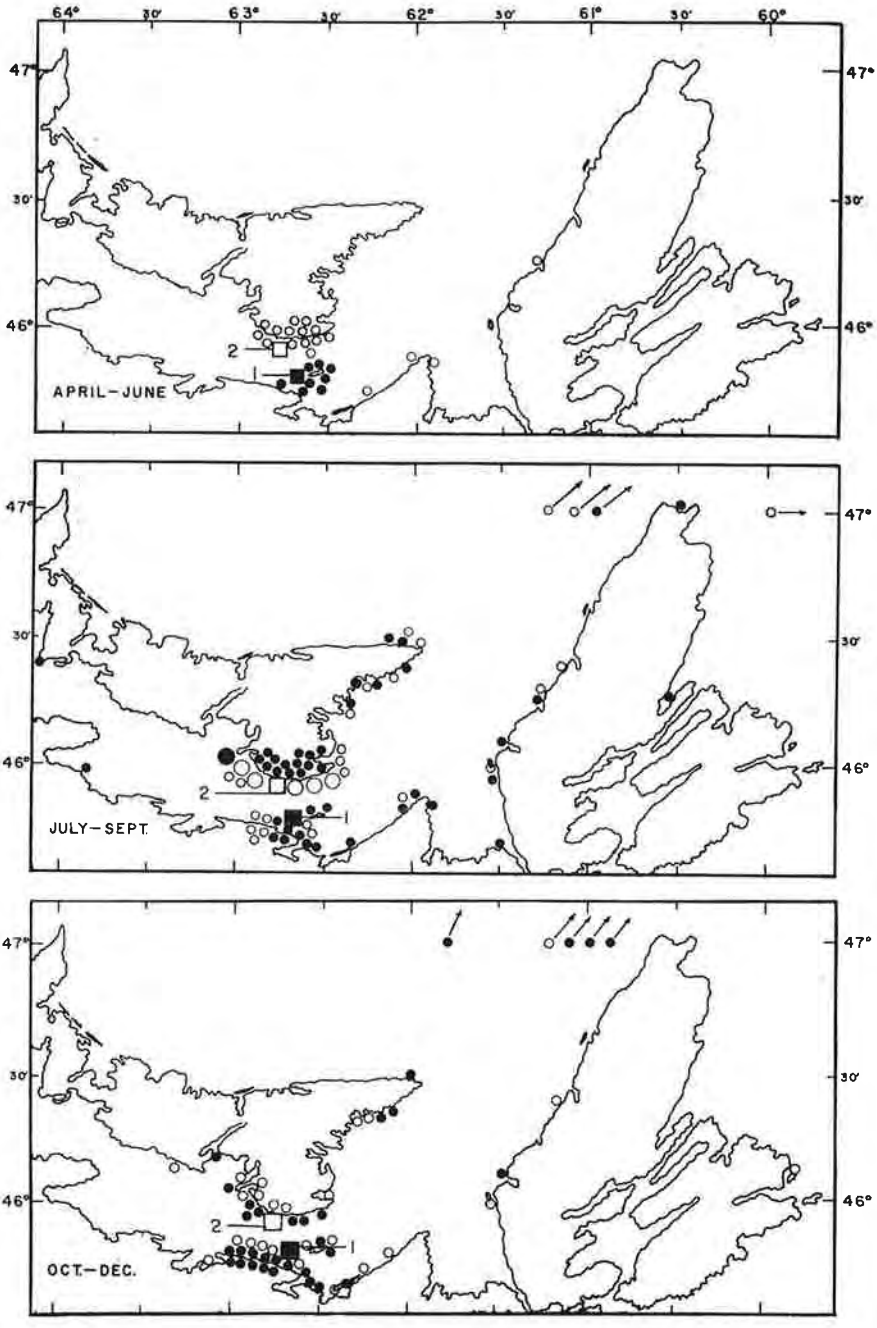

FIG. 6. Distribution of drift bottle recoveries, *Selkirk* series, from April to December 1962. Squares: release stations 1 and 2; circles: recoveries. A small circle represents one recovery, and a large circle represents ten recoveries.

a certain amount of westward drift but it hardly extends into the central segment. A definite easterly drift from the Pictou segment to the eastern P.E.I. segment and beyond is inferred. From the summer releases, 22% of all the recoveries are recorded to the east more than 20 miles from the point of release, and 15% more than 40 miles away. At the same time 75% of all recoveries were observed within 15 miles of the point of release. There is no strong evidence of drift on the south side of the Strait opposite to that on the north side.

In June 1963, 46 drift bottles were released at seven stations in the eastern P.E.I. segment at approximately the same time other releases were conducted in the northern end of the Strait. A percentage recovery of 50% was recorded for the releases in the eastern P.E.I. segment. More than half of these recoveries infer an easterly drift towards outside the area of release, while the others infer a westerly drift, up to 25 miles west of the point of release. There are similarities between the northern segment and the eastern P.E.I. segment. To someone in Northumberland Strait, looking towards the open Gulf, there seems to be a southward drift on the left hand side of the segments and a northeasterly drift on the right hand side. The presence of cyclonic eddies is inferred in both cases.

OUTSIDE RELEASES

On several occasions, drift bottles were released during cruises in the vicinity of Northumberland Strait. The surface non-tidal drift over the southwestern Gulf of St. Lawrence as inferred from drift bottle recoveries seems to be generally to the south and to the east (Bumpus and Lauzier, 1964). It is important to assess the contribution of outside waters to Northumberland Strait. From 974 bottles released north of the Strait, 247 bottles were recovered (before winter) in various parts of the Gulf. Less than 9% (21) of all recoveries or 2.2% of all releases were reported from Northumberland Strait, most of them in the northern segment, and none as far as the central segment. These originated only from some of the cruises.

The inferred circulation in the area north of Northumberland Strait seems to be in most cases to the southeast or east and in at least 10% of the cases to the south towards the Strait. However, it is impossible to estimate the extent of a southerly drift which makes a "u-turn" in northern Northumberland Strait: into the northern segment along the New Brunswick coast and out into the Gulf again along the Prince Edward Island coast. It seems that Northumberland Strait does receive on the average a rather small "share" of the surface waters just north of it.

Time Distribution and Inferred Speed

The overall percentage recoveries for the summer month releases in 1962 were 63%, 61%, and 35% for the *Pandalus*, *Abegweit*, and *Selkirk* series, respectively. The time taken to recover a definite proportion of released bottles

varies from one series to the other, depending on their location in the Strait. From the *Abegweit* series, 25% of the releases in the central segment were recovered within 10 days; from the *Pandalus* series, 25% of the releases in the northern segment were recovered in 17 days; and from the releases in Pictou segment, the *Selkirk* series, 25% were recovered in 23 days.

Such a short lifetime afloat of an *Abegweit* bottle is not surprising if one considers the geographical location of the points of release, the predominant drift from the mainland to Prince Edward Island, and the rate of recovery within 10 miles of the point of release — 67% of all recoveries. It took a longer time to recover 25% of the bottles from *Pandalus* and *Selkirk* series because these were released in wider parts of the Strait which are adjacent to the open Gulf. The time given for "25% recovery" is not constant for a given segment but the shorter period always seems to be characteristic of the *Abegweit* series, released in the central segment.

The inferred speed of surface drift has been calculated in two different ways, after eliminating the recoveries recorded within 10 miles from the point of release. First, an average speed was computed from the fastest bottles (the upper third of the speed frequency) irrespective of the distance travelled outside the 10-mile radius; this was the technique used by Bumpus and Lauzier (1964). Second, another average speed was computed from most of the bottles which had travelled a certain distance, always greater than 10 miles; some very slow ones were excluded.

In using the fastest bottles an attempt was made to show seasonal variations of speed and direction; however, no such attempt was made with the other technique. The average speeds are listed in Table IV. As expected, the speeds computed for trips longer than 20 miles are approaching the values calculated for the fastest bottles. In general, the longer the "trip", the faster

TABLE IV. Average surface drift in miles per day from June to October.

Series segment	*Pandalus* northern	*Abegweit* central	*Selkirk* Pictou
Fastest bottles[a]	4.5 (NE)	3.5	3.5
	3 (SE)		
Most bottles			
10–15-mile trips	1.6	1.3	1.8
15–20-mile trips	2.9	1.3	1.5
20–50-mile trips	3.7	3.3	2.3
>50-mile trips	3.5	–	2.7

[a]Upper third of the speed frequency and drifts of 10 miles or more

is the drift. Possibly a short trip may be a series of drifts back and forth or drifts around an eddy and ending not too far from the point of release. A longer trip may be a more straightforward drift free from aleatory motion. It should be realized that the speed values listed here are minima and in some cases may be much smaller than the actual speed of the drift. However, they represent the speed of a thin surface layer 18–20 cm deep. The residual currents recorded by the Canadian Hydrographic Service (Farquharson, 1959) are of somewhat lower strength. They vary generally between 1 and 2 miles a day and represent the speed of a residual current at a depth of 7 m.

In the northern segment, the northeast drift always seemed to be faster than the southwest drift by a factor that varies between 1.3 and 2.5. The maximum speeds occurred in July for the northern segment and from June to August for the Pictou segment. They may reach 5 miles a day. There were no seasonal tendencies in the inferred speeds for the central segment.

DISCUSSION

Because of the high proportion of local recoveries, the three series *Pandalus*, *Abegweit*, and *Selkirk* seem to indicate that they are three "stocks" that do not "intermingle". Most recoveries infer a drift to a certain point along the Strait but very seldom further. There seems to be a drift from northwest to southeast at various points along the Strait. Bottles released in a relatively small body of water have a short average lifetime and are subjected to a high rate of recovery. From the rate of recovery, the average speed, and the distance to be travelled to go from one area of release to the other, it is possible to estimate the chances for bottles released in the central segment of the Strait to drift into another area of release. With an average speed of 2 miles a day, it would take 25 days to reach another area of release; by that time, 40–45% of the bottles released would have already been recovered. In the case of the bottles released in the northern segment, the assumed speed is higher and the rate of recovery within the first month, lower. Then 25% of the bottles released would have been recovered before being able to reach the area of release in the central segment, if all the bottles had drifted into the segments to the southeast. In fact only 15% did so. Consequently the experiment cannot demonstrate continuity of flow.

The recovery charts (Fig. 2–6) do not imply a continuous drift from one end of the Strait to the other. However, the similarities in the speeds within various segments, the consistency and some predominance of southeasterly and easterly drift, as well as the lack of long drifts westward in the central and Pictou segments infer a resultant drift of surface water in Northumberland Strait from the northwest to the southeast. Figure 7 shows the average surface circulation in Northumberland Strait as inferred from drift bottle releases and recoveries. The inference of a resultant drift from the northwest to the southeast is strengthened by consideration of the seasonal variations of salinity conditions. During the summer, a large body of relatively low salinity

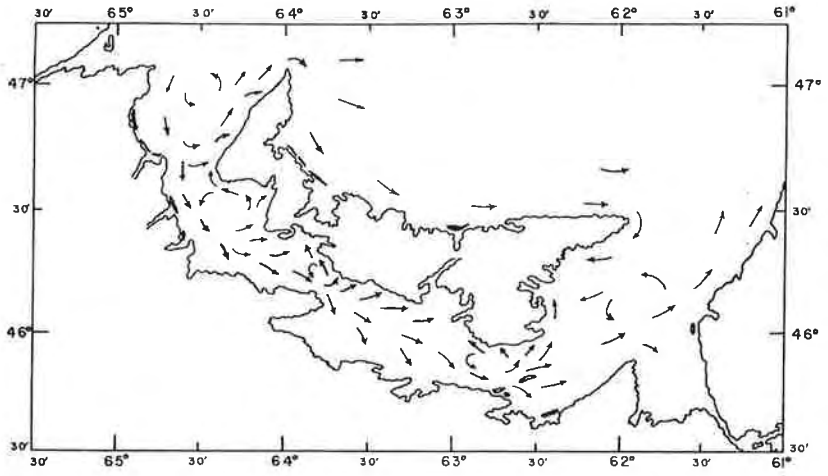

FIG. 7. The inferred non-tidal drift in Northumberland Strait.

water drifts southward over the Magdalen Shallows. A summer minimum of salinity is also observed in Northumberland Strait (Lauzier, 1957).

It was mentioned previously that, in general, the relative distribution of recoveries from the July *Pandalus* series is different from average conditions. It was presumed then that either dispersion or rapid flushing occurred in the area. Approximately at the time there is a summer minimum of salinity and a definite gradient of salinity between the western and eastern ends of Northumberland Strait which might be partly responsible for a stronger circulation through the Strait, or at least in both the northern and Egmont Bay segments.

The predominant drift in Northumberland Strait from the mainland to Prince Edward Island during the summer months was observed to diminish during the autumn all over the Strait and almost to the point of a reversal in the Pictou segment. This might be associated with the weakening of the southwest winds and the strengthening of the easterly winds in the autumn. Although the outside contributions to Northumberland Strait from the north are generally small, they were greater in June and August 1959 and May 1960 than at any other time of observation. From one cruise as many as 23% of the recoveries were reported in Northumberland Strait. In most cases, when bottles were recovered in the Strait, the resultant winds (as observed at Summerside, P.E.I.) had either a stronger easterly or a weaker southerly component than usual. When bottles released outside were not recovered in the Strait, the resultant winds seemed to have a stronger component than usual from either the south or the west. These are the only relationships found so far, between the direction of the surface drift and the resultant winds on a monthly basis.

It is assumed that the bottles drift with the water and its biological content such as lobster and herring larvae. Drift bottle observations give some of

the history of particles of water (Lagrangian observations) in contrast with current-meter observations which give the history of what goes on at one point (Eulerian observations) without knowledge of origin or past history of the particles in motion. Most biological and oceanographic observations are of the Eulerian type. The circulation of the surface waters in Northumberland Strait illustrated in Fig. 7 should be taken as the most probable circulation pattern under various conditions. From the data on hand it is impossible to say how constant and how fast is the renewal of waters and the biological content in a given segment, or how long the water stays in a segment. However, eddies seem to exist at both ends of the Strait. There is a northwest–southeast drift through the Strait but it is not known if this inferred drift is counterbalanced by a reverse drift which is impossible to observe because of the prevalent onshore drift along Prince Edward Island. It is hoped that the answers to this and many other unknowns concerning water circulation in Northumberland Strait will be revealed through further research.

SUMMARY

The surface circulation in Northumberland Strait has been studied from drift bottle experiments at fixed stations and during cruises. Emphasis was given to the northern sector of the Strait, starting in 1960, but the studies covered the whole Strait in 1962. From releases of 2741 bottles in 1960 to 1963 the overall percentage recovery was 44%. The percentage recovery for a year or for the summer months was generally higher (above 60%) in the northern part of the Strait, and lower (less than 40%) in the eastern end of the Strait.

The main features of the inferred surface non-tidal drift are:

1. A general movement of the surface waters through the Strait from the northwest and west to the southeast and east.
2. A predominant drift from the mainland to Prince Edward Island, stronger in the summer than in the autumn.
3. A cyclonic eddy in the northern entrance of the Strait with a southerly drift along the New Brunswick coast and northeasterly drift along the Prince Edward Island coast, the latter being the main avenue towards the open Gulf.
4. Other eddies are suggested mainly south of West Point, P.E.I., and at the eastern entrance of the Strait.
5. The speeds seem to vary seasonally in certain parts of the Strait. They are generally greater than 3 miles a day on the average, and may reach 5 miles a day.

In general the rate of drift bottle recoveries is high for the releases made in the central part of the Strait, where 25% of the bottles released are recovered within 10 days. It takes 17 and 23 days to recover the same proportion of those released in the northern and southern ends, respectively.

ACKNOWLEDGMENTS

The author is indebted to Dr D.G. Wilder of the lobster investigations at the Biological Station, St. Andrews, N.B., for his assistance in organizing the drift bottle releases from M.V. *Pandalus II* starting in 1960; to the masters of *Pandalus II* (Fisheries Research Board), of *Abegweit* (Canadian National Railways), and of *Lord Selkirk* (Northumberland Ferries) for their co-operation in the task of drift bottle releases. The assistance of Messrs J.G. Clark and A.W. Brown in the organization and co-ordination of releases and in the compilation of drift bottle data is gratefully acknowledged. Drift bottle data related to outside releases in 1959 were supplied to the author by Dr Y.M.L. Jean.

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APPENDIX B-1

Caribou Harbour and Caribou Channel - dynamics, tides, ice, marine species and fisheries

21 February 2019

Submission from Local Fishermen and

Introduction

and are two of approximately 82 (lobster) and 100 (herring) local fishers who fish in the immediate area encompassing and surrounding the effluent outfall discharge location (CH-B) proposed by Northern Pulp. Both have a lifetime of experience fishing in the productive waters of the Northumberland Strait, in the very area where Northern Pulp now seeks to discharge its effluent.

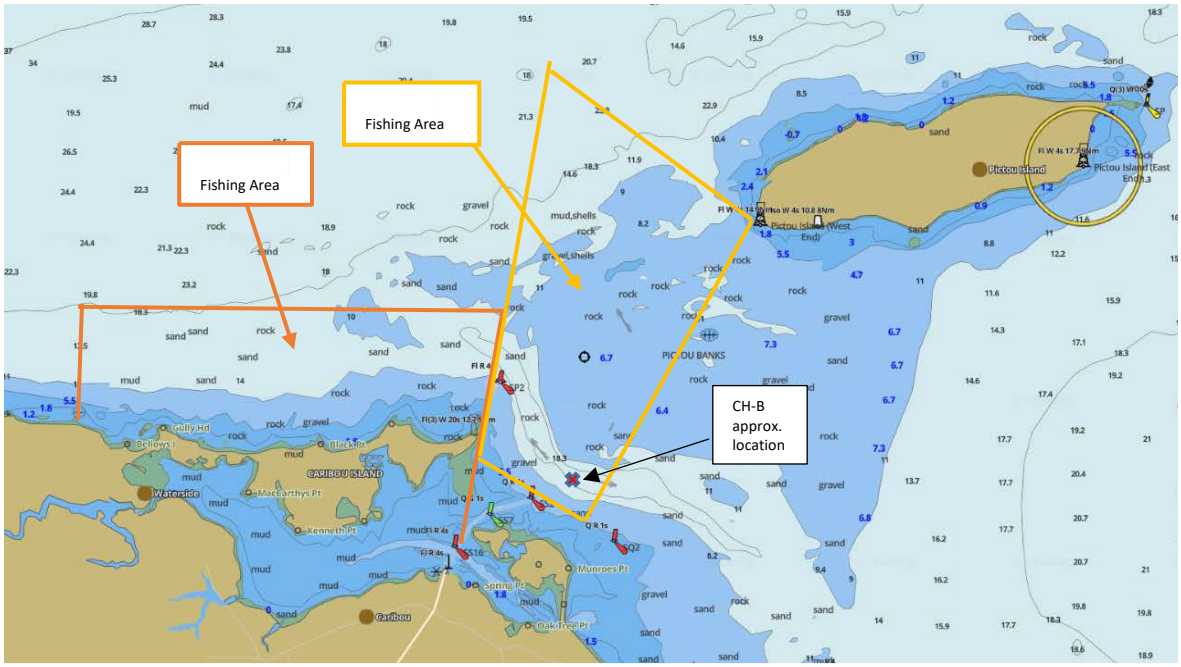
is a life-time resident and fisherman in the Caribou-Pictou area. He started out fishing with his dad and his uncle, and has since fished on his own for 40 years. For the last 17 years he has fished in his boat called the " ". Mr. MacCarthy holds a Fishing Master Class II and Watch Keeping Mate Certifications. He has both trained in and taught navigation and meteorology at the School of Fisheries in Pictou (now part of the Nova Scotia Community College). is a past member of the DFO/Industry Gulf Herring Advisory Committee and Scallop Advisory Committee. He fishes lobster, herring, rock crab and scallops in the Northumberland Strait. He has also fished mackerel and, prior to 1998, groundfish there.

's lobster fishing grounds are located in the Caribou area, and cover an area of approximately 20 nautical miles^2 (37 km^2) (5 nautical miles (9.2km) east-west x 4 nautical miles (7.4km) north-south), positioned to the north of Caribou Island (see the chart below). The eastern edge of his fishing area is approximately ½ nautical mile from the outfall location (CH-B) proposed by Northern Pulp. 's fishing grounds overlap with about 13 or 14 other fishers who use some of the same territory.

is likewise a life-long fisherman in the Caribou area. He has fished on his own for 30 years, and for 10 years before that with other fishermen. In his vessel, the " ", he fishes lobster, herring and scallops, and has also fished mackerel and groundfish in earlier years. Like , holds Fishing Master and Watch Keeping Mate certifications and lectured on navigation and meteorology at the Pictou School of Fisheries. He is of the Gulf NS Herring Federation and represents Area 16F herring fishers (PEI & NS) at local and Gulf Small Pelagics Advisory Committee meetings. He is also a member of the working group for that Committee.

's lobster fishing grounds are adjacent to 's to the east (see chart below), but angle northeast toward Pictou Island, and include an area northwest from that line. The proposed outfall point CH-B is positioned inside his territory at the southeast corner. often hauls his first trawl of the day during lobster season in roughly the same location as Northern Pulp's proposed outfall. His fishing grounds overlap with those of about 20 other fishers.

The lobster fishing grounds of and are marked approximately on the following chart. However, it is important to note that they are only 2 of up to 82 lobster fishers who fish in the Caribou area.



Lobster Fishing Grounds – and

Fishing in the Caribou Area

Fishing seasons in the Caribou area follow approximately this pattern annually:

Lobster– May and June

Herring – September to Mid-October

Rock Crab – early August to end of November

Scallops – November to mid-December

Oysters – are harvested in the fall but grow year round in Caribou Harbour

Local fishermen use several wharves near to the Caribou-Prince Edward Island Ferry Wharf, including Logans, Little Entrance Wharf, Sinclair's Island, Pictou Island, and Pictou Landing First Nation. The public fish mackerel, bass and smelts off the Caribou wharf.

There are approximately 25 commercial tuna fishing vessels and 8 tuna charter vessels that fish for tuna in the middle grounds (between Caribou and Pictou Island), within a commercial fishery, or for sport and tourism.

Moving out from the immediate proposed outfall location, many more fishers work in the Strait, which supports approximately 1800 fishers from Nova Scotia and Prince Edward Island. PEI is approximately 9 nautical miles (16.7 km) across the Strait from the outfall site.

Fish species

Lobster

The Caribou Channel and the Strait support a large lobster population. The area falls within Lobster Fishing Area (LFA) 26A-1. As indicated above, 82 lobster fishers fish in the area, including the approximately 12 fishers from Pictou Landing First Nation whose fishing grounds are located to the southeast of the proposed outfall.

Lobster larvae float at or near the water surface for about 12 weeks, starting mid-July each year. The larvae are swept along by the currents and may circle Pictou Island in the gyre. Once the lobster begin to mature they drop to the sea floor. Mature lobsters feed on the floor of the Strait, and will be affected by any alteration to the seabed, and the accumulation of pulp mill solids or contaminants in their feeding area.

Lobster are very sensitive to temperature changes. If water temperature rises or drops quickly, lobster typically "disappear" – meaning that they become inactive and do not enter lobster traps.

The Caribou Channel hosts a productive lobster fishery, as do most other parts of the Strait. In the Caribou area, approximately 82 fishers set about 280 traps each, for an estimated total of 22,960 traps (5 traps per trawl). Lobster season falls within May and June. Lobsters are retained if they are of sufficient size[1]; but undersized lobsters, berried females (females carrying eggs) and windows (large females above 110 mm) are returned to the water to ensure a sustainable population.

Herring

As mentioned above, approximately 100 Nova Scotia herring fishers, and fishers from Prince Edward Island fish in the grounds in the immediate area of the proposed outfall at CH-B. Herring fishers go where the fish are. In the 2018 herring fishery in the Caribou area, 90 percent of the herring were caught within a 2 mile radius of the proposed outfall location (CH-B).

Herring is fished in September and October. It is used as a food fish and also for lobster bait and is important in the food chain for numerous species. Herring stocks have been declining and DFO has designated herring as a "low caution" stock, the step before critical – DFO is watching the fishery closely to determine if it will remain viable. The proposed outfall CH-B is located in the middle of the last major active spawning area for Area 16F herring. Herring spawning grounds have compressed in the past few years as the stock has declined. Very little herring spawning occurs anywhere else in the Eastern Gulf.

During the herring fishery, it is not unusual for the Caribou-Prince Edward Island Ferry to navigate around the herring vessels, as they sometimes fish right in the ferry channel.

Rock Crab

also fishes for rock crab, from August to the end of November each year. He and others fish out in a wide area, including near the proposed outfall location CH-B. There are 22 rock crab fishers in the local area. and have observed large numbers of juvenile rock crab in

[1] In 2018, must have a carapace size of at least 73 mm in LFA 26A-1

Caribou Harbour, which is viewed as a crab nursery. Mature crabs tend to seek out cooler deeper water in summer and shallower water in winter.

Scallops

and fish scallops in the Caribou area from November to mid-December, outside the DFO-imposed Scallop Buffer Zone. DFO prohibits scallop fishing within one mile of shore or of Pictou Island, in order to protect juvenile lobster and lobster nursery habitat. DFO's website[2] designates this habitat as important to biodiversity conservation, due to its importance for the life-cycle of the species.

Scallops are filter feeders, making them susceptible to contaminant build-up in their local environment.

Detail of Scallop Buffer Zone – SFA 24

Oysters

While neither nor harvest oysters themselves, they advise that there is an oyster fishery in Caribou Harbour. Caribou Harbour is open to the Strait only by way of the ferry channel, and Harbour water moves in and out only via that channel, due to blockage of "the Little Entrance" channel into the Strait. As filter feeders, oysters fished in the Harbour are particularly vulnerable to any build-up of contaminants that could occur. As stated below, tides and currents can push water from the Caribou Channel into Caribou Harbour, where it may accumulate until conditions change. The proposed effluent outfall at CH-B is located close to the ferry route by which the water enters the Harbour.

[2] DFO - Scallop Buffer Zones (SFA 21, 22, 24) - http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/sfa-zpp-eng.html

Bathymetry and Depths

Northern Pulp's proposed outfall at point CH-B in the Caribou Channel is to be placed in a relatively deep and narrow part of the channel, 20 m deep and about 0.1 nautical miles (0.2 km) wide. From there the channel slopes upward to the much shallower waters found on either side of the channel (at depths of approximately 7 to 9 m).

Depths are shown in metres in the attached chart. A pipeline leading to the outfall will have to travel across areas with depths in a range of 0 to 8 m. As discussed further below, this makes the pipeline leading to the outfall very vulnerable to ice damage and increases the likelihood of rupture and leakage.

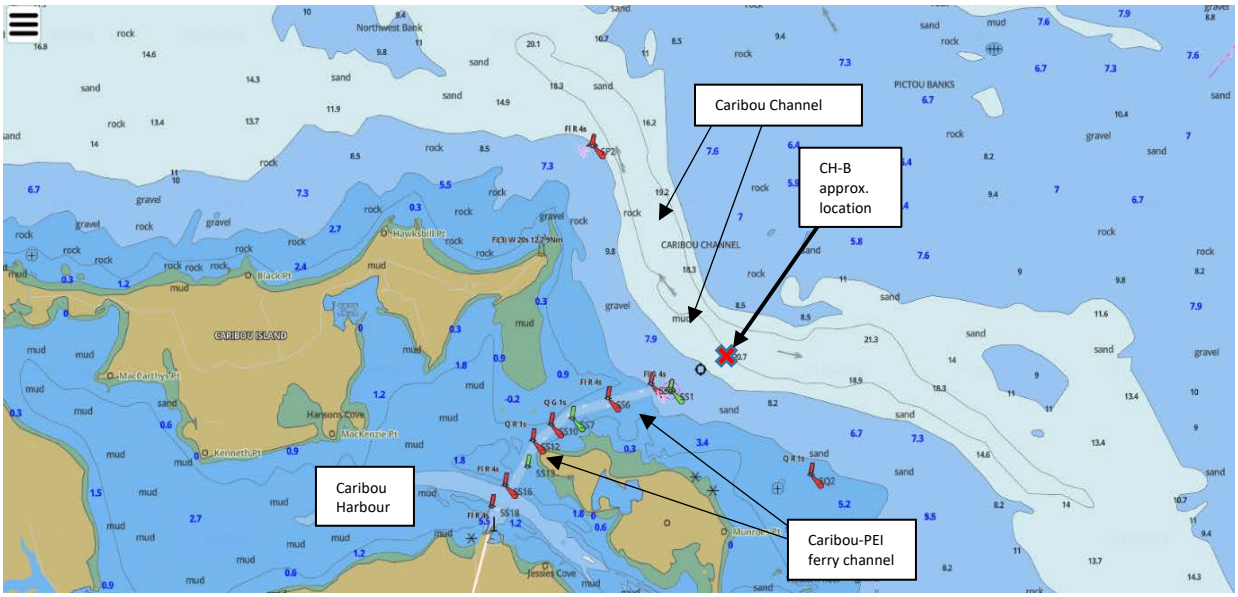


Chart of Caribou Channel and surrounding area

The Caribou-Prince Edward Island Ferry departs Caribou Harbour via the ferry channel. The ferry channel has to be dredged to maintain sufficient depth for the ferry. Prior to the creation of the dredged ferry channel, people would walk their cattle at low tide through the shallow water between Munroe's Island and Caribou Island.

Until recent decades, there was a passage between Munroe's Island and the mainland called the "little entrance". Winds and tides have since filled the little entrance and blocked that passage, effectively joining Munroe's Island to the mainland and limiting the flushing of Caribou Harbour. This is indicative of the shifting sea bottom, which is common in this area.

Currents and Tides

Currents are complex in the Caribou Channel area and are very localized. The water moves back and forth with the tides, but on the south side of the Channel will also flow into Caribou Harbour. The channel area between Caribou Island and Pictou Island is narrower than the Strait on either end of the channel, and the water must speed up as the tides push it through in both directions. As the water moves through the channel, it causes an upwelling effect up the slopes on either side of the channel.

Northern Pulp's materials say that water movement due to tides is southeast and northwest.[3] While the falling tide does move southeast, the rising tide generally moves more north than northwest. Northern Pulp has made very general assumptions about its proposed outfall location, but has taken no steps to actually measure currents in the outfall area, or along the pipeline route, despite its proposed placement in the midst of an area used by local fishers.

The tide moves southeastwards through the channel, and then roughly northwards, and repeats this pattern, on approximately 6 hour intervals. Tides vary in height, but there is a roughly 4 to 5 foot differential between low and high tide, with 6 feet on a full moon. There is an approximately 1 hour period of slack tide between each high and low tide during which the water does not flow in any significant way and no meaningful dispersal would occur in Caribou Channel. Slack tides can last up to 2 hours during the summer months.

Slack tide periods in Caribou Harbour

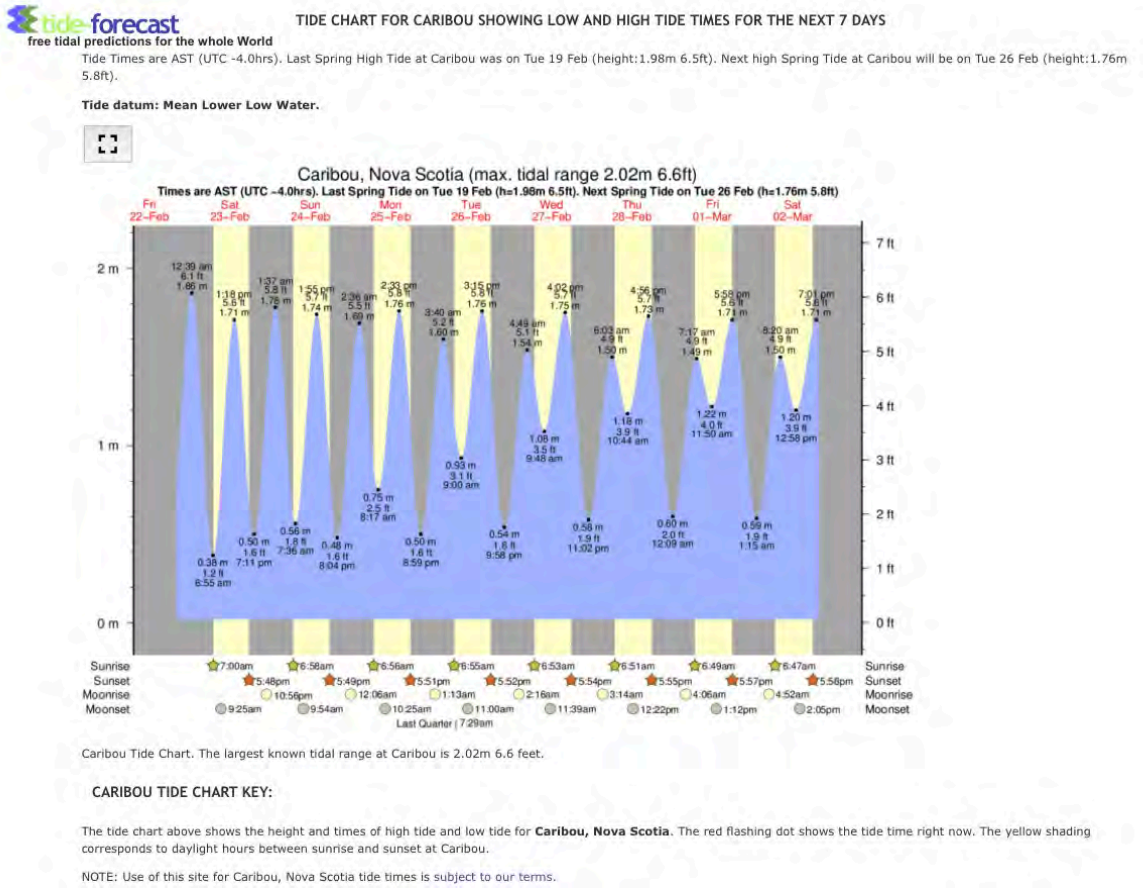
In Caribou Harbour, there are four slack tide periods per day. Fishermen estimate that in the vicinity of the proposed outfall, slack tides last on average 45 minutes, four times a day.

Local fishermen describe a slack tide as "when everything stops, even in a dynamic area." They also describe water movement as much slower than normal for a period of time before and after a slack tide period. Slack tide periods are a preferred time for herring fishing.

Periods of slack tide vary in different bodies of water and under different conditions. Currents, wind direction and stress, and tidal heights affect the duration of slack tide periods.

Duration of slack water at a given location is inversely related to the height of the tide at that location. The smaller the tide, the longer the period of slack tide will last. Tidal flow in the Caribou Harbour area can be quite small. See the image on the next page.

[3] Addendum to Receiving Water Study, p. 18.



Caribou Tide Chart. The largest known tidal range at Caribou is 2.02m 6.6 feet.

CARIBOU TIDE CHART KEY:

The tide chart above shows the height and times of high tide and low tide for **Caribou, Nova Scotia**. The red flashing dot shows the tide time right now. The yellow shading corresponds to daylight hours between sunrise and sunset at Caribou.

NOTE: Use of this site for Caribou, Nova Scotia tide times is subject to our terms.

Variations in the strength of the current will also vary the time when the stream reverses, altering the time and duration of slack water. Northern Pulp's Receiving Water Study does not account for slack tides or their effect on predicted diffusion of effluent released from the proposed pipe at CH-B.

Northern Pulp's submissions do not take into account storms and storm surges and the heavier waves that can occur, especially in the fall. During rough weather and storm surges, very high water levels occur within the Harbour, and can be 5 or 6 feet higher than typical as shown in the photos on the next page.

These extreme tide events can last for several days, when combined with winds and waves from the northeast, holding the high water in Caribou Harbour. At such times, if effluent were to be discharged in the channel at CH-B, it would not disperse to the east or north – rather it would be pushed into Caribou Harbour and might accumulate there until the dynamic changed.

Regular High tide in Caribou Harbour

High tide in Caribou Harbour during a storm in the fall of 2018

Water can also enter the Harbour via movement of vessel traffic. When the PEI ferry enters Caribou Harbour from the Caribou Channel, it pushes in a wall of water with it from the channel. The wave is high enough to "surf".

As well, the water in the Caribou Channel is part of a gyre/current that circles Pictou Island, in a counter-clockwise rotation, rather than strictly east-west. The Pictou Island gyre is well-known to fishers. In one winter during the 1930s, a ferry vessel became stuck in the ice south of Pictou Island. The gyre moved the vessel with the ice around Pictou Island three times over the winter, until the thaw released the ice's grip on the ferry in the spring. Gyres in the Strait and localized currents in the Caribou Channel and around Pictou Island were also noted in a series of drift bottle studies conducted by DFO scientists in the 1960s[4]. and believe that the significant effects of the Pictou Island gyre, and how it might affect effluent dispersal or build-up, are not analysed or considered in Northern Pulp's materials.

Northern Pulp's materials fail to account for the significant localized water flow dynamics in the Caribou area, and in the Strait overall. Northern Pulp's failure to take basic measurements of currents and other dynamics results in incorrect and oversimplified modelling of crucial water flows.

Swells and Wave action

The largest waves in the Caribou area occur in the fall. They come generally from the Northwest with the prevailing winds, although the largest storms with the highest tides come out of the Northeast every fall and winter. and observe that storms have become more frequent and more violent over the past 40 years.

[4] Lauzier, L.M., 1965. Drift bottle observations in Northumberland Strait, Gulf of St. Lawrence. Journal Fisheries Research Board of Canada 22(2), 353-368.

Ice

Ice is typically present in the Caribou area from the end of December through April, but can set in earlier and remain later if temperatures are cooler than normal. Due to ice conditions, the Caribou-Prince Edward Island Ferry does not run from late December until the beginning of May. See in Appendix A, the Ice Chart for 3 February 2019 for the Gulf of St. Lawrence, including the Northumberland Strait. This chart is updated daily and Mr. MacCarthy reviews it on a regular basis.

In the shallows of the inshore area the ice freezes to the bottom. The fishermen call this “fast ice”. Further out into the deeper water drift ice forms on the surface. As water splashes on to the ice, it builds up into thicker and thicker layers.

These photos were taken by in 2014 off Caribou Island, and show the fast ice in the foreground and the ridge of sea ice farther out.

In the photo below, the sea ice is resting on the bottom which makes it stand far out of the water.

When, due to ice thickness or low tide, ice sheets rest on the sea floor, they will freeze to boulders and sediment. When high tide returns it lifts the ice and frozen material from the sea floor and moves it elsewhere. The ice in the Strait has picked up concrete vessel anchors weighing 2200 pounds and moved them far from their original location, such that they could not be located by divers. Ice also moved a 5000 lb piece of armour stone a considerable distance within the Strait.If wind or currents move the ice sheets, ice can also scour across the sea floor. Scour can be enhanced if boulders or other material have frozen on to the bottom of the ice. Ice scour can occur quite deep, even as deep as the proposed outfall position. As indicated in Stantec's Preliminary Receiving Water Study, in 1991 an undersea fiber optic cable to Prince Edward Island was broken by ice at a depth of over 18 metres.[5] Divers have reported ice scour occurring as deep as 20 m.

[5] Stantec, Preliminary Receiving Water Study, August 2017, at page 4.81.

Ice can be pushed up on to shore by the wind. In spring the ice begins breaking up into large icebergs and ice pans. At this time, when the wind blows from the northeast, it pushes the ice into harbours where it can pile up 25 (7.6m) to 30 feet (9m) high. See the photo below, taken near Caribou Lighthouse.

Given the dynamics observed by and , any pipeline or diffuser installed on or under the sea floor, whether in shallow water or at a depth of 20 m, would be vulnerable to ice damage. Likewise, any piping infrastructure on or near the shore could be damaged from ice moving on to the shore. Attempts to protect the pipeline by trenching or covering it with armour stone would be insufficient, given the ice's ability to scour and move heavy objects and sediment, and the shifting sea bottom in that area.

Wind

and reviewed the wind directions as recorded in a recent air emissions study of the Pictou Area.[6] They agree that Figure 2 in the study report accurately captured the typical wind patterns[7] but note that the winds are much stronger offshore than at the Granton station where the data was tracked for the Pictou study.

Figure 2 is reproduced below:

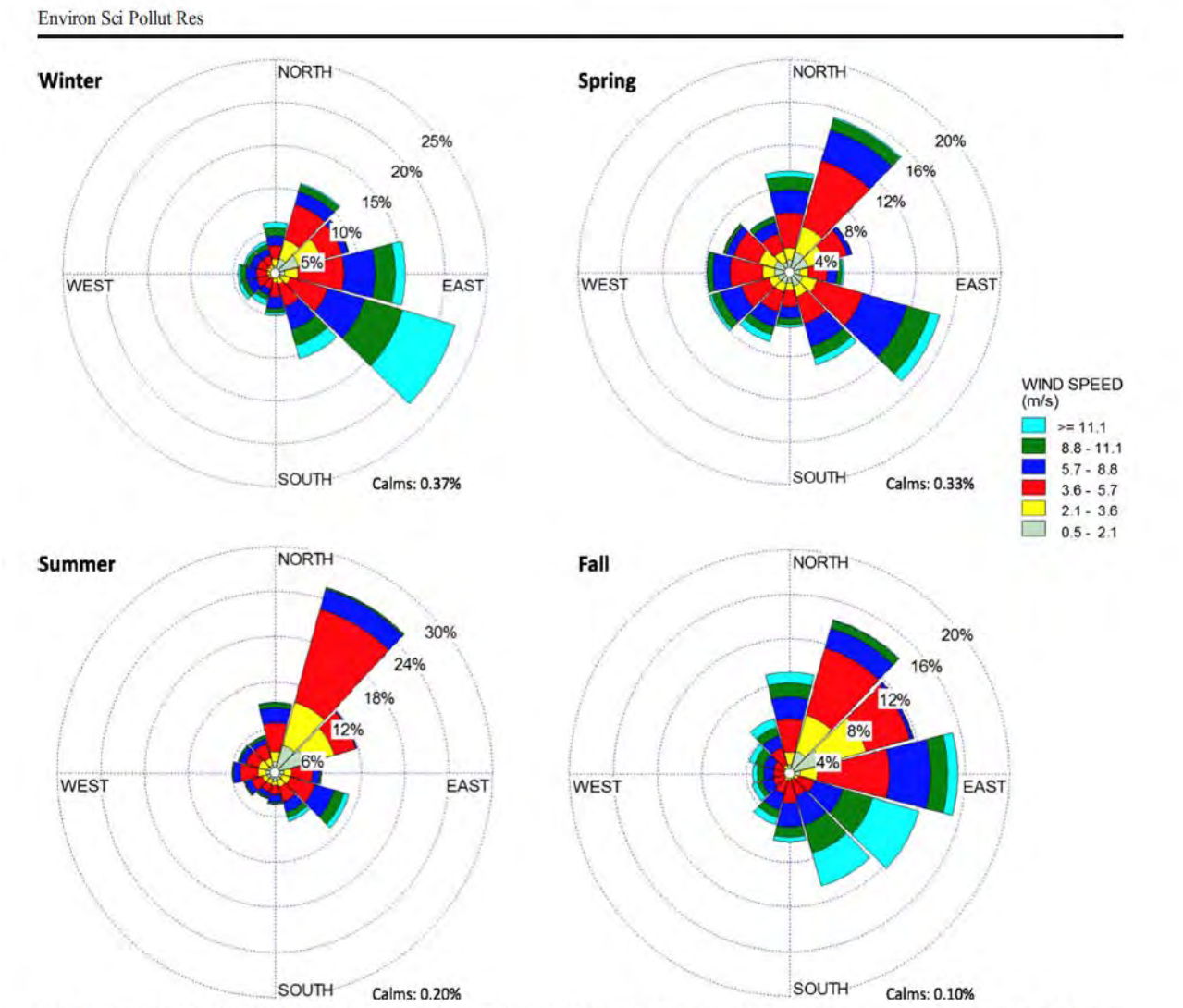


Fig. 2 Seasonal (2006–2013) wind rose simulations using WRPlot View™ (blowing to direction). Percentages represent frequency of wind direction

[6] Hoffman, E., Guernsey, J.R., Walker, T.R. et al., Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia, Environmental Science and Pollution Research (2017) 24: 20685. https://doi.org/10.1007/s11356-017-9719-5.

[7] Pilot study investigating ambient air toxics emissions, *supra*, at p. 20689, Figure 2.

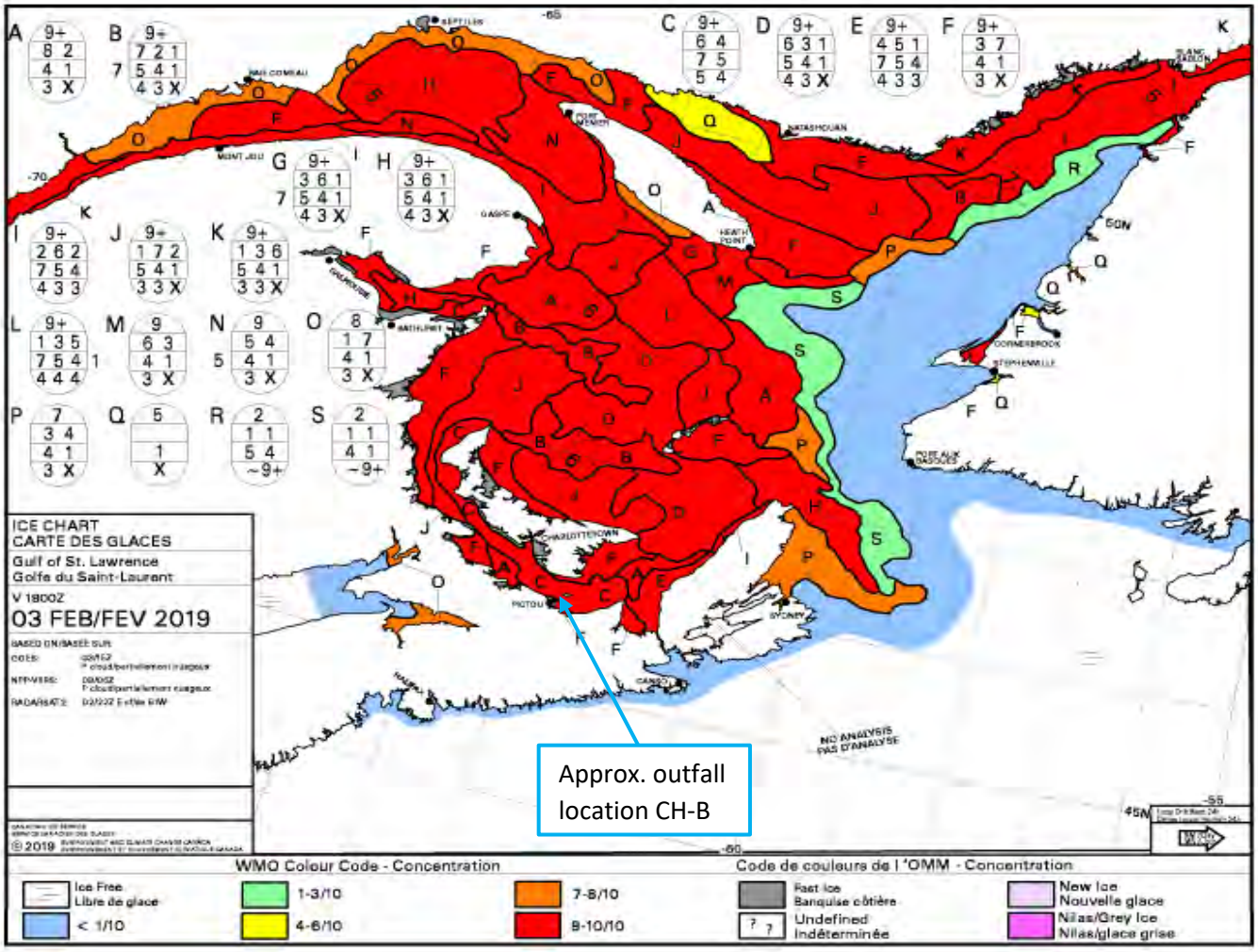
Conclusion

and believe that much of the above information was not taken into account by Northern Pulp and its consultants in the process of developing its materials and providing information on the ability of the Caribou Channel and the Northumberland Strait to neutralize the impacts of a continuous effluent flow into that environment.

Contrary to the conclusions of Northern Pulp's consultants, the carrying capacity of the Strait, combined with the currents, overall and local, does not permit quick and complete dispersal of the constant flow of effluent and its constituents. The effluent will not simply vanish, but will circulate and build up within the system of local tides, currents and dynamics in the Strait, creating an unreasonable and serious risk of harm to fish and fish habitat.

Further, the pipeline and the diffusers are extremely vulnerable to damage from ice, storms and other forces, likely resulting in effluent discharge into Caribou Harbour, or other parts of the Caribou area. Such discharges could go undetected for weeks or months due to ice cover, and because there is no effective monitoring equipment installed on the pipeline and diffuser. Likewise, in the event of a rupture or leak, pipeline infrastructure repair would be extremely difficult or impossible prior to ice breakup in spring. All of these factors present serious individual and cumulative risks to the fishery and to the marine environment.

APPENDIX A


ICE CHART
CARTE DES GLACES
Gulf of St. Lawrence
Golfe du Saint-Laurent
V 1800Z
03 FEB/FEV 2019
© 2019
Approx. outfall location CH-B
NO ANALYSIS
PAS D'ANALYSE
WMO Colour Code - Concentration
Code de couleurs de l 'OMM - Concentration
Ice Free
Libre de glace
< 1/10
1-3/10
4-6/10
7-8/10
9-10/10
Fast Ice
Banquise côtière
Undefined
Indéterminée
New Ice
Nouvelle glace
Nilas/Grey Ice
Nilas/glace grise

APPENDIX B-2

March 5, 2019
Re: Northern Pulp Replacement Effluent Treatment Project

My name is . I live in , NS. I am a master diver and have been for almost decades. I have over 4000 dives in and around the Pictou County area. I have spent many years on the bottom in the Caribou area and I have seen a lot of changes made by ice each year.

Here are a few examples.

1. , a fisher from Toney River, asked me to go and look for a couple of lobster traps he lost in 32 feet of water. I came across an ice scour on the bottom that was probably 4 feet deep and wide enough that you could fit a small car in. This was located just west of Toney River, in lobster bottom about ½ km from land. This would be about 10 miles from the proposed outfall location.

2. Another fisher from Toney River named had a trawl hung up on bottom several years ago and he asked me to go look for it. It was tangled up in a buoy and chain from Prince Edward Island. The buoy had dragged from northern PEI. It weighed approximately 5000 pounds and had a 4000-pound stone mooring attached to it. We figured out where the buoy was from by prying a tag with serial number off the solar panel on the side of the buoy. It was a fairway buoy, one of the larger ones. This was found just west of the Ballast Island, Caribou Island, about 5 miles from the proposed outfall location, about ½ km from land.

3. In Caribou Harbour I used to help every spring installing the navigation buoys in the channel with and Sometimes the ice would drag them for miles and it was all we could do to drag them back into place. Some of the large navigation buoys in Caribou are about 30" around and about 23 feet long. Buoys weigh from 150 to 5000 lbs. Buoy anchors are 2000-pound blocks with 500 pounds of chain on them depending on the depth. Larger buoys would have double the weight on them. DFO tend to use larger ones, such as the Gull Rock buoy and the last green Caribou buoy which is also a RACON buoy that shows up on radar as a Morse code letter. The navigation buoys are located in the channel in Caribou Harbour, parallel to the proposed pipe route.

The channel shifts from time to time mostly due to storms. Ice and tide also move sand around as it is very shallow in this area. Storms can pile ice up to 30 feet high which can dig deep into the soft bottom. This could damage the buried pipe.

If the pipe is covered in armour stone, the sand on either side will be undermined by wind and wave action exposing the pipe to the full force of the ice in winter. If no armour stone is used, those same fall storms could easily expose the pipe, as anyone living near a beach knows how easily sand is shifted by storm winds and waves. Either way the pipe is unlikely to survive extreme conditions in this area.

The armour stone proposed for this pipe would likely be moved around by the ice and could end up in the channel used by Northumberland Ferries which is barely deep enough to begin with.

The sea bottom in the area of the proposed pipe is very fragile. It's mostly sand and in the inner harbour, mud and eel grass. The eel grass is very fine and important to juveniles and larvae of lobster and crab.

I have personally witnessed the things that I have described above.

APPENDIX B-3

March 4, 2019

Re: Northern Pulp Replacement Effluent Treatment Facility Environmental Assessment

My name is . I have been a fisherman for 27 years. I fish in and around the area of Caribou Harbour and have great concern over the possibility of an effluent pipe in this area.

Caribou Harbour is one of the largest rock crab nurseries in the Eastern Gulf. It contains millions of female and juvenile crab. I have fished rock crab for several years. I fish Hillsborough, PEI and from Wallace Harbour to Caribou Harbour in Nova Scotia. Female crab can be found in all the bays and inlets, but for some reason Caribou Harbour holds a far greater number of female and juvenile crab than all the other areas.

The survival of the lobster industry in this end of the Strait depends on the health of this rock crab nursery. Crab is the main food supply for lobster.

I am concerned about the potential impact of a pipe carrying and **continuously discharging up to 3 million litres an hour** of effluent through three diffusers, and the potential that this will produce noise and/or vibration that would disturb marine life.

I would like to draw the Minister's attention to the potential impact of noise and/or vibration from the diffusers on the marine species in Caribou Harbour and surrounding area. This issue has not been addressed in Northern Pulp's submission. I believe this issue must be fully addressed before any approval is given. Noise and vibration can carry long distances under water and change conditions which make a habitat favourable for many species.

I also believe that Northern Pulp's plan to excavate a trench through the centre of this very special eco-system may disrupt the fishery in this area.

The DFO description of Scallop Buffer Zone 21, 22 and 24, which runs 1 nautical mile from the nearest point of land and includes the entire proposed pipeline and outfall, states that the ecological components of interest protected by the buffer zone are" juvenile American lobster and habitat that is important to biodiversity" and states "specifically American lobster nursery habitat is important for the life-cycle of the species."

The description also states, "No other human activities that take place in this area are incompatible with the conservation of the ecological components of interest" and that "These closures offer protection to other important species and habitats in the southern Gulf of St. Lawrence." As an example, DFO refers to SFA 22 containing "rock crab (an important prey for several species and a commercial species." http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/sfa-zpp-eng.html

Caribou Harbour is home to the largest commercial fishing fleet in the Northumberland Strait. The strong lobster catches in this area are the result of the continuous food supply from the rock crab nursery. The potential destruction of this crab habitat will have devastating consequences on the lobster industry in this area. No studies have been done on the possible effect noise and/or vibration from this effluent pipe could have on local marine life. When foreign material is dumped into the environment, it will have an effect. Sometimes it takes years to realize how big that effect will be and then it is too late to fix it. Northern Pulp needs do something environmentally friendly, not something that is economically beneficial to themselves.

Sincerely,

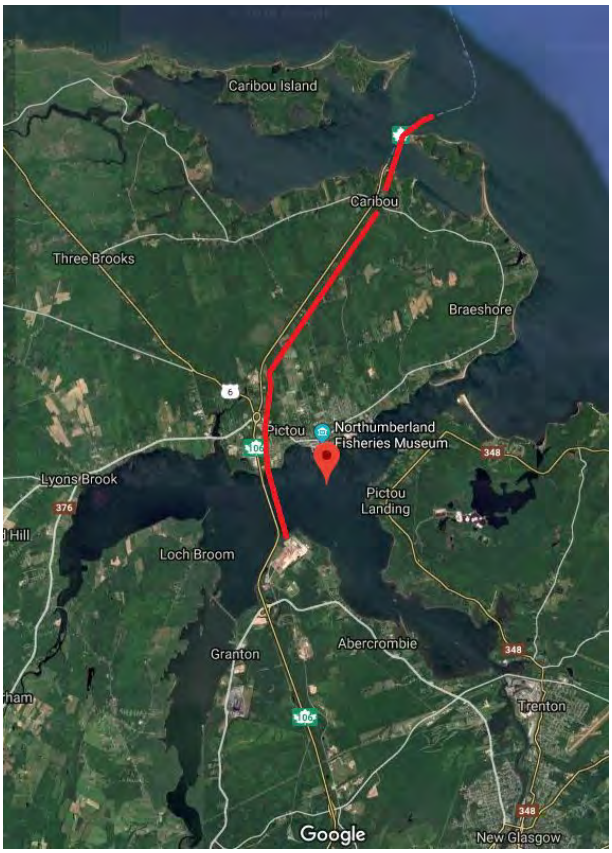
APPENDIX C-1

Northern Pulp's Effluent Disposal Plans - Issues and Answers

by

February 2019

BACKGROUND



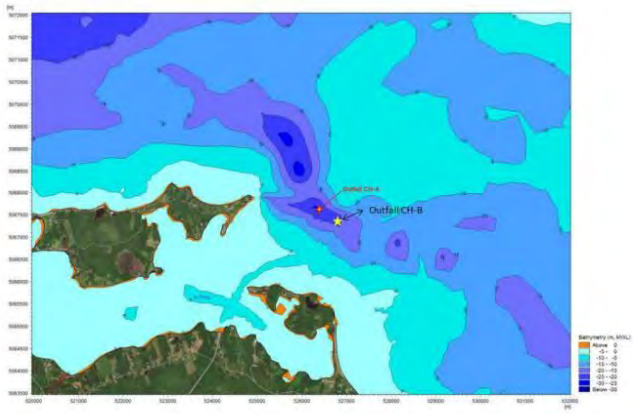


Figure 2.4 **Bathymetry and Outfall Locations CH-A and CH-B in Caribou Harbour Offshore**

Northern Pulp Nova Scotia Corporation (Northern Pulp) started operations in 1967 and is located in Pictou County, NS, on the shore of Pictou Harbour. The company states that it "*manufactures 280,000 tonnes of Kraft pulp annually, primarily for export*". It claims to have 300 employees and to generate $200 million annually into the Nova Scotia Economy.(1)

On February 7, 2019, Northern Pulp Nova Scotia Corporation (Northern Pulp) registered a project for environmental assessment. The purpose of the Project is to replace the existing effluent treatment facility (ETF) with a new one to treat wastewater received from the Northern Pulp pulp mill at Abercrombie Point, Pictou County.

Northern Pulp intends to use a biological activated sludge treatment process which combines moving bed biofilm reactor technology with conventional activated sludge. Once treated, effluent would be sent via an approximately 15.5 kilometers-long pipeline. The effluent pipeline would follow the Highway 106 for approximately 11.4 kilometers, then enter the marine environment near the Northumberland Ferries marine terminal, and continue for approximately 4.1 kilometers through Caribou Harbour to the Northumberland Strait where the treated effluent would be discharged via an engineered diffuser. (Modified from 3)

There are also plans to eliminate the existing treatment facility at Boat Harbour.

ADDENDUM RECEIVING WATER STUDY FOR NORTHERN PULP EFFLUENT TREATMENT FACILITY REPLACEMENT PROJECT – ADDITIONAL OUTFALL LOCATION CH-B, CARIBOU POINT, NOVA SCOTIA

Table 3.5 Water Quality at the End of the Mixing Zone for a Three-port Diffuser

Parameter	Unit	Effluent Daily Maximum Limit	CCME, Marine Guideline	Ambient Conditions	End of Mixing Zone at 100 m from Diffuser	Distance (m) from Diffuser Ambient Condition is Reached
Adsorbable Organic Halides (AOX)	mg/L	7.8	n/a	Trace amount	0.05	n/a
Total Nitrogen (TN)	mg/L	6.0	45[1]	0.24	0.24	< 2
Total Phosphorus (TP)	mg/L	1.5	n/a	0.35	0.35	< 2
Colour	TCU	750	n/a	10.8	10.8	< 5
Chemical Oxygen Demand (COD)	mg/L	725	n/a	n/a	5.0	n/a
Biochemical Oxygen Demand (BOD_5)	mg/L	48	n/a	n/a	0.33	n/a
Total Suspended Solids (TSS)	mg/L	48	Narrative [2]	8.5	8.5	< 2
Dissolved Oxygen	mg/L	> 1.5	>8	7.2	7.2	< 2
pH	-	7.0 - 8.5	7.0 - 8.7	8.0	8.0	< 2
Temperature (summer)	°C	37	Narrative [3]	17.6	17.7	< 2
Temperature (winter)	°C	25	Narrative [3]	0	<0.1	< 2
Salinity	g/L	4	Narrative [4]	28	28	< 2

n/a – not available
[1] - CCME marine limit for NO_3^- as N
[2] - Maximum average increase of 5 mg/L from background levels for longer-term exposures (e.g., inputs lasting between 24 h and 30 d).
[3] - Human activities should not cause changes in ambient temperature of marine and estuarine water to exceed ±1°C at any time, location, or depth
[4] - Human activities should not cause the salinity (parts per thousand [‰], expressed here in g/L) of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth.

This figure shows the estimated water quality for some common parameters such as halides, nitrogen, phosphates, oxygen demand, dissolved oxygen, pH, temperature and salinity at the outfall and at varying distances away.

The purpose is to show that dilution occurs and as a result, all is well. However, except for Board Harbour data, I can find no definitive statement about the toxic chemicals that are of real concern in the Strait and in Caribou Harbour. This includes, among other things, cadmium, dioxins, furans, mercury, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, zinc, etc. (8)

How toxic are these chemicals? You can check each of these at:

http://scorecard.goodguide.com/chemical-profiles/ which, for each chemical, provides information on Human Health Hazards, Hazard Rankings, Chemical Use Profile, Chemicals Rank in the United States, Regulatory Coverage, Basic Testing to Identify Chemical Hazards, Information Needed for Safety Assessment, and Links to associated information.

ASSESSMENT:

The “Replacement Effluent Treatment Facility Project” (11) is a massive document with 15 large sections and numerous appendices. “Section 8 - Environmental Effects Assessment” alone contains 356 pages that cover the following topics: Atmospheric Environment, Acoustic environment, Soils and Geology, Surface Water, Groundwater, Freshwater and Fish Habitat, Wetlands, Flora/Floral Priority Species, Terrestrial Wildlife/Priority Species, Migratory Birds and Priority Bird Species/Habitat, Harbour Physical Environment, Water Quality, and Sediment Quality, Marine Fish and Fish Habitat, Marine Mammals, Sea Turtles and Marine Birds, Socio-Economic Environment, Indigenous Peoples Use of Land and Resources, Marine Archaeological Resources, Terrestrial Heritage Resources, Effects of the Environment on the Project.

While the work itself is impressive and one would expect that it does impress in most circles, it has serious flaws which limit its short-term and long-term value in ensuring the ecosystem health of Caribou Harbour and Northumberland Strait. Unfortunately, it seems that few if any primary surveys have been done to determine the vital ecosystem components of the target areas apart from the engineering, construction surveys. As far as the biological components of the area goes, much of the material quoted is obtained from other studies of various purpose and extent, from opinions expressed and from limited surveys undertaken many years ago (plankton results from 1992 are used, for example).

In addition, only “Valued Environmental Components” and “Priority Species” are considered. Thus, only species that are deemed to be important such as commercial fish, are considered in the report. As a consequence, the foundational species of the ecosystem such as planktonic species, invertebrate and fish larvae, subtidal and intertidal invertebrates and plants, forage species, etc are not considered. Seasonality is an important issue and to truly understand ecosystem dynamics, at least 12 monthly surveys must be undertaken that include records for plankton, fish and invertebrate larvae, forage species, fish, bird, and mammals.

Also, baseline chemical analyses are required for water and bottom samples at predetermined sites which can be revisited for ongoing monitoring purposes in future years. The following figure is an example of how these sites should be selected to adequately cover the area under question. The white lines are transects used to survey marine organisms and bottom type. The red dots are sediment samples. For details on how sampling may be carried out see Chapter 2 at https://issuu.com/ /docs/healthofstcroixestuary

In the absence of this information, the impact of the effluent from the proposed outfall pipe at Caribou Harbour or the proposed cleanup at Boat Harbour cannot be measured in the short term or long term. More particularly, the “out-of-sight-out-of-mind” pipeline will be unlikely to foster any response to future

deleterious impacts in Caribou Harbour and the Northumberland Strait … or for that matter any improvements that might be made in Pictou Harbour.

While there seems to be an abundance of engineering studies, fishermen and other knowledgeable individuals have provided some descriptive information on the abundant life in Caribou Harbour and the Northumberland Strait, I have found no reference to professional biological surveys in Caribou Harbour, Pictou Harbour or the adjacent section of the Northumberland Strait.(12)

Many of the issues associated with the outfall proposed for Caribou Harbour are outlined in a letter to NS Advocate by (6) and others which can be summarized as follows:

1. The one ton of solids that will discharge daily with the millions of liters of effluent are still scientifically considered toxic waste.
2. The composition of toxic wastes is, at least in part, known.
3. Enormous amounts of water are required to dilute the effluent to permissible concentrations allowable in the receiving waters.
4. The average effluent temperature released in the summer will be 37 degrees C when the Straits ambient temperatures are already nearing 20 C and lobster larvae are present and may be impacted by this temperature difference.Other plankton and larvae will also be impacted by temperature and pressure changes.
5. Lobster larvae survival diminishes rapidly when the water temperature surpasses 20º C and is already a major concern without the addition of the millions of liters of hot effluent.
6. According to Northern Pulp, the effluent temperature and salinity will meet that of the ambient surrounding water within 100 meters of the discharge point. However, some calculations suggest the proposed system will impact 65,000 square meters of area (See John Collins 5).
7. The proposed discharge location is a narrow channel, just outside the mouth of Caribou Harbour and just alongside the ferry channel which is dredged regularly.

It appears that no long term and adequate surveys have been done for Pictou Harbour. However, such surveys have been done for the St. Croix River and Estuary on the border between Maine and New Brunswick (See: https://issuu.com/ /docs/healthofstcroixestuary), Saint John Harbour, and elsewhere and these surveys suggest that similar conditions can be found in Pictou Harbour and in the adjacent Strait area. Since effluent will be introduced continuously into the Strait at levels substantially elevated from those coming out of Boat Harbour into the Strait, the impacts can be expected to be substantially higher on a day-by-day basis. While Caribou Harbour will not be subjected to the same direct pollution, the incursion of seawater containing effluent from the outfall should be expected to create conditions similar to those that occur in Pictou Harbour, albeit over a longer period of time. Impacts that can be expected include but are not limited to:

1. Caribou Harbour - Tidal incursions of effluent can be expected from the outfall in the strait as well as from potential leaks and accidents. As a consequence effluent impacts will occur in Caribou Harbour estuary which has been identified as a small, shallow harbour “rich with fish of all sorts, including lobster, crab, mussels, clams, mackerel, etc.”(5)
2. Toxic Chemicals can be expected to accumulate in the sediments of Caribou Harbour and the Northumberland Strait at, as yet, unknown locations.

3. As in the St. Croix, biological magnification of toxins will occur in the Harbour and in Northumberland Strait. A broad range of marine organisms including plankton, fish larvae, fish, birds, marine mammals and humans will be impacted directly or indirectly at lethal and sublethal levels. While these impacts will be observable in Caribou Harbour in a relatively short time, they will only be observable in the strait after more time has passed. This is partly why annual long term monitoring is required.
4. As in the St. Croix, toxic chemicals and physical alterations (pH, temperature, residual solids, etc.) will impose negative impacts on life forms, particularly at the planktonic level and will foster impacts on organisms up the food chain.
5. As in the St. Croix, over time anoxic “Dead Zones” should be anticipated.
6. As in the St. Croix, decline in marine invertebrates and fish as well as some birds and mammals can be anticipated. Those that remain are likely to harbour toxic chemicals.
7. As in the St. Croix, negative impacts on the local fisheries should be anticipated with consequence loss of income.
8. As in the St. Croix, some fisheries may be closed due to the presence of toxic chemicals in fish caught for human consumption.
9. As in the St. Croix, the impacts in the marine system are shared by multiple jurisdictions - Nova Scotia, Prince Edward Island, New Brunswick and the Federal government of Canada. All of these jurisdictions must be included in the crafting of studies and the decisions made to proceed with this proposal for an outfall off Caribou Harbour.
10. As in the St. Croix, the proposed outfall may impact several coastal parks and tourist destinations as well as human properties along all of the shores.

RECOMMENDATIONS:

The problems associated with the outfall proposed for Caribou Harbour are outlined and well defined by local knowledge. However, the knowledge base seems to be largely related to economically valuable and obvious species only and a literature search has not found any extensive science-based, ecosystem surveys and reports. Unless appropriate studies are undertaken, likely impacts are hard if not impossible to assess and cannot be tracked over the long term.

Effluent must be tested in the laboratory for lethal and sub-lethal impacts by an independent laboratory using appropriate local freshwater and marine species from all target areas including Caribou Harbour and the rivers flowing into it.

Frankly, in relation to the proposed pipeline, no work should begin until professional ecosystem surveys are undertaken at Caribou Harbour, Northumberland Strait at Caribou Harbour and Northumberland Strait at the Boat Harbour outfall (vital for comparison purposes). In the absence of these necessary surveys, the Minister must be made aware that there can be no confidence in the purported lack of impacts stated and implied in the Northern Pulp environmental submission. Additionally, the Minister will be remiss in supplying necessary data that will be required by subsequent Ministers to make essential decisions related to future environmental impacts in Caribou Harbour and Northumberland Strait.

Make no mistake, adequate surveys take time and requires highly qualified and experienced field staff. While running sufficient transects and collecting sufficient samples is time consuming, seasonal variations in abundance and distribution of marine organisms dictates designing a sampling regime that takes this into account. As a consequence, a full year at least should be designated for the work. Proposals must include an appropriate ongoing annual monitoring regime.

THE AUTHOR

As CEO and owner of research and consulting company Marine Research Associates Ltd, has had over 50 years of professional experience studying the marine environment of the east coast. In relation to this presentation he has several decades of field surveys and research relating to the pulp mill pollution in the St. Croix River and Estuary in New Brunswick. Other applicable experience includes studies on effluent and ecosystem impacts of the Point Lepreau Nuclear Generating Station, The Coleson Cove Generating Station, Saint John Harbour, coastal quarries in New Brunswick and Nova Scotia as well as mill impacts on the Humber River in Corner Brook Newfoundland. Additional information can be found at: https://1drv.ms/b/s!AlJhIkiSGh1knL5BB8Fyl05bnPdYJQ

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[4] "Northern Pulp effluent plan will affect marine life: prof | Regional ...." 16 Jul. 2018, https://www.trurodaily.com/news/northern-pulp-effluent-plan-will-affect-marine-life-prof-226437/. Accessed 23 Feb. 2019.
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[10] "How a pulp mill killed commercial fisheries in New Brunswick's St ...." 9 Jan. 2019, https://nsadvocate.org/2019/01/09/how-a-pulp-mill-killed-commercial-fisheries-in-new-brunswicks-st-croix-estuary-and-its-lessons-for-the-northumberland-strait/. Accessed 24 Feb. 2019.
[11] "Replacement Effluent Treatment Facility Project | Environmental ...." 7 Feb. 2019, https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/. Accessed 24 Feb. 2019.
[12] "Northumberland Strait Ecosystem Overview Report Moncton, New ...." http://docplayer.net/33332787-Northumberland-strait-ecosystem-overview-report-moncton-new-brunswick-final-report.html. Accessed 28 Feb. 2019.

APPENDIX C-2

1 Page Removed as per Section 20 of the FOIPOP Act

APPENDIX D-1

DALHOUSIE UNIVERSITY
FACULTY OF SCIENCE

March 5, 2019

James Gunvaldsen Klaassen
Barrister & Solicitor | Ecojustice
520-1801 Hollis Street, Halifax, NS B3J 3N4

Dear Mr. Gunvaldsen Klaassen,

Please find below comments on the document "Replacement Effluent Treatment Facility Project," prepared by Dillon Consulting for North Pulp Nova Scotia Corporation, and submitted for environmental assessment, in accordance with Part IV of the Environment Act.

My comments are based on my training, research and experience as an Associate Professor, Endowed Chair in Sustainability and Environmental Health, Director of the Environmental Science program, and as a Senior Research Scholar with the Healthy Populations Institute at Dalhousie University in the fields of environmental epidemiology and health geography. I hold a Ph.D. in Population Health Science from the University of Ottawa and have conducted research in the area of air pollution epidemiology for more than a decade. I have also participated as a Co-investigator on a Canadian Institutes of Health Research-funded project to evaluate the health and environmental conditions of residents in Pictou Landing First Nation (PLFN) which employed a two-eyed seeing approach to evaluate environmental exposure and community health status in the community.

Given my background the following comments explore the potential for health-related impacts arising from the project and ongoing operation of the pulp mill, and form a response to the following questions:

1. Please identify the portions of the materials filed by Northern Pulp as part of its registration package on which you are qualified to comment based on your expertise.

I have reviewed specific sections of the Registration Document as they relate to my expertise, including Sections 1-7, Section 8.1 on air emissions, Section 8.2 on noise, and Sections 9.1, 9.2.1, and 9.2.4.1 on health effects.

2. Within the portions of the materials identified in your response to question 1, what is your opinion with respect to the major findings and conclusions expressed in the materials?

Section 6.7, Page 117: Concerns by community members living in Pictou Landing First Nation (PLFN) and others were raised about perceived high incidence of cancers. The use of the 2018 NSCCP report (Saint-Jacques et al., 2018) is not an adequate response to this concern for several reasons. The report estimates cancer incidence for the county (Pictou) and not for sub-regions within the county or for populations surrounding the mill. In addition, the report does not provide detailed reporting of specific cancers that could be linked to ingestion of weakly-chlorinated compounds, such as bladder, pancreatic and other cancer sites, via consumption of marine or terrestrial food sources, or the inhalation of fine particles from stack emissions.

Saint-Jacques N, Dewar R, Nauta L, MacIntyre M. 2018. Nova Scotia Cancer Incidence and Survival. Statistics Update: Focusing on 2011-15. Registry & Analytics, Nova Scotia Cancer Care Program, Nova Scotia Health Authority.

Section 9.1: The Registration Document identifies two main sources of emissions or discharges that may result in potential human exposure to toxins, including air emissions from the replacement ETF and existing mill and the marine treated effluent diffuser. The evaluation does not include the estimation of human health impacts, even if low risk, arising from contamination of ground and well water supplies due to leakage from the effluent pipe from mechanical or connection failures at drain valve locations.

Regarding effluent characteristics the report claims that the actual chemical composition, including specific substances in the treated effluent and their associated concentration, are not known with certainty until operations begin. However, it is well within the capacity of the proponent to develop emission/effluent models with varying degrees of uncertainty associated with chemical composition. What is known is that the effluent will contain low but detectable levels of chlorinated by-products, some of which are high toxic, mutagenic and that can bioaccumulate even in small amounts.

The registration document refers to a toxicological report authored by scientists with Toxikos (2006) that reported negligible risks to human health from consumption of marine-based food sources exposed to effluent discharge near the diffuser. However, the report does not include assessment of chlorinated aliphatic compounds which may still be present at low concentrations even under modern effluent treatment conditions. The reason provided for this omission is the notion that modern kraft pulp production uses chlorine dioxide as a bleaching agent which results in significant reductions in chlorinated residual compounds in effluent.

However, although concentrations of chlorinated compounds have decreased significantly from levels generated by mills employing elemental chlorine as a bleaching agent, they have not been eliminated by the use of chlorine dioxide (Bajpai, 2015).

Bajpai P. Green Chemistry and Sustainability in Pulp and Paper Industry. Switzerland: Springer International Publishing, 2015.

Toxikos. 2006. Human Health Risk Assessment – Bell Bay Pulp Mill Effluent. Prepared for: Gunns Ltd. Prepared by: Toxikos Pty Ltd., Toxicology Consultants. TR081205-RJF. July, 2006.

Section 9.2.1: The registration document identifies three exposure pathways, including inhalation, ingestion and dermal absorption. However, it is now well recognized, supported by a substantive evidence base, that exposure to harmful or beneficial characteristics of the environment may also occur through visual and aural routes leading to physiological impacts, eg. via damage to hearing, or the development of psychological impacts leading to increased stress response and mental health challenges. The development of (perceived) community illness (e.g. cancer incidence) in PLFN offers an interesting case example of how contamination of the environment, particularly environments with long-standing valued ecosystem components (VECs), e.g. hunting, fishing, recreational and spiritual values, leads to a severing of community connections to the surrounding environment and a real or perceived impact of contamination on health in the community. Additional impacts may also arise in the broader community, particularly among the fishing sector which may experience challenges with the sale of products sourced from locations near the effluent diffuser.

Section 9.2.4.1 : The registration document outlines the identification of Chemicals of Potential Concern (COPC) in air emissions associated with different aspects of the project. Specifically, the report evaluates emissions regulated in Nova Scotia under current air quality regulations and existing approvals for the emissions of fine particles. These pollutants include, and are limited to, carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulate matter (TSP), and fine particulate matter ($PM_{2.5}$). According to the report, ambient air monitoring data for the last three years show no exceedances when assessed against current Nova Scotia Air Quality Regulations, other than the occasional instances of excess H_2S releases. However, the report provides no data or discussion with reference to speciation of particulates, specifically fine particles ($PM_{2.5}$) which may have significant health impacts at any level above background.

Much of the epidemiological literature on the association between fine particles and human health impacts employs measurements of particle mass of a specific aerodiameter as a fraction of air volume, and as a function of exposure. However, not all particles and their associated chemical composition are created equally; those arising from emissions associated with the creation of kraft pulp will have chemical signatures and composition that differs from other sources. Typical *speciation methods* will enable detection of particle- and gas-phase organic and carbonyl compounds, metals, as well as determination of air toxics typical to emissions from pulp and paper operations using recovery boilers. Although there are several sources of air emissions, including fine particle emissions, within the study area, speciation of fine particles would provide data on the fraction of $PM_{2.5}$ associated with mill operations and the potential for human exposure to air toxics characteristic to kraft pulp operations.

Section 9.2.4.2: In addition to air emissions, human exposures to mill emissions are possible via ingestion of marine organisms exposed to substances released at the location of the effluent diffuser (Page 495). Of greatest concern would be chlorinated COPCs such as chlorinated aliphatic hydrocarbons, chlorinated organics and metals such as cadmium and mercury. In addition to chlorinated compounds, the effluent is likely to contain endocrine disrupting compounds such as androstenediones and other substances with androgenic or estrogenic properties. These substances may interfere with endocrine balance critical to fish or reproduction of other marine organisms, thus affecting associated populations relevant to commercial and recreational fishing operations. The proposed Environmental Assessment follow-up and performance monitoring program should include monitoring programs of marine species relevant to human exposure pathways.

3. What is your view as to the reliability of the underlying research conducted and relied upon in reaching the findings and conclusions? What if any information gaps or data gaps exist within the materials? If so, what impacts, if any, do those gaps have on the data and on the reliability of the conclusions that can be drawn, or are drawn, from that data?

I am confident in the reliability of the underlying research conducted and relied upon in supporting the findings and conclusion presented in sections of the Registration Document reviewed for the purposes of developing the comments in this letter. However, there are instances of statements and conclusions made in the document that are not well supported by the evidence referenced.

For example, reference to provincial cancer statistics released at the county level do not provide evidence of no negative effect on human health associated with exposures to mill effluent among residents of PLFN (Page 117).

In another example, the document relies heavily on analysis (Toxikos, 2006) of effluent from a proposed mill. In other words, the true chemical composition of the effluent is unknown and toxicological analysis was based on sample effluent taken from operating mills of similar design at dilutions equal to or less than 10% which does not account for potential diffusion problems.

In terms of routes of human exposure, the registration document omits research on the psychological impacts of the project, limiting exposures to traditional routes such as inhalation, ingestion and dermal absorption. The notion of releasing pollution (formally identified as effluent) into the local environment will invariably increase stress levels in the communities affected, regardless of efforts made to dilute the pollution in the receiving media. The result of the omission is an inability to recognize and assess health effects of stress associated with perceived contamination of the local environment and potential impacts to local livelihoods.

The registration document also omits reference to the practice of speciation as a legitimate approach to the identification of fine particulate pollution origin. Although measured concentrations of fine respirable particulate pollution are within guideline values it should also be recognized that: 1) there is no safe level of exposure to fine particulate pollution, and 2) the chemical composition of particles varies with source so that the toxicity of particulate pollution will also vary with the source. The omission of any reference to speciation limits the reliability of the conclusion of no significant impact arising from the proposed project or continuing mill operations.

4. What significant assumptions are relied upon in the materials filed by Northern Pulp, and what is your view as to the reliability of each such assumption? What is the impact of each assumption on the findings contained in the Northern Pulp materials?

There are several significant assumptions contained with the materials filed by Northern Pulp.

Assumption 1: There is no evidence of increased cancer risk associated with mill operations, either historic or proposed modifications to these operations. The materials do not provide any evidence in support of this assumption other than a provincial report of cancer prevalence for the county as a whole. The use of this report would support the assumption that there is no variation in cancer prevalence within the county.

Assumption 2: The analysis and conclusions reached as part of a toxicological analysis of potential effluent (not actual effluent) from a proposed mill in another location are applicable to the proposed project. While the science underlying the analysis is likely to be sound, the conclusions may not be as reliable as portrayed in the registration document.

Assumption 3: The identification of human exposures assumes no impact on health associated with perceived risk of pollution discharge, regardless of dilution, in areas of concern including local wetlands, groundwater recharge zones, and in active fishing grounds. The conclusion of no significant impact on health is potentially erroneous in this context.

Assumption 4: Current air emissions from the mill are well within provincial and federal air quality guidelines and thus there are no potential health effects from air pollution exposures. This assumption does not acknowledge the fact that there are no "safe" concentrations of air pollution, particularly for particulate air pollution which has been shown to have health effects even at low concentrations (Cohen et al., 2017; ECCC, 2017). Moreover, the materials assume that particulate air pollution, regardless of source, will have similar health impacts. However, without conducting speciation analysis on particles collected in receptor communities, the impact of mill emissions cannot be discounted by concluding that there are a variety of air pollution sources within the vicinity of local populations (e.g., power plant, tire plant, vehicular emissions, fugitive dusts, etc.). The conclusion of no significant impact on health may not be accurate.

Cohen et al. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. Lancet 2017;389:1907-18.

http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=CB7B92BA-1&pedisable=true. Accessed: February 22, 2019.

5. Within the portions of the materials identified in your response to question 1, are there any [findings/issues/etc] on which you are unable to express an opinion? If so, why are you unable to express an opinion? What, if anything, would enable you to express such an opinion?

There are no portions in the sections identified in my response on which I was unable to express an opinion.

Thank you for the opportunity to provide comments on the environmental assessment materials submitted by Northern Pulp.

Sincerely,

Director, Environmental Science
Senior Research Scholar, Institute of Population Health

APPENDIX D-2

, PH.D.

CURRICULUM VITAE

35 Pages redacted as per Section 20 of the FOIPOP Act

RESEARCH AND IDEAS IN THE MEDIA:

November 2017: What neighbourhood noise drives you nuts? CBC Maritime Noon, November 3, 2017.

November 2017: Noise and health effects. CBC Radio 1: Mainstreet. November 2017.

November 2014: Dal study looks at physical effects of exposure to nature. By Ben Cousins. UNews, November 18, 2014.

May 2013: Chronic illness high near pulp mill. By Daniel Campbell. The News, May 3, 2013.

July 2012: The future of downtown: re-ripening Barrington Street. By Chris Benjamin. Openfile, July 6, 2012.

June 2012: Getting kids moving. Maritime Noon, CBC, Halifax, Nova Scotia (.mp3).

June 2012: A television interview about the Environment, Nutrition and Physical Activity Project and the results of the paper published in the American Journal of Preventive Medicine. CTV Morning Live, Halifax, Nova Scotia.

May 2012: City kids get more exercise than rural ones. The Chronicle Herald, Halifax, Nova Scotia (online).

April 2012: Obesity linked to neighbourhood features: Do you live in a fat neighborhood? ABC News (online).

April 2012: New technology maps the surprising subtleties of childhood and teen obesity. Scientific American (Observations Blog),

August 2011: A television interview about the Legacy Research Grant and Kelsey O'Brien's work on radon mapping. CTV Morning Live. Halifax, Nova Scotia.

July 2011: Feds to probe air pollution from ships; Study will analyze data from 55 air quality monitors in Halifax. The Chronicle Herald. Halifax, Nova Scotia.

August 2010: Researcher wants to probe air quality. The Chronicle Herald. Halifax, Nova Scotia.

November 2009: Sustainable Offices 101. Green Living Magazine.

February 2009: Tracking our eco-footprints. The Coast. Halifax, Nova Scotia.

October 2008: The Joy of Parking: Hot Meters Map and Map of Parking Ticket Intensity. CBC News Feature Report. Halifax, Nova Scotia.

February 2007: A night on the town: Interactive Map of Reported Crimes. CBC News Feature Report. Halifax, Nova Scotia.

June 2009: Is your neighbourhood healthy? Harrowsmith Country Life (Vol. 30, pp. 108-9).

March 2006: He knows where you've been. Dalhousie Alumni Magazine. Halifax, Nova Scotia.

APPENDIX E-1

February 23, 2019

IN RESPONSE TO: Dillon Consulting Limited (2019). Northern Pulp Nova Scotia environmental assessment registration document: replacement effluent treatment facility. https://www.novascotia.ca/nse/

Dear ,

Thank you for your interest in our study, "*Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia*" (Hoffman et al. 2017). The following is a response to the misrepresentation put forth by Northern Pulp's Environmental Assessment (EA) of the scientific contributions our study provides.

Explanation of key topics (Hoffman et al. 2017):

- There is growing concern about the toxicity of volatile organic compounds (VOCs) (Cicolella 2008), their presence in air, and the consequences of long-term, low-dose exposure to these agents. Airborne VOCs are varied and widespread pollutants (e.g., hydrocarbons, aromatics, and some chlorinated compounds) and are increasingly recognized as important precursors to $PM_{2.5}$ and ground-level O_3 formation through photochemical reactions (Ryerson et al. 2001). Many VOCs are included in the US Environmental Protection Agency (EPA) air toxics list.
- "Air toxics" are defined as "those pollutants that cause or may cause cancer or other serious health effects […] or adverse environmental and ecological effects" (EPA 2015a).
- Ambient air monitoring in the US is conducted in accordance with the Clean Air Act (CAA) (Clean Air Act 1970). CAA amendments identify 187 air toxics, which form the basis for EPA's approach to regulating emissions (EPA 2015a). Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas (EPA 2015b). Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment (NATA), a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics (EPA 2015c). Such a rigorous initiative has not been implemented in Canada, where no federal guidelines exist for ambient air toxics. Yet, some of these air toxics, as noted in our publication, have been identified as associated with increased risks for chronic disease. See, for example, Paul Villeneuve et al. (2013) (https://www.ncbi.nlm.nih.gov/pubmed/23369806) which showed an increase risk of cancer mortality associated with elevated ambient air benzene concentrations in urban Toronto.
- The National Air Pollution Surveillance (NAPS) program was established to monitor and assess ambient (outdoor) air quality at various urban and rural areas across Canada. This program focuses primarily on the criterion air pollutants (nitrogen dioxide, ozone, $PM_{2.5}$ and sulphur dioxide). Several EPA-designated air toxics are routinely quantified in Canada; however, at a subset of NAPS monitoring sites.
- VOCs selected for analysis in this investigation were based on EPA's list of 30 urban air toxics (EPA 2015b) and *National Air Toxics Trends Station Work Plan Template* (EPA

2015d). Therefore, this investigation represents one of the few peer-reviewed published studies on record about airborne VOCs in rural Canada.

This was a "*pilot*" study (as indicated by the title and subsequent sections of the study); therefore, it was not meant to provide causal evidence to implicate the presence of airborne VOCs as solely emanating from Northern Pulp ("the mill"), as the EA suggests. Nevertheless, we were interested in documenting VOC-related air quality in the vicinity of the mill, given that pulp mills are present across rural Canada. Publicly accessible Environment and Climate Change Canada (ECCC) data (VOC concentrations [Granton NAPS ID: 31201, located southwest of the mill], and local meteorological conditions [Caribou Point]) (http://climate.weather.gc.ca/climateData/; http://maps-cartes.ec.gc.ca/rnspa-naps/) were examined using temporal (2006–2013) and spatial analytic methods to investigate prioritized air toxic ambient VOC concentrations near a pulp plant to determine whether these emissions concentrations were in the range of US EPA air toxic levels (EPA 2015d) (https://www3.epa.gov/ttnamti1/files/ambient/airtox/nattsworkplantemplate.pdf).

Results highlight associations with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to the location of the mill. Compared to all other wind directions, prevailing winds from the northeast and the mill typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations; however (as stated in the study), the origin(s) of VOCs are "*inconclusive*", and "*other local sources likely contribute to air toxics emissions*". The mill's EA states that "[this study] did not attempt to rule out contributions from other potential sources of VOCs in the area", which is clearly not a true statement - other potential local emission sources were discussed in detail in the publication. Figure 1, for example, is a map displaying other local point source emitters in the community (e.g., tire manufacturing facility, coal-fired thermal electrical generating station).

VOCs (1,3-butadiene, benzene, and carbon tetrachloride) routinely exceeded EPA air toxics-associated cancer risk thresholds, regardless of whether the mill contributed to these VOC levels, and is a significant finding that warrants further investigation. The EA's statement: *"When other study uncertainties are considered […] there is no current air quality issue with the seven targeted VOCs in the Pictou County area"* is misleading. Due to the limited number of sampling sites, the problem with the location of the sampling site in relation to the location of the mill, and the short duration of our study, we explicitly identified the need for further investigation on this question. As commonly identified by environmental researchers, absence of evidence is not necessarily evidence of absence. Therefore, the limitations caused by sparse data does not necessarily mean there is no problem with air emissions in this community and there is no justification for this erroneous conclusion, as stated in the EA.

The EA statement, *"The seven VOCs are not known (based on literature review) to be associated with pulp and paper mill activities and air emissions to any significant extent",* is both unclear and undefined. Furthermore, the EA does not specify how the literature was reviewed/cited to support this statement. According to the mill's own self-reported NPRI report in 2012, 143.18

tonnes of VOCs were atmospherically emitted on-site (ECCC 2012). An estimated 3.195 tonnes of benzene were released to the air from a stack higher than 50 m and 0.022 tonnes were released within 50 m of the ground. Benzene can combine with chlorinated hydrocarbons associated with the Kraft bleaching process to form a range of toxic compounds which can be volatilized. Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not officially reported to have been released by Northern Pulp, these VOCs may become airborne through evaporation from pulp and paper wastewater (Soskolne and Sieswerda 2010). Boat Harbour (the mill's effluent treatment facility) may therefore contribute to ambient concentrations of VOCs. The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane (EPA 1985). However, we address other local and area sources which likely contribute to the observed VOC concentrations, which warrants further investigation. We note that direct links between 1,3-butdiene and vinyl chloride with pulp and paper industries have not been reported in the scientific literature to date.

With regards to the EA statement, "For the carcinogenic inhalation TRVs that were applied, the authors did not adjust these values from the default USEPA target cancer risk level of 1 in 1 million to the target cancer risk level that is current public health policy in Nova Scotia and most other provinces (i.e., 1 in 100,000). Thus, the TRVs for carcinogens cited in the paper should have been ten times higher than indicated. This correction would alter the conclusions of the study substantially in that for the seven VOCs considered, there would be no to negligible exceedances of the TRVs that were applied", their proposal is not relevant given that Health Canada has no guidelines nor process in place that is required for such comparisons. In contrast, the US NATA process is based upon a 2005 scientific risk assessment process well laid out by EPA which established the cancer risk levels to which the ECCC data were compared (Hoffman et al. 2017). Furthermore, it should be stated that our study was published in an excellent, internationally-recognized environmental science peer-reviewed journal (*Environmental Science and Pollution Research*) and met the journal's quality control standards.

To reiterate the value of this study: "*Despite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with pulp and paper emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in pulp and paper towns and contribute to poor health in nearby communities.*" Various recommendations were put forth to improve the rigor and validity of the present study (e.g., a field component consisting of real-time measurements of ambient air toxics; a comprehensive risk assessment to investigate uncertainties that have implications for risk estimates in the present study).

Furthermore, we addressed various limitations and gaps in air quality monitoring, not only locally but nationally, and provided recommendations how air quality management could be improved to support informed public health decisions (e.g., epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate considerations, as outlined; more strategically placed air monitoring stations; evaluation of a wide-suite of air toxics) - topics ECCC and applicable stakeholders should consider. To the

contrary and to my surprise, the Granton NAPS station has now been decommissioned. This information vacuum only emphasizes the need for more research on these questions.

In summary, the intent of this pilot study was to address local air quality conditions in a Nova Scotia rural community, which clearly indicates the need for further investigation. Moreover, this pilot study serves as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of all citizens is safeguarded and prioritized.

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APPENDIX E-2

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Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia

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RESEARCH ARTICLE

Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia

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Received: 15 December 2016 / Accepted: 21 June 2017
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Abstract Air toxics are airborne pollutants known or suspected to cause cancer or other serious health effects, including certain volatile organic compounds (VOCs), prioritized by the US Environmental Protection Agency (EPA). While several EPA-designated air toxics are monitored at a subset of Canadian National Air Pollution Surveillance (NAPS) sites, Canada has no specific "air toxics" control priorities. Although pulp and paper (P&P) mills are major industrial emitters of air pollutants, few studies quantified the spectrum of air quality exposures. Moreover, most NAPS monitoring sites are in urban centers; in contrast, rural NAPS sites are sparse with few exposure risk records. The objective of this pilot study was to investigate prioritized air toxic ambient VOC concentrations using NAPS hourly emissions data from a rural Pictou, Nova Scotia Kraft P&P town to document concentration levels, and to determine whether these concentrations correlated with wind direction at the NAPS site (located southwest of the mill). Publicly accessible Environment and Climate Change Canada data (VOC concentrations [Granton NAPS ID: 31201] and local meteorological conditions [Caribou Point]) were examined using temporal (2006–2013) and spatial analytic methods. Results revealed several VOCs (1,3-butadiene, benzene, and carbon tetrachloride) routinely exceeded EPA air toxics-associated cancer risk thresholds. 1,3-Butadiene and tetrachloroethylene were significantly higher ($p < 0.05$) when prevailing wind direction blew from the northeast and the mill towards the NAPS site. Conversely, when prevailing winds originated from the southwest towards the mill, higher median VOC air toxics concentrations at the NAPS site, except carbon tetrachloride, were not observed. Despite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with P&P emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in P&P towns and contribute to poor health in nearby communities.

Keywords Air toxics · Air quality · Volatile organic compounds (VOCs) · Community health · Pulp and paper · Cancer risk

Responsible editor: Constantini Samara

Electronic supplementary material The online version of this article (doi:10.1007/s11356-017-9719-5) contains supplementary material, which is available to authorized users.

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Introduction

Poor ambient air quality is an increasing global concern with recent revelations that 92% of the world's population is exposed to air pollution levels above the World Health Organization (WHO) air quality guidelines (WHO 2006, 2016; Kelly and Fussell 2015). Ambient air pollution is widely recognized and increasingly associated with a wide range of acute and chronic adverse health effects, including cancer, cardiovascular, respiratory, and mortality outcomes (IOM 2011; Villeneuve et al. 2013; ECCC 2015a). The pathological mechanisms by which these toxic exposures exert their effects are not well understood. WHO highlights the need for research in order to better inform exposure-response relationships (WHO 2016).

Published online: 15 July 2017

Most air pollution surveillance activities are limited to measurement of respirable fine particulate matter ≤2.5 μm ($PM_{2.5}$), without regard to their specific chemical composition and criterion air contaminant (CAC) gases (i.e., nitrogen oxides [NO_x] and ground-level ozone [O_3]). There is growing concern about the toxicity of volatile organic compounds (VOCs) (Cicolella 2008) and the consequences of long-term, low-dose exposure to these agents. VOCs are varied and widespread air pollutants (e.g., hydrocarbons, aromatics, and some chlorinated compounds) that are increasingly recognized as important precursors to $PM_{2.5}$ and ground-level O_3 formation through photochemical reactions (Ryerson et al. 2001). Atmospheric deposition of VOCs may contaminate other environmental media (e.g., soils, sediments, and biota) (ATSDR 2014a; MacAskill et al. 2016). Many VOCs are included in the US Environmental Protection Agency (EPA) "air toxics" list. "Air toxics" are defined as "those pollutants that cause or may cause cancer or other serious health effects […] or adverse environmental and ecological effects" (EPA 2015a).

According to the Canadian Environmental Protection Act 1999 (CEPA), VOC releases are acknowledged as a health concern, but, due to their highly volatile properties, are challenging to monitor and manage (CCME 2011). Although no specific Canadian legislative or regulatory tools address ambient VOC levels, emissions are indirectly controlled through regulatory mitigation of $PM_{2.5}$ and ground-level O_3 under the Canadian Ambient Air Quality Standards (CAAQS). Under CEPA, it is mandatory for owners or facility operators, who meet reporting requirements, to self-report pollutant releases to air, water, and land to Environment and Climate Change Canada (ECCC)'s National Pollutant Release Inventory (NPRI) (ECCC 2014). While this provides a disincentive to those industries releasing these agents, there is less regulatory control or routine monitoring of these agents in Canada which, in turn, limits scientific understanding of sources, exposures, and the effectiveness of current control measures across the country.

Ambient air monitoring in the US is conducted in accordance with the *Clean Air Act* (CAA) (Clean Air Act 1970). CAA amendments identify 187 air toxics, which form the basis for EPA's approach to regulating emissions (EPA 2015a). Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas (EPA 2015b). Although many CEPA-toxic or equivalent agents are monitored by the National Air Pollution Surveillance (NAPS) network, it includes a selection (not all) of EPA's list of prioritized air toxics, and the main criteria for air toxics monitoring in Canada has been their potential contribution to ambient PM and ground-level O_3 (Galarneau et al. 2016). Consequently, there are gaps in understanding of air toxics concentrations across the NAPS network. Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment (NATA), a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics (EPA 2015c). Such a rigorous initiative has yet to be implemented in Canada, where no federal guidelines exist for ambient air toxics.

Despite economic benefits of the P&P industry, it generates large quantities of atmospheric and effluent emissions, resulting in environmental degradation (Hewitt et al. 2006; Hoffman et al. 2015; Hoffman et al. 2017). P&P mill emissions vary depending on the pulping method, wood species, and by the age and technology used (Soskolne and Sieswerda 2010). P&P mills are industrial emitters of air toxics, although few investigations (e.g., the Nez Perce National Air Toxics Program, funded by EPA [STI 2009]) have characterized ambient concentrations in nearby communities.

Potential adverse health effects associated with exposure to air pollutants in the vicinity and downwind from P&P facilities include respiratory disease, neurophysical symptoms, and higher risks of contracting lung cancer (Soto et al. 1991; Toren et al. 1996; Mirabelli and Wing 2006). Yet, few investigations reported adverse health effects from chronic community-level ambient exposures to P&P mills emissions in Canada (Mirabelli and Wing 2006; Soskolne and Sieswerda 2010). While there have been a number of occupational epidemiological studies of P&P workers, these investigations have not been extended to examine community exposures, due to research design challenges including ecological fallacy (i.e., inferences made about individuals deduced from the population) in community studies (Soskolne and Sieswerda 2010). Additionally, most of these studies focused on respiratory disease outcomes; there is a dearth of epidemiological studies of cardiovascular effects or cancer effects in these communities.

Decades-long concerns for perceived higher incidence and mortality rates for all-cause cancer, cardiovascular disease, chronic respiratory disease, and diabetes (Reid 1989; PCHA 2008; Statistics Canada 2013) in PC, Nova Scotia, have generated considerable community antipathy among residents towards a local P&P mill (Hoffman et al. 2015). This bleached kraft P&P mill ("the mill") is located approximately 3 km south of the town of Pictou (population 3500) and produces approximately 280,000 t of bleached kraft pulp annually from softwood and hardwood chips (NP 2016b) (Fig. 1) and has been in production since 1967 (Ogden 1972). Public backlash gained momentum during 2014 due to the failure of the recovery boiler electrostatic precipitator (i.e., particulate filtration device).

Environmental reporting by the mill, when compared against provincial and federal regulatory compliance standards, contrasted to local perceptions of impacts. Most environmental monitoring reports indicated some

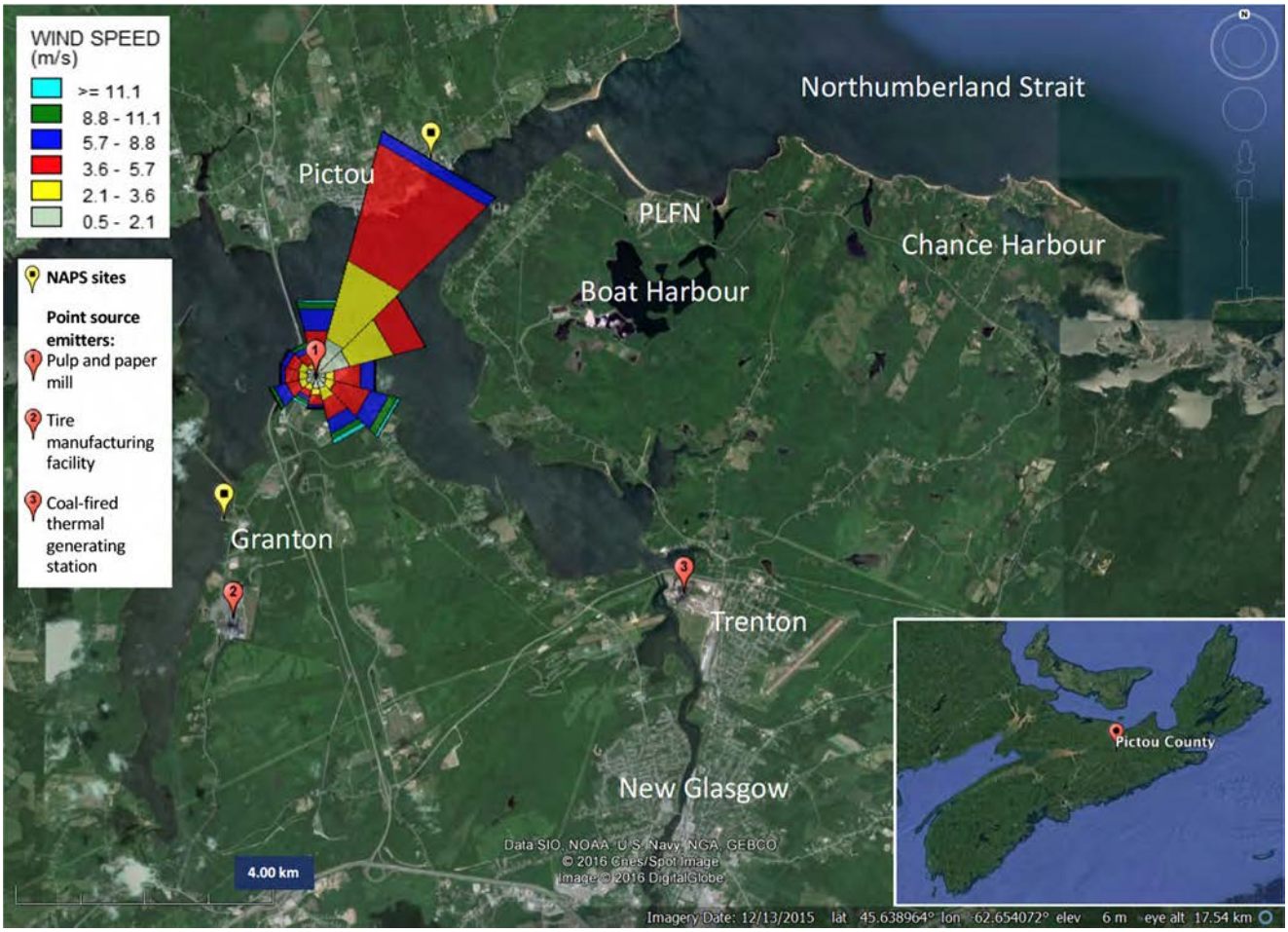

Fig. 1 Summer (2006–2013) wind rose simulation using WRPlot View™ (blowing to direction) with the mill as the focal point (*1*), relative to communities (e.g., Pictou and Pictou Landing First Nation [PLFN]), NAPS discrete receptor sites, and other local point source emitters (e.g., tire manufacturing facility (*2*), coal-fired thermal electrical generating station (*3*)). The length of each radial spoke represents the relative frequency of wind direction (©Google Earth)

level of compliance in atmospheric emissions, but when compliance targets were exceeded, there were inconsistent regulatory enforcement (Hoffman et al. 2015). The mill is required to report emissions to NPRI: conduct third-party stack testing, continuous emission monitoring of total reduced sulfur (TRS), and ambient air monitoring for pollutants found in the Nova Scotia Air Quality Regulations pursuant to the *Environment Act* (NSE 2015). The mill's air emission monitoring data are reviewed by provincial and federal regulators to ensure compliance with applicable environmental permits and air quality objectives (ECCC 2014). Hoffman et al. (2015) provided detailed information on new and existing environmental policies that impose pollution abatement in the P&P industry in Canada, particularly the PC mill (e.g., 2015 Industrial Approval).

These are critical research gaps both in relation to community exposures to VOCs in P&P communities and in regard to adverse health effects resulting from chronic exposure to P&P emissions which are a concern given the potential adverse health outcomes that VOCs and other P&P air emissions pose. This further justifies the need for more research to characterize air quality in this particular subset of industrial communities, which have often been neglected because of their remote locations.

An intensive study of specific ambient air toxic emissions in PC has not been undertaken. The aim of this pilot study was to assess levels of PC community exposures to VOC air toxics emissions from 2006 to 2013, and to evaluate these data in relation to potential risks suggested by EPA air toxic guidelines. The main objective of this study was to determine whether wind direction correlated with prioritized air toxic ambient VOC concentrations at a nearby NAPS site (Granton). As the Granton NAPS site is positioned southwest of the mill, it was hypothesized that prevailing winds (PW) from northerly and northeasterly directions would

positively correlate with an increase in ambient VOC concentrations, as capturing potential VOCs from the mill's plume would be optimized (Fig. 1).

Materials and methods

Spatial and temporal sampling

Historical meteorological and NAPS data from the Granton NAPS site discrete receptor (ID: 31201) were collected from publically assessable ECCC databases (http://climate.weather.gc.ca/climateData/; http://maps-cartes.ec.gc.ca/rnspa-naps/). Hourly surface wind observations (i.e., speed and direction to the nearest 10°) were obtained from the closest EC meteorological station, Caribou Point (45.767° N; 62.683° W), located ~10 km north of the mill (45.652° N; 62.718° W). Temporal data for ambient VOCs monitored at the Granton NAPS station were limited to 2006 to 2013.

Nova Scotia Environment (NSE) operates both NAPS monitoring stations in PC: (i) downtown Pictou (ID: 30901) located 3.5 km northeast of the mill and (ii) Granton (ID: 31201) located 2.5 km southwest of the mill (Fig. 1). The Pictou NAPS site routinely monitors NO, NO_2, NO_x, O_3, $PM_{2.5}$, TRS (not VOCs), and wind characteristics, whereas the Granton site monitors 36 VOC species. Multi-component VOC monitoring at NAPS sites are conducted using canister sampling and gas chromatography/mass spectrometry (GC/MS) (CCME 2011). Sampling of 24 h (midnight to midnight) cumulative ambient air samples ($\mu g/m^3$) are taken on a 1-in-6-day schedule by pumping ambient air into pressurized stainless steel SUMMA® canisters and analyzed by an EC accredited Laboratory (CCME 2011; Galarneau et al. 2016).

Statistical analyses

Variation of meteorological conditions and VOC concentrations were assessed by conducting a spatiotemporal analysis to characterize ambient air toxics emissions in PC from 2006 to 2013. Various analytical methods can be applied to concentration data to estimate source apportionments of air pollutants to provide additional insights into the source/receptor relationships to guide development of more effective air quality management strategies (Hopke 2016). However, given the limitations of having complete VOC data from only one NAPS monitoring station in the region, a full chemical mass balance analysis to identify and apportion sources of atmospheric contaminants were not conducted in this study.

Wind rose plots were generated with WRPlot View™ (©Lakes Environmental Software) to simulate seasonal and spatial variation of wind direction (°) frequency and wind speed (m/s) with the mill as the focal point. Although simplified, wind rose models have proven utility for estimating spatial gradients for fate and transport of pollutants from emission sources (Gibson et al. 2013). Summer, when local people spend more time outdoors (and more vulnerable to outdoor pollution exposure), was a focus of this study (Figs. 1 and 2).

This pilot study was conducted to determine whether ambient concentrations of VOCs exceeded their EPA-associated cancer and/or noncancer risk thresholds, to help identify potential human health concerns in PC. VOCs selected for analysis were based on EPA's list of 30 urban air toxics (EPA 2015b) and *National Air Toxics Trends Station Work Plan Template* (EPA 2015d). Health Canada and the province of Nova Scotia currently do not have specific guidelines for air toxics exposures. Therefore, EPA thresholds were considered a more acceptable standard for carcinogenic exposures in this study. Cancer risk threshold refers to the probability of contracting cancer if exposed to a substance every day over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity. Noncancer risk threshold is associated with effects other than cancer, based on reference concentrations via the "hazard quotient" ratio (HQ; exposure divided by appropriate chronic or acute value) (EPA 2015c). The HQ should not be interpreted as a probability of adverse effects. Noncancer risk thresholds are typically higher compared to cancer risk thresholds, as lower concentrations can elicit a carcinogenic response, whereas other diseases are not triggered until higher exposure thresholds are reached. US and Canadian method detection limits (MDL) are provided (Health Canada 2010; EPA 2015d) (Table 1).

The mill is located approximately 40° northeast of the Granton NAPS site. The selected PW range expected to result in increased VOC concentrations at the NAPS site (±40° either side of the mill [80° total]). A narrower range may be more accurate; however, due to the sample size of VOC samples, the selected range captured more data. All other wind directions (AOWD) represent ranges outside PW (i.e., >80°, <360°). AOWD represent sampling days when no time PW blew from the selected range (i.e., 0 h). VOC concentrations for AOWD were compared to when PW were present for at least 1 h.

Hourly meteorological data were compiled to correspond with ambient VOC sampling. Hourly wind direction within defined PW range (i.e., 360°–80°) was assigned a value of 1; AOWD were assigned a value of 0. Daily totals represented the proportion of time with PW (i.e., 1–24 h) compared to AOWD. Daily

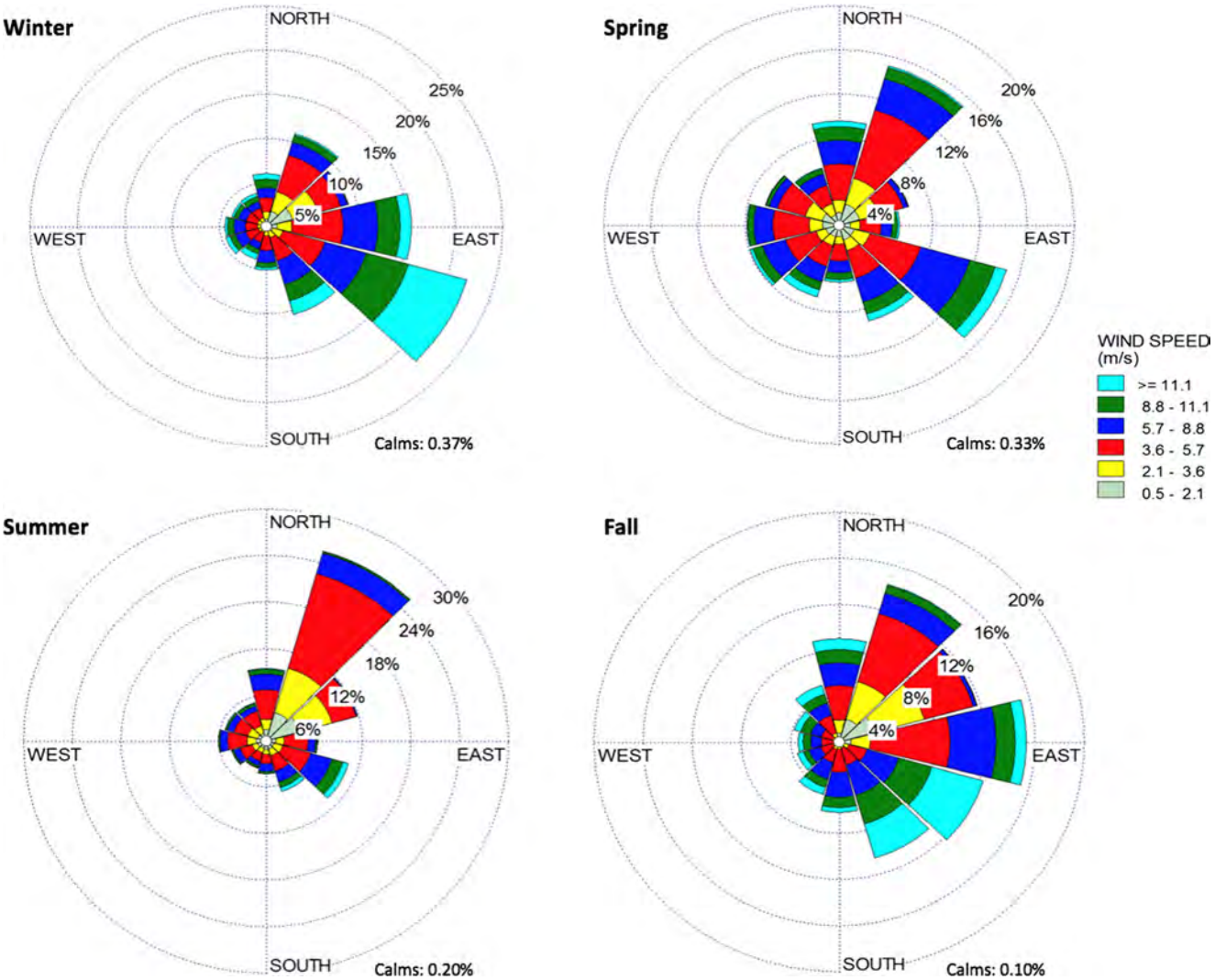

Fig. 2 Seasonal (2006–2013) wind rose simulations using WRPlot View™ (blowing to direction). Percentages represent frequency of wind direction

totals corresponding to VOC sampling were paired. Increasing proportions of PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) categorized VOC concentrations, which were predicted to correlate with higher VOC concentrations. To test the effect of wind direction and season on ambient VOC concentrations, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) were applied in ©R. Due to right-skewed distributions for all VOCs, except for carbon tetrachloride, statistical procedures were performed on both raw and log-transformation of VOC concentrations (Supplementary material Table S1).

Box plots and histograms were used to compare VOC concentrations with PW ≥ 1 h to AOWD on an annual and seasonal basis in relation to their respective cancer and noncancer risk thresholds. See Supplementary material for histograms, and additional box-and-whisker plots illustrating VOC concentrations with increasing time categories with PW (AOWD [0 h], ≥1 h, ≥4 h, ≥8 h, ≥12 h) (Figs. S2 and S4). Box plots display the distribution of data based on a five-number summary: minimum, first quartile, median, third quartile, and maximum. The central rectangle ("box") spans the first to the third quartile (i.e., interquartile range [IQR]). The horizontal line segment within the box represents the median, and "whiskers" above and below the box represent the minimum and maximum. Radar plots consist of a sequence of angular spokes, whose length extending from the center along a separate axis is proportional to the magnitude of the variable relative to the magnitude of the variable across all data points. Lines connect the data values for each spoke. Radar plots were used to display seasonal variation of median VOC concentrations for PW ≥ 1 h and AOWD. One-tailed *t* tests, assuming unequal variance, were performed to determine whether seasonal variation associated with increasing proportions of time

Table 1 List of priority air toxics (i.e., VOCs), associated cancer/noncancer risk thresholds (μg/m^3), and method detection limits (MDL) (μg/m^3) (Health Canada 2010; EPA 2015d)

VOC	Cancer risk[a] (μg/m^3)	Noncancer risk at HQ = 0.1[b] (μg/m^3)	MDL[c] (NATS) (μg/m^3)	MDL (Health Canada) (μg/m^3)
Chloroform	–	9.8	0.50	0.089
1,3-Butadiene	0.0300	0.2	0.10	0.055
Vinyl chloride	0.1100	10.0	0.11	0.046
Benzene	0.1300	3.0	0.13	0.038
Carbon tetrachloride	0.1700	19.0	0.17	0.123
Trichloroethylene	0.2083	0.2	0.20	0.190
Tetrachloroethylene	3.8462	4.0	0.17	0.120

[a] Cancer risk threshold: the probability of contracting cancer over the course of a lifetime (assumed to be 70 years for the purposes of NATA risk characterization). Lower threshold values correspond with higher toxicity (EPA 2015c)

[b] Noncancer risk threshold: the risk associated with effects other than cancer, based on the reference concentration via a ratio known as the "hazard quotient" (HQ; the exposure divided by the appropriate chronic or acute value)

[c] MDL: the lowest concentration that can be detected with confidence. NATA and Health Canada's MDLs are listed for comparison (Health Canada 2010; EPA 2015d)

with PW (i.e., ≥1 h, ≥4 h, ≥8 h, ≥12 h) resulted in a significant increase ($p < 0.05$) in VOC concentrations compared to AOWD (see Supplementary material, Table S3).

Quality control

Standard procedures of the Meteorological Service of Canada have been developed in accordance with internationally recommended procedures established by the World Meteorological Organization (ECCC 2013a). As part of the quality assurance and quality control (QA/QC) program, observational meteorological data are subjected to a computer analysis or review to reveal possible errors. EC and the operating agency are jointly responsible for the NAPS network QA/QC program. Elements of the program include site selection, sampling system requirements, instrument calibration and reference standard requirements, and inter-laboratory testing and performance audits. With few exceptions, analyzers are accorded with EPA designation as either a reference or equivalent method for ambient air monitoring (ECCC 2004). ECCC's air quality laboratories use International Organization for Standardization requirements (i.e., ISO 9001:2008 or ISO/IEC 17025:2005) (ECCC 2013b).

Results and discussion

Meteorological observations

Wind rose simulations illustrate seasonal variability with respect to wind direction, with the mill as the focal point (Fig. 2). During summer, wind blew NNE (25.47%) and ENE (11.80%) directions (aggregate range 15°–75°) towards Pictou and Pictou Landing First Nation (PLFN) (Figs. 1 and 2). Wind blew less frequently towards S-NNW (aggregate range 165°–345°) towards the Graton NAPS site. During winter, wind typically prevailed from the north; the highest frequency (21.99%) blowing ESE, followed by E (15.37%) directions (aggregate range 75°–135°) (Fig. 1). Spring and fall have meteorological characteristics that are similar to summer and winter and were considered transitional periods. Pictou, PLFN, Chance Harbour, Trenton and New Glasgow are communities close to the mill that are downwind of annual PW (range 15°–165°). The Granton NAPS site correlates poorly with seasonal or annual wind directions (Fig. 2).

VOC concentrations

Carbon tetrachloride had the highest median concentration (0.5452 μg/m^3) and vinyl chloride had the lowest (0.0014 μg/m^3) (Fig. 3). Carbon tetrachloride concentrations exceeded its EPA cancer risk threshold (0.1700 μg/m^3) for all samples, with maximum and minimum concentrations of 0.7047 and 0.2892 μg/m^3, respectively. Benzene concentrations exceeded its cancer risk threshold (0.1300 μg/m^3) for most samples, with maximum and minimum concentrations of 1.889 and 0.0266 μg/m^3, respectively. Concentrations of 1,3-butadiene concentrations occasionally exceeded its cancer risk threshold (0.0300 μg/m^3), with maximum and minimum concentrations of 0.1062 and 0 μg/m^3, respectively (Fig. 3). Consequently, 1,3-butadiene, benzene, and carbon tetrachloride were air toxics of primary concern in terms of local

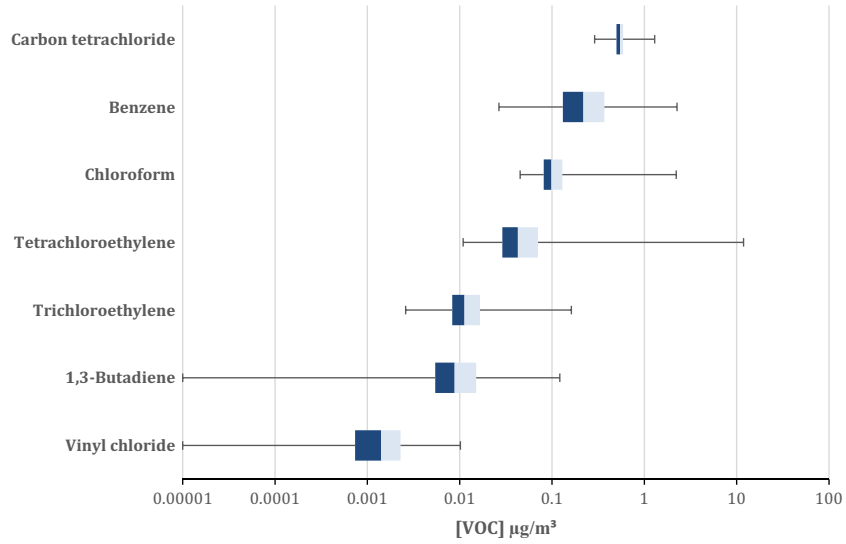

Fig. 3 Relative VOC concentrations (µg/m^3) (2006–2013). Should not be interpreted as orders of magnitude of toxicity. Minimum concentration for 1,3-butadiene and vinyl chloride is 0 µg/m^3 or undetectable

population risk. Other VOCs are presented in Supplementary material (Fig. S5).

ANOVA and MANOVA results revealed that 1,3-butadiene was significantly higher with the presence of PW ≥ 1 h (p = 0.001and p = 0.01 for raw and log-transformed data, respectively). Tetrachloroethylene was also statistically higher with the presence of PW ≥ 1 h (p < 0.01) for log-transformed data. Benzene approached significance with the presence of PW ≥ 1 h (p = 0.07) for log-transformed data. Although not statistically significant, median concentrations of other VOCs, except carbon tetrachloride, were equal or marginally higher with presence of PW ≥ 1 h compared to AOWD. Season had a consistent significant effect on VOC concentrations, except chloroform and tetrachloroethylene (Supplementary material Fig. S2 and Table S1).

Box plots combined with radar graphs illustrate seasonal variation of VOC concentrations of primary concern (i.e., 1,3-butadiene, benzene, carbon tetrachloride) under PW ≥ 1 h and AOWD conditions (Figs. 4, 5, and 6). Median VOC concentrations associated with PW ≥ 1 h and AOWD display parallel

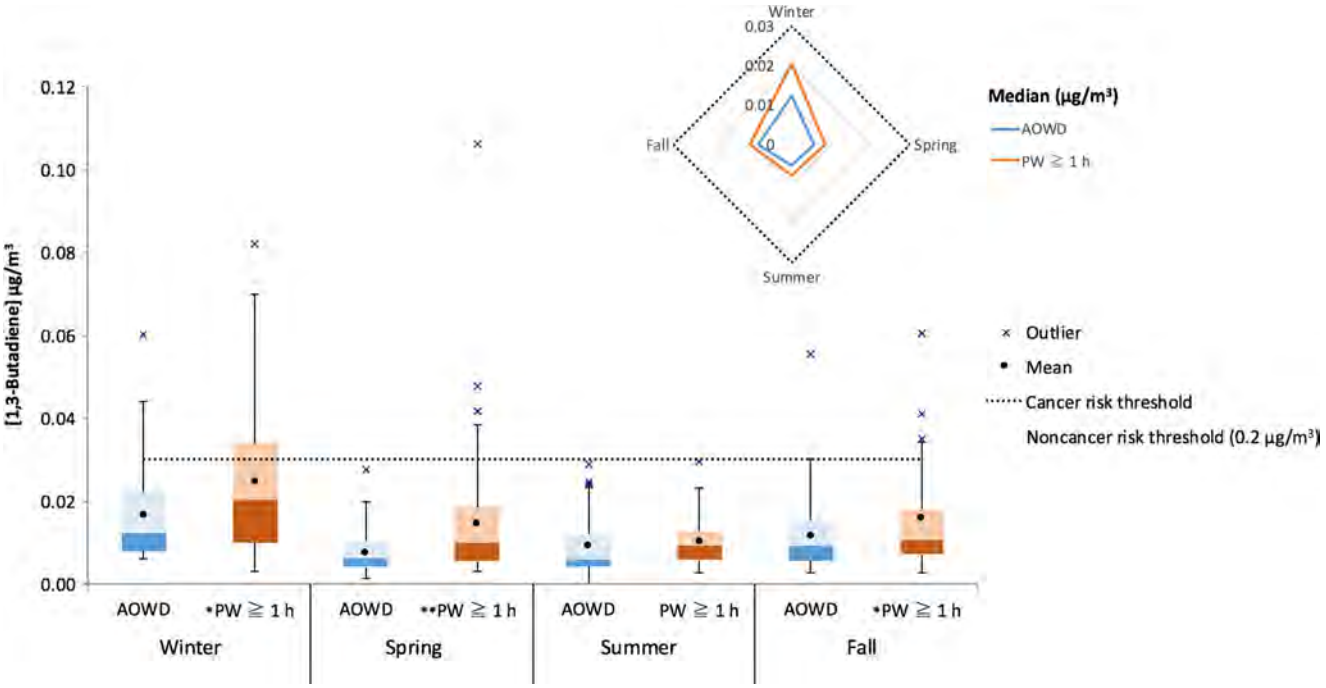

Fig. 4 Seasonal variation (2006–2013) of [1,3-butadiene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds. Minimum concentration is 0 µg/m^3 or undetectable. Significant differences indicated as *<0.05; **<0.01

seasonal trends. Concentrations of 1,3-butadiene (Fig. 4) and benzene (Fig. 5) exhibit seasonal variation. Both have evidently higher concentrations during winter, with summer having overall lowest concentrations. In addition to exceeding cancer risk thresholds, *t* test results revealed that 1,3-butadiene and benzene concentrations were significantly higher with the presence of PW ≥ 1 h compared to AOWD during at least two seasons, including spring and fall. Conversely, median carbon tetrachloride concentrations showed little variation (Fig. 6). Regardless of season or wind direction, all carbon tetrachloride samples exceeded its associated cancer risk.

This pilot study presents findings of a secondary analysis of 8 years of air toxic VOC exposure data associated with ambient air quality in a Canadian P&P town. Concentrations of three ambient outdoor air toxics routinely exceeded EPA air toxics-associated cancer risk thresholds and are consequently of primary health concern in relation to population health risk in PC: 1,3-butadiene, benzene, and carbon tetrachloride. Exceedance in cancer risk thresholds for these air toxics is consistent in the literature (e.g., Morello-Frosch et al. 2000). The extent to which threshold exceedances of 1,3-butadiene adversely affect human health is poorly understood, with little toxicity information available to compare with cancer risk estimates (Morello-Frosch et al. 2000). With respect to benzene exposure, most monitoring data are associated with occupational studies (ATSDR 2007a), where long-term exposure can cause leukemia (ATSDR 2007b). High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage (ATSDR 2005). Combinations of air toxics may have additive or synergistic adverse health effects (Morello-Frosch et al. 2000). Therefore, exposure to mixed VOCs might pose health risks to facility employees and neighboring residents (An et al. 2014; He et al. 2015).

Emission sources within the defined PW range, N to ENE of the Granton NAPS site, may be a causal factor for the increase in VOC concentrations, except carbon tetrachloride. The largest point source emitter within this range is likely the mill; however, the origin(s) of VOCs are inconclusive. According to the mill's most recent substance report submitted to NPRI in 2012, 143.18 t of VOCs were atmospherically emitted on-site (ECCC 2012). An estimated 3.195 t of benzene were released to the air from a stack higher than 50 m and 0.022 t were released within 50 m of the ground. Additionally, benzo(a)anthracene and of benzo(a)phenanthrene were emitted to the air (9.7 and 6.7 kg, respectively) and deposited on-site (0.753 and 0.142 kg, respectively) (ECCC 2012). Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not reported to have been released, they may become airborne through evaporation from P&P wastewater (Soskolne and Sieswerda 2010). Boat Harbour (the mill's effluent treatment facility) may therefore contribute to ambient concentrations of VOCs. Collectively, these emissions may have contributed to the ambient atmospheric levels of VOCs measured at the Granton NAPS site. While

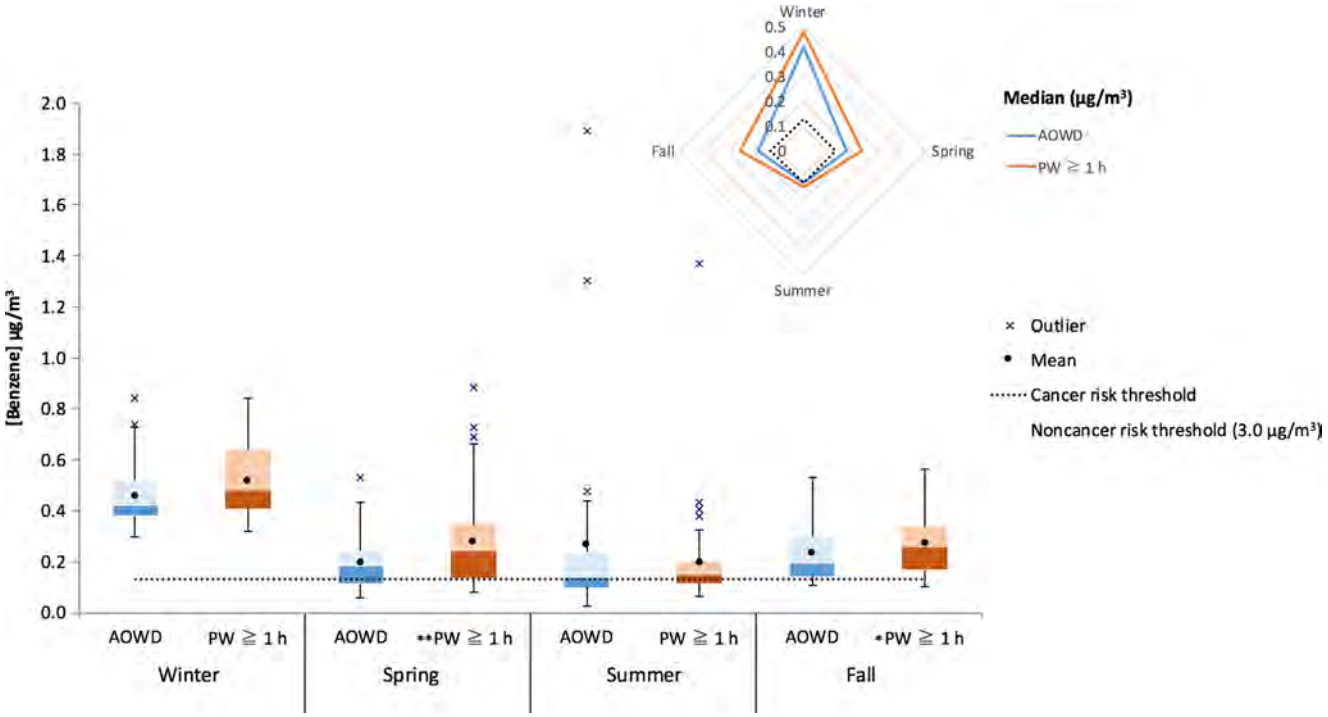

Fig. 5 Seasonal variation (2006–2013) of [benzene] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds. Significant differences indicated as *<0.05; **<0.01

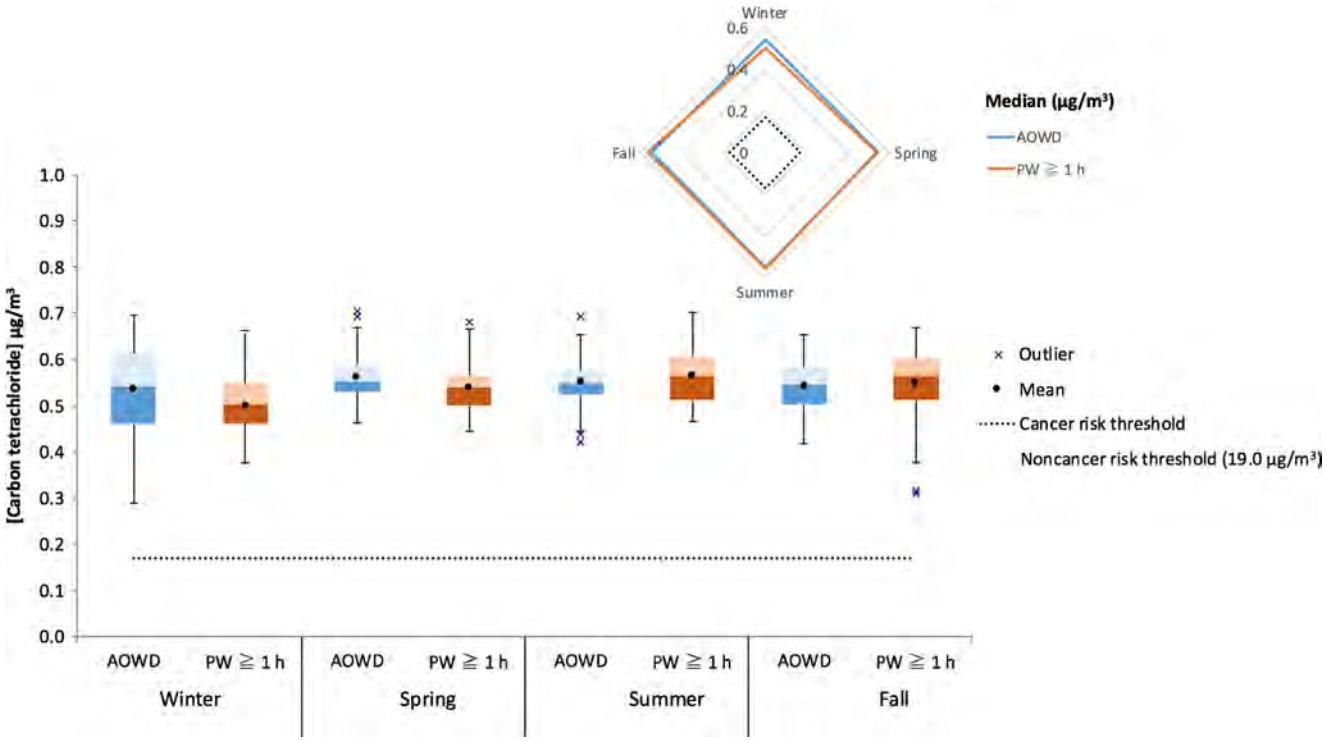

Fig. 6 Seasonal variation (2006–2013) of [carbon tetrachloride] (µg/m^3) comparing AOWD to PW for at least 1 h on sampling days (i.e., 360° − 80°), relative to associated cancer and noncancer risk thresholds

NPRI provides detailed information on pollutant releases, data are self-reported by facilities, with no audits to ensure accuracy. Consequently, data quality may be compromised.

The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane (EPA 1985). Although chloroform is a recognized by-product of the chlorination process in the P&P industry, it has been suggested that up to 90% of total emission sources may be natural in origin and is widely dispersed in marine environments (McCulloch 2003). As PC is located along the coast of the Northumberland Strait, marine environments may have contributed to the observed ambient chloroform concentrations (see Supplementary material).

Results implicate the mill as a source of air toxics (particularly 1,3-butatdiene and tetrachloroethylene); however, other local sources likely contribute to air toxics emissions. Area and mobile sources have been reported to largely contribute to concentrations of 1,3-butadiene (ATSDR 2014b) and benzene (ATSDR 2007a). Because the Granton NAPS site is located near a highway and access roads, vehicle emissions may have contributed to the observed concentrations of these compounds. A coal-fired thermal generating station and a tire manufacturing facility (located 7 km E and 1.5 km S from the Granton NAPS site, respectively) may be other local point source emitters of VOCs (e.g., 1,3-butadiene is used to make synthetic rubber [ATSDR 2014b]) (Fig. 1). According to the latest NPRI substance reports: the tire manufacturing facility released 220 t of atmospheric VOCs, whereas no VOC releases were reported by the thermal generating station (ECCC 2015b), despite that coal combustion is a significant contributor (Chagger et al. 1999). Direct links between 1,3-butdiene and vinyl chloride with P&P industries were not found in the literature.

Major monitored pollutants at the mill include NO_x, sulfur dioxide (SO_2), and total PM ([TPM] upper size limit of 100 µm diameter) (NP 2016a). A 2013 study concluded that $PM_{2.5}$ concentrations were highest (0.88 µg/m^3) downwind from the mill from using an AERMOD atmospheric dispersion model (Gibson et al. 2013), though this investigation used Halifax wind speed and direction meteorological data (130 km to the south). Hoffman et al. (2015) reported an analysis of 2013 data showing that when Pictou is downwind of the mill, average 1 h ambient $PM_{2.5}$ concentrations result in a twofold increase (12.96 µg/m^3), compared to all other wind directions (5.73 µg/m^3), suggesting the mill is likely the primary contributor of ambient $PM_{2.5}$ in the community. Additionally, TRS, TPM, $PM_{2.5}$, and coarse particulate matter ≤10 µm (PM_{10}) emission exceedances at the mill during 2012 were two to three

orders of magnitude higher than five similar Canadian kraft P&P mills; however, VOC emissions were comparable (Hoffman et al. 2015).

A comparable ambient air toxics monitoring study of a P&P community was conducted in the metropolitan Lewiston, Idaho area and the Nez Perce Reservation (STI 2009). Findings revealed that concentrations of formaldehyde and acetaldehyde were much higher than expected relative to Lewiston's size. Chloroform, tetrachloroethylene, and trichloroethylene were highest at monitoring sites nearest the mill, which presumably contributed at least 50% to pollutant concentrations (STI 2009). However, due to insufficient information on local concentrations of anthropogenic and biogenic VOCs, it was inconclusive whether the mill was a causal factor.

Recent (2009–2013) measurements of ambient CEPA-toxic or equivalent agents monitored at NAPS sites revealed that 11 air toxics, including benzene, chloroform, trichloroethylene, and tetrachloroethylene exceeded ambient air quality guidelines set by respective Canadian jurisdictions (Galarneau et al. 2016). An additional 16 air toxics approached guidelines. Although these guidelines are not necessarily enforceable, CEPA outlines provisions for toxic compounds and are thus subject to risk management actions. Air toxics' contribution to poor health on a regional and national scale has not been thoroughly investigated; therefore, calls into question the effectiveness of current toxic substance management in Canada.

Nova Scotia is known as the "tail pipe of North America," due to being within the trajectory of long-range transport of emissions from transboundary sources along the Eastern Seaboard, plus central and eastern Canada (NSE 2014). Background levels of air pollution that originate from resuspension and natural sources has been found to be major contributors to concentrations of carbon tetrachloride and benzene (Morello-Frosch et al. 2000). Background levels, in combination to carbon tetrachloride's capacity to persist in the atmosphere for a least a year, may explain why observed concentrations are consistently above its associated cancer risk threshold at the Granton NAPS site, regardless of wind direction.

Atmosphere circulation plays a complex role in dispersion, transformation, and removal of pollutants. The dispersion of pollutants from source emitters (e.g., smokestacks) is affected by crosswind mixing in both horizontal and vertical directions. Meteorological variables, including wind speed, wind direction, temperature, humidity, precipitation (process of removal), and atmospheric pressure are the main drivers of variation in pollutant concentrations and dispersion (Bates and Caton 2002). Furthermore, gravitational settling is important for pollutants with larger molecular weights (Oliver 2008); heavier particles settle or deposit closer to emission sources (Walker et al. 2003a, 2003b). Gravitational settling may also explain the high concentrations of carbon tetrachloride.

Topography and coastal conditions can affect wind characteristics (e.g., direction, speed) and the behavior of pollutant transport. A sea breeze that is trapped under descending warmer air from land can exaggerate conditions at coastal zones, a phenomenon known as coastal inversion (Bates and Caton 2002). In addition, turbulent winds along the coast may influence wind characteristics at the Caribou Point meteorological station, and the fate and transport of pollutants. Such coastal conditions, in combination with transboundary air pollution, may be occurrences that coastal areas experience in Nova Scotia, including PC.

Seasonal variability

Seasonal variability exists for both meteorological conditions and VOC concentrations. Variations in meteorological conditions, the nature and intensity of emissions from nearby sources, and photochemical activity are factors that could have led to the observed seasonal variability of outdoor VOC levels (Al-Khulaifi et al. 2014). Of the three VOCs considered particular concern in this study, 1,3-butdaiene and benzene exhibited the highest concentrations during winter. Photochemical reactions involved with ground-level O_3 formation are catalyzed by ultraviolet radiation and temperature. Therefore, peak ground-level O_3 levels typically occur during warm days with sufficient sunlight exposure; thus, people are more vulnerable to exposure during summer. The opposite is true during winter, when available light is diminished, and temperatures are colder (ATSDR 2014b).

Demographic behavior and technological improvements that aim to mitigate emissions (e.g., smokestack precipitator installation in 2015) also need to be considered when evaluating pollutant concentrations. For instance, households in the Atlantic provinces are heated primarily with oil, electricity, and wood or wood pellets (Statistics Canada 2011); therefore, as residential heating increases during winter, biogenic VOCs (e.g., benzene [ATSDR 2007a], 1,3-butadiene [ATSDR 2014b]) from wood burning may have contributed to higher concentrations of these compounds observed in this study. As the mill operates on a 24/7 schedule (ECCC 2012), atmospheric VOC emissions were assumed consistent throughout the year.

Implications

Location of ambient air quality monitoring stations has a direct impact on the observed concentrations of pollutants

(Craig et al. 2008). Based on the time series and spatial analyses, wind direction appears to play a key role in the Granton NAPS site's ability to monitor ambient VOCs from the mill. PW ≥ 1 h from the selected range (360°–80°) typically resulted in equal or higher VOC concentrations for all compounds, except carbon tetrachloride, compared to AOWD (Figs. 4, 5, and 6; Supplementary material), suggesting that the mill is likely a causal factor. Furthermore, as there is a higher frequency of northerly winds blowing towards the south during winter (Fig. 2), the Granton NAPS site is more likely to capture ambient pollutants from the mill's atmospheric emissions. Southwest PW blowing towards Pictou dominate during the summer months when people are more vulnerable to ambient air pollution exposure. Due to Pictou's geography, air toxics from the Eastern Seaboard in combination with local emission sources, including the mill, converge there; hence, higher concentrations of VOCs are expected in Pictou during summer. Subsequently, southwest PW are expected to result in lower VOC concentrations at the Granton NAPS site, as capturing the mill's atmospheric emissions would not be optimized. Therefore, VOC concentrations at the Granton NAPS site during winter would likely be representative of ambient VOC concentrations in Pictou during summer. Moreover, Pictou's considerably larger population base compared to the rural area of Granton further confirms that the NAPS site is not strategically positioned to accurately represent ambient levels of air toxics where there is higher residential exposure.

Study limitations

This study only evaluated exposure to ambient VOC air pollutants. Human exposure to air pollution is a combination of both outdoor and indoor environments and varies according to daily activity patterns and the conditions of specific settings. Secondary data analysis was used in this study; therefore, the ecological nature of these findings limit the explicit attribution of ambient air toxic exposures to the risk potential for cancer for community residents. Personal exposure monitoring, more detailed spatial analysis of ambient conditions, and source apportionment studies would be required to establish more explicitly the health risk associated with these exposures. The analysis was limited by the inability to examine the interaction of local meteorological conditions. Meteorological data were retrieved from Caribou Point, located approximately 10 km from the mill; consequently, coastal conditions may cause differences in meteorological measurements between sites.

Future research and monitoring

A *field component* consisting of real-time measurements of ambient air toxics would improve the rigor and validly of the present study. Although labor intensive, air toxics samples can be analyzed with a high degree of accuracy (Craig et al. 2008). Because monitoring stations are typically fixed, government-approved *atmospheric dispersion modeling* that considers landscape dynamics and seasonal meteorological variability (e.g., ©CALPUFF, ©AERMOD) would more accurately estimate spatial patterns of air toxics dispersion, and human exposure at the population or individual level (EPA 2013). This would require numerous stations within the community so would likely only be feasible for a specific research investigation. Further, installation of a new precipitator in 2015 has likely changed in ambient conditions. A follow-up assessment would provide a comparison to these findings to determine if VOC levels have improved. Additional research includes applying a *Conditional Probability Function* to calculate the probability that an air pollution source is located within a particular wind direction sector to help determine direction of a source from a NAPS discrete receptor site, and conducting an analysis of the effect of mixing height on measured VOC concentrations to further investigate seasonal patterns.

Investigation of health outcomes might involve longitudinal epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate consideration for latency of health outcomes, while controlling for indoor and occupational sources and other contextual factors. Several recent Canadian nationwide cohort studies that may provide a foundation for such investigations have been described (e.g., Crouse et al. 2012).

A *comprehensive risk assessment* investigates uncertainties that have implications for risk estimates in the present study, including those surrounding toxicity information (Morello-Frosch et al. 2000). More research is required to determine what cancer and noncancer risks are from ambient air toxics exposure. Further, it is important to consider synergistic effects of a full suite of ambient pollutants, and physical and chemical processes involved in fate and transport of these compounds. Comprehensive emission inventories are necessary to thoroughly address (i.e., characterize, model, and manage) air quality issues (CEC 2009). Collectively, these research efforts aim to better inform air quality management, composed of federal (e.g., ECCC, Health Canada) and provincial (e.g., NSE, Nova Scotia Department of Health and Wellness) government and public health agencies, how best to proceed to ensure the health of residents in industrial communities is prioritized. Implications of the current findings warrant further investigation.

Given the contribution emissions from local sources have to regional, national, and global airsheds, local mitigation initiatives should be an integral part of air quality strategies. There is no common approach to assess health effects of a mixture of pollutants, as they tend to be site specific; hence, an assortment of effective measures may be required. Case studies that provide evidence of effective of air quality

management interventions and guidance documents for risk managers may help inform air quality management for stakeholders (Craig et al. 2008).

To address potential adverse health effects associated with degraded air quality, Health Canada, the Public Health Agency of Canada (PHAC) and provincial partners might work collaboratively with local stakeholders to mitigate health risks and improve efficient industrial technology, while balancing economic, political, and social factors in development and implementation of air quality management. Mitigating industrial emissions has beneficial outcomes for wellbeing (Clougherty 2010); environmental stewardship and governance fosters a more proactive and cleaner environment, while building trusting relationships between industrial stakeholders (Pascal et al. 2013). "A comprehensive enforcement program with mandatory reporting of emissions, […] and meaningful penalties for noncompliance ensures that emission standards are being met" (Craig et al. 2008), and facility operators are held accountable. Data collected internally by the mill is not readily available. To improve transparency, siting rationale for air quality monitoring stations and accompanying data should be provided as part of a commitment to corporate responsibility of the mill (Hoffman et al. 2015).

To improve air quality conditions, stakeholders could increase the capacity for surveillance, assessment, and response to air quality. Furthermore, evaluation of a wide-suite of air toxics, including NATA compounds not measured by the NAPS network (particularly prioritized air toxics) would contribute to ensuring that air quality in Canada is adequately studied. Therefore, ECCC and NSE should consider implementation of a long-term monitoring program for priority air toxics that is comparable to the NATA network monitored by EPA to characterize air toxics exposure on local, regional, and national scales. Data will be useful to help mitigate emissions and achieve acceptable air quality standards that do not exceed cancer or noncancer risk thresholds.

ECCC should also consider the feasibility of installing and maintaining additional strategically placed NAPS sites to improve air pollution evaluation in both rural and urban areas, as well as in microenvironments (e.g., near point source emitters, high-traffic areas) (Craig et al. 2008). More effective communication of the results is required to increase transparency among stakeholders, including the public (Hoffman et al. 2015). Based on the population's risk of exposure, it is strongly recommended that ambient air toxics monitoring to be incorporated at the established NAPS station in Pictou to optimize capturing of said air toxics, and to best correlate pertinent results. Additionally, atmospheric dispersion modeling should use local meteorological data; therefore, meteorological data should also be collected concurrently at NAPS sites to help identify source emitters.

Measurement of individual VOC compounds is necessary to provide insight into their contribution to $PM_{2.5}$ and ground-level O_3 formation. Data would be useful to help target large source emitters and aid regulatory enforcement. Establishment of stringent and/or adapted air quality standards that encompass more air toxics (e.g., VOCs) fosters strong public support and political engagement to address air quality issues. Moreover, health impacts associated with background air pollution should be estimated. Air quality management programs are human resource intensive; therefore, they must have clear and feasible short- and long-term objectives. These initiatives gain predictive insights on atmospheric chemistry, and engage and support relevant sectors in the development and implementation of policies to reduce health risks associated with air pollution exposure (Craig et al. 2008).

Conclusions

Findings reveal that 1,3-butadiene, benzene, and carbon tetrachloride exceeded their respective cancer risk thresholds and are of primary health concern in terms of population risk. Results highlight associations with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to location of the pulp mill. Compared to AOWD, PW from the selected range (360°–80°) typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations. In addition, there are clear seasonal variations of meteorological conditions and VOC concentrations. Southwest PW blowing towards Pictou dominate during summer months, when people spend more time outdoors, and consequently are exposed to higher concentrations. Due to Pictou's geography, air toxics from transboundary and local sources may converge in summer, resulting in higher VOC concentrations. Findings suggest the Granton NAPS site is not positioned to accurately represent ambient levels of toxicity in PC. Therefore, ECCC and NSE should consider incorporating ambient air toxics (e.g., VOCs) monitoring at the established Pictou NAPS site where there is higher residential exposure.

Future research will provide air quality management with a comprehensive characterization of air toxics to support informed public health decisions. Moreover, this pilot study may serve as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of citizens is safeguarded and prioritized.

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APPENDIX F-1

Comments regarding the Northern Pulp, Nova Scotia *Environmental Assessment Registration Document. Replacement Effluent Treatment Facility*

, M.Eng., PhD

Email:
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March 8, 2019

The following are comments with regard to the Environmental Assessment (EA) Registration documents submitted in support of the Northern Pulp effluent treatment proposal.

By way of introduction, please find my curriculum vitae attached to this report. I am trained in chemical engineering, applied chemistry and biochemical engineering (doctoral level). I have subsequent experience examining toxicants in environmental and human health, and regulatory issues; clinical epidemiology / medical research; research specifically into arsenic, cadmium, lead and mercury; and have published in the peer-reviewed literature on biosorption of toxic metals, as well as health effects of toxicants and medical approaches to environmentally-linked disease in clinical practice. I have examined environmental toxicants and human health in a number of situations and locations, ranging from chemicals used at CFB Gagetown, to air quality in the Peace River district of Alberta. I have also worked in modelling enhanced oil recovery, which is similar to but more complex than hydrology, and is relevant in consideration of groundwater flows.

My comments regarding the current Northern Pulp EA are limited due to the short timeframe within the selected Nova Scotia process. I would have provided a more fulsome review of a more comprehensive selection of topics, if more time had been available. I am focusing on what I consider to be some important gaps and shortcomings in the information provided, and the issues considered. In the present case, omission by NPNS and its consultants of topics for consideration, and presentation of incomplete or unreliable information can lead to under-estimation and lack of consideration of potential harms. Decision-making on this EA, in the absence of a more complete submission from NPNS, could result in missed opportunities to make wiser choices and to avoid future harms and liabilities, and could result in further (potentially preventable) future harms.

In response to the EA Registration documents, I herein:

1. comment briefly on section 9, pertaining to scoping of a potential future human health review;

2. address implications and reports of specific toxicants (mercury, cadmium, reduced sulphur compounds [RSCs] and polyaromatic hydrocarbon [PAH] chemicals, including chlorinated dioxins and furans); and in this context
3. broaden consideration to include sensitive and directly applicable human and environmental health indicators and effects.

In summary, the current Environmental Assessment lacks:

- Data and analysis regarding some unmentioned and unaddressed hazards, particularly mercury, associated with the Canso Chemicals Ltd. legacy landfill as well as mercury spilled into bedrock beyond the landfills. This includes an underground mercury plume, and related risks to drinking water and the surrounding environment, biota and all who may consume affected foods. Precise locations are unclear and the Canso legacy is not mentioned in EA Registration documentation, but the landfill abuts or overlaps the proposed effluent treatment facility;
- Sufficient information to establish baseline environmental conditions in terms of mill operations and emissions (in part because the oxygen delignification equipment, a key component promised to the public, and important for pollution reduction, is not yet in place), as well as contamination of the environment, ecosystems and foods;
- Sufficient information to establish baseline health and contamination of the surrounding lands, water, biota and populations.

In the absence of necessary data and analyses, the current EA is incomplete. In the absence of information, the Minister cannot make a decision with confidence that the proposed Effluent Treatment Plan will not result in serious harms to the environment, or to people living and working in the area. The Minister cannot ensure that necessary baseline data and surveillance are in place for early alerts to increasing toxicants or ecological changes. Any approvals would appear to be ill-informed and premature at best.

Section 1. Comments on EA registration document section 9, regarding scoping of a potential human health risk assessment (HHRA), or a human health evaluation (HRA)

Section 9 of the EA registration document, "Human Health Evaluation" is 31 pages long, describing what a human health risk assessment (HHRA) might consider, and arguing for exclusion of considerations on the basis of supposed irrelevance. Should a HHRA be required in the future, this section argues for a narrow scope in terms of:

- chemicals of potential concern;
- populations;
- potential effects related to the proposed waste water treatment project; and
- issues that arose historically.

NPNS is seeking an overly narrow scope for the assessment. This approach is not acceptable, as it would fail to address significant issues, including but not limited to:

- scoping is argued in the context of a proposed mill (Toxikos, 2006), that did not have the history of and location on a site with pre-existing toxic chemicals (this mill was never built);
- the fact that air emissions and effluent composition will not be known with certainty until after the NPNS mill equipment is updated, new equipment is installed, and burning of sludge is implemented;
- lack of analyses of anticipated sludge composition, and effects on air emissions of toxic metals and polyaromatic hydrocarbons (PAHs);
- omission of the foetus and pregnant mother as a population of concern;
- the fact that historical issues such as mercury, and PAH (including dioxin and furan) contamination will continue for extended periods of time; and
- contaminant analyses of foods available on the land and in the waterways and ocean.

Section 2. Comments on EA registration document sections reporting environmental contaminants mercury, cadmium, reduced sulphur compounds and polyaromatic hydrocarbons (including dioxins/furans)

Mercury

Mercury, including methylmercury, is an established developmental and neurological toxicant, and is recognized as a global pollutant for action under the Minimata Convention. Canada has ratified the Minimata Convention. Methylmercury, the common form of organic mercury, is formed via microbial action, under oxygen-poor or anaerobic conditions such as in wetlands and sediments. Methylmercury is lipophilic ("fat loving"), so it accumulates in fatty tissues. Methylmercury in fish and other aquatic organisms poses risks to fishers, and individuals and communities relying upon these foods. Other forms of mercury (vapour and salts) are also highly toxic.

Mercury was historically essential to the process to generate the chlorine and sodium hydroxide that were used to bleach pulp, in "chor-alkali" plants. Mercury pollution is well known for being associated with chor-alkali plants at Canadian pulp mills. Mercury in waterways such as the English-Wabigoon river system in Ontario has debilitated generations of Aboriginal peoples.[1] Most chlor-alkali plants were closed during the 1970s,[2] but Canso Chemical Ltd. operated through the 1980s.[3] Appendix I1-B in the EA Registration package indicates that with the closure of Canso in 1992, "Generation of mercury and dioxins & furans from chlor-alkali process ceases." Unfortunately, concerns regarding these persistent toxicants linger to this day.

Mercury contamination exists at the Northern Pulp Site
A Statutory Declaration by John Daniel Currie, dated July 8th, 1997, reveals that Canso Chemicals Ltd. operated a chlor-alkali plant and associated landfills at Abercrombie Point, on a property approximately 23.29 acres in size, abutting the Northern Pulp Mill site and immediately adjacent to the site of the proposed Effluent Treatment Facility. The Canso Chemicals Ltd. Decommissioning Final Report (Attention Mr. Dan Currie, January 26, 2000) indicates that mercury infiltrated the bedrock more than eight metres below the room where the mercury cells produced chlorine gas and alkaline water. Thus, substantial quantities of mercury apparently remain on the site, in landfills created to hold wastes during operation and subsequent demolition, on the site of the demolished Canso buildings, and in the bedrock.

The location, condition and contents of the mercury-containing Canso site would have to be confirmed, to avoid further releasing mercury into the local environment during construction of the new effluent treatment facility, via disturbance of landfills, or as a result of alteration of groundwater flow and drainage. Groundwater in the area should be monitored, with a view to intercepting mercury contamination as it spreads.

The Decommissioning Report speculated (perhaps optimistically) that the mercury plume would eventually (in perhaps, approximately 200 years) emerge underwater in Pictou Harbour. That said, it is acknowledged that the mercury might surface sooner, closer to its source, potentially affecting the shoreline and wetlands, and presumably groundwater quality en route. **Vagaries of fractured bedrock make it virtually impossible to predict mercury migration, so to protect neighbours' drinking water and to anticipate impacts on the environment and marine food sources, it is important to investigate migration of the mercury plume, and biological receptors within the landscape that may accumulate mercury (e.g., wetlands species and shellfish).** This should be an essential component of any EA process.

Importantly, albeit without having examined existing detailed geological investigations should they exist, I wish to flag the possibility that the mercury plume may intercept wells in the neighbourhood. If the plume intercepts one well, there is potential for contamination of several wells, via contamination of any aquifer that is common among wells. With fractured bedrock, it is not necessarily the case that the closest wells would be affected first. Hydrogeological testing and well water testing would have to be carried out.

Wherever the mercury plume encounters pulp mill effluents or organic materials, methylmercury might be formed.

Among dozens of metals and other chemicals, mercury and methylmercury were *not* measured in the assessment (Appendix M4 – Surface Water Data, Dillon). It is surprising that mercury was omitted from the report, as mercury (and

methylmercury) would typically be a standard element in a large panel of environmental analyses such as is reported in Appendix M4.

Lack of analyses of mercury species is a serious omission, given that:

- **mercury is an important toxicant in any environmental assessment of an old pulp mill that previously hosted a chlor-alkali plant on site. Contamination may spread into ground- and surface water, and may enter effluent during treatment;**
- **methylmercury is a well known contaminant of aquatic species, posing risks throughout the food chain. Populations along the coast may be high consumers of these foods, posing risks to all ages and particularly to unborn children;**
- **there is a history on this site of mercury contamination remaining in landfills and the bedrock, from Canso Chemicals Ltd. Mercury contamination is documented in the immediate area of the proposed effluent treatment facility. The current status of this mercury plume is undisclosed. Disturbance of mercury containing landfill, soils and rock during construction and operation may accelerate toxicant mobilization and amplify harms to environmental and human health;**
- **there was a well publicized, third party report of mercury in the immediate area (e.g., https://www.capebretonpost.com/news/local/report-shows-heavy-metals-in-pulp-mill-effluent-7486/);**
- **as the regulator, and recipient and custodian of all documentation, Nova Scotia Environment should be well aware of this history; and**
- **Dillon Consulting prepared both the final decommissioning report for Canso Chemicals Ltd., as well as the EA documents for Northern Pulp, so clearly should have been aware of the issue.**

Cadmium

Cadmium is a highly toxic heavy metal that occurs naturally, and can be accumulated from the soil by plants. Cadmium is at elevated concentrations in pulp mill effluent, because the naturally occurring element is concentrated from high volumes of biomass. Cadmium also bioaccumulates in liver, kidney and bone, building up with age. Toxicologically, cadmium is somewhat similar to, but much more potent than lead (environmental quality standards for water and air are typically 10 to 100 fold lower for cadmium than for lead). According to the International Agency for Research on Cancer (IARC) cadmium is a probable human carcinogen.[4] Among numerous other health effects, cadmium is toxic to the developing child, affects multiple organ systems including the kidneys, liver, and cardiovascular system, disrupts the endocrine (hormone) system, and weakens bones.[5,6,7,8]

Cadmium may accumulate in wildlife, including fish and crustaceans, and is the reason for consumption restrictions for wild foods such as shellfish, and organ meats. [9,10]

It is claimed in section 9 that cadmium has not been detected in NPNS emissions. The spreadsheet of 2017 analyses of water from the Boat Harbour Raw Effluent Ditch, (author Wayne Williams), indicates that the detection limit for cadmium was 0.01 µg/L, which is identical to the provincial ecological criterion for surface water. Thus, the cadmium analyses would not detect levels below the ecological criterion. In fact, cadmium may be of limited solubility in these waters, and should be monitored in particulates and sediments. Of note, this is consistent with shellfish being particularly susceptible to contamination.

Table 1 summarises cadmium levels in "watercourse" samples, as reported in Appendix M. Cadmium at WC05 was at levels almost an order of magnitude higher than elsewhere (cadmium was also elevated at WC03). Levels at WC03 and WC05 exceeded Canadian Water Quality Guidelines (Table 2) for the protection of aquatic life, both for fresh and marine waters. I did not identify a map of these locations, but apparently these lowest numbered samples are closer to and may be more likely to be impacted by NPNS.

I bring up the topic of cadmium in the absence of definitive evidence in the data presented that it is of high impact in this particular instance. Rather, cadmium is a highly toxic element, is expected to be a significant issue in this instance, has not been sufficiently investigated with regard to NPNS, and bears investigation as part of any EA.

Table 1. Cadmium levels (µg/L) in watercourse samples, December 3, 2018. (ref. Appendix M4)

Location	Cadmium concentration (µg/L)
WC16	0.037
WC15	0.056
WC14	0.024
WC13A	0.018
WC13B	0.017
WC12	<0.01
WC11	0.033
WC10	0.019
WC09	0.05
WC08	0.032
WC06	0.041
WC05	0.43
WC03	0.23

Table 2. The Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life for cadmium

	Long-term Exposure (µg/L)	Short-term Exposure (µg/L)
Freshwater	0.09[a]	1.0[b]
Marine	0.12	NRG

NRG = no recommended guideline

a The long-term CWQG of 0.09 $\mu g \cdot L^{-1}$ is for waters of 50 mg $CaCO_3$/L hardness. At other hardness values, the CWQG can be calculated with the equation $CWQG = 10^{\{0.83(\log[hardness]) - 2.46\}}$, valid for hardness between 17 and 280 mg $CaCO_3$/L

b The short-term benchmark concentration of 1.0 $\mu g \cdot L^{-1}$ is for waters of 50 mg $CaCO_3 \cdot L^{-1}$ hardness. At other hardness values, the benchmark can be calculated with the equation $Benchmark = 10^{\{1.016(\log[hardness]) - 1.71\}}$, valid for hardness between 5.3 and 360 mg $CaCO_3$/L

Hydrogen Sulphide

Hydrogen sulphide, with its characteristic "rotten eggs" smell, is the simplest of a group of chemicals called "reduced sulphur compounds" (RSCs), also reported as "total reduced sulphur" (TRS). Other RSCs include carbonyl sulphide and carbon disulphide that do not have strong smells, as well as mercaptans and others that do have strong odours (a trace quantity is used as an alert chemical in natural gas). RSCs are the compounds largely responsible for the odour of pulp mills.

RSCs are sometimes characterized inaccurately as mere nuisance odours, but they are in fact toxic to the nervous system and to multiple organs.[11] Acute, episodic exposure to malodorous sulphur air pollutants released by a pulp mill causes breathing difficulties, and other respiratory, ocular (eye) and neuropsychological symptoms.[12]

Larger RSC molecules may be longer acting than simple hydrogen sulphide. Numerous reduced sulphur compounds exert substance-specific toxicities, but then are ultimately metabolized to create hydrogen sulphide, so they can all also have similarly toxic effects in the body. These include multi-system adverse effects, with life-long implications for the foetus and developing child (e.g., irritation of eyes, nose and throat, cough, headache, fatigue and malaise, nausea and vomiting, and headache, confusion and depression, and effects on the central and peripheral nervous system with chronic exposure). [11,13]

Pulp mill emissions of RSCs contain many more chemicals, and greater quantities of reduced sulphur, than may be measured or estimated as hydrogen sulphide *per se*. If this is true in the present case, the analyses reported in the EA Registration package (reproduced below) may under-estimate the load of reduced sulphur, and thereby its biological effects.

A 2017 study by Hoffman et al. [14], [1] was extensively discussed in the Environmental Assessment document (section 8.1.2.2). The Hoffman report clearly indicates, using straightforward treatment of routinely gathered data, that some toxic volatile chemicals measured in Pictou probably originate at the Northern Pulp facility. The data is from routine Canadian pollutant monitoring as well as weather data.

Northern Pulp monitoring reports posted on the Nova Scotia website, and modelling in the EA Registration package, all indicate exceedances of hydrogen sulphide or RSCs. These exceedances are predicted to continue with the new effluent treatment facility. The following tables, reproduced from the EA Registration package, indicate that hydrogen sulphide has been and is expected to continue to exceed permissible concentrations.

AIR DISPERSION MODELLING STUDY – REPLACEMENT EFFLUENT TREATMENT FACILITY

January 21, 2019

Hydrogen Sulphide

The maximum predicted ground level concentrations for hydrogen sulphide (H_2S) at each discrete receptor are presented in Table 6.5.

Table 6.5 Maximum Predicted Ground Level Concentrations (GLC) for H_2S – Existing

Receptor ID/Regulatory Limit	UTM Coordinates		1-hour (µg/m³)	24-hour (µg/m³)
	Easting (m)	Northing (m)		
Regulatory Limit	**-**	**-**	**42**	**8**
1	519768	5055219	20.4	0.86
2	520907	5053346	18.1	1.16
3	522480	5053951	7.69	0.77
4	522963	5054415	40.5	2.69
5	522899	5054854	37.0	2.55
6	524552	5055699	**96.6**	4.90
7	524337	5056312	34.8	2.21
8	526942	5057565	15.4	1.46
9	528826	5055486	2.52	0.24
10	522169	5058110	2.21	0.58

Bold – indicates an exceedance

Exceedances of the Nova Scotia maximum permissible ground level concentration limit for H_2S for the 1-hour averaging period were predicted at discrete receptor 6. The source contributing to the exceedance at discrete receptor 6 is the existing ETF. There were no exceedances of the 24-hour maximum permissible ground level concentration limit.

Further analysis of the above modelling results, including a exceedance frequency analysis at receptor 6, are discussed in Section 7 below.

[1] This study is found at Appendix E-2 of the Friends of the Northumberland Strait/Ecojustice submission, along with a response at Appendix E-1, from Ms. Hoffman to Stantec's critique in the NPNS EA submission.

Hydrogen Sulphide

The maximum predicted ground level concentrations for hydrogen sulphide (H_2S) at each discrete receptor are presented in Table 6.11. No exceedances of the Nova Scotia maximum 1-hour permissible ground level concentration limits were predicted for H_2S. For the 24-hour time averaging period, the maximum predicted concentration of H_2S at Receptor 5 was slightly above the maximum permissible ground level concentration limit.

Table 6.11 Maximum Predicted Ground Level Concentrations (GLC) for H_2S - Future

Receptor ID/Regulatory Limit	UTM Coordinates		1-hour ($\mu g/m^3$)	24-hour ($\mu g/m^3$)
	Easting (m)	Northing (m)		
Regulatory Limit	-	-	**42**	**8**
1	519768	5055219	9.46	1.89
2	520907	5053346	10.4	2.01
3	522480	5053951	12.2	2.66
4	522963	5054415	18.0	4.40
5	522899	5054854	21.3	**8.52**
6	524552	5055699	2.15	0.75
7	524337	5056312	10.6	2.50
8	526942	5057565	7.21	1.14
9	528826	5055486	1.08	0.23
10	522169	5058110	1.59	0.61
Bold – indicates an exceedance				

Further analysis of the above modelling results is presented in Section 7 below.

Table 7.1 Emission Impact Summary Table - Existing Operation

Contaminant	Maximum Predicted Concentration at Nearby Specific Receptors (ug/m^3)	Averaging Period	Reference Criteria* (ug/m^3)	Percentage of Criteria (%)
Carbon monoxide (CO)	340	1-hour	34,600	1%
	200	8-hour	12,700	2%
Hydrogen sulphide (H_2S)	**96.6**	1-hour	42	**230%**
	4.9	24-hour	8	61%
Nitrogen dioxide (NO_2)	29	1 hour	400	7%
	0.78	Annual	100	1%
Sulphur dioxide (SO_2)	57.3	1 hour	900	6%
	11.1	24 hour	300	4%
	0.68	Annual	60	1%
Total suspended particulate (TSP)	51.1	24-hour	120	43%
	3.35	Annual	70	5%
$PM_{2.5}$	7.92	24-hour	28	28%
	0.68	Annual	10	7%
*The criteria for the listed contaminants are Maximum Permissible Ground Level Concentration Limits specified in the Nova Scotia *Air Quality Regulations* except for $PM_{2.5}$, which criteria are Canadian Ambient Air Quality Standards.				

These results, copied from the EA Registration package, indicate both past and projected exceedances of hydrogen sulphide exposures. One might think that prediction of reaching a high proportion, let alone exceedances of air pollution guidelines, would send proponents back to the drawing board. This was not the case. Following these reports and predictions of excessive levels of RSCs, it is explained not that these are the result of the pulp mill, but that these are the result of abnormal weather conditions or "meteorological anomalies." It is then recommended that these may be ignored. The nature of anomalies is not detailed, but could include situations such as temperature inversions that impede atmospheric mixing. The consultants then explain that by using the 9th highest hourly concentration rather than the highest concentration in modelled years (i.e., previously observed "extremes" are removed), the hydrogen sulphide levels are predicted to be within compliance at a residential area close to the existing effluent treatment facility. The report concludes that although hydrogen sulphide exceedances are modelled, that with elimination of meteorological anomalies it is anticipated that exceedances will not be experienced.

It is unreasonable and certainly not precautionary, particularly in this era of climate change, to base environmental assessments on assumptions that "meteorological anomalies" will not repeat. Indeed, with weather anomalies of all kinds becoming more frequent and extreme, the opposite is expected, and should be assumed and factored into assessments.

Furthermore, approving and thereby facilitating periodic exceedances of health-based exposure criteria, for communities that include the most vulnerable of individuals and who are more susceptible to adverse effects, is contrary to the purpose of limits, and the mandate to protect public health. Process changes for pollution prevention and capture, and validation of emissions to land, water, air and deposition on soil, would be necessary to improve confidence that these communities will no longer be exposed to excessive levels of hazardous RSCs.

Dioxins and furans

Dioxins and furans ("dioxins") are among the most toxic chemicals that may be emitted from pulp mills. Their creation and release has been reduced as pulp mills have switched from elemental chlorine, to chlorine dioxide for bleaching. Dioxin levels are further reduced if oxygen is used in delignification, and peroxide is used later in the process. Sweden leads the world in advanced technologies for pulp manufacture.[15]

2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD), made famous as a contaminant of the defoliant Agent Orange used in the Vietnam War, is one of the most toxic, persistent, bioaccumulative man-made chemicals. This chemical is considered to be the most toxic, in the family of related dioxins and furans. With three chemical rings in a row, these are examples of poly-aromatic hydrocarbons (PAHs). Chlorinated PAHs have

chlorine atoms attached to the carbon structure. As a result of comparative toxicity based on historical experiences and scientific methods, dioxins and furans with four or more chlorine atoms (maximum eight chlorine atoms), including at the positions numbered 2, 3, 7 and 8, are considered extraordinarily toxic. Other dioxins are pro-rated in terms of toxicity, to calculate total toxic equivalents (TEQs).

An advance in pulp manufacture was made with introduction of chlorine dioxide bleaching that results in lower levels of chlorinated PAHs. Oxygen de-lignification, to which Northern Pulp committed during public consultation (see EA Registration document, Appendix 6), also assists to reduce use of chlorine based bleach and releases of chlorinated PAHs.

PAHs form, and may be chlorinated, during pulping and bleaching. PAHs can also form during combustion, and chlorination during combustion may be enhanced when the fuel contains higher levels of chlorine.[16] This is expected to be the case with addition of sludge to feed the boiler. Temperatures also affect formation of PAHs.[16] Thus, rigorous analyses of emissions and environmental contaminants are necessary to provide a baseline, as well as to monitor emissions and effects before and following operational changes in the pulp mill.

It is stated in the EA Registration document (e.g., Table 6.7-1), "In fact, dioxins and furans testing for the last 5 years has consistently shown that all of the compounds required to be tested under the regulations have not been detected in NPNS' effluent (non-detect)." The dioxin-free message is not consistent with reports from Northern Pulp that are posted on the Nova Scotia government website, nor the data reported to the National Pollutant Release Inventory (NPRI).[17] NPRI data indicates that on average 3.6 tonnes of PAHs have been emitted to the air annually since 2006, and 8 mg TEQ dioxins/furans have been emitted annually since 2011.

Environment Australia published a helpful review of chlorinated dioxin and furan emissions.[18] Of particular interest is a series of diagrams of typical dioxin "fingerprints" or patterns of emissions from various processes, as discussed below.

Biomass entering the pulp mill should contain little material with chlorine atoms bound to carbon atoms. In this case, typically there would be significant proportions of dioxins with four to six chlorine atoms (that have the highest TEQs), and lower proportions of dioxins with seven or eight chlorine atoms.

The opposite is reported for Northern Pulp in analyses reported on the Nova Scotia website, with all dioxin findings restricted to the hepta- and octo- (seven and eight) chlorinated forms. This is highly unusual. It is not consistent with the Australian experience,[18] and is also not consistent with reports of changes in dioxin fingerprints in fish affected by emissions from a pulp mill on Lake Superior, after bleaching was switched from chlorine to chlorine dioxide.[19]

Although I know of no evidence of either of the following actually happening, I offer two possible explanations from my experience and research, for this unusual situation. There may be laboratory deficiencies and/or irregularities during analyses, or alternatively, wood chips treated with polychlorinated phenols (wood preservatives) may have been processed at the facility.[18,20] These bear investigation.

In summary, regarding PAHs, including dioxins and furans:

- **Total chlorine free pulp production, with innovations to reduce water, waste and pollution, should be reassessed independently, because advanced technologies are established internationally. At a bare minimum, oxygen delignification must be installed as promised, to help to reduce toxicity of effluents, including both chlorinated PAHs (in particular dioxins and furans) and non-chlorinated PAHs;**
- **independent verification of laboratory analyses should be conducted, with blinded field blanks and, importantly, spiked samples included with field samples;**
- **possible origins of the unusual dioxin finger-print observed in samples from recent years should be investigated, including boiler fuels;**
- **the statement by Dillon, on behalf of Northern Pulp, that dioxins and furans have not been detected for the past five years is not true. This should be withdrawn. Releases of PAHs and other NPRI data should be reported.**

Looking for contaminants where they will be found, and pose hazards

While monitoring emissions directly is important for any industry, these samples do not adequately predict what is important – the levels of toxicants in the environment, and in foods and people. PAHs and metals emitted by NPNS are bioaccumulative. For example, lipophilic ("fat loving") PAHs tend to bioaccumulate in fatty tissues, [19] so analysis of aquatic organisms may reveal substantial levels despite "no detection" results in water or air. Similarly, metals attached to particulates may not be detected in finely filtered water or air, but may nevertheless build up in plants and animals. It is of course easier to measure pollutants when they are at higher concentrations, and is more relevant to the environment as well as to populations, to measure toxicants where they accrue and pose greatest hazards and risks.

According to a 2017 study of foods consumed by First Nations in the Atlantic Provinces, oysters and organ meat are highest in cadmium.[21] Mussels [22] and lobster hepatopancreas have been monitored for toxic chemicals in other situations (Appendix R of the Environmental Assessment). There are many options for relevant, sensitive longitudinal monitoring. It is beyond the scope of this work to offer recommendations, but it may also be time to expand toxicant and toxicity testing beyond simple acute fish mortality.

Summary

In summary, in my view, it is essential that the environmental assessment information for this project must include, at a minimum:

- independent scoping of a human health assessment, to ensure that the details and particulars of the diverse populations, vulnerabilities, changes in exposure within the particular contexts of these populations and their diets, and current industrial legacy pollution are adequately addressed;
- assessment of progressive measures to modernize equipment and processes in the mill, to eliminate pollutant exceedances, and to advance technologies and practices, to place NPNS as a leader in environmentally preferable pulp production, as well as promotion of public and environmental health;
- baseline and regular surveillance monitoring that is accurate, verified, reliable and relevant to the environment and human populations;
- investigation and assessment of any proposed developments, in recognition of legacy mercury contamination in proximity of the proposed effluent treatment facility;
- plans to minimize contamination and to monitor for contaminants and related effects, using both conventional measures as well as with assays of biological samples (e.g. shellfish).

Unfortunately, I could identify none of these in the current EA Registration package. What is more, inaccurate statements denying pollution that occurred cast a shadow over the reliability of the EA.

The above comments address a few, but given the time frame certainly not all, shortcomings and misperceptions within the Northern Pulp Environmental Assessment Registration documents. It is my opinion that the current EA Registration package is insufficient to permit adequate assessment, and that any permissions or approvals on this basis are not justified.

I hope that the above is of assistance, and am available for further discussions in this important matter.

Respectfully Submitted,

Email:
Telephone:

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APPENDIX F-2

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APPENDIX F-3

Chapter 4
The Greening of the Pulp and Paper Industry: Sweden in Comparative Perspective

Ann-Kristin Bergquist and Kristina Söderholm

4.1 Introduction

Since the 1960s, concern about environmental degradation has greatly altered the commercial conditions for most industries in the Western world, but the global pulp and paper industry (PPI) has encountered more serious challenges than most other industries. The reason is that pulp and paper production, especially bleached pulp manufacturing, is extremely damaging to the environment. Thus, pulp mills cause, among other things, emissions of odorous gases and sulphur compounds into the air and of organic and inorganic chemicals including chlorinated compounds and other substances into waterways. Thanks to technological developments, however, the environmental situation has been greatly improved during the last five decades with reduced emissions; in many cases the reduction has been more than 90%. This chapter concerns the environmentally driven transformation of the PPI and examines it in a country which has pioneered parts of the greening process in this industry, namely Sweden. This nation is one of the world's leading pulp and paper countries, as it ranks as the ninth largest producer of paper and the fourth largest producer of pulp (Lamberg et al. 2012; Järvinen et al. 2012; Bergquist and Keskitalo 2016).

For any polluting industry, technology is at the very core of the challenge to reduce its environmental impact (Jaffe et al. 2005) and indeed this has been the case for the PPI (Bajpai 2011). Technological strategies and timing for investments have differed between countries and regions depending on the different national jurisdictions, organizational solutions, demand characteristics and geographical circumstances. The

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T. Särkkä et al. (eds.), *Technological Transformation in the Global Pulp and Paper Industry 1800–2018*, World Forests 23, https://doi.org/10.1007/978-3-319-94962-8_4

literature on corporate environmentalism, which has stressed companies' modes of responding to environmental issues, has generally identified a movement along an evolutionary, adaptive learning process that formed specific attitudes or means of response during certain periods (Hoffman and Bansal 2012). An important conclusion from this research when it comes to technological strategies is that before the 1990s, firms typically employed end-of-pipe approaches to achieve regulatory compliance, which practically means external treatment of effluents after they have left the plant (Lee and Rhee 2005; Frondel et al. 2007; Hoffman 1997). The alternative technological approach, internal process changes (e.g., in-plant measures that prevent or reduce effluents before they leave the plant, sometimes also referred to as 'cleaner production technologies'), has subsequently been acknowledged and adopted as a more advantageous and effective strategy (Sinclair 1990).

As will be discussed in this chapter, Swedish PPI has not followed the textbook example of the learning process from end-of-pipe technology to "cleaner" production processes. The Swedish PPI, in contrast to both its North American and Finnish counterparts, embarked already in the 1970s on developing internal process alterations rather than end-of-pipe solutions, as the main technological strategy for pollution control (Bergquist and Söderholm 2015; Harrison 2002). This early strategy became formative for the Swedish PPI's green technological development for decades to come. Kemp and Soete (1990) have argued that, compared to 'normal' technological efforts in industry, pollution control efforts are generally more focused on incremental improvements in 'cleaning' technology, following relatively well-established technological strategies of 'progress'. This argument suggests that pollution control technologies are particularly 'path dependent' and breaking the 'path' demands a lot of investments and even a new way of thinking. The notion of path dependence can be seen from several perspectives; from the simple assertion that 'history matters' to the problem of imperfect information and the appreciation that institutional arrangements may have limits, and the phenomenon of increasing returns (e.g. Liebowitz and Margolis 1995; Pierson 2000). When it comes to technology, path dependence can provide very powerful incentives for limiting actions to incremental technological solutions, which in turn strengthen established lines of action (Geels 2004; Kemp and Soete 1990; David 1994). Technological approaches in one country, as well as divergent technological strategies between different pulp and paper producing countries, might therefore be considered in the logic of technological path dependence.

For several reasons the greening of the PPI has been a core challenge for the sector. Environmental regulations have greatly altered the commercial conditions for the PPI over the past five decades (as for most industries), and since the 1980s, market pressure has also interacted with environmental regulation as a driver towards greener production processes and products. In addition, since the 1970s, the drive to use energy more efficiently has been increasingly linked with environmental issues, not least through the issue of climate change. Overall, the greening of the PPI has been a complex process. It has evolved along several different paths in combination with other business challenges, with the latter stemming from changed input

prices on, for instance, energy, wood and labour and also changes in market competition, governmental policies, and new technologies outside the immediate realm of pollution control.

4.2 Environmental Impacts of Pulp and Paper Production: A Short Background

The environmental impact of pulp and paper mills has been, and still is, serious from many aspects (Table 4.1). It causes or produces human toxicity, ecotoxicity, photochemical oxidations, acidification, nutrification, solid wastes and climate change (Bajpai 2011). Still, the situation is much better today than it was in the past; wastewater from a modern pulp mill contains only a small fraction of the contaminants that it did in the 1960s. One of the most serious problems is the very large quantity of wastewater resulting from pulp manufacturing, and it is contaminated with a number of organic and inorganic chemicals including lignin, cellulosic compounds, phenols, mercaptans, sulphides and chlorinated compounds (Thompson et al. 2001). The PPI is also a large user of both energy and water, and toxic chemicals. For example, in the United States (US) the paper industry is the third largest energy user among manufacturing industries, accounting for 11% of domestic energy consumption in 2010 (World Watch Institute 2015). The most significant environmental problems occur in the stage of the pulping process (in relation to paper production), which is why the most severe problems in the past were found in pulp producing countries, such as Sweden, Finland, Canada and the US although pulp importing countries, such as the United Kingdom and Germany also have struggled with severe problems (Bajpai 2015; Bergquist and Söderholm 2015; Mutz 2009).

Pulp can be roughly divided into the processes (and products) of mechanical and chemical pulp. Each process varies in terms of immediate environmental impact depending upon the amount and type of energy and chemicals used. Pulp mills are, however, traditionally associated specifically with the discharge of high levels of wastewater contaminated with organic matter. In the chemical pulp process, wood chips are first cooked in chemicals and then the solution is washed to produce "clean pulp", which consists of only cellulose fibres. Dirty "wash water", containing cooking chemicals and dissolved lignin, are thereafter sent to a recovery boiler[1] from which the cooking chemicals are recovered for reuse and the lignin is burned for power generation. Wastewater containing the remaining organic matter and chemicals is then discharged (Gunningham et al. 2003, pp. 10–11).

The most serious environmental problem related to pulp manufacturing in the past was caused by the bleaching process. It takes place in stages, generally alternating between acid and alkaline stages. The use of elemental chlorine (Cl_2) as the bleaching agent became dominant in the 1950s (Norberg-Boom and Rossi 1998) and was

[1] The invention of the recovery boiler by G. H. Tomlinson in the early 1930s was a milestone in the advancement of the Kraft pulp process.

Table 4.1 Major pollution problems caused by pulp and paper production

Suspended solids (SS)	Have its origins in bark, pieces of fibres and filling, and coating agents. Consumes oxygen when decaying and can be carriers of poisonous substances
Organic matter in general (BOD and COD)	Uses oxygen from water. May cause oxygen deficiency in waterways, which leads to the death of, i.e., fish and cause severe damage to the ecosystem
Chlorinated organic compounds (AOX)	From mills using elemental chlorine in their bleaching sequence. Wastewater containing organic matter formed by elemental chlorine reacting with wood products to form absorbable organic halide (AOX). AOX has become an accepted measure of chlorinated organic material, and is used to monitor and regulate bleached Kraft pulp mill effluents. AOX is used as a surrogate parameter of dioxins in wastewater (and stack gas) from pulp mills
Water consumption	Pulp mills are major water users. Consumption of fresh water can seriously harm habitats near mills from reduced water levels (necessary for fish) and changed water temperature (also a critical environmental factor for fish)
Sulphur dioxide (SO_2) and reduced sulfur compounds	Leads to acid rain and causes soil degeneration
Nitrogen oxides (NOx)	Gases composed of nitrogen and oxygen formed during combustion. In moist air, the substances are converted into nitrogen oxides and then nitric acid, which creates acid rain. Originates from recovery boilers in the Kraft pulp process
Sulphur compounds (TRS gases)	Smell

Source Ince et al. (2011), Skogsindustrierna (1995), Nilsson (2007)

subsequently replaced after the 1980s with new bleaching agents and methods such as the elemental chlorine free (ECF) and total chlorine free (TCF) bleaching.

4.3 Environmental Regulation as a Driver for Technology Development

The Swedish PPI has been central to the Swedish economy ever since the introduction of mechanical pulp in the 1850s and chemical pulp in the 1870s. Already at the time of the First World War Sweden was the world's second largest pulp producer after the US and the world's largest pulp exporter (Fahlström 1948; Rydberg 1990; Järvinen et al. 2012). As the PPI represented both one of the largest industrial sectors in Sweden and one of the biggest polluters, it has received much attention in Swedish policy to control industrial pollution, including joint state-industry efforts in R&D to control it (Bergquist and Söderholm 2011).

Over time environmental policies have grown more complex with a long-term shift in focus from local conflicts over water pollution and odour problems in the late nineteenth century to transnational and global problems such as climate change in the late twentieth century. This development has taken place in stages (McNeill 2000). Hence, in the 1960s, Sweden along with many other western societies saw the initiation of serious governmental action to control industrial pollution in parallel to a growing environmental awareness in society (Lönnroth 2010). In contrast to the US, environmental awareness in Sweden grew mainly amongst experts and not the public in the 1960s and 1970s. It is often assumed that heavy polluting industries did not focus seriously on mitigating their environmental impacts before this environmental awakening. There is plenty of historical research, however, which illustrates how companies and even industrial sectors undertook action to control pollution due to local conflicts and governmental intervention before the 1960s and sometimes they did so even proactively to avoid a bad outcome for business (for an updated literature overview, see Bergquist 2017). In fact, the Swedish PPI undertook action to control pollution long before the 1960s due to increasing local criticism and the industry's own awareness of the negative environmental effects from production. This in turn spurred joint efforts to develop new and cleaner technologies already in the early 1900s (Söderholm and Bergquist 2012). For example, by 1908 all Swedish sulphate pulp producers had united to form the so-called *Sulphate Pulp Committee* to develop technology to lessen the odour problem stemming from the sulphate pulp process.[2] Central reasons behind these initiatives were rising concerns about industrial pollution that had been expressed in the Swedish Parliament in the early 1900s, along with court cases concerning the contaminating activities of single pulp mills. These court cases built on early health- and water protective regulation, which to some degree included regulation of industrial pollution. For instance, the Public Health Act of 1874 constituted the first governmental "all-embracing" attempt to address sanitary issues. In the 1910s, the Swedish government presented a proposal to implement stricter legislation against air and water pollution. However, the proposal was rejected in the early 1920s due to an economic recession (Söderholm 2009; Lundgren 1974).

Pollution problems, however, increased in tandem with a growing Swedish economy in the 1930s, whereupon the Swedish government initiated a process of tightening the regulation of water pollution. Hence the Water Act was reformed in 1942, whereby it introduced a concession system according to which enterprises such as chemical pulp and sugar mills and textile factories had to apply to the Water Court for permission to operate. Still, air pollution was not addressed properly until 1963, and then through the formation of the State Air Pollution Control Board (Lundgren 1999). Finally, in 1969, the Environmental Protection Act (EPAct), the first uniform Swedish framework for regulating air and water pollution, noise and other disturbing activities from industrial plants, was passed by the Swedish Parliament. Years before the final bill was enacted, the construction of a modern system for environmental

[2]For a more detailed overview of regulation and organization of the Swedish PPI during this period, see Söderholm and Bergquist (2012).

protection had begun in Sweden. Thus, in 1967 the government created the National Environmental Protection Agency (EPA), a unified body for almost the entire area covered by the Environmental Protection Act (Lundqvist 1971). Soon other countries followed this lead, such as the US, which established its own EPA in 1970. Still, in the neighbouring pulp producing country of Finland, environmental policy developed at a slower pace (Söderholm et al. 2017). The National Board of Waters was created in 1970, but it was not until 1983 that a unified body to handle a major part of the environmental issues founded there (i.e., the Ministry of the Environment) (Joas 1997).

From the 1970s until the 1990s, the Swedish EPAct was the main tool to control pollution and other environmental problems related to Swedish industry, and it fundamentally changed the conditions for the operations of the Swedish PPI. Thus, in the 1970s and the 1980s it forced the sector to increase considerably its green R&D activities and to undertake deep emission cuts (Bergquist and Söderholm 2011). The regulatory approach was based on case-by-case assessments whereby permits had to be reassessed and renewed every 10 years or after production increased. It relied on so-called performance standards rather than technology standards and these were negotiated with each plant owner, sometimes over extended periods of time. The standards were typically implemented in combination with extended compliance periods, meaning that the companies were giving necessary time to develop and test technology. In these ways, the regulatory approach provided scope for environmental innovation and permitted the affected companies to coordinate pollution abatement measures with productive investments (Bergquist et al. 2013). In 1999, the EPAct along with 15 other acts were amalgamated into the Swedish Environmental Code and the responsibility for issuing permits was thereby transferred from the Franchise Board of Environmental Protection (the organ responsible for issuing permits since 1969) to the Environmental Courts (Michanek and Zetterberg 2007).

The Swedish PPI has also been governed by European Union (EU) environmental legislation ever since Sweden became an EU-member in 1995. One example is the Integrated Pollution Prevention Control Directive (IPPC Directive) of 1996 and 2008. The IPPC Directive is a key instrument in the EU's environmental legislation, and its purpose is to achieve 'integrated pollution prevention' and control of the pollution occurring at large industrial installations (Schoenberger 2009).[3] Further, in 2011, the Industrial Emission Directive (IED)[4] came into force, meaning all Member States before 7 January 2013, had to incorporate the IED into national leg-

[3]The conditions of required permits have to be based on Best Available Techniques (BAT), and in 1997, the Sevilla Process was established to develop BAT. Since then, 33 BAT Reference Documents (BREFs) have been drafted, adopted and published containing ambitious consumption and emission levels which cannot be found anywhere else (Schoenberger 2009).

[4]The IED is the successor of the IPPC Directive and, in essence, is about minimizing pollution from various industrial sources throughout the EU. Operators of industrial installations are covered by Annex I of the IED and are required to obtain an integrated permit from the relevant EU country authorities. Permit conditions including emission limit values (ELVs) must be based on the Best Available Techniques (BAT) as defined in the IPPC Directive.

islation. In Sweden the directive was included in the Industrial Emission Regulation (*Industriutsläppsförordning* 2013, p. 250) (SEPA 2016).

Since the 1990s in Sweden, policies targeting the PPI sector have embraced a blend of mandatory governmental and voluntary stipulations concerning social and environmental requirements. Thus, in line with international trends, environmental management systems (EMAS) have been implemented in virtually all Swedish pulp and paper mills. And most mills have chosen to certify their environmental management systems under either the global standard ISO 14001 and/or the European EMAS scheme. Thus, in 2013, 97% of the pulp and 98% of the paper produced in Sweden was manufactured under certified environmental management systems (Swedish Forest Industry Federation 2015). Essentially the EMAS scheme is an opportunity for producers to formally demonstrate from year to year their improved environmental performance to customers and partners, and is thus a form of 'eco-labelling'. The opportunity for the Swedish PPI to engage in 'eco-labeling' first appeared in the 1980s (see below). Regulatory measures to stimulate improvements in energy efficiency and lower carbon dioxide emissions have developed as an additional control box parallel to other emissions (see e.g. Thollander and Ottosson 2008; Henriksson et al. 2012). Also, in 2005 the voluntary Swedish Program for Energy Saving (PFE) came into force (Henriksson et al. 2012).

4.4 The "Spring-Cleaning" of the Swedish PPI

4.4.1 Internal Process Changes and Structural Rationalizations

The magnitude of pollution control implied by the EPAct in 1969 made the Swedish pulp and paper producers conclude that it was only through reconstructed and new plants embodying the most novel techniques that the discharges could be substantially reduced and requirements met (Wohlfart 1971b, p. 320). In this context, the Swedish pulp producers strategically aimed for production expansion based on the adoption of the sulphate process in the late 1960s, since the calcium-based sulphite mills had many environmental disadvantages in terms of their discharges of BOD, lignin, gases and dust, and chemical recovery. The discharges of the sulphite mills required radical external purification works while the sulphate process had the potential to recover chemicals and at the same time generate electricity (Wohlfart 1971b). Thus, the enforcement of the EPAct made it economically impossible for some mills to continue operating, especially small, inefficient mills, many of which were forced to shut down. And it was in this context that Swedish sulphite pulp mills were almost totally phased out. The Domsjö sulphite mill owned by the Modo Group is, however, one of few sulphite mills that survived in Sweden after the 1970s (Söderholm and Bergquist 2013).

Contributing to the reduction of discharges from the PPI was a process of structural rationalization, and Sweden was not the only country to experience this phenomenon. The OECD stated in 1973 that replacing small, uneconomical and environmentally obsolete units with larger more energy- and resource-efficient mills would create cost-effective means of reducing discharges per production ratio opportunity without deviating from the business inclination to seek productivity gains through capacity expansion. The approaches, however, differed between countries. In most cases, oxygen depletion of waterways required the rapid adoption of stringent Biochemical Oxygen Demand (BOD) limits, which typically locked industry into end-of-pipe measures (Rajotte 2003; OECD 1973). In Sweden, however, the pulp and paper producers at the time of the enforcement of the EPAct had a basic approach developed, one that already defined decades of environmental development activities and which they aimed at maintaining (i.e., to cope with the pollutants inside the mills and not when they "leave the plant") (Wohlfart 1971a, pp. 432–434).

The Swedish PPI's approach to dealing with pollution through changing internal processes can be traced back to the 1940s and 1950s and the pioneering R&D activities then taking place within collaborative platforms established jointly by the industry sector (see Sect. 4.4.3 below). While the first collaborative initiatives of the sector to deal with pollution problems had taken place already at the turn of the twentieth century, the R&D activities thereafter increased in tandem with the development of environmental policy up to the 1960s. During this novel period, attention was foremost directed towards improved efficiency and reduced fiber emissions. The practice of discharging fibers was highly inefficient as it resulted in 15% waste. Increased efficiency was therefore closely linked to the ability to reduce discharges of organic materials (Söderholm and Bergquist 2012). Also Swedish authorities and other industrial sectors, such as the metal smelting industry, early on chose to focus on in-plant measures and primary effluents instead of external measures (Lindmark and Bergquist 2008). For example, in describing this strategy, the environmental manager of Stora Enso in the 1990s explained that 'internal process changes have a completely different potential for the business. An end-of-pipe is a cost. An integrated solution can provide so much more. It can provide opportunities to increase production, reduce operating costs, and simply increase productivity. The key to all the improvements we have seen over the years is that the industry has been able to expand. The basic rule is that environmental improvements are a consequence of the corporate will to invest and its propensity to do so in the future. You take care of environmental costs as an integrated part.'[5]

4.4.2 Emission Reductions and Costs

During the 1970s and 1980s, costs for environmental investments were considerable for the Swedish PPI and accounted for 9–14% of the total investments (see Table 4.2).

[5]Interview with Per G Broman, Falun, 9 May 2006.

Table 4.2 Environmental investments in the Swedish pulp and paper industry, 1968–1988. Real prices (2000) million SEK (deflated using investment price index for the pulp and paper industry)

	68–70	71–75	76–79	80–84	85–88	Total
Environmental investments	930.2	4254.7	2372.9	2235.1	3388.9	13101.5
Environmental investments (share of total investments)	6	12.15	13.67	9.9	13.5	na

Source Swedish Forest Industries' Water and Air Pollution Research Foundation (SSVL) 'SSVL 74–85' (1989), see *Miljöskyddskostnader inom Svensk Skogsindustri 1985 t o m 1991. Appendix 2 and 20.* The estimates are based on questionnaire data collected by SSVL during the periods 1968–1970, 1971–1975, 1976–1979, 1980–1984, and 1985–1988. For a detailed accounting, see Söderholm and Bergquist (2012)

Over 60% of these investment costs involved altering internal processes that aimed to decrease water use and improve chemical and fibre recycling while about 14% of the costs concerned external wastewater purification measures. The cost share for air-purification measures amounted to only 15% (SSVL 1991, p. 93).

Costs were the highest among pulp producers (in comparison to paper producers), a sector in which the share of environmental investments in 1985–1988 accounted for as much as 17.5% of total investments (SSVL 1989, Appendix 10). This share was even higher among producers of bleached pulp at the beginning of the 1990s due to the discovery in the mid-1980s of the formation of dioxin in the process of pulp bleaching. Reported expenditures of US mills during the 1970s were on average 24% (i.e., higher than for the Swedish mills). However, during the 1980s capital expenditures on pollution control in the US PPI declined to 8.1% (Smith 1997, pp. 109ff).

The environmental investments undertaken by Swedish pulp and paper producers generated significant emission cuts. One example occurred in terms of Chemical Oxygen Demand (COD), which over the period 1970–1995 decreased from approximately 2.3 to 0.4 million tons annually. Moreover, from the mid-1980s to 2010 emissions of absorbable organic halides (AOX) declined by 97%.[6] AOX is associated with dioxin and is a measure of total halogens (chlorine, bromine, iodine). Emissions of sulphur, AOX and COD are shown in Figs. 4.1, 4.2 and 4.3, while pulp production is shown in Fig. 4.4.

[6] http://www.skogsindustrierna.se/skogsindustrin/branschstatistik/hallbarhet/. Accessed 19 January 2018.

4.4.3 Firm Collaboration

A central part of the technologies that generated the significant emission cuts illustrated in Figs. 4.1, 4.2, 4.3 and 4.4 were developed within collaborative R&D arenas of the Swedish PPI. And at the time of the enforcement of the EPAct (1969) these measures were supported by environmental authorities and involved various actors of importance to the innovation process. Two new collaborative environmental R&D

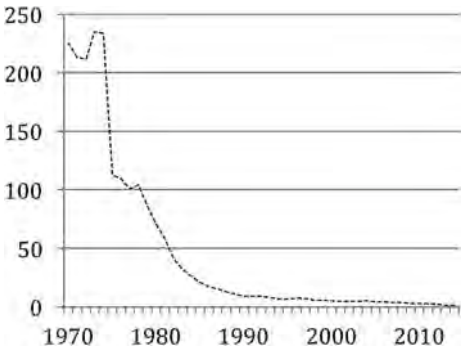

Fig. 4.1 Emissions of sulphur 1970–2014 (tons). *Source* Skogsindustriernas miljödatabas

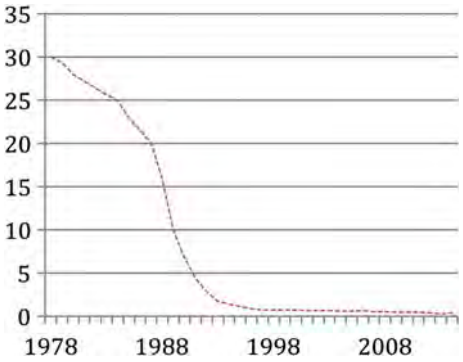

Fig. 4.2 Emissions of AOX 1978–2014 (tons). *Source* Skogsindustriernas miljödatabas

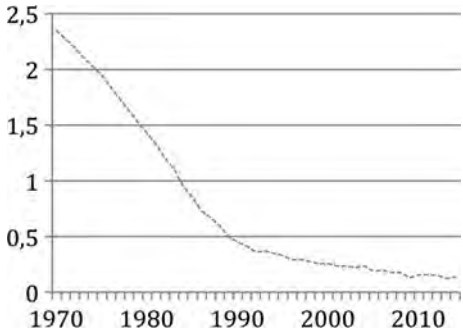

Fig. 4.3 Emissions of COD 1970–2014 (million tons). *Source* Skogsindustriernas miljödatabas

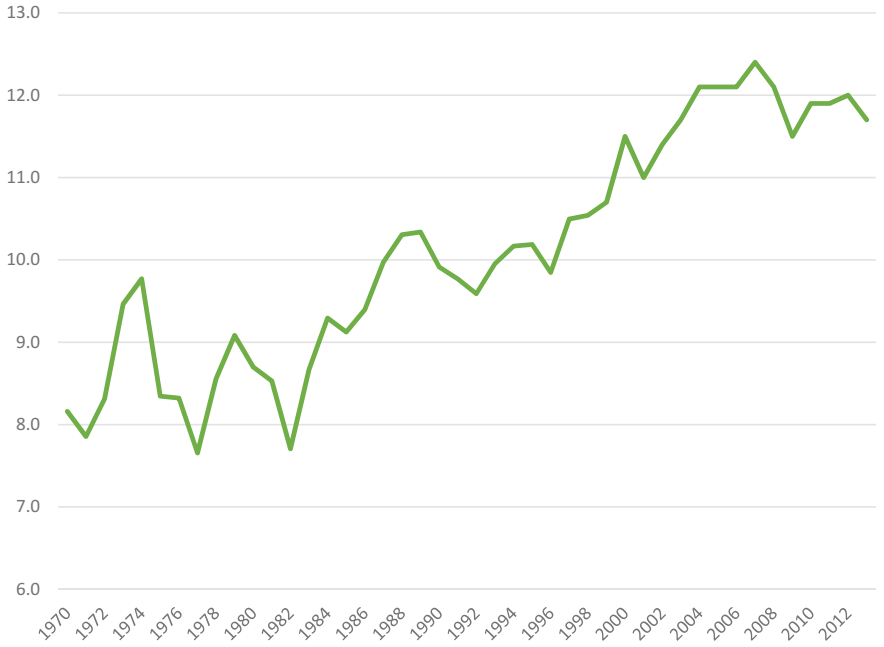

Fig. 4.4 Swedish pulp production 1970–2013 (million tons). *Source* Skogsindustriernas miljödatabas

platforms were established by the Swedish PPI in the 1960s. These were the state- and industry-funded Institute for Water and Air Protection (IVL), created in 1966, and the Forest Industries' Water and Air Pollution Research Foundation (Stiftelsen Skogsindustriernas Vatten- och Luftvårdsforskning, hereafter SSVL), established in 1969. The motive for creating the two new platforms was the recognized need for effective collaborative efforts in environmental R&D to manage costs and risks related to emerging stricter environmental requirements. SSVL consisted not only of a broad set of representatives from private companies, research institutions, and industry interest groups, but also of consultants, equipment suppliers, and research institutions outside the immediate sector (Bergquist and Söderholm 2011).

The furthering of green knowledge was accomplished in collaboration also with state agencies, particularly within IVL. The Institute was jointly founded in 1966 by the Swedish government and the Swedish pulp and paper industry in collaboration with other industrial sectors. Its primary assignment was to conduct research on the relationship between industrial production and environmental problems and to identify effective solutions. Closely affiliated with the Institute was the Industry Water and Air Protection Agency (Industrins Vatten och Luftvård AB), a service company that was also established in 1966. Together with SSVL, IVL supported knowledge diffusion and technology development of decisive importance to the green reconstruction of the Swedish PPI from the 1960s through the 1970s and 1980s

Table 4.3 Industry-wide collaborative platforms of the Swedish pulp and paper industry for environmental R&D until 1973

Organisation/Institute	Time period
Sulphate Pulp Committee	1908–1909 (?)
Swedish Pulp and Paper Research Institute (STFI)	1945—Changed name to Innventia AB in 2009
Central Laboratory of the Pulp Industry	1936 (ascended into STFI in 1968/69)
Water Pollution Committee	(1937) 1945–1953/54
Water Laboratory of the Forest Industry (SIV)	1953/55–1964 (was first governed by the Water Protection Committee of the Forest Industries, but in a few years turned into the Forest Industries' Water Protection Council respectively the Forest Industries' Water Protection Research Foundation, which in turn later became SSVL)
Swedish Forest Industries' Water and Air Pollution Research Foundation (SSVL)	1963—still active
Institute for Water and Air Protection (IVL)	1966 (today IVL Swedish Environmental Research Institute)
Service company of IVL	1966 (acquired by the Swedish Steam Boiler Association in 1982)
Energy Committee	1973—still active

Sources Söderholm and Bergquist (2012, 2016)

(Bergquist and Söderholm 2011). Table 4.3 provides an overview of the collaborative platforms.

It should be mentioned that the knowledge generated within IVL and SSVL was applied by the Franchise Board of Environmental Protection (FBEP) while enforcing the EPAct through the issuing of individual permits. The network connected to the environmental R&D activities, including both industry and environmental authorities, hosted technical competence and contributed to a shared understanding of reasonable courses of action. There were, however, conflicting opinions on how far industry could and should go in terms of environmental compliance.

4.5 Towards ECF and TCF Bleached Pulp

The replacement of elemental chlorine as a bleaching agent with the alternative ECF and TCF methods is an internationally well-known, environment-related technological shift of the PPI. Technically the ECF-process means a complete replacement of chlorine (Cl_2) with chlorine dioxide gas (ClO_2). By replacing Cl_2 with ClO_2 the levels of absorbable organic halogens (AOX) are greatly reduced. The TCF-process in turn completely eliminates the use of both Cl_2 and ClO_2 and instead typically

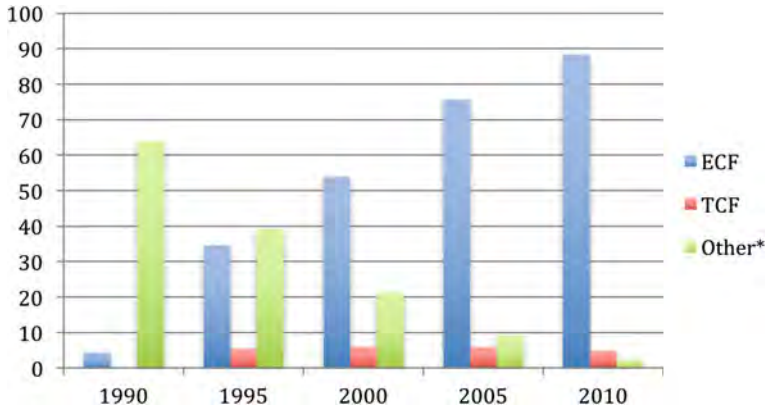

Fig. 4.5 Bleached chemical pulp production in the world 1990–2010 (million tons). *Source* Alliance for Environmental Technology (2012). *Pulp bleached with some molecular chlorine

uses hydrogen peroxide (H_2O_2) and/or ozone (O_3) as substitute bleaching agents. The development of ECF and TCF was further aided by improvements in the oxygen delignification technology, which is used in a pre-bleaching stage.

The shift towards alternative bleaching methods was dramatic. Soon after the US EPA in 1985 detected low concentrations of the extremely toxic and highly chlorinated hydrocarbon group dioxins in fish caught downstream from a few pulp mills, Swedish environmental authorities immediately followed up with their own investigations. In 1986, they concluded that crabs collected near the effluent site of a Swedish pulp mill contained dioxins, too. In the years to come the issue of bleached pulp was raised on both public and governmental agendas throughout the world and regulatory processes were initiated in pulp producing countries. Hence, the risks of dioxin were intensively discussed during the European environmental debate and Sweden was, already in 1988, the first country in the world to set up a regulatory standard for controlling dioxins discharged from pulp mills (Bergquist and Söderholm 2015). Until recently the dioxin alarm has caused a major shift in bleaching technologies worldwide. In 1990, 93% of the bleached pulp produced in the world was bleached by elemental chlorine and in 2010, this figure had dropped to only 2.7%. Figure 4.5 illustrates this development.

It is widely recognized that the technologies diffused more rapidly in the Nordic countries compared to North America, and it is mainly explained by the rise of green consumerism in key markets for Nordic producers while the demand for chlorine free paper was absent in North America (Marcus 1999; Smith and Rajotte 2001; Harrison 2002; Norberg-Bohm and Rossi 1998; Reinstaller 2005; Smith 1997; Popp et al. 2011). Figure 4.6 illustrates the diffusion of ECF and TCF in the Nordic countries since 1990.

Yet, it gives a highly simplified picture to bundle the Nordic countries in this respect. It is rarely highlighted that the great majority of the pulp producers a few

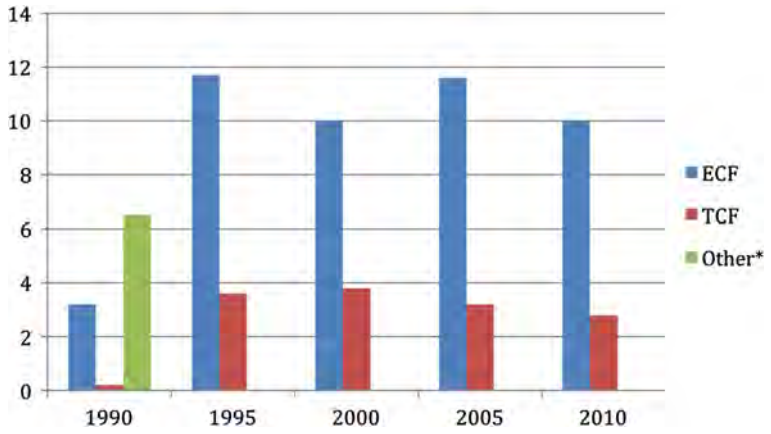

Fig. 4.6 Bleached chemical pulp production in the Nordic countries 1990–2010 (million tons). *Source* Alliance for Environmental Technology (AET) (2012). *Pulp bleached with some molecular chlorine

years into the 1990s that had switched to TCF were of Swedish origin and only two were Finnish (Reinstaller 2005, p. 1373). Moreover, Swedish producers, unlike Finnish ones, pioneered in the development of several core technologies for the ECF and TCF processes in the 1970s and 1980s, such as oxygen delignification, advanced batch cooking and ozone bleaching (Kramer 2000). The pioneering development of the Swedish producers in this matter should be viewed in the collaborative context of the long-term environmental R&D activities discussed above, and where important technological steps were achieved through networks of actors rather than by single firms. Thus, already from the mid-1970s, projects were initiated within both SSVL and the Swedish Pulp and Paper Research Institute (STFI) that focused largely on improving the pulp bleaching process.

The projects typically aimed at decreasing the use of chemicals while increasing the level of delignification in the boiler and in the subsequent oxygen delignification. The main motives in these instances were both to decrease costs and cut emissions from the bleaching process. Thus, already in the early 1970s a pilot plant for oxygen delignification was constructed at a Swedish mill in relation to a SSVL-project (Jerkeman 2007), and two decades later the technology was installed at all Swedish pulp mills (SSVL 1991). At the time, the Nordic Council of Ministers considered the oxygen delignification technology the single most effective process-oriented device to reduce chlorinated organic compounds (Nordic Council of Ministers 1989, pp. 21–23). Also during the 1980s, methods of boiling the pulp to very low levels of lignin, which in turn reduced the need for bleaching chemicals even further (Modified Continuous Cooking/Super Batch Cooking), were developed jointly (and later widely diffused) in the Swedish PPI (Jirvall and Noodapera 1995).

Industrial pollution was regulated only in a limited way in Finland before the late 1980s, and the preferred method for controlling it was by end-of-pipe technology and

particularly the activated sludge method. In 1989, it was applied by a large number of Finnish sulphate/kraft pulp mills, whereas Swedish mills instead were better outfitted with pollution prevention methods such as oxygen delignification, modified cooking and high chlorine dioxide substitution (Auer 1996). Hence, before green consumerism grew in key markets for Nordic producers in the 1990s, regulation was the main trigger for the technological shift towards ECF and TCF among Swedish pulp mills. The Swedish FBEP took an initial and clear standpoint on the dioxin issue already in 1986, when it delivered final conditions for a sulphate pulp mill that declared that the wastewater from the bleaching process caused significant local damage to water-based organisms. In 1988, the Swedish Parliament in turn adopted a proposal which stipulated that industrial emissions of chlorinated organic compounds must be reduced to 1.5 kg AOX/ton of pulp (the normal emission level was about 4 kg per ton of pulp at this time). At this stage the Swedish Forest Industries Federation identified necessary investments to meet the requirements that were now being enforced to be 4 billion SEK, and for some mills it represented up to 50% of the annual investments until 1992 (Bergquist and Söderholm 2015).

The final important technological steps towards TCF pulp were taken by the Swedish PPI in the very last years of the 1980s due to rather forceful regulatory action. In 1988 the Swedish government imposed on an individual mill the most stringent standards ever, namely a maximum of 0.5 kg AOX per ton. The mill, Aspa, was a small producer of market pulp, however, with a sensitive location on a lake that supplied drinking water for several communities. Already in the spring of 1989 the mill had installed a method which produced these low emissions, however, after further development work and only a year later the so called Lignox process[7] allowed for the production of TCF pulp. Hence, the small Swedish firm ASPA was the first mill in the world to produce TCF pulp. Still, it is important to note that while the development work physically took place at ASPA, the knowledge underpinning the transition stemmed from the long-term, industry-wide R&D collaboration described above (Bergquist and Söderholm 2015). In 1991, ASPA would, in collaboration with Greenpeace, produce an exact copy of "Das Plagiat", the weekly *Der Spiegel* printed on paper made of such pulp. It was the first time a magazine was published on chlorine-free paper and this accomplishment has been recognized as having had a great impact on the German public and, by extension, also the greater northern European market (Waluszewski and Håkansson 2004). For the first time it was possible to market paper products with eco-labelling, an opportunity which the Swedish producers quickly embraced. At this time the Swedish Nature Conservation Association had launched two environmental classes ("low chlorine" and "chlorine-free") for bleached paper qualities which got major impact and helped the Swedish pulp producers in their first-time marketing of green products by this new 'eco-labelling' standard (i.e., chlorine-free pulp and paper products) (Bergquist and Söderholm 2015).

[7]The Lignox process: oxygen-bleached pulp is treated with hydrogen peroxide at high temperatures after the removal of heavy metals with a complexing agent. Subsequent final bleaching takes place with peroxide and chlorine dioxide.

In 1994 the majority of the Nordic mills that had switched to TCF were of Swedish origin (remaining Swedish mills had all switched to ECF). In contrast, only two mills in Finland had opted for TCF by this time. Also in the US, the companies showed little interest in shifting to TCF. Only two mills had adopted TCF in 1994 (Reinstaller 2005, p. 1373). Thus, also in the US the policy process moved more slowly and when the Swedish PPI aimed to produce ECF and TCF pulp in the early 1990s the US EPA still worked on defining the standard settings for controlling dioxin emissions. For the US PPI, the dioxin issue meant something completely new as the mills could not compel only by installing end-of-pipe treatments, but had to invest significant funds in adopting new bleaching technology. The US industry had never had a strategy to deal with pollution with internal process changes (Gunningham et al. 2003, p. 16; see also Smith 1997). Thus, resistance to making the change was strong within the sector because it would come both at a very high cost and without any advantages on the American market (Reinstaller 2005, 1380). This helps explain why Greenpeace failed in its attempt in 1992 to convince the American *Time* magazine to switch to publishing on TCF paper. Further, Georgia Pacific, one of the leading pulp and paper producers in the US, announced in 1992 to consumers that it would not market TCF pulp, having decided to invest in chlorine dioxide substitution instead. Customers who wanted TCF pulps would have to seek other suppliers. This was possible for the company to do and say as as the demand for TCF pulp was very low on the US market (Smith 1997, p. 131). And together with a slower regulatory process, US firms could wait to alter the technology. In this context, in 1989 the US Office of Technology Assessment (OTA) reported on the compliance of Swedish pulp mills to more stringent standards of chlorinated organics, whereas it was unreasonable to hold US firms to such standards due to both economic risks and scientific uncertainties (Powell 1997, p. 12).

In sum, although the shift towards ECF and TCF apparently happened swiftly in the Swedish case, the development-path towards environmentally friendlier bleaching methods was the outcome of decades-long industrial efforts to increase efficiency and reduce the use of chemicals by changing internal processes, in combination with long-term and continuously strengthened environmental legislation.

4.6 Energy Transition

In parallel to the "greening" of industry with respect to increased pollution control, two other issues have had a major impact on the greening of the PPI since the early 1970s. The first is the increased energy prices in the wake of the oil crises of the 1970s and the second is the fear of a shortage of wood. Neither issue was initially related to environmental concerns, but became increasingly so as they drove serious concerns about energy use and triggered energy savings as well as recycling.

Indeed, pulp and paper production is energy-intensive. The PPI is the largest energy user in Sweden and accounts for 52% of the total industrial energy use (SEA 2017, p. 21). In the EU the PPI accounts for 14% of the total industrial energy

use (Jönsson 2011). Although energy usage was always important to the PPI due to its cost, the 1970s caused the need for energy savings and finding substitutes for oil to become preeminent concerns, and both the Swedish PPI and the Swedish government turned their attention to phasing out oil from pulp and paper production. As a consequence, the energy mix of the Swedish PPI underwent radical changes over the 1970s and 1980s, and a large-scale substitution of oil took place. In 1973, for instance, oil accounted for 43% of the total external energy use and in 1984 the share of oil had decreased to 16%. Moreover, in 2011 the corresponding number was 5% (Skogsindustrierna 2012).

Oil reduction was mainly achieved through increased use of internal biofuels (external biofuels remained fairly constant); between 1973 and 1984 the share of energy generated from internal biofuels increased from 55 to 72%, and in 2011 the share of biofuels was 79% (Fig. 4.7). The biofuels mainly consisted of by-products from the pulp manufacturing process, where the biggest share is generated from black liquor[8] and the rest from bark and wood residues (Federation of Swedish Forest Industry 2012). The overall reduction in the use of oil was also made possible through other energy efficiency improvements and increased internal production of electricity through back-pressure turbine power generation (Lindmark et al. 2011; Bergquist and Söderholm 2016). Of central importance for this development, which included a great deal of incremental technology development, was the already established collaborative strategy of firms within the industry and between the PPI and state authorities. Thus, a large number of energy projects were subsequently conducted through inter-firm and state-industry collaborative R&D platforms established after the 1940s, such as STFI and SSVL (Table 4.3). Still, to manage the new energy challenge the Swedish PPI had already appointed in 1973 a standing Energy committee consisting of 12 members from among management and technical personnel within the sector.

Between 1973 and 1977, no fewer than 51 new energy projects had been initiated or at least proposed within the sector. These involved 37 energy conservation and 14 energy generation projects, most conducted/proposed in collaboration with organisations closely associated with the sector, such as STFI, the Swedish Cellulose and Paper Mill Association (SCPF), and the Steam Generator Association (in Swedish Ångpanneföreningen), but also universities and research institutes outside the sector (e.g., the Thermal Engineering Research Institute (in Swedish Värmeforsk) (Marklund 1994, p. 143). Underpinning the energy transition of the Swedish PPI was also a proactive governmental strategy to emphasize knowledge management and collaboration with industry along with the substitution of oil with internal biofuels. The Swedish government assigned significant subsidies for prototypes and demonstration plants by its energy policy decision in 1975, and such activities increased greatly over time. In the 1970s, new processes and technologies on a factory-wide scale could be subsidised by as much as 50% (Bergquist and Söderholm 2016).

[8] In the pulping process, cooking chemicals, known as white liquor are used to break out and dissolve the lignin whereas the white liquor becomes black liquor. There are basically two main process streams coming out of a pulp mill: cellulose fibres and black liquor.

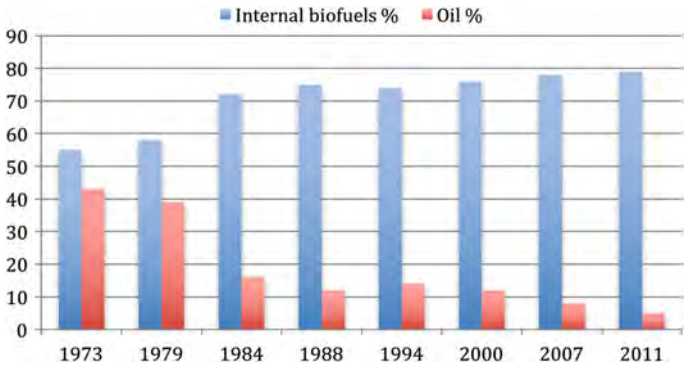

Fig. 4.7 Consumption of internal biofuels and oil in the Swedish pulp and paper industry 1973–2011 (% of total energy use). *Source* Skogsindustrierna (2012)

The energy transition of the Swedish PPI was further driven by the fact that focus was directed towards unutilized potential energy sources, whereby a previous waste problem with bark and chips now could be transformed into energy savings and improved energy efficiency. Moreover, the PPI feared shortages of wood and sought means of increasing its energy efficiency, and these forces led it to increase its use of recycled paper in pulp production; producing pulp from recycled paper requires only one-fifth of the energy needed produce it from virgin wood. Thus, from not have being utilised at all in Swedish pulp production prior to 1975, recycled paper came to be an important raw material. Of central importance for this development were improved methods for removing ink and other contaminants, such as plastic, from the recycled paper, and the introduction in 1975 of a compulsory collection system for old newsprint from households (Bergquist and Söderholm 2016).

The improved energy efficiency over the 1970s and 1980s coincided with an on-going structural change in industry, namely a trend towards fewer and larger production units and an improved ability to take advantage of economies of scale (Järvinen et al. 2012). The concentration of production units allowed, among other things, a higher degree of integrated pulp and paper production whereby the energy intensive step of drying the pulp (at the pulp mill, only to dissolve it again at the paper mill) was avoided (Bergquist and Söderholm 2016).

Today the energy efficiency of the Swedish (and Finnish) PPI is higher than that of other major pulp producing countries such as Brazil, the US and Canada (Fracoro et al. 2012). However, the sector's total energy use has stayed relatively constant due to considerable production expansion, not the least in mechanical pulp, which has contributed to increased use of electricity beginning in the early 1980s (Bergquist and Söderholm 2016). As a result, between 1973 and 2011 the total energy consumption of the Swedish PPI increased from 55 to 57 TWh (Skogsindustrierna 2012).

4.7 Environmentally Driven Transformation—The Past and the Future

Over the second half of the twentieth century, environmentally related issues have played a central role in the overall transformation of the Swedish PPI, essentially as new or altered technologies were required to comply with tightening environmental regulations. In the Swedish context, the greening of polluting manufacturing industries occurred within a collaborative regulatory framework. Knowledge was flowing quite openly between Swedish PPI companies and between environmental authorities and the regulated industry (Bergquist and Söderholm 2011). Thus, the significant environmental improvements accomplished within the Swedish PPI over the period can only be fully comprehended by acknowledging the role of collaborative environmental R&D activities among firms within the sector and between the sector and the state. Furthermore, the development after the 1980s illustrates how the emergence of green consumerism came to play a role as a driver towards environmental improvements.

The PPI has developed from being considered one of the greatest polluters of the twentieth century to an industry that is essential for the transition towards a more sustainable (bio-based) economy. In the EU, the PPI today already constitutes the biggest single industrial producer and user of renewable energy; 56% of the industry's primary annual energy consumption is bio-based (CEPI 2013, p. 50). And there are big hopes, especially within the Nordic countries, that the PPI will take the lead in clean-tech innovation and green growth in terms of new products and the second generation of "green" fuels. The trend is global and most pulp and paper companies are working in this direction. The sector, particularly in Sweden, is at the same time undergoing substantial change due to stricter environmental regulations, unstable oil price, energy policies, global competitiveness and structural changes. In addition, the increasing use of electronic rather than paper-based communications are pushing the PPI towards self-renewal to improve its profitability (Backlund and Nordström 2014), whereby it appears as if parts of the pulp industry have experienced a shift towards becoming more "biorefineries" than pulp producers (Hamaguchi et al. 2012). One promising technology in this context is black liquor gasification (BLG[9]) for the production of fossil free transportation fuels. Here the Swedish company Chemrec has been a key player. Thus, in 2009 and after 20 years of R&D on BLG, Chemrec constructed a pilot plant with financial support from the European Community's Framework Programmes and the Swedish Energy Agency. However, after the BLG demonstration technology did not develop as expected and there was a lack of investment interest in the project, the pilot plant was shut down and remains so. One suggested reason for the lack of interest was the uncertain market conditions for biodiesel and methanol (SEA 2016). Still estimates suggest that BLG could supply as much as 7% of Sweden's total—not merely its industrial—demand for electricity, or as much as 30% of the nation's demand for transportation fuels. Outside the

[9]BLG is in its essence a process in which a clean synthesis gas is produced from black liquor by converting its biomass content into gaseous energy carriers (Bajpai 2014, p. 3).

Nordic countries, BLG technology is also developing in the US and Asian pulp producing countries (Bajpai 2014, pp. 4–5). Another example of on-gong renewals is the Finnish Metsä Group's investment in the 'bioproduct' mill in Äänekoski, Central Finland, which represents the largest forestry investment ever made in Europe, with a value of EUR 1.2 billion. It is the first next-generation product mill in the world, were the production of energy, along with the pulp production, play a crucial role (Metsä Group 2017).

Another trend in the PPI's development towards environmental improvements, partly from new products within the area of bioenergy, is a continued expansion of the traditional pulp and paper production driven by an increased global demand for cardboard and sanitary papers. For example, the Swedish pulp and paper company SCA is currently rebuilding its Östrand mill (due to start up in 2018) in Sweden and has publicized that a large-scale investment programme will lead to 'the largest production line for bleached softwood sulphate pulp in the world'. Above all the firm has stressed that the mill will become 'world class in terms of product quality, environment and competitiveness' by becoming 'the leader in terms of resource management' and 'generate surplus energy' to be sold in the form of 'green electricity and district heating'. Also, 'both TCF and ECF pulp' will be produced with raw materials from 'sustainable forestry'.[10] Overall the Swedish example illustrates, however, that the transition towards cleaner and more energy efficient pulp and paper production is the result of long-term and incremental processes, whereby the technology development has been shaped by both evolving markets, long-term collaborative R&D and shifting concerns in society about the natural environment and human well-being.

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[10]https://www.sca.com/sv/massa/aktuellt-inom-pulp/expansion-av-ostrand/. Accessed 19 January 2018.

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IChemE

0957–5820/00/$10.00+0.00
© Institution of Chemical Engineers
Trans IChemE, Vol 78, Part B, January 2000

THE ROLE OF CHLORINE IN DIOXIN FORMATION

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There is poor correlation between total chlorine in waste streams and formation of polychlorinated dibenzodioxin and polychlorinated dibenzofuran (PCDD/F) during waste combustion. This is because the active chlorine (Cl) species are strongly dependent upon combustion conditions. For homogeneous conditions, trace amounts of a hydrocarbon species (benzene) injected into the effluent from complete combustion of a mixed chlorocarbon fuel (ethylene and chloromethane) results in formation of stable, oxygenated and chlorinated compounds. This occurs over a broad range of temperatures (400–900°C), provided that a fraction of the system chlorine is in the Cl radical form. Cl is the only form in which chlorine can react, in gas-phase, with stable hydrocarbon species, and these reactions are very fast, even in the low temperature regime. Molecular chlorine (Cl_2) may subsequently participate in reactions with carbon-based radicals, and these reactions are the primary source of chlorinated products. Hydrogen chloride (HCl)—the major chlorine species in the products—can react with oxidizing radicals (eg, OH) and promptly form significant amounts of Cl. Gas temperature has a great influence on the final distribution of products. At 800–900°C, practically all of the benzene which was attacked by Cl is converted to carbon monoxide and small unsaturated hydrocarbons by subsequent reactions with oxygen. At about 750°C, measurable concentrations of chlorobenzenes are formed. At lower temperatures (400–600°C), chlorophenols become a large fraction (up to 15%) of the total reacted benzene. Heterogeneous reactions result in the formation of Cl_2 through catalyzed reactions (most actively by copper salts) and promotion of carbon-Cl bond formation. The latter is dependent on the ash surface species and type, ash adsorptive characteristics, temperature, and presence of regenerative Cl in the waste combustion products.

Keywords: polychlorinated dibenzodioxin; dibenzofuran; air pollution; combustion; chlorination.

INTRODUCTION

The public concern with the emissions of 'dioxins' or polychlorinated dibenzodioxin and polychlorinated dibenzofuran (PCDD/F) from incinerators has resulted in periodic calls for the banning of chlorine from waste streams. This paper reviews the mechanisms for the formation of dioxins to try to establish a better understanding of the role of chlorine in the dioxin formation process in order to guide both control measures and regulations on the composition of the waste stream.

The formation of PCDD/F as trace by-product pollutants from combustion processes has been extensively studied over the last 15 years. These chemicals are highly persistent, bioaccumulating in the environment and ending up in the food chain. The more toxic form has been classified as a 'known' human carcinogen[1], and they have been linked with tumour formation, learning deficits, endometriosis, immunosuppression, and developmental/reproductive effects[2,3] in experimental animals.

PCDD and PCDF are each composed of eight homologue groups (mono through octa), distinguished by the number of chlorine (Cl) atoms attached to their ring structures. The eight homologue groups have varying numbers of structural isomers, totalling 210 congeners (75 of PCDD, 135 of PCDF). Of these 210, 17 are considered toxic to varying degrees due to their biological activity, and each is Cl-substituted in at least the 2,3,7,8 positions. Each of these 2,3,7,8 isomers has been assigned a toxicity equivalency factor (TEF) which, when combined with the concentration, produces a weighted toxic equivalency (TEQ) of the mixture.

The occurrence of PCDD/F in the environment, as deduced from the depth profiling in sediments, has grown dramatically since the 1930s in parallel with the growth with the production of chlorinated organic compounds[4]. This has led to the attribution of the dioxins to primarily anthropogenic sources with incineration implicated as a major source[5]. The dioxins are widely distributed globally[6] with the concentrations being generally highest in industrialized countries.

Despite the predominance of PCDD/F from combustion sources, our understanding of the formation mechanisms and reaction rates in combustion systems has not yet reached the point where we can predict the potential of a system to form PCDD/F or take adequate measures to substantively prevent formation. This is due to the extremely difficult nature of the reaction mechanism: only trace concentrations of products are formed; multiple gas- and solid-phase reactions are involved; the combustor reaction environment is difficult to simulate; the reactants themselves are present at only trace concentrations; simultaneous chlorination, dechlorination, formation, and decomposition reactions occur; and monitoring PCDD/F

formation is possible only through application of long and difficult manual sampling methods and costly chemical analyses.

THEORIES AND FACTORS

PCDD/F are formed via both homogeneous and heterogeneous processes with the heterogeneous pathway generally considered to be the more important. There are two main mechanistic theories to account for observed PCDD/F heterogeneous formation of which the distinction is likely to be blurred by further research. The first theory is the so-called '*de novo* synthesis' mechanism which has been postulated and demonstrated by Stieglitz and coworkers[7]. In this mechanism, the presence of fly ash containing unburnt aromatic moieties and metal catalysts is essential. Gas-phase Cl, likely as hydrogen chloride (HCl), is said to form metal - chloride ligands on the fly ash surface, after which Cl is transferred to carbon (C). The subsequent metal-catalysed oxidation/gasification of the fly ash surface releases these C-Cl structures, some of which comprise the subject PCDD/F pollutants, and others which form related compounds such as chlorophenols, chlorobenzenes, and non-aromatic chlorinated hydrocarbons. The second theory is the so-called 'precursor' theory which has been demonstrated by Dickson and Karasek[8] and Karasek and Dickson[9]. In this mechanism, combustion byproducts including compounds such as chlorophenol or chlorobenzenes react on the catalyst-laden fly ash surfaces to form PCDD/F through condensation reactions. More recently, it has been demonstrated[10] that polycyclic aromatic hydrocarbons (PAHs) also chlorinate and decouple to form isomer-specific PCDD/F compounds. Both of these theories have been adequately validated in laboratory experiments. Arguments based on relative reaction rates, product congener profile comparisons, and temperature dependencies have been used to support both theories. The relevance of each of the theories, however, is difficult to ascertain: laboratory simulations of assumed microscale phenomena leave considerable doubt regarding their ability to replicate or represent conditions in a practical combustion system. The actual situation may be such that the carbon source is derived from both condensing, gas-phase organics and volatilizing, fly-ash-derived organics, the relative magnitude of which is due to system- and operational-specific variables but both of which subsequently participate in the same, or a similar, reaction mechanism.

At any rate, the generally requisite conditions for formation of PCDD/F are: (1) incomplete combustion of an organic fuel; (2) the presence of trace metals and surfaces to act as catalysts; (3) a temperature/time history providing at least 1 s below 600°C; and (4) a source of Cl. The focus in this paper will be Cl: evolution of various Cl species, Cl species concentrations and temperature/time dependency, mechanisms in carbon chlorination, and combustion factors that affect Cl species.

CORRELATION OF PCDD/F WITH CHLORINE IN WASTE

Data from some 169 municipal waste combustors, hazardous waste incinerators, medical waste incinerators, cement kilns, hazardous-waste-fired boilers, biomass combustors, and laboratory- and pilot-scale combustors were examined to determine if there was a correlation between the chlorine content in the feed and the PCDD/F concentrations in the stack[11]. The chlorine content in the feed varied from less than 0.1% for some biomass combustors to over 80% for some hazardous waste incinerators. The chlorine in the waste stream was in the form of inorganic salts as well as synthetic organic products including polyvinyl chloride (PVC). The results of the statistical analysis of the data showed that there was no significant effect of chlorine in the feed and the PCCD/F concentrations in the stack for field data although well controlled laboratory experiments showed an increasing concentration of PCDD/F with inlet chlorine content. The conclusion of the study was that in field studies the effects of confounding variables such as the temperature of the particulate control device, the excess air, and other combustor operating conditions masked any effect of the chlorine content in the feed. In order to understand such data, it is therefore important to understand what the active form of chlorine is and how it is influenced by changes in design and operating conditions of combustors and air pollution control devices.

Chlorine is undeniably required for formation of PCDD/F but only trace amounts in the fuel feed are needed to provide the minimum amount. For example, while emissions of PCDD/F from coal combustion are generally considered to be low, if measurable, even coal with less than 1 ppt (part per trillion, 1×10^{-12}) of Cl has more than sufficient Cl to produce PCDD/F that would exceed common regulatory limits. So the relevant question is not what amount of chlorine is limiting but what are the pathways for PCDD/F versus other chlorinated pollutants?

Homogeneous Formation

Which form of chlorine favours the formation of chlorinated hydrocarbons and PCDD/F?

The three forms of chlorine present in the post-combustion products of organic wastes are HCl, Cl, and chlorine (Cl_2). The hypothesis, for which support will be provided, is that the active form of chlorine is atomic chlorine and not total chlorine and that the concentrations of chlorinated hydrocarbons can be changed significantly by manipulating post-combustion conditions to modify the concentrations of either the atomic chlorine or hydrocarbon intermediates.

While the majority of the system chlorine in the products is in the HCl form, a non-negligible fraction may be present as Cl radicals and Cl_2. These two species (as opposed to HCl, which has very little reactivity in the combustion environment) can react with organic compounds. Cl radicals can readily abstract H atoms from stable hydrocarbons, forming carbon-based radicals and HCl. At high temperatures, 1400–1500°C, equilibrium indicates that a minor, but not negligible, fraction of the total system chlorine is in the Cl radical form. Furthermore, kinetic constraints may cause the persistence of high concentrations of Cl radicals, which exit the primary zone of chlorocarbon flames. The high concentrations of Cl radicals that survive during the cool-down of combustion products can promote the fast, gas-phase formation of chlorinated and oxychlorinated pollutants, under conditions possibly arising during practical combustion processes.

The concentrations of HCl, Cl, and Cl_2 can be calculated for different conditions by taking the following reactions into account.

Interconversion reactions of Cl and HCl:

$$HCl + OH = H_2O + Cl$$

$$HCl + O = OH + Cl$$

$$HCl + M = H + Cl + M$$

$$HCl + O_2 = HO_2 + Cl$$

Interconversion reactions of Cl and Cl_2:

$$Cl_2 + M = Cl + Cl + M$$

$$Cl_2 + O = ClO + Cl$$

$$Cl_2 + H = HCl + Cl$$

The kinetics of the reactions are relatively well understood, and the concentration of Cl and Cl_2 can be calculated with fair confidence[12,13]. The factors that favour high chlorine concentrations are: (1) high temperatures; (2) rapid cooling from high temperatures because of the slow rate of recombination of the chlorine atoms; and (3) high oxygen or OH concentrations because of their abstraction of H from HCl.

As the temperatures are reduced, the atomic chlorine recombines to form Cl_2. High concentrations of molecular chlorine in combustion products are therefore an indirect measure of high concentrations of atomic chlorine.

What conditions favour the formation of chlorinated hydrocarbons?

The reaction of chlorine atoms with hydrocarbons in the presence of oxygen will depend upon the temperature of reaction. This will be demonstrated here by summarizing results by the authors of injecting benzene into the lean post-flame combustion products of a chlorinated hydrocarbon after the combustion products had been cooled to different temperatures[13].

High-temperature oxidation: At 1100°C, benzene was promptly oxidized and converted to CO_2 (Figure 1-a). At the same time, a significant increase in the concentration of Cl_2 in the quenched samples was observed (Figure 1-b) indicating that new Cl radicals were generated by the reaction of HCl with oxygen-containing radicals (primarily OH). The OH radicals needed to drive this process were those generated during the full oxidation of the carbon species. These results indicate that benzene was oxidized primarily by the initial attack of oxygen species. H abstraction by Cl radicals certainly occurred, at least to some extent, and the resulting phenyl radicals were completely oxidized to carbon dioxide (CO_2). It can be concluded that, due to the high temperature, only the products of the complete oxidation of benzene were formed.

Intermediate temperature reactions: A similar experiment conducted at 900°C (Figure 1-a) showed that about 100 ppm of benzene is initially consumed and converted to smaller secondary products (primarily carbon monoxide (CO), acetylene, and vinyl acetylene). After the initial phase (0–2 ms), benzene oxidation continues at a much slower

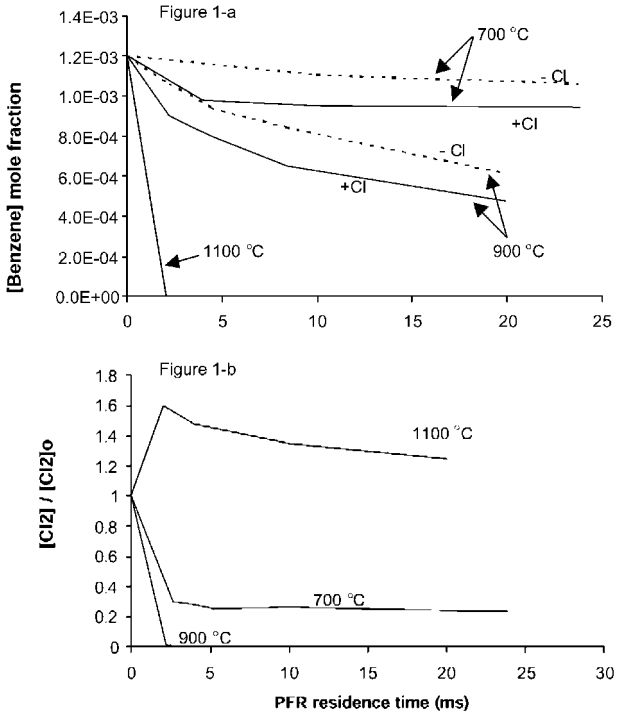

Figure 1. Concentration profiles of benzene (Figure 1-a), and Cl_2 (Figure 1-b) in quenched combustion products. Measurements relative to three different plug flow reactor (PFR) temperatures (700, 900, and 1100°C) are reported. For benzene measurements, data relative to control experiments (dashed lines labelled '-Cl') are also reported. During the control experiments, no chloromethane (ie, the only chlorine source) was fed to the primary reactor stage and the benzene concentration was measured. The comparison of the benzene profiles with and without chlorine in the system allows one to estimate the fraction of benzene which was consumed through the direct interaction with chlorine species. In Figure 1-b, data on Cl_2 concentration refer to the measurements in quenched combustion gas and are normalized with the Cl_2 concentrations measured just upstream of the secondary benzene injection. The initial values of the Cl_2 mole fractions are 1.6×10^{-4}, 1.4×10^{-4}, and 1.1×10^{-4}, respectively, for the 1100, 900, and 700°C measurements.

rate, yielding an increasing amount of the same secondary products. Given the relatively low temperature, the oxidation process was not complete and, after a residence time of 25 ms, no measurable CO_2 production was observed. A parallel decrease in the concentration of Cl_2 in the quenched products (Figure 1-b) indicates that the initial benzene consumption occurred through reactions with Cl radicals. The likely products of the reaction of benzene and Cl were HCl and phenyl radicals. The latter were subsequently attacked by oxygen species and converted to secondary products. Chlorobenzene, the only chlorinated product of incomplete combustion (PIC) observed, accounted for just a minor, although non-negligible, fraction of the conversion products (about 1.5 ppm mole fraction, which was equivalent to 1.5% of the total benzene consumed). Chlorobenzene may have formed, at least in part, by the reaction:

$$\text{phenyl} + Cl_2 \rightarrow \text{chlorobenzene} + Cl$$

Lower reaction temperatures: A third experiment was conducted at 700°C and, this time, benzene consumption was observed practically only in the initial phase of the process (Figure 1-a). The product distribution included the same secondary reaction products observed at 900°C

and a much larger fraction of chlorinated or oxychlorinated species (the sum of the concentrations of chlorobenzene, 2-chlorophenol, and 4-chlorophenol, measured after a residence time of 25 ms, accounted for about 12% of the total benzene consumed). The concentration profile of Cl_2 (measured in the quenched samples) showed a different pattern than in the two previous cases. After a prompt decrease in mole fraction to about one fourth of the initial concentration, the Cl_2 level remained practically constant. This indicates that, in fact, not all the Cl_2 measured in the quenched products sampled before the benzene injection was, at 700°C, in the form of Cl, but only about three-fourths.

The above results are consistent with the following mechanism:

(1) At a low enough temperature (eg, 700°C), benzene reacts with chlorine species and oxygen in a process initiated either by H abstraction by Cl radicals or via Cl attack on the benzene ring.
(2) The resulting radical further reacts with oxygen, yielding secondary products and chlorophenols, or can react with Cl_2, yielding chlorobenzene. Chlorobenzene might also be formed by the recombination of phenyl and Cl radicals.

Can chlorinated hydrocarbon formation be controlled by controlling the chlorine atom concentration?

Support for the above role of chlorine atoms has been obtained by injecting ethylene upstream of the benzene addition. If ethylene is injected at 1250°C, it burns and generates OH which augments the Cl atom concentration through the reaction $OH + HCl = Cl + H_2O$. In this case the production of chlorobenzene and chlorophenols was augmented by a factor equal to the increase in Cl atom concentration. If the ethylene is injected in the lower temperature regime, again upstream of the benzene injection, it will react with and consume the chlorine radicals. In this case, the chlorobenzene and chlorophenol consumption is suppressed.

What determines polychlorination?

Chlorine atoms in the lower temperature regime are the source of chlorination. As long as the concentration of the hydrocarbon injected is greater than that of the chlorine atom, monochlorinated hydrocarbons will result. Polychlorinated products are produced once the chlorine atom concentration exceeds that of the hydrocarbon.

Heterogeneous Formation

The mechanism of carbon chlorination is a significant question relating to an understanding of the mechanism of chlorinated organic formation.

Is a fuel or waste C-Cl bond required for subsequent formation?

With an understanding that PCDD/F emissions are due to formation processes in the combustor and not simply the result of incomplete combustion of a PCDD/F-containing feed stock, the next likely question concerns whether organic Cl is necessary for formation. This is a contentious issue, particularly regarding the role of specific forms of chlorinated organics, mainly PVC.

Numerous studies (eg, Wikström *et al.*[14]) have shown that inorganic chloride sources are comparatively equivalent to organic chloride sources for formation of PCDD/F. This suggests that pre-existing C-Cl bonds are not necessary for formation; chlorination readily occurs in the combustion process. This apparent equivalency may be partly understood by studying the role of inorganic chlorides in producing HCl in combustors. Experiments by Uchida *et al.*[15] showed that high temperature (>700°C) production of HCl from alkaline and alkaline earth chlorides occurs and is promoted by the presence of alumina (Al_2O_3) and silicon dioxide (SiO_2), common compounds in fly ash. If the presence of HCl then (at least) partially determines the extent of formation of PCDD/F, then even inorganic chlorides can lead to PCDD/F emissions.

Can gas-phase chlorination occur at lower temperatures?

Direct, quantitative chlorination of phenol by gas-phase Cl_2 has been demonstrated[16,17,18] with a maximum at 400°C; significantly less chlorination was observed using HCl as the Cl source (at a maximum of 600°C). As temperatures cool, equilibrium predicts the dominant Cl species to be Cl_2. However, the rate of Cl_2 formation is extremely slow such that most Cl is in the form of HCl as it leaves the stack. It has been hypothesized[19] that some Cl_2 forms as the result of a surface-catalysed reaction (the 'Deacon' reaction) between HCl and O_2:

$$2HCl + \tfrac{1}{2}\,O_2 \leftrightarrow H_2O + Cl_2$$

This first-order reaction occurs[16] with high yields, and the Cu catalyst can be reactivated by addition of HCl to the system. More rapid cooling minimizes this reaction[20] by slowing the recombination of Cl to Cl_2. This reaction is catalysed by metals, such as CuCl, of various oxidation states. Gullett *et al.*[17] analysed Cu_2O, CuO, and Cu and found nearly equivalent Deacon activity at a peak temperature equivalent to that of maximum reactivity of Cl_2 with phenol (400°C). No Deacon activity (Cl_2 production) was noted for Fe, Fe_2O_3, and $FeCl_2.4H_2O$. Fly ash testing indicated that 1.3% of HCl was converted to Cl_2.

Are surfaces necessary for C-Cl bond formation? Does chlorination occur as a result of gas-solid or solid-solid reactions?

Taylor *et al.*[21] propose that indirect chlorination of carbon via a transfer from surface Cu occurs as opposed to direct chlorination by gaseous precursors of Cl· or Cl_2. This work, and that of Froese and Hutzinger[22], showed that chlorination of acetylene (C_2H_2), a known precursor of aromatics and soot, occurs in the presence of surfaces and a chlorine source. Taylor *et al.*[21] proposed a surface transfer of Cl from $CuCl_2$ to C_2H_2 to form a chlorovinylic intermediate, with the presence of these surfaces reducing the formation temperature from 700 to 150°C. Formation of this intermediate is the rate limiting step (30.5 kcal mole^{-1}), and it is more energetically favourable than the Deacon process (48.7 kcal mole^{-1}). The authors report this reaction at as low as 150°C with $CuCl_2$ (although they show significant yields only at temperatures $\approx$ 300°C), whereas the Deacon process with CuO occurs at temperatures in excess of 300°C. Subsequent Cl transfers result in dichloroethylene or chloroacetylene (Taylor *et al.*[21]). Repetition

of these steps results in production of multiple chlorinated ethylenes or acetylenes. A lack of unchlorinated molecular growth products indicates that chlorination occurred prior to C growth reactions. Regeneration of the $CuCl_2$ is possible with HCl supply; hence, the metal serves as a stoichiometric oxidant and not a catalyst. The role of CuCl species in PCDD/F formation via Cl transfer is evidenced by variation in the colour of the Cu, reflecting changes in the Cu oxidation states with temperature. This is a plausible pathway, although it does not explain evidence for direct gas-phase chlorination of phenolic precursors (via electrophilic aromatic substitution reactions) nor did the tests account for possible decomposition of the copper chloride into Cl and/or Cl_2 gas (as shown in Gullett *et al.*[16,17]).

Considerable work (see Chaltykyan[23]), mostly in the field of aqueous catalyst reactions, supports the catalytic role of Cu-Cl species in formation of aromatic aldehydes; aryl halides; hydrolysis of chlorobenzene to form phenol and allyl chlorides to form alcohols; transformation of allenes to form halogenated dienes; dimerization, polymerization, and hydrochlorination of acetylene; and dechlorination reactions. Cu readily forms complexes with electron-donating ligands. When multiple ligands are present, equilibrium is determined by the polarizability of the competing ligands. Thus, copper-catalysed reactions are made up of complicated successive reactions consisting of acts of complex formation and break-down into the original components, activation of ligand molecules in the complex, and conversion of ligand molecule in molecules of the final product. This supports the proposed role of copper catalysts as 'transfer' agents for Cl (as indicated by Taylor *et al.*[21]).

Solution chemistry has shown that acetylene in concentrated aqueous solutions of cuprous chloride is extremely reactive. Acetylene polymerization is also possible using an acidified solution of cuprous chloride and ammonium chloride with acetylene[24]. A number of non-chlorinated products result, including butenyne (C_4H_4)$CH_2=CH\text{-}C\equiv H$ and traces of acteylene hexamer ($C_{12}H_{12}$) and chloroderivates. Nieuwland[24] hypothesized that one or two acetylene molecules displace the ammonium chloride and enter into the cuprous complex. This complex decomposes to form, possibly, $CH_2=C=$ which reacts with an unreacted acetylene to form butenyne.

Gas-phase work has also shown the role of copper catalysts. Freidlin *et al.*[25] showed the gas-phase hydrolysis reaction of chlorobenzene over silica gel to be greatly enhanced in the presence of $CuCl_2$, CuCl, and Cu powder, resulting in the formation of phenol and HCl. Others[26,27] have measured continuous hydrochlorination of acteylene over dry metal chlorides (Pt, Hg, Cu, Fe, and Ba) supported on activated carbon (180–195°C). Processes to improve vinyl chloride preparation from acteylene and HCl also make use of cuprous chloride.

Similarly, hydrochlorination of butenyne is aided by KCl and NH_4Cl, but mostly by $CaCl_2$ to form products such as 4-chloro-1,2-butadiene[28] and chloropropene[29]. In the presence of copper salts, a second HCl will be added[28]. Likewise, dechlorination reactions also occur. The Cu-catalysed dechlorination of tetrachlorophenol was observed when passing H_2 and tetrachlorophenol over cuprous chloride[30].

Does PCDD/F suppression by SO_2 act through an effect on the Cl reaction?

The studied effect of sulphur dioxide (SO_2) on preventing formation of PCDD/F may also offer some indirect clues regarding the mechanism and role of Cl in the formation of chlorinated organics. Much research has shown, in bench[31,32], pilot[33,34] and field tests[35], that the presence of S, likely as SO_2, effects suppression of formation of chlorinated organics. This effect may explain why coal-fired boilers, despite sufficient levels of Cl, Cu, organics and particle surfaces, are not significant PCDD/F emitters[36].

There are several possible hypotheses for mechanistic interference by the S species. It has been proposed[19] and demonstrated at 400°C[32] that an effect of S is to deplete the Cl_2 levels through the gas-phase reaction

$$Cl_2 + SO_2 + H_2O \leftrightarrow 2\,HCl + SO_3$$

perhaps through a sulphuryl chloride (SO_2Cl_2) intermediate. This reaction occurs and may be carbon-catalysed. This reaction would presumably inhibit reaction of Cl_2 into aromatic structures via electrophilic aromatic substitution reactions due to reductions in the amount of available Cl. A preliminary concentration effect has been observed such that S/Cl (not Cl_2) ratios around or above, approximately, unity are necessary to produced decreases in PCDD/F formation[34].

Another hypothesis suggests that the presence of higher concentrations of sulphur during coal combustion shifts the phase distribution of metallic deposits away from the chlorides necessary for PCDD/F formation. Experimental and equilibrium analyses by Chen *et al.*[37] found that the presence of sulphide (added as sodium sulphide, Na_2S) inhibited the formation of the more volatile metallic chlorides, instead resulting in more metallic oxides than chlorides. This may limit the activity of the metal catalysts for PCDD/F formation through reductions in the available metal chloride concentrations. Likewise, equilibrium calculations by Verhulst *et al.*[38] similarly show that the presence of S stabilizes many metals in sulphate phases below 800°C. These metal sulphates can displace chlorides; for Cu, the formation of copper sulphate ($CuSO_4$) completely dominates the formation of copper chloride (CuCl) at temperatures below 500°C. In the absence of S, gaseous Cu_xCl_x species still exist between 300 and 500°C. Increasing Cl levels result in increased Cu volatilization.

Miller and Krause[39] also found that chloride salts on wall deposits react with SO_2 and oxygen near the boiler tubes to evolve high concentrations of HCl directly adjacent to the metal. These observations are consistent with work by Uchida *et al.*[15] who found that the presence of SO_2 resulted in the overall reaction ('Hargreave reaction'):

$$2NaCl + SO_2 + \tfrac{1}{2}\,O_2 + H_2O \Leftrightarrow Na_2SO_4 + 2\,HCl$$

producing HCl(g). The equilibrium constants for these types of reactions increase with decreasing temperatures. An analogous reaction with CuCl or $CuCl_2$ may be responsible, at least partly, for the reduced formation of PCDD/F observed in combustion systems.

CONCLUSIONS

Major progress has been made in our understanding of the homogeneous and heterogeneous pathways to the polychlorinated hydrocarbons, including PCDD/F. This understanding shows that total chlorine is an imperfect measure of PCDD/F formation potential. For the homogeneous pathway, the concentration of chlorine atoms is the major factor, and its concentration can be augmented by reactions contributing to OH formation or suppressed by hydrocarbon injection of reactants such as hydrogen. The heterogeneous reactions depend on ash surface species and type, ash adsorptive characteristics, temperature, and the presence of regenerative Cl. Knowledge of the chemistry not only explains the imperfect correlation of total chlorine content and PCDD/F formation but can also lead to the development of control strategies which are targeted at suppressing the active chlorine species, either atomic chlorine for the homogeneous pathway or active surface ligands for the heterogeneous pathway.

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This paper was presented at the 2nd International Symposium on Incineration and Flue Gas Treatment Technologies, organized by IChemE and held at the University of Sheffield, UK, 4–6 July 1999.

The South Karelia Air Pollution Study: Acute Health Effects of Malodorous Sulfur Air Pollutants Released by a Pulp Mill

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ABSTRACT

We evaluated the acute health effects of a strong emission of malodorous sulfur compounds released from a pulp mill in South Karelia, Finland. The 24-hour ambient air concentrations of hydrogen sulfide for the two emission days were 35 and 43 $\mu g/m^3$ (maximum 4-hour 135 $\mu g/m^3$). A questionnaire was distributed after the high exposure and later after a low exposure period to 29 households with 75 subjects living in the nearby community. During the high exposure, 63% of the respondents reported experience of at least one symptom compared to 26% during the reference period. Every third participant reported difficulties in breathing. In the 45 subjects responding to both questionnaires more eye, respiratory and neuropsychological symptoms occurred during the exposure compared to the reference period. The strong malodorous emission from a pulp mill caused an alarming amount of adverse effects in the exposed population. (*Am J Public Health.* 1992;82:603–605)

Introduction

Large populations in northern Europe and North America are often or constantly exposed to malodorous sulfur air pollutants such as hydrogen sulfide (H_2S), methyl mercaptan (CH_3SH), and methyl sulfides produced by the paper and pulp industry. The knowledge of the adverse effects of these pollutants is sparse, although people living in the neighborhood affected commonly complain of discomfort and express concern about the health effects.

A cluster of paper mills producing wood pulp is located in South Karelia, in southeastern Finland. The two sulfate pulp mills, located in the small city of Imatra (33 000 inhabitants), were, in 1989, estimated to emit annually 2800 tons of H_2S into the air. The annual mean (2 $\mu g/m^3$) concentration of sulfur dioxide (SO_2) is low because of the use of natural gas as the source of industrial energy.

During 2 days in September 1987, a strong emission, with H_2S as the major component and mesityloxide as a minor component, was released from one of the two pulp mills, exposing the local population to intensive catty odor for the 2 days. We evaluated the acute health effects of the emission by comparing the occurrence of symptoms during the high-exposure period and 4 months later during a low-exposure period.

Material and Methods

During the introduction of a new processing technique, a strong malodorous emission was released from the pulp mill using the sulfate method for production, and increased concentrations of H_2S were measured for 2 days at our monitoring station located in a nearby community about 1 km southeast of the source of exposure. The H_2S exposure was measured by absorbing the air sample to cadmium hydroxide.[1] The 4-hour concentrations of H_2S during the high exposure were, on the average, 4 to 5 times higher, and a maximum of 20 times higher, than the levels before and after the peak emission, during which there was inversion of the air and no wind (Figure 1). The highest 4-hour concentration of H_2S, 135 $\mu g/m^3$, was measured at 2 AM. The 24-hour averages for the 2 days were 35 and 43 $\mu g/m^3$.

During the peak emission of malodorous sulfur compounds, the mean 1-hour concentration of SO_2 was only 3 $\mu g/m^3$. It was not possible to measure mesityloxide in the ambient air. Mesityloxide is produced inside pulp mills under the same kinds of conditions that occurred during the peak emission. The presence of mesityloxide was recognized in the air by its characteristic catty odor.

A reference period of 2 days was chosen about 4 months later, in January 1988. During the 2 reference days no odor was sensed, and the concentration of H_2S was low (0.1 to 3.5 $\mu g/m^3$ for 4 hours). The SO_2 concentration was low, 3 $\mu g/m^3$, as during the high-exposure period.

An open-ended questionnaire was distributed 10 days after the high exposure to all 29 households of the nearby community; 66 (88%) of a possible 75 subjects responded. Six subjects were excluded because of missing information, leaving 60 subjects: 44 adults (15 men and 29 women; mean age = 45 years and range = 17 to

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This paper was submitted to the Journal November 26, 1990, and accepted with revisions July 9, 1991.

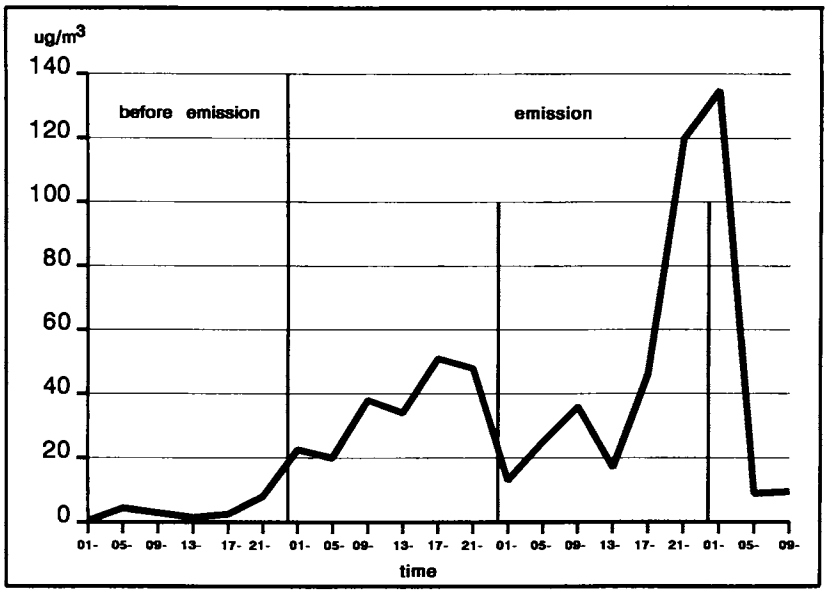

FIGURE 1—Four-hour concentrations of hydrogen sulfide before and during the emission from the first day at 1 AM to the fourth day at 9 AM at the monitoring station located about 1 km from the pulp mill.

TABLE 1—Prevalence of Symptoms in Subjects Who Responded after the High-Exposure Period (n = 60) and after the Reference Period (n = 66)

	High-Exposure Period		Reference Period	
	n	%	n	%
Eye symptoms	13	22	1	2***
Males	5	21	0	0
Females	8	22	1	3
Nasal symptoms	5	8	13	20
Males	2	8	5	16
Females	3	8	8	24
Cough or pharyngeal irritation	9	15	3	5
Males	5	21	1	3
Females	4	11	2	6
Breathlessness	21	35	1	2***
Males	7	29	0	0
Females	14	39	1	3
Nausea	14	23	3	5**
Males	8	33	1	3
Females	6	17	2	6
Headache	14	23	5	8*
Males	5	21	1	3
Females	9	25	4	12
Mental symptoms[a]	6	10	0	0*
Males	1	4	0	0
Females	5	14	0	0

Note. Differences between prevalences were obtained using a χ^2-test.
[a]Depression, anxiety.
*$p < .05$.
**$p < .01$.
***$p < .001$.

85) and 16 children (9 boys and 7 girls; mean age = 7 years and range = 1 to 15). The respondents were asked to describe the symptoms they had experienced during the days of peak exposure, without mention of the exceptionally high emission of pollutants or what kinds of symptoms the emission may generate. Parents responded on behalf of their children.

An identical questionnaire was distributed to the same households 4 months later. The link of this reference questionnaire to the first inquiry was not revealed. The response rate was 79%, no data had to be excluded, and 66 persons were included in the analyses. The effect of confounding was controlled by studying the intraindividual difference in the symptoms in the subpopulation of 45 subjects who responded to both questionnaires. The statistical significance of the difference in the occurrence of the symptoms during the high-exposure and reference periods was assessed by a χ^2-test and McNemar's test.[2]

Results

The unadjusted prevalences of the different symptoms in the two population samples are given in Table 1. Large proportions of the participants reported breathlessness (35%) and mental symptoms (10%) during the high-exposure period, while no such symptoms were indicated during the reference period. The prevalence of eye symptoms (22% vs 2%), cough or pharyngeal irritation (15% vs 5%), and nausea (14% vs 3%) were also significantly larger during the high exposure. However, nasal symptoms (8% vs 20%) were more common during the reference period than the high-exposure period, although the difference was not significant. Altogether, 63% of the subjects reported experience of at least one symptom during the high-exposure period compared with 26% during the reference period.

The presence of symptoms during the exposure and reference periods in the 45 subjects who responded to both questionnaires is shown in Table 2. Eye symptoms, cough or pharyngeal irritation, breathlessness, nausea, and headache were experienced more often during the exposure period than during the reference period. The difference was significant for breathlessness.

Discussion

The occurrence of the symptoms during the high-exposure period was large: Every third participant reported difficulties in breathing, and every fourth participant indicated irritation of eyes, headache, and nausea. Mental symptoms were also common. The prevalence of these symptoms was significantly larger than those during the reference period in the comparison of the two samples. The direction of the differences was similar in the intraindividual comparison of those who responded to both questionnaires, al-

though significance was not reached in all of the symptoms because of the smaller number of subjects than in the two-sample comparison. Interestingly, more subjects reported nasal symptoms during the reference period than during the high-exposure period. A possible explanation is that breathing difficulties due to exposure were so prominent that attention was not paid to mild nasal symptoms. The highest 4-hour concentration of H_2S was 135 $\mu g/m^3$, which is nine times higher than the guideline in Canada (15 $\mu g/m^3$). There are no guidelines for ambient air H_2S in Finland.

The observed symptoms correspond to physiological effects of acute exposure of H_2S suggesting direct irritative effect on mucous membranes and eye conjunctivae, although in far smaller concentrations than described earlier.[3] Previously, we have observed an increased amount of eye and nasal symptoms and cough among subjects living in the most polluted area of Imatra.[4]

According to the World Health Organization (WHO) guideline values for H_2S, the highest acceptable half-hour concentration is 7 $\mu g/m^3$ for odor nuisance, along with a daily mean of 150 $\mu g/m^3$ for health hazards.[5] During the period of high exposure, the highest measured 4-hour concentration (135 $\mu g/m^3$) and 24-hour averages (35 and 42 $\mu g/m^3$) were well below the recommendation. These kind of emissions are rather commonplace and are always possible wherever wood pulp production takes place. It seems likely that the WHO guideline value of 150 $\mu g/m^3$ for H_2S is too high and does not provide prevention from adverse health effects. Furthermore, the presence of other pollutants should be taken into account, because H_2S is rarely the only hazardous component of air pollution. □

TABLE 2—Occurrence of Symptoms during the High-Exposure and Reference Periods in the 45 Subjects Who Responded to Both Questionnaires

	Exposure Period Only, No.	Reference Period Only, No.	Both Periods, No.	No Symptoms, No.	Significance[a]	
					t	P
Eye symptoms	5	1	0	39	1.63	NS
Nasal symptoms	3	11	1	30	2.14	<.05
Cough or pharyngeal irritation	5	1	0	39	1.63	NS
Breathlessness	16	0	1	28	4.00	<.001
Nausea	6	2	1	36	1.41	NS
Headache	8	2	2	33	1.90	NS
Mental symptoms[b]	2	0	0	43	1.41	NS

Note. NS = not significant.
[a]McNemar's test of significance.
[b]Depression, anxiety.

Acknowledgments

This study was supported by the Academy of Finland and the Ministry of the Environment.

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Science of the Total Environment 468–469 (2014) 950–957

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada

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HIGHLIGHTS

- Similarities between the prevalence of complaints in Minamata and Grassy Narrows
- Similarities in neurological findings were also found.
- Quantitative sensory measurements gave similar results for impairments.
- Younger Canadians were less severely affected than older ones.
- Results suggest that subjects from Grassy Narrows had methylmercury poisoning.

ARTICLE INFO

Article history:
Received 26 June 2013
Received in revised form 5 September 2013
Accepted 5 September 2013
Available online 1 October 2013

Editor: Frank Riget

Keywords:
Methylmercury
Complaints
Neurological findings
Sensory disturbance
Quantitative somatosensory measurements

ABSTRACT

In 1970, fish caught in the English–Wabigoon River system in northwestern Ontario, Canada, were found to be contaminated with mercury coming from a chlor-alkali plant in the province. In the 1970s, patients exhibiting some of the symptoms of the Hunter–Russell syndrome (e.g. paresthesias, visual field constriction, ataxia, impaired hearing, and speech impairment) were reported by some researchers. However attempts to diagnose the patients as suffering from methylmercury poisoning proved to be controversial. In order to research the presence of methylmercury contamination, and show that the patients, through eating contaminated fish, were suffering from methylmercury poisoning, we studied the results of subjective complaints, neurological findings, and quantitative somatosensory measurements gathered in Grassy Narrows Indian Reservation, Ontario, in March, 2010. At that time, the population of the Grassy Narrows settlement was around 900. Ninety-one residents volunteered to be examined. From them, we selected 80 people who were older than 15 years old, and divided them into two groups. Canadian Younger (CY): 36 residents who were from 16 to 45 years old. Canadian Older (CO): 44 residents who were from 46 to 76 years old. We compared them to Japanese Exposed (JE): 88 methylmercury exposed residents from the Minamata district in Japan, and Japanese Control (JC): 164 control residents from non-polluted areas in Japan. Complaints and abnormal neurological findings were more prevalent and quantitative sensory measurements were worse in the two Canadian groups and the Japanese Exposed group than in the Japanese Control group. Complaints, neurological findings and quantitative sensory measurements were similar in Canadian Older and Japanese Exposed. The results for Canadian Younger fell between those of Canadian Older and Japanese Control. These findings indicate that the clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan.

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1. Introduction

Since the 1960s, a chlor-alkali plant had been releasing waste products contaminated with mercury into the waters of the English–Wabigoon River system in northwestern Ontario, Canada. In the first examples of fish, from the river system, that were contaminated with methylmercury (Bligh, 1970) levels of up to 16 μg/g were reported. Fimreite and Reynolds (1973) found highly contaminated fish with a maximum

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http://dx.doi.org/10.1016/j.scitotenv.2013.09.015

methylmercury concentration of 27.8 μg/g in 1970. The contamination in fish there was almost equal to that measured in fish from Minamata Bay, Japan, where a barracuda was recorded as having 23 μg/g in May 1961 (Fujiki and Irukayama, 1979). The average mercury concentrations, measured in 1971, in walleye and northern pike from Ball Lake, English–Wabigoon River, were 1.99 μg/g and 5.05 μg/g respectively (Armstrong and Scott, 1979).

In 2003, results of similar measurements were 0.40 μg/g in walleye and 0.85 μg/g in northern pike (Kinghorn et al., 2007). The concentrations of mercury in fish are declining, but they are still higher than those found in fish in Minamata Bay, Japan, where the average concentration of mercury in fish has been from 0.17 to 0.42 μg/g during the period of 1998-2004. (Kindaichi and Matsuyama, 2005). Residents living in that area of Japan, still continue to be exposed to low levels of mercury from the eating of locally caught fish.

The two First Nations' communities living in Grassy Narrows and Whitedog Indian Reservations became victims of methylmercury poisoning through the consumption of locally caught fish. Patients with some of the Hunter–Russell syndrome symptoms have been reported in these reserves (Harada et al., 1976). Canadian researchers also examined the indigenous residents of the areas. Wheatley et al. (1979) reported that effects associated with methylmercury poisoning were observed, but they concluded that direct impacts on human health were difficult to prove.

Pathological studies of a cat from Whitedog, which exhibited acute neurological symptoms, revealed high mercury levels in the brain similar to those of Minamata disease in Japan (Takeuchi et al., 1977). Another cat from neighboring Grassy Narrows showed no symptoms, but on closer examination it was shown to have high mercury levels in the brain and latent defects caused by methylmercury poisoning (Takeuchi et al., 1977).

Since 2004, more than 60,000 people from the Minamata district have been diagnosed with abnormal neurological symptoms. In many cases, the abnormalities were being reported for the first time since the release of methylmercury contaminated wastewater was stopped in 1968 (Takaoka et al., 2009). In chronic methylmercury poisoning the somatosensory disturbance from cortical damage is specific and sensory disturbance is present either in all four limbs or throughout the body, sometimes with the exception of the face and head. To detect such abnormalities, quantitative sensory measurements are useful (Takaoka et al., 2008). So we carried out a health survey that included the examination of subjective complaints, neurological symptoms, and quantitative sensory measurements in Grassy Narrows, Ontario, Canada, in 2010 and tried to reassess the effect of methylmercury in this area.

2. Materials and methods

2.1. Subjects

The study was carried out in March 2010 in Grassy Narrows, Ontario, Canada. We contacted a Grassy Narrows support group and asked for their help. They informed the indigenous population of our coming survey to detect any health effects from methylmercury poisoning and asked for volunteers to take part in the study. The Chief of Grassy Narrows First Nation went on the local radio to ask for volunteers for our research. Posters, informing of our coming research project and our wish for volunteers, were displayed in the band office and a local store. Of the approximately 900 residents, 91 volunteered to be examined. We selected 80 residents, who were older than 15, for the study. Subjects were informed verbally and in writing about the examination method, how the data would be used and that their confidentiality would be protected. Each participant gave their written consent.

We divided them into two groups. (1) Group Canadian Younger (CY): consisted of 36 residents who were from 16 to 45 years old (M/F = 18/18, 34.4 ± 9.5 years old). (2) Group Canadian Older (CO): consisted of 44 residents who were from 46 to 76 years old (M/F = 19/25, 57.5 ± 8.1 years old).

We studied subjective symptoms, neurological findings and carried out four quantitative sensory measurements (including minimal tactile sensation, vibration, position sense, and two-point discrimination) among the 80 residents. In order to assess the state of health of the residents of Grassy Narrows, we compared them to a group of Japanese residents who had also been exposed to methylmercury as well as a group of Japanese control residents. These residents were the same people we had used as subjects in our previous study (Takaoka et al., 2008).

(3) Group Japanese Exposed (JE): was comprised of 88 randomly selected Japanese subjects. They were chosen from residents of the Minamata area who had been exposed to methylmercury and who had been included in our former study at the Minamata Kyoritsu Hospital and the Kyoritsu Neurology and Rehabilitation Clinic between November 2004 and April 2005. Their ages matched those of the corresponding Canadian group but the genders could not be matched exactly (M/F = 38/50, 59.0 ± 7.5). They answered a detailed questionnaire and were given a neurological examination including the same four quantitative sensory measurements as we performed in Canada. All of them were born before 1969. In our former study, we separated the subjects into those with and without neurological or neurologically related diseases, but we found that there was little difference between those two groups. So in this study, Group JE included subjects both with and without such related diseases.

(4) Group Japanese Control (JC): consisted of 164 residents who lived in other districts, e.g. around Fukuoka City, Kumamoto City, and Kagoshima City, aged between 40 and 79. In the control group, people who had lived around Minamata City or who suffered from a neurological disease or a neurologically related illness were excluded. The control subjects were examined between February and May 2006 (M/F = 67/97, 58.4 ± 11.6).

2.2. Epidemiological conditions and questionnaire on complications

The questionnaire, both in Canada and Japan, included questions to determine the subject's exposure to methylmercury and asked for information regarding place of residence, dietary habits, occupational history, medical complications and the health and medical histories of family members.

The questionnaire on complaints for the Canadian groups (CO and CY) consisted of 47 questions related to sensory impairment (7 items), somatic pain (4), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (4), other movement impairment (11), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (6).

The questionnaire on complaints for the Japanese groups (JE and JC) consisted of about 50 questions. We selected 35 relevant questions from the Japanese questionnaire and used them in the Canadian one. They were as follows: sensory impairment (4 items), somatic pain (3), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (5), other movement impairment (4), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (4).

In answer to questions on health complaints, subjects were asked to select one of 4 possible choices. 1) Yes, always, 2) Yes, sometimes, 3) Yes, in the past but not at present, and 4) No, never. The prevalence of each complaint was calculated for each group and then compared between the four groups. All subjects completed the questionnaire before their medical examination. Subjects who could not complete the questionnaire by themselves were asked the questions verbally. All questionnaires were reviewed prior to the examinations.

2.3. Standard neurological examination

A standard neurological examination was carried out on 32 of the 36 subjects in Group CY and on all 44 subjects in Group CO. Dysarthria, auditory disturbance, visual constriction, finger–nose test with the eyes open and closed, diadochokinesis, heel–shin test, gait disturbances, tandem gait test, Mann's test, balancing on one foot with eyes open and closed, and superficial sensory disturbance (touch and pain) were used and tested for. The examination methods and criteria were almost the same as the former study (Takaoka et al., 2008).

Dysarthria, auditory disturbance, visual constriction, postural hand tremors, gait disturbances and Romberg's sign were judged to be either present or absent. Dysarthria, auditory disturbance, and visual field constriction were judged by the examining physician without using special instruments. Tunnel vision was considered to be present when the confrontation test showed a lateral field of vision of 80° or less.

Limb and truncal ataxia were judged as being either absent, mildly abnormal or moderately to severely abnormal. The results of the finger–nose test and the heel–shin test were judged to be positive not only when there was constant dysmetria or decomposition but also when there was uncertain dysmetria, decomposition, or very slow movement involved. Dysdiadochokinesis was judged to be present from when there was a constant abnormality to when there was an uncertain abnormality or slow movement. Tandem gait disturbance was judged as present not only when the subject could not walk more than five steps but also when they could walk five steps but were unstable. In the balancing on one foot test, disequilibrium was judged as present when it was impossible to balance more than 3 s or when the subject was unstable, but could keep their balance for more than 3 s.

The examinations were carried out in Canada by one neurologist and four psychiatrists. The neurologist and two of the psychiatrists had previous experience in carrying out these tests from earlier examinations of Minamata disease patients. The other two psychiatrists had been briefed and trained to carry out the tests. In Japan, Group JE was examined by six physicians and one neurologist and Group JC was examined by forty-five physicians, several of whom were neurologists.

Because there was not enough data collected from Group JE for the finger–nose test with eyes closed, Mann's test, Romberg's sign or balancing on one foot with eyes closed test, we excluded that information from our calculations.

2.4. Quantitative sensory measurements

Four categories of tests were used in the quantitative measurement of the somatosensory system. All four categories were the same as in the former study (Takaoka et al., 2008).

2.4.1. Assessment of minimal tactile sense

The minimal tactile sense was measured by the Semmes–Weinstein monofilament test. Twenty kinds of filaments from 0.008 to 300 g were used. Subjects were tested with eyes closed after receiving clear instructions on which locations would be tested. Each filament was pushed until it bent about 90° for about a second. The threshold was the smallest size filament which a subject could feel as touch. The trial was performed starting from a smaller size filament and then gradually increasing the size.

Each filament was tested only once except when the subject was unsure. In that case the examiner, using the same filament, repeated the test an odd number of times and selected the dominant response. If a subject could not detect the maximum filament (300 g), we defined the threshold as 400 g for calculation. Testing was carried out on the lower lip, upper chest and ventral sides of both index fingers and big toes.

2.4.2. Vibration sense

Vibration sense was measured by using a 128 Hz tuning fork. The vibration test was carried out on the middle or upper sternum, the radial side of both wrists and the fibular side of both ankles. Subjects were told to indicate when they no longer could feel the vibrations. The examiner simultaneously struck a tuning fork and started a stopwatch, then placed the base of the fork against the area to be tested. The time interval until the subject reacted was recorded.

2.4.3. Position sense

The testing of position sense was carried out on subjects with their eyes closed. A ruler with a millimeter scale was used. Tests were carried out on the subject's index fingers and big toes. A ruler was placed vertically alongside the digit. With the digit held horizontally, the zero point was the position of the digit's nail on the ruler's scale. The examiner held the digit by its sides and moved it either up or down, holding the position for about 1 s. The subject was asked to indicate whether they felt the movement and if it was up or down. The upward or downward movement started from 5 mm from the zero point and was considered to be the minimum value. The movement was increased in 5 mm increments and the subject's threshold distance was recorded.

Each trial was carried out once for each distance except when the subject was uncertain. In that case the examiner would repeat the test again for an odd number of times and choose the dominant response. If the subject could not feel the maximum movement, the threshold was defined as the maximum distance plus 5 mm.

2.4.4. Two-point discrimination

The two-point discrimination test was carried out on subjects while their eyes were closed. A drafting divider, with the legs set at different distances, was pressed against the subject's skin at an angle of 30 to 45° to a depth of between 1 and 2 mm for about 1 s. The distances between the points used in the test were 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 and 36 mm. The threshold recorded was the shortest distance at which a subject answered correctly. This method was performed on the lower lip and the ventral side of each index finger. If the subject was unable to detect the maximum distance of 36 mm, the threshold was defined as 40 mm for calculation purposes.

In testing Groups CO and CY, the “Yes/No” method was used. However, when a subject felt that 1-point stimulation was actually 2-point stimulation, they were re-tested using the “2-alternative, forced-choice method”. In Groups JE and JC the “2-alternative, forced-choice method” was used exclusively.

2.5. Statistical methods

All the calculations were performed using MS Excel and SPSS. Chi square analysis was used in MS Excel when the prevalence was compared, and t-test was used in MS Excel when the average was compared. The correlations were calculated by SPSS.

When we calculated the minimal tactile sense, we converted the grams to the evaluator size using the equation: Evaluator size $=$ $\log([\text{gram}]) + 4$.

3. Results

3.1. The subjects' backgrounds

The age and sex of the subjects are shown in Table 1. The age and sex in Groups CO, JC and JE were not statistically different. The age of Group CY was less than the other groups.

From Table 2, we can see that 86% of Group CO and 83% of Group CY answered the question on how they obtained fish and over 60% of Groups CO and CY answered that they are catching fish by themselves. Also from Table 2, we can see that 41% of Group JE and 1% of Group JC

Table 1
Age and sex of each group.

	Age	n (M/F)
Group CO	57.5 ± 8.1	44 (19/25)
Group CY	34.4 ± 9.5	36 (18/18)
Group JE	59.0 ± 7.5	88 (38/50)
Group JC	58.4 ± 11.6	164 (67/97)

belonged to a fisher family. Ninety-three percent of Group JE and 25% of Group JC ate fish every day.

Table 3 shows the relevant medical history of Group CO and Group CY. The information was collected through interviews. On the question of hypertension, although some subjects had no recorded history of hypertension, high blood pressure was detected during the tests. If we detected a systolic pressure of 170 or more or and diastolic pressure of 110 or more in a subject, we recorded that hypertension was present. Some neurological or neurologically related diseases were found in 47 subjects (53%) of Group JE. No neurological or neurologically related diseases were found in Group JC.

3.2. Questionnaire on medical complaints

Medical complaints reported from each group are shown in Table 4, and the p-values by chi square among the four groups are shown in Table 5. In general, the prevalence in both "Yes, always" and "Yes, always" + "Yes, sometimes" in Groups JE, CO, and CY was statistically higher than Group JC. In general, the prevalence in Group JE and Group CO was similar. For most of the complaints Group CY showed a lower prevalence than Group CO.

The questionnaire consisted of questions related to specific and non-specific symptoms in the methylmercury polluted area. Specific symptoms included numbness, difficulty in speaking, fine-finger tasks, buttoning, losing slippers while walking, difficulty in differentiating tastes, detecting smells etc. Non-specific symptoms included headaches, forgetfulness, general fatigue, and so on. In specific symptoms, the prevalence of the answer "Yes, always" + "Yes, sometimes" was lower in Table 4. A tendency to a similar prevalence was observed both in specific and non-specific symptoms.

The correlation efficient among four groups was shown in Table 7. In "Yes, always" answers, the correlation between Groups JE and CO was highest, and was followed by the one between Groups CO and CY. In "Yes, always" + "Yes, sometimes" answers the correlation between Groups CO and CY was highest, and was followed by the one between Groups JE and CO and between Groups JE and CY.

Table 2
Fish sources and frequency of ingestion.

In Canada	Group CO	Group CY
Self-caught fish	28/44 (64%)	24/36 (67%)
Fish caught by relatives and friends, purchased etc.	30/44 (68%)	22/36 (61%)
A combination of both the above	38/44 (86%)	30/36 (83%)
In Japan	**Group JE**	**Group JC**
Fishermen	10/88 (11%)	0/164 (0%)
Fishermen's families	36/88 (41%)	1/164 (1%)
Sport fishing/recreational fishing	62/88 (70%)	17/161 (11%)[b]
Daily ingestion	81/87 (93%)[a]	40/157 (25%)[c]
Ingestion more than once a week	85/87 (98%)[a]	119/157 (76%)[c]

[a] Datum for 1 person was missing.
[b] Data for 3 persons were missing.
[c] Data for 7 persons were missing.

Table 3
Complications in Canadian subjects.

	Group CO	Group CY
Hypertension	15 (34%)	16 (44%)
Diabetes mellitus	8 (18%)	3 (8%)
Stroke	3 (7%)	1 (3%)
Lung diseases	0 (0%)	1 (3%)
Stomach diseases	6 (14%)	1 (3%)
Heart diseases	1 (2%)	0 (0%)
Orthopedic diseases	7 (16%)	4 (11%)
Psychiatric diseases	3 (7%)	1 (3%)

3.3. Neurological examination

The neurological findings for each group and p-values by chi-square among the four groups are shown in Table 6. The prevalence was generally highest in Group JE, and the prevalence of all the findings of Groups JE and CO was statistically higher than Group JC. All the findings of Group CY were less prevalent than Group CO, and seven of twelve findings of Group CO showed statistically higher prevalence than Group CY.

The most prevalent findings in Groups CO are tandem gait abnormality and somatosensory disturbances of pain and touch, followed by hearing impairment, truncal ataxia other than tandem gait abnormality, upper extremity ataxia (finger–nose test and diadochokinesis), and lower extremity ataxia (heel–shin test). The prevalence of visual constriction or dysarthria was lower. Although the orders of prevalence for the positive findings were different, the tendencies of the abnormalities were similar between Groups CO and JE.

Correlation among four groups was shown in Table 7. Correlations between Groups JE and CY, Groups CO and CY, and Groups JE and CO were higher than those between Group JC and other three groups, and p-values were lower.

3.4. Quantitative sensory measurements

3.4.1. Minimal tactile sensitivity using the Semmes–Weinstein monofilament test

Thirty-three subjects (75%) of Group CO and 24 subjects (67%) of Group CY were examined. One set of data for the lower lip in Group CO and one set of data for the left and right big toes in Group CY were absent. 84 of 88 subjects (95%) in Group JE (in which three sets of data were missing for the lower lip) and all 164 subjects of Group JC were examined and calculated.

Fig. 1 shows the results of the minimal tactile sensitivity using the Semmes–Weinstein monofilament test. The results were worst in Group CO, and there were distinct statistical differences between Groups CO, CY, and JC. Group JE was, in general, positioned between Groups CO and CY.

3.4.2. Vibration sense

Thirty-five subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 33 subjects (75%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. Three sets of data for the right ankle and 4 sets of data for the left ankle were absent for Group CO. All 88 subjects of Group JE and all 164 subjects of Group JC (in which one set of data for the chest and one set of data for the left and right ankles were absent) were examined and calculated.

Fig. 2 shows that the vibration sense was worst in Group JE, followed by Group CO, Group CY and Group JC. Most of them had statistical differences between each other.

Table 4
Percentage of complaints.

		Yes, always				Yes, always + Yes, sometimes			
		Group CO	Group CY	Group JE	Group JC	Group CO	Group CY	Group JE	Group JC
1	Numbness in hands	40%	11%	49%	2%	86%	75%	92%	6%
2	Numbness in legs	39%	8%	42%	1%	91%	61%	86%	6%
3	Cannot judge bath water temperature	26%	8%	15%	0%	47%	31%	35%	0%
4	No pain when burned or wounded	23%	17%	16%	0%	65%	49%	44%	0%
5	Hand weakness	34%	22%	56%	3%	78%	69%	81%	5%
6	Leg weakness	35%	11%	49%	2%	79%	54%	77%	4%
7	Tremor in hand	23%	19%	24%	2%	74%	67%	68%	4%
8	Difficulty in speaking	2%	6%	8%	0%	51%	53%	62%	2%
9	Difficulty in fine finger tasks	47%	14%	57%	0%	77%	72%	86%	7%
10	Dropping things	9%	8%	16%	0%	77%	47%	73%	6%
11	Difficulty in buttoning clothes	21%	6%	25%	0%	49%	28%	57%	0%
12	Stumbling	29%	17%	5%	0%	79%	58%	65%	1%
13	Losing slippers while walking	8%	0%	23%	0%	50%	27%	70%	1%
14	Disturbed vision	33%	19%	49%	3%	93%	75%	87%	15%
15	Difficulty in finding things in shops	13%	9%	29%	0%	63%	46%	72%	6%
16	Limited peripheral vision	32%	14%	25%	1%	59%	31%	64%	4%
17	Difficulty in hearing	42%	25%	35%	7%	72%	61%	71%	15%
18	Tinnitus	30%	19%	34%	6%	86%	81%	80%	17%
19	Can hear, but cannot understand	5%	3%	7%	1%	65%	64%	45%	6%
20	Difficulty in differentiating tastes	28%	6%	18%	0%	53%	28%	46%	1%
21	Difficulty in sampling food while cooking	26%	0%	15%	1%	48%	23%	47%	1%
22	Difficulty in detecting smells	28%	11%	22%	0%	49%	28%	48%	4%
23	Muscle cramps	33%	17%	31%	3%	98%	91%	91%	29%
24	Headaches	37%	25%	37%	1%	88%	81%	86%	30%
25	Shoulder stiffness	24%	6%	64%	10%	95%	53%	95%	51%
26	Forgetfulness	21%	17%	34%	1%	81%	72%	97%	52%
27	Inability to hold concentration at work	26%	3%	28%	0%	74%	58%	67%	11%
28	Lack of motivation to do things	16%	0%	26%	1%	58%	56%	86%	21%
29	Irritation	21%	22%	31%	0%	72%	78%	85%	33%
30	Difficulty in sleeping	37%	39%	39%	3%	74%	69%	84%	19%
31	Dizziness when standing up	23%	14%	15%	0%	86%	83%	85%	17%
32	Feeling of head spinning	0%	3%	3%	1%	49%	58%	63%	5%
33	Swaying dizziness	5%	3%	5%	1%	72%	72%	57%	6%
34	Dizziness, bordering on fainting	7%	0%	5%	1%	47%	22%	46%	2%
35	General fatigue	40%	31%	45%	2%	95%	78%	87%	25%

3.4.3. Position sense

Twenty-eight subjects from Group CO and 24 subjects from Group CY were examined. One subject from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 27 subjects (61%) from Group CO and 23 subjects (64%) from Group CY were used in the calculation. One set of data for the left and the right big toe, both upward and downward movements, was absent for Group CO. Eighty-seven subjects from Group JE (in which one set of data for both big toes in both directions was absent) and all 164 subjects of Group JC were examined and calculated.

Fig. 3 shows that the position sense was worst in Group JE, followed by Group CO, Group CY, and Group JC. Although there were some exceptions, most of the groups had statistical differences.

3.4.4. Two-point discrimination

Thirty-four subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 32 subjects (73%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. 87 of 88 subjects (99%) from Group JE and all 164 subjects of Group JC (in which one set of data for the right index finger was absent) were examined and calculated.

Fig. 4 shows that the position sense was worst in Group JE or Group CO, followed by Group CY and finally Group JC. Most of them had statistical differences, except for the results for index fingers when comparing Group JE with Group CO.

Table 5
p-Value for complaints — comparing groups.

		$p < 0.01$	$p < 0.05$	n.s.
"Yes, always"	CO, JC	All others	Nos. 25, 34	Nos. 8, 19, 32, 33
	CY, JC	All others	Nos. 1, 2, 6, 8, 11, 18, 20	Nos. 13, 19, 21, 25, 27, 28, 32, 33, 34
	JE, JC	All others	Nos. 12, 19	Nos. 32, 33, 34
	CO, CY	Nos. 1, 2, 9, 21	Nos. 6, 20, 27, 28	All others
	JE, CO	Nos. 12, 25	No. 5	All others
	JE, CY	Nos. 1, 2, 5, 6, 9, 13, 14, 25, 27, 28	Nos. 11, 15, 21	All others
"Yes, always" + "Yes, sometimes"	CO, JC	All	–	–
	CY, JC	All others	No. 26	No.25
	JE, JC	All	–	–
	CO, CY	Nos. 2, 25	Nos. 6, 10, 16, 20, 21, 34, 35	All others
	JE, CO	No. 28	Nos. 4, 19, 26	All others
	JE, CY	Nos. 2, 11, 13, 16, 25, 26, 28	Nos. 1, 6, 10, 15, 21, 34	All others

Table 6
Neurological findings and group comparisons.

Examination	Prevalence of abnormality				p-Value					
	Group CO	Group CY	Group JE	Group JC	CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
Hearing impairment	49%	17%	32%	6%	<0.01	n.s.	<0.01	<0.05	n.s.	n.s.
Visual constriction	14%	0%	28%	0%	<0.01	n.s.	<0.01	n.s.	n.s.	<0.01
Dysarthria	17%	3%	18%	1%	<0.01	n.s.	<0.01	n.s.	n.s.	n.s.
Postural tremor	20%	19%	28%	3%	<0.01	<0.01	<0.01	n.s.	n.s.	n.s.
Normal gait—unstable	28%	6%	30%	5%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.05
Tandem gait—unstable	87%	34%	68%	7%	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Finger–nose test (eyes open)	21%	0%	47%	0%	<0.01	n.s.	<0.01	<0.05	<0.01	<0.01
Adiadokokinesis	23%	3%	43%	1%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.01
Balancing on one foot (eyes open)	53%	22%	63%	8%	<0.01	<0.05	<0.01	<0.05	n.s.	<0.01
Heel–knee test	24%	0%	50%	1%	<0.01	n.s.	<0.01	<0.05	<0.05	<0.01
Touch disturbance (four limbs)	50%	44%	83%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01
Pain disturbance (four limbs)	59%	50%	97%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01

4. Discussion

Our results show that subjective complaints were most prevalent in Group JE, followed by Groups CO, CY and JC. Similar and high prevalence of more specific complaints from methylmercury poisoning between Groups JE and CO suggest that these similarities are mainly related to methylmercury poisoning. The increase of non-specific complaints, which was found in Group JE, was also observed in Group CO.

The high prevalence of somatosensory disturbance and following ataxic movement in Groups JE and CO suggests that those two groups are similarly affected by methylmercury and Group CY is affected to a smaller extent by methylmercury. Harada et al. (1976) conducted health surveys on 89 indigenous inhabitants of Grassy Narrows and Whitedog and found sensory disturbance (47.6%), abnormality in visual field (18.0%), impaired hearing (44.9%), ataxia (9.0%), and dysarthria (5.6%). These findings together with the Hunter–Russell syndrome suggest methylmercury pollution in these communities.

Except for the high prevalence of tandem gait abnormality and hearing loss, the pattern of prevalence is almost the same as our study from the Minamata area in the 1970s (Fujino, 1994). Harada and his colleague visited Grassy Narrows in 2002 (Harada et al., 2005a) and Grassy Narrows and Whitedog in 2004 (Harada et al., 2005b). In 2002, glove and stocking type of sensory disturbance (54.4%), tunnel vision (10.5%), ataxia (12.3%) and impaired speech (12.3%) were observed in 57 subjects (Harada et al., 2005a). Combining the results of both studies, 2002 and 2004, glove and stocking type sensory disturbance was found in 65.1% of the cases, tunnel vision in 10.8%, ataxia in 25.1% and impaired speech in 6.9% of the 175 subjects (Harada et al., 2005b). As the criteria used for determining ataxia was not described in those papers, it is possible that the actual percentage could be greater than the papers suggested. We show the raw data for ataxic movement in this study.

Our present study differs from the former studies of 1975, 2002 and 2004, in that quantitative measurements of somatosensory disturbance were added to the study. The results of two-point discrimination sensitivity of the lower lip, vibration sense and position sense in big toes were also worse in Group JE, followed by Groups CO, CY and JC. Somatosensory acuity was most impaired in Group JE. Whereas minimal tactile sensitivity of the lower lip and left big toe were worst in Group CO, followed by Groups JE, CY and JC. The reason for these differences is, as yet, unascertained. As to two-point discrimination, the "Yes/No" method was used in testing Groups CO and CY, and the "2-alternative, forced-choice method" was used in testing of Groups JE and JC. But, in our experience, there were no great differences between results of these two methods.

Quantitative measurements showed that somatosensory disturbance, showing a similar pattern, was present in all tested body areas. These patterns are assumed to be the characteristics of somatosensory disturbance due to a uniformly injured central nervous system, especially the sensory cortex.

The similarity in the symptoms of abnormalities, neurological findings and quantitative measurements in Groups JE and CO were assumed to be produced by methylmercury poisoning. The intermediate abnormalities in Group CY suggest a milder and continuing effect of methylmercury poisoning in the younger generations of this area.

There are some limitations in this study. The first one is that the subjects in the study consisted of applicants who volunteered for the examination. The subjects in Groups JE, CO and CY ate a lot of fish, but the subjects in Group JC ate less fish. Also the lifestyle and occupations of the Japanese and the Canadian subjects are likely to be quite different. Also, the lifestyle and occupations were not the same in the two Japanese groups JE and JC.

Secondly we had no control area in Canada. Instead, we compared the Canadian results with the results from a control area in Japan, as well as from an exposed area in Japan.

Thirdly, there can be other factors involved which can affect the findings. In Groups CO and CY, some neurological diseases were found which confused the analysis of the test results. In order to overcome this limitation, we tried to compare a wide range of symptoms and complaints, neurological findings and quantitative measurements.

In the earlier study in Japan, we found that some complaints, symptoms, neurological findings, and quantitative measurements recorded could be affected by the presence of certain other neurological diseases. However, the similar patterns of symptoms, neurological findings, and quantitative sensory measurements cannot be explained without taking

Table 7
Correlation of prevalence of complaints and neurological examinations — group comparisons.

		CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
"Yes, always"	Correlation coefficient	0.315	0.301	0.549	0.630	0.712	0.450
	p-Value	n.s.	n.s.	<0.01	<0.01	<0.01	<0.01
"Yes, always" + "Yes, sometimes"	Correlation coefficient	0.578	0.521	0.693	0.813	0.787	0.712
	p-Value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Neurological examination	Correlation coefficient	0.628	0.242	0.048	0.784	0.708	0.825
	p-Value	<0.05	n.s.	n.s.	<0.01	<0.01	<0.01

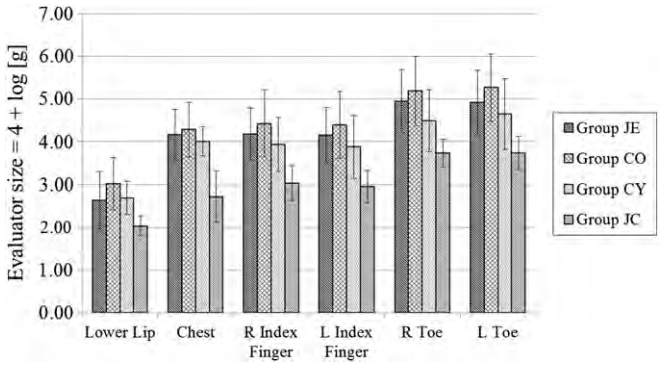

Fig. 1. Threshold for minimal tactile sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (all locations), JE, CO: $p < 0.01$ (lower lip), $p < 0.05$ (L toe), n.s. (other locations), JE, CY: $p < 0.01$ (R toe), $p < 0.05$ (chest and R index finger), n.s. (other locations), and CO, CY: $p < 0.05$ (chest), $p < 0.01$ (other locations).

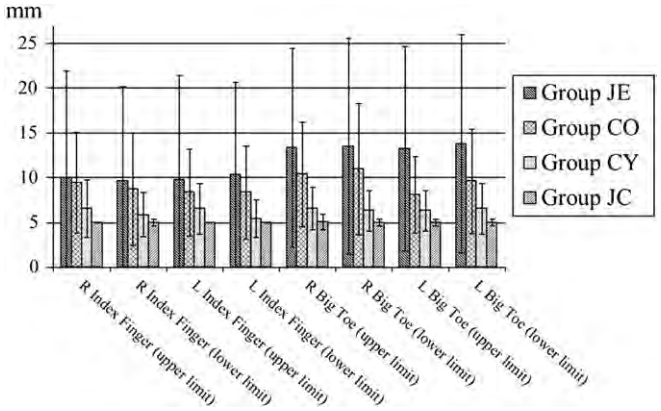

Fig. 3. Threshold for position sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger—lower), n.s. (L index finger—lower), $p < 0.01$ (all other locations), JE, CO: $p < 0.01$ (L big toe—upper & lower), $p < 0.05$ (R big toe—upper), n.s. (all other locations), JE, CY: $p < 0.05$ (L index finger—upper), $p < 0.01$ (all other locations), and CO, CY: $p < 0.05$ (R index finger—lower, L index finger—upper, L big toe—upper), $p < 0.01$ (all other locations).

into account the possibility of the presence of methylmercury poisoning (Takaoka et al., 2008).

After Harada's paper in 1976, the health effects of methylmercury on indigenous Canadians (First Nations) were reported by Canadian researchers. Barbeau et al. (1976) reported that he discovered symptoms like Minamata disease patients in Quebec, but he soon modified and toned down his conclusions. Shephard (1979) admitted the higher exposure in Canadian Indians and insisted that there was no agreement on the clinical diagnosis of mercury poisoning. But no conclusive human health-related data of Canadian Indians were presented by them. Wheatley et al. (1979) reported that they failed to prove abnormalities attributable to methylmercury. But his study in 1979 was based on clinical and pathological test results taken from only one male Cree Indian.

In north-western Quebec, McKeown-Eyssen and Ruedy (1983) studied individuals from the Cree First Nation and reported incoordination (15.4% in males/6.5% in females in Mistassini, 44.2% in males/26.5% in females in Great Whale), abnormal perception of sensations (5.7% in males/4.3% in females in Mistassini, 9.3% in males/2.1% in females in Great Whale). The results for subjects who had visual field scores of over 55° were 16.0% in males and 19.4% in females in Mistassini, and 0.7% in males and 15.5% in females in Great Whale. Although the patterns of abnormalities are very different from our results, the presence of these abnormalities could suggest milder methylmercury poisoning. The Canadian researchers did not, however, come to this conclusion. It would appear that they did not follow up and observe the individuals for a longer period of time, which is unfortunate. In our new Minamata disease cases, observed from November 2004 to April 2005, about half of them were considered to have had their first abnormalities after 1968, the year when the Chisso Company ceased to release methylmercury contaminated industrial wastewater (Takaoka et al., 2009).

Spitzer et al. (1988) found no abnormalities in north-western Quebec when they compared people from the Cree First Nation with a control group. In this study, the exposed group (SDD: The Self Designated Disease Group) and other three control groups were compared. Visual constriction was observed in 4.9% of SDD and in 0.0–1.7% of other groups. Peripheral sensory disturbance (written as "peripheral neuropathy" in the paper) was observed in 9.9% of SDD and in 1.5–3.1% of other groups. There was a higher tendency in the prevalence in SDD, but there was no statistical difference between SDD and other groups.

In examining the Cree people, McKeown-Eyssen et al. (1990) emphasized inter-observer variation. It is more important, however, to do the same examination in the control area and to set criteria for judging the results of the examination, rather than to repeat an examination in the same group. Even though there were some variations and differences between the results obtained by the screener and the results of the neurological examination by the neurologist, e.g. prevalence of tremor (screener 40.2%, neurologist 29.9%) and incoordination (screener 22.8%, neurologist 15.4%) in men in Mistassini, they were still high. They also had differences in criteria when identifying neurological abnormalities, but it should be possible to set standard criteria for the assessment of the neurological findings similar to our methods.

Changeability of neurological functions is quite common in cases of Minamata disease. In Minamata disease the range of four limb

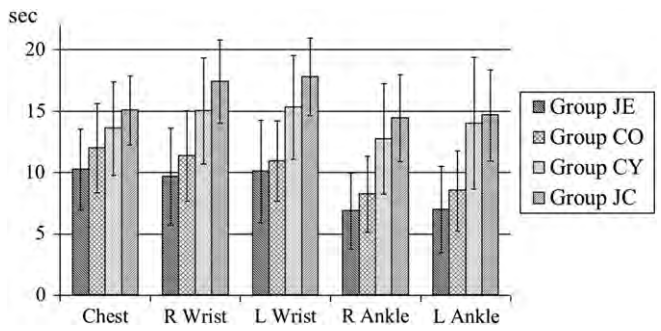

Fig. 2. Threshold for vibration sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (bilateral wrist), $p < 0.05$ (chest and R. ankle), n.s. (L. ankle), JE, CO: $p < 0.01$ (chest), n.s. (L wrist), $p < 0.05$ (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: n.s. (chest), $p < 0.01$ (all other locations).

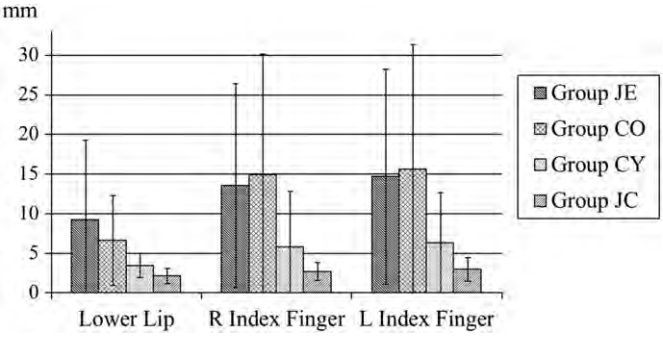

Fig. 4. Threshold for two-point discrimination — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger), $p < 0.01$ (other locations), JE, CO: $p < 0.05$ (lower lip), n.s. (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: $p < 0.01$ (all locations).

somatosensory disturbance is changeable. Uchino and Araki (1984) reported on 100 cases of Minamata disease. In 77 of the 100 cases the examination for superficial sensory disturbance was carried out from 2 to 5 times, and 63 of the 77 cases (82%) were recorded as "unstable type" in which the area of the body showing somatosensory disturbance changed. The most important factor in showing the effect of environmental pollution on the inhabitants of an area is the ability to gather data and information from both the people exposed to the pollution and from a control group which has not been exposed.

There are some other Canadian studies about the exposure to methylmercury (Wheatley and Paradis, 1996; Wheatley et al., 1997; Wheatley and Paradis, 1998), but there are few that take into account epidemiological human health data. Wheatley (1996) stressed that the people of the First Nations understanding of mercury contamination is influenced by their holistic concepts of health and environment. But there was too little physical data available to corroborate this concept. Without the presence of human physical data, we cannot evaluate psychological, social and spiritual values of health.

5. Conclusions

The data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

Information on funding sources

The study was conducted partly with funding from Grants-in-Aid for Scientific Research of Japan Society for the Promotion of Science (JSPS) (No. 20330118). The title of the funding is "Studies on the reappraisal of the real situation of Minamata disease damages and their social impact in the past half-century."

Conflict of interest

There is no conflict of interest in this study.

Acknowledgment

We, the authors, would like to express our thanks to the late Masazumi Harada of the Open Research Center for Minamata Studies, Kumamoto Gakuen University, for his planning and involvement in carrying out this research, by dedicating this paper to his memory.

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APPENDIX G-1

Comments on *File No: 1003*
Environmental Assessment of Northern Pulp's Proposed Effluent Treatment Facility

, PhD
Halifax, Nova Scotia
February 2019

Executive Summary

Overall, the material provided in *Section 9.0: Human Health Evaluation* of the environmental assessment is lacking, and additional content is required in order to provide a fully informed assessment. The information provided falls short and does not include an exposure assessment, toxicity assessment or thoughtful risk characterization. The scoping or screening level approach to the human health evaluation is superficial. The content is missing supporting evidence for the claims that are made, its reference materials are dated and rely heavily on the Toxikos (2006) report, and there is misinterpretation of key concepts throughout.

Unfortunately, it is not possible to fully assess the potential health impacts of the proposed effluent as Northern Pulp states that "various project details [are] under development and/or in the process of being refined" and specific effluent chemistry characteristics "will not be known with certainty until the project is operational" (p. 489, 491). This lack of detailed information about the proposed effluent is problematic, it provides an inaccurate and ultimately incomplete environmental assessment and makes it difficult to truly assess its content and to comment on risks and potential hazards without additional information.
It is very concerning that the environmental assessment did not include existing reference material available on Pictou Landing (e.g., Pictou Landing Native Women's Group et al., 2016; Castleden et al., 2016). There was no formal consultation by Northern Pulp and/or its consultants with Pictou Landing First Nation, and no information has been provided regarding consultation that may have occurred or is in progress with the Province.

There is only a single study identified as having a similar method/approach to the Northern Pulp project, a proposed elemental chlorine free kraft pulp mill in Bell Bay, Tasmania. The human health evaluation is largely dependent upon the Toxikos (2006) report, *Marine Impact Assessment – Bell Bay Pulp Mill Effluent* from Bell Bay, Tasmania. Perhaps most concerning about the reliance on the Tasmania project is that it is not explicitly clear that this data comes from a proposal rather than an operational pulp mill. It is not reassuring that Northern Pulp has relied so heavily on a singular proposed pulp mill and cannot point to another example of the proposed work that would provide evidence of successes and/or failures, as well as lessons learned.

The information provided in Northern Pulp's environmental assessment is insufficient in addressing the potential health risks associated with the proposed work. Ultimately, by not providing information on the treated effluent itself, the environmental assessment is incomplete which makes it difficult to truly assess its content and to comment on risks and potential hazards without additional information. The information provided in the human health evaluation does not provide sufficient evidence to support its claims. This project would benefit from a complete risk assessment process, including complete information and evidence about the treated effluent, and a consultation with Pictou Landing First Nations and other community members. The assessment should apply sex- and gender-based analysis and incorporate an in-depth understanding about the limitations of threshold values in accounting for low dose cumulative exposures, as well as a hazard assessment which accounts for the intrinsic hazard or intrinsic toxicity of the substance(s) and the potential to cause harm.

Introduction

I am writing in regard to the Environmental Assessment of Northern Pulp's proposed effluent treatment facility in Pictou County, Nova Scotia. I have been asked to comment on this environmental assessment which will be reviewed by the Minister of Environment, the Honourable Margaret Miller. I hope the Minister will carefully consider the feedback received as part of the public comment period of the environmental assessment in making her decision.

My research background has resulted in experience and expertise across broad disciplines, such as environmental health, population health and sex- and gender-based analysis, and in specific areas such as breast cancer, occupational health and cancer prevention. I completed a PhD at York University in the only interdisciplinary Environmental Studies doctoral program Canada. My dissertation research examines the body of Canadian law, policy and practice which encompasses Canada's regulatory regime for toxic substances. It demonstrates that these approaches are not inherently precautionary and do not enact a primary prevention approach to women's health, and breast cancer in particular. I have translated this research into a book chapter, four peer-reviewed articles, 13 local, national and international presentations, as well as contributions for non-academic audiences.

I play an active role in an advisory and research capacity for organizations focused on health and environmental health issues. I was the Acting Director for the National Network on Environments and Women's Health in 2012-2013. I have served in an advisory capacity for this national organization, as well as for Breast Cancer Action Quebec. I am an affiliate scientist for the Beatrice Hunter Cancer Research Institute and a researcher on the ENRICH project which focuses on environmental racism in Mi'kmaq and African Nova Scotian communities. I am also a member of the Board of Directors for Prevent Cancer Now and the Scientific Review Panel of Breast Cancer UK, both organizations that focus on preventing cancer by reducing exposure to carcinogens and hazardous chemicals.

I am currently the Director of Strategic Research Initiatives at the Atlantic Partnership for Tomorrow's Health (Atlantic PATH) study. Atlantic PATH is part of the Canadian Partnership for Tomorrow Project, a national multi-cohort prospective research study with more than 300,000 participants. The data collected includes questionnaire data, physical measures and biological samples (blood, urine, saliva, toenails). My research at Atlantic PATH and active participation in our multi-disciplinary research team has resulted in seven published articles to date, with one currently accepted, two under review and one pending submission. In my role as the Director of Strategic Research Initiatives at Atlantic PATH, I am also responsible for overseeing the data access process which involves working directly with researchers and the research platform that holds data and biological samples for more than 35,000 participants.

Human health evaluation

As my expertise lies in health research, I focused on the related material in Northern Pulp's environmental assessment. Overall, I find the material provided in *Section 9.0: Human*

Health Evaluation to be lacking, and that additional content is required in order to provide a fully informed assessment. The information provided falls short and does not include an exposure assessment, toxicity assessment or thoughtful risk characterization. The scoping or screening level approach to the human health evaluation is superficial. The content is missing supporting evidence for the claims that are made, its reference materials are dated and rely heavily on the Toxikos (2006) report, and there is misinterpretation of key concepts throughout.

Vague language is used throughout the discussion (e.g., "the marine study boundary is considered to be a radius of *a couple to a few hundred metres*…" (p. 494, emphasis added) which does not aid in the evaluation of the environmental assessment. There are also problematic language choices such as "implausible" which negates any level of risk, rather than framing something as unlikely to occur.

Unfortunately, it is not possible to fully assess the potential health impacts of the proposed effluent as Northern Pulp states that "various project details [are] under development and/or in the process of being refined" and specific effluent chemistry characteristics "will not be known with certainty until the project is operational" (p. 489, 491). This lack of detailed information about the proposed effluent is problematic, it provides an inaccurate and ultimately incomplete environmental assessment and makes it difficult to truly assess its content and to comment on risks and potential hazards without additional information.

While Northern Pulp does acknowledge that there are other pulp and paper mill projects that may share similarities to the proposed project in Pictou County, the language is both vague and at times contradictory. For example, it is stated that key aspects of these studies, such as exposure pathways and receptors "cannot be assumed to be directly applicable to the current project," but that they "may facilitate to some degree the identification of key exposure pathways [and] receptors…and may also inform on certain assessment approaches" (p. 492). There is no supporting evidence offered related to these projects.

There is only a single study identified as having a similar method/approach to the Northern Pulp project, a proposed elemental chlorine free kraft pulp mill in Bell Bay, Tasmania.[1] The human health evaluation is largely dependent upon the Toxikos (2006) report, *Marine Impact Assessment – Bell Bay Pulp Mill Effluent* from Bell Bay, Tasmania. Northern Pulp appears to rely heavily on this report, while also critiquing its findings. It is framed as a "highly conservative assessment that substantially overestimated exposure and risk to potential human consumers of fish and shellfish that may be influenced by the effluent diffuser discharge in Bell Bay" (p. 491) without providing any substantive context or evidence for this claim.

Perhaps most concerning about the reliance on the Tasmania project is that it is not explicitly clear that this data comes from a proposal rather than an operational pulp mill. From the media coverage available, it becomes apparent that the Gunns Ltd. timber

[1] It should be noted that the Tasmanian mill process would focus on hardwood eucalyptus, as opposed to softwood coniferous wood species in Nova Scotia.

company collapsed and that the permits for the mill have lapsed. It is not reassuring that Northern Pulp has relied so heavily on a singular proposed pulp mill and cannot point to another example of the proposed work that would provide evidence of successes and/or failures, as well as lessons learned.

It is well established that Atlantic Canada has among the highest rates of cancer and other chronic disease in Canada (Marrett et al., 2008; Canadian Cancer Society's Steering Committee on Cancer Statistics, 2012; Xie et al., 2015; Sweeney et al., 2017a). There are numerous factors that must be considered regarding cancer outcomes, including lifestyle and behavioural factors, genetics, and environmental exposures. As demonstrated in the research report published on Pictou Landing (which is not referenced in the environmental assessment), there is significant concern about the impact that the mill has had in the past and will have in the future on the health of local residents and the broader environment (Pictou Landing Native Women's Group et al., 2016). Northern Pulp states that the proposed project is "expected to have no negative effects on human health" (p. 117). It also references a recent report from the Nova Scotia Health Authority (NSHA) in response to concerns that there is a high incidence of cancer [and other chronic health issues] experienced by Pictou Landing First Nation and surrounding communities. To support this claim, Northern Pulp refers to the NSHA report by stating that the incident rate of all cancers for men in Pictou County is below the provincial average. However, this interpretation could be skewed by the low rates of prostate cancer in Pictou County, as well as by considering the county as a whole rather than at the community-level (Saint-Jacques et al., 2018). It should also be noted that Statistics Canada data indicates that the cancer incidence among men, women and the total cancer cases in Pictou County-Guysborough Antigonish Strait are above the Canadian average (Statistics Canada, 2013).

Northern Pulp suggests that there are limited data on traditional marine food item harvesting and consumption patterns within the Pictou Landing First Nation, as well as the broader experiences of this community. The amount of space dedicated to this topic seems wholly inadequate (p. 485). It is very concerning that the environmental assessment did not include existing reference material available on Pictou Landing (e.g., Pictou Landing Native Women's Group et al., 2016; Castleden et al., 2016), and that the process did not include a formal consultation with Pictou Landing First Nation, as well as with those who could speak to the other community marine recreational patterns. It is stated that a Pictou Landing First Nation dietary survey would be preferable but may not be feasible (p. 499), however, this should be a requirement. A fulsome consultation process with Pictou Landing First Nation should be undertaken, as well as with key experts, such as Dr. Diana (Dee) Lewis who spent seven years researching the impacts of the pulp and paper mill on the health of Pictou Landing First Nation.

Gaps in understanding of environmental exposures and potential health outcomes

I have numerous concerns about the information presented in section 9.2.2: *Identification of Potential Human Receptors and Their Characterization*. This section starts by describing a human receptor as a hypothetical person who may experience exposure and encompasses infants, toddlers, children, adolescents, and adults (p. 496). This definition, as well as the

proposed human receptor age classes (p. 497) exclude fetal exposure which is an important component of exposure to carcinogenic and endocrine disrupting chemicals and intergenerational outcomes. Biomonitoring research demonstrates that virtually all pregnant women in the United States experience body burdens with reproductive and developmental toxic substances such as lead, mercury, toluene, perchlorate, phthalates, bisphenol A (BPA), pesticides, polychlorinated biphenyls (PCBs), perfluorochemicals (PFCs), and polybrominated diphenyl ethers (PBDEs) (Sutton et al., 2010, 2012; Woodruff et al., 2011; Parry et al., 2018). Similar findings have emerged from biomonitoring studies in other western countries, including Canada (Environmental Defence, 2006, 2013; Basu et al., 2013; Sweeney, 2014, 2017; Health Canada, 2018). The body burden associated with exposure to toxic substances that is revealed through biomonitoring processes can be viewed as representing the personalization of pollution -- pollution is no longer something external that occurs in isolation outside of the body (Altman et al., 2008; Sweeney, 2017). These toxic substances can cross the placental barrier which results in infants who are born ''pre-polluted'' and can result in intergenerational health outcomes (Leffall and Kripke, 2010: 98; Mallozzi et al., 2016; Eisen et al., 2018; Lee and Mykitiuk; 2018).

Northern Pulp also suggests that females may be more sensitive than males as a "function of differences in physiological, endocrine and biochemical parameters" without providing any evidence of this statement (p. 498). In fact, carcinogenic and endocrine disrupting chemicals have been detected in human seminal fluid (Chapin et al., 2004; Marques-Pinto and Carvalho, 2013; UNEP and WHO, 2013; Jeng, 2014; Sweeney, 2017; Rehman et al., 2018; Adoamneia et al., 2018; Smarr et al., 2018). The impairment of testicular development and reproductive function in males have also been associated with fetal exposure to toxic substances (Royal College of Obstetricians and Gynaecologists, 2013; Sweeney, 2017).

It is noted that those with the greatest potential for exposure to toxic substances and/or those who have the greatest sensitivity or potential to develop adverse effects should be considered in a formal human health risk assessment. However, without conducting a human health risk assessment, the next sentence seems to predict that there will be no potential health risks found among these populations and thus, there would be no risk (p. 497). Furthermore, it is suggested that infants and children may be more sensitive to exposure to some toxic substances than adults. This does not allow for fully understanding vulnerable or susceptible populations, including women who may be more susceptible to exposures to toxic substances and subsequent health outcomes based on the timing of exposure and windows of susceptibility. These windows of susceptibility involve periods of development or hormonal activity in which women's bodies may be more susceptible. They occur throughout the lifecourse and include the prenatal period, childhood, puberty, menstruation, pregnancy, and menopause (Birnbaum, 2009; Diamanti-Kandarakis et al., 2009; Schwarzman and Janssen, 2010; Schug et al., 2011; Brophy et al., 2012; Mallozzi et al., 2016; Gray et al., 2017; Herceg et al., 2018; Cohn et al., 2019).

There is also a great need for a sex- and gender-based analysis to be applied to any evaluation of health, risk and exposure to toxic substances. The analysis of sex and gender in health research has emerged as an increasingly important methodology which

necessitates the consideration of impacts on both men and women, as well as identifying the shortcomings which emerge as a result. The foundation of sex- and gender-based analysis is the understanding that both biology and social experiences, and thus sex and gender, impact the health status of Canadian citizens (Sweeney, 2014; Canadian Institutes of Health Research – Institute of Gender and Health, 2019). In this instance, Northern Pulp is conflating the two concepts when they speak about gender (p. 498).

In brief, sex refers to biological and genetic characteristics which are manifested in one's anatomy, physiology and hormones. Sex includes the "specific capacities of our bodies, and affects the propensity and trajectory of diseases and health conditions" (Greaves, 2009: 3). Gender should not be confused or conflated with sex as it is a social construct that "extends beyond the boundaries of biologically defined categories of sex" (Benoit and Shumka, 2009: 7). Gender includes the social, cultural and economic factors that influence the socially constructed roles and relationships, personality traits, attitudes, behaviours, values, and influence that a particular society assigns to women, men and other gender groups (Clow et al., 2009; Greaves, 2009; Sweeney, 2014). The consideration of gender in health research is especially critical as it can "determine different exposures to certain risks, different treatment-seeking patterns, or differential impacts of social and economic determinants of health" (Hankivsky, 2007: 155).

The discussion related to sex, stated incorrectly in the environmental assessment as gender, does not provide evidence to support the statements about exposure and risk among male and female receptors. There also seems to be some misunderstanding about "body weight" which is stated as both having little difference between men and women, and as a relevant factor potentially affecting female receptors due to a "slightly higher intake rate to body weight ratios" (p. 498). However, there is a difference between body weight and body fat distribution. For instance, women may be at higher risk for health outcomes related to exposure to toxic substances which tend to concentrate in body fat and are often related to estrogen receptors, and women tend to have a higher ratio of body fat and estrogen levels than men (Nickerson, 2006; Assembly of First Nations Environmental Stewardship Unit, 2009; Clow et al., 2009; Sweeney, 2014). It is important to ask questions about levels of susceptibility and sex-linked differences when considering environmental exposures which raises additional issues related to sex-specific variations in disease, health and illness (Sweeney, 2014).

The discussion of "receptors" in this section is lacking. In this case, a "human receptor" is described as someone who lives, visits or works an area where exposure may occur, and the "receptor type," influenced by physical and behavioural characteristics, is used to determine the amount of chemical exposure received by the human receptor (p. 496). The discussion would benefit from evidence to support the claims, likewise the definitions would benefit from being fleshed out. For instance, the use of the term "Indigenous receptors" is unclear. Is this describing "human receptors" with First Nations ancestry and is thus focused on relevant social determinants of health which are not adequately explored, or are there specific biological receptors relevant to members of the Pictou Landing First Nation? Perhaps the discussion of receptors would also benefit from

consideration of biological receptors, such as estrogen receptors which are impacted by endocrine disrupting chemicals (Shanle and Xu, 2011; Li et al., 2013; Barrett, 2014).

Key concepts in assessing exposure to toxic substances

Should a risk assessment process be required moving forward, there are also gaps in this process that should be highlighted. Throughout the human health evaluation, there is a reliance on the concept of risk posed to human health *if there is significant exposure* to toxic substances. This approach is grounded in the risk assessment process that determines toxicological effects employing the traditional dose-response relationship whereby "the dose makes the poison" and utilizing threshold values. The use of threshold values in the risk assessment process suggests that threshold effects occur only at a specific level of exposure (Sweeney, 2014). Health Canada contends that a toxicological threshold exists below which adverse effects do not occur.

> Below a certain minimum dose,…compensatory mechanisms can mitigate the adverse effects of a substance, even on a continuing basis. At higher dose levels, however, the ability of the organisms to compensate or adapt becomes overwhelmed, leading to an impairment in organ function or development of disease state (Health Canada, 2007: 6; Sweeney, 2014).

Endocrinologists, environmental health researchers and advocates are raising competing paradigms to contest the reliance on toxicology and the dose-response relationship in risk assessment processes (Pesch et al., 2004; Vandenberg et al., 2009, 2012; Ritter, 2011; Grossman, 2012, 2013; Darbre and Fernandez, 2013; Sweeney, 2014; Zoeller and Vandenberg, 2015; Mallozzi et al., 2016). The traditional dose-response relationship posits that toxicological effects increase with increased exposure and dose of a toxic substance (Health Canada, 2007). The high dose animal testing and linear extrapolation utilized in toxicology does not allow for the potential of health effects occurring below the "safe" levels utilized in evaluating threshold values (Birnbaum, 2012; Brophy et al., 2013). Vandenberg et al. (2012) analyzed hundreds of epidemiological studies in order to demonstrate the impact of low-dose effects of endocrine disrupting chemicals on human health in comparing the role of non-monotonic responses and the traditional dose-response relationship.

> Whether low doses of EDCs influence certain human disorders is no longer conjecture, because epidemiological studies show that environmental exposures to EDCs are associated with human diseases and disabilities.…[W]hen nonmonontonic dose response curves occur, the effects of low doses cannot be predicted by the effects at high doses. Thus, fundamental changes in chemical testing and safety determination are needed to protect human health (Vandenberg et al., 2012).

Thus, the argument that the amount of exposure, whether it is considered "significant," does not allow for the acknowledgement of low-dose cumulative exposures. Exposure data and threshold effects, the premise of risk assessment, do not adequately account for the possibility of substances such as endocrine disrupting chemicals that have low dose,

cumulative and synergistic effects as a result of exposure to complex mixtures of toxic substances (Rochon Ford and Sweeney, 2015). While mixtures of chemicals are briefly mentioned in the environmental assessment (p. 512), there is no discussion of synergistic effects and related health outcomes.

Another gap in human health risk assessments conducted in Canada is that they focus on both risk and exposure, but not *hazard*. Health Canada does not recommend the use of hazard assessment over risk assessment because the potential for harmful effects is "wholly dependent upon the extent of exposure," and that the level of risk increases with an increase in exposure (Health Canada, 1995). As noted above, this does not account for low-dose cumulative exposures and the potential health outcomes. Conversely, environmental health experts recommend the use and implementation of a *hazard assessment*, which does not contain an exposure requirement but rather includes an assessment of the intrinsic hazard or intrinsic toxicity of the substance and its potential to cause harm (Sweeney, 2014; Kienzler et al., 2016; Syberg and Hansen, 2016; Solecki et al., 2017). "The issue of how much of the substance enters the environment is not taken into account. The possibility that an inherently toxic substance *might* enter the environment is accepted as reason enough to trigger the regulatory process" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 60).[2]

Potential examples of exposure to toxic substances

Northern Pulp references toluene as having a measurable exposure above recommended detection limits in recent chemical analyses of current treated mill effluent (p. 516). Toluene is an example of a toxic substance that possesses inherently toxic properties but was found to be not toxic under the *Canadian Environmental Protection Act* because of the exposure requirement and thus is not subject to federal risk management provisions. This substance is linked to numerous health concerns including developmental and reproductive toxicity, neurotoxicity, and organ system toxicity (Sweeney, 2014). In California, toluene falls under the risk management provisions of the *Safe Drinking Water and Toxic Enforcement Act*, also known as Proposition 65. Proposition 65 requires the state to publish a list of toxic substances that are known to cause cancer, birth defects or other reproductive harm and which must be updated at least once a year. Industry and businesses must notify citizens about "significant amounts of chemicals in the products they purchase, in their homes or workplaces, or that are released into the environment" (Office of Environmental Health Hazard Assessment, 2013). To some extent, the onus of responsibility is placed on the individual to use the information provided though Proposition 65 to reduce exposures that may not be adequately controlled under other state or federal regulation. However, this law has also created incentives for manufacturers to remove toxic substances that are listed as part of this initiative. For example, following their inclusion on the list, toluene was removed from many nail care products (Office of Environmental Health Hazard Assessment, 2013; Sweeney, 2014). The European Union placed restrictions on toluene in 2004 so that the substance "shall not be placed on the

[2] For a more detailed discussion of risk vs. hazard assessment and threshold vs. non-threshold values, please refer to Sweeney, 2014.

market, or used, as a substance or in mixtures in a concentration equal or greater than 0.1% by weight where the substance or mixture is used in adhesives or spray paints intended for supply to the general public" (Armstrong and Dupont, 2012: 52).

Northern Pulp also reports a significant list of metals tested in 2002 that were above recommended detection limits, including lead and arsenic. Exposure to lead through drinking water is an issue of increasing concern, particularly with recent high-profile cases of lead-contaminated water (Bellinger, 2016; Hanna-Attisha et al., 2016). Low-level effects of lead are associated with neurodevelopmental, neurodegenerative, cardiovascular, renal, reproductive, and developmental impacts (Sweeney et al., 2017b). The maximum acceptable concentration level for drinking water in Canada is 10 µg/L, whereas the current blood intervention level is 10 µg/dL. The health effects related to lead exposure are well established and there is evidence that blood lead levels as low as 5 µg/dL are associated with adverse health effects in both children and adults. Water and toenail samples from Nova Scotia residents have been analyzed for lead concentrations. Approximately 46% of Nova Scotia residents use well water as their primary source of drinking water. Water from dug wells had higher lead concentrations compared to drilled wells, and the lowest lead levels were found in water from municipal supplies. Although the majority of the lead levels in the drinking water provided by individuals in Nova Scotia were below the Canadian maximum acceptable concentration level, there were outliers, particularly among unregulated private well water sources. Given the health effects that are linked to low-level exposures, any exposure to lead in water sources remains a concern (Sweeney et al., 2017b).

Long-term exposure to environmental arsenic has been associated with many chronic diseases, including cancer and diabetes (Hughes et al., 2011). There are a number of local ongoing projects exploring arsenic and arsenic speciation exposure and associated health conditions, including cancer and diabetes. An article currently under review found that the percentage of monomethylarsonic acid (%MMA) was found to be significantly higher in the toenails of individuals in Atlantic Canada with arsenic-related cancers, compared to healthy individuals with similar total arsenic exposure (Smith et al., Under Review). Other toxic substances highlighted in Northern Pulp's discussion of substances above recommended detection limits in 2018 include hydrocarbons, cyanide, mercury, other metals and metalloids, and trace polyaromatic hydrocarbons (PAHs); there are also various health concerns with these substances.

It is particularly concerning that the risks associated with a potential accident where the pipeline travels across land and through watersheds in Pictou County are not considered in the human health evaluation. It is suggested that exposure pathways (e.g., air, ground water) "do not merit consideration in relation to the project" (p. 496), but exposures to toxic substances via air pollution or in drinking water do have potential for detrimental health outcomes and should be fully considered (e.g., Hoffman et al., 2017).

Finally, it is concerning that Northern Pulp uses non-committal language in discussing environmental monitoring in the marine area where treated effluent will be discharged. For example, stating that there "will likely be environmental monitoring" (p. 519), rather

than committing to monitoring practices as part of comprehensive risk management practices.

Conclusion

In sum, I do not believe that the information provided in Northern Pulp's environmental assessment is sufficient in addressing the potential health risks associated with the proposed work. Ultimately, by not providing information on the treated effluent itself, the environmental assessment is incomplete which makes it difficult to truly assess its content and to comment on risks and potential hazards without additional information. The information provided in the human health evaluation does not provide sufficient evidence to support its claims. This project would benefit from a complete risk assessment process, including complete information and evidence about the treated effluent, and a consultation with Pictou Landing First Nations and other community members. The assessment should apply sex- and gender-based analysis and incorporate an in-depth understanding about the limitations of threshold values in accounting for low dose cumulative exposures, as well as a hazard assessment which accounts for the intrinsic hazard or intrinsic toxicity of the substance(s) and the potential to cause harm.

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APPENDIX G-2

13 Pages redacted a per Section 20 of the FOIPOP Act

APPENDIX G-3

PROJECT MUSE

"Put It Near the Indians": Indigenous Perspectives on Pulp Mill Contaminants in Their Traditional Territories (Pictou Landing First Nation, Canada)

Heather Castleden, Ella Bennett, Pictou Landing Native Women Group, Diana Lewis, Debbie Martin

Progress in Community Health Partnerships: Research, Education, and Action, Volume 11, Issue 1, Spring 2017, pp. 25-33 (Article)

Published by Johns Hopkins University Press
DOI: https://doi.org/10.1353/cpr.2017.0004

For additional information about this article
https://muse.jhu.edu/article/661289

Access provided by Dalhousie University (21 Feb 2019 16:37 GMT)

"Put It Near the Indians": Indigenous Perspectives on Pulp Mill Contaminants in Their Traditional Territories (Pictou Landing First Nation, Canada)

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Submitted 20 January 2016, revised 26 July 2016, accepted 27 August 2016.

ABSTRACT

Background: Pictou Landing First Nation (PLFN), a small Mi'kmaw community on the Canadian east coast, has had a relationship with a tidal estuary known as A'se'k for millennia. In the 1960s, it became the site of effluen disposal from a nearby pulp mill. Almost immediately, health concerns regularly and consistently reverberated throughout the community.

Objectives: The Pictou Landing Native Women's Group (PLNWG) formed a community-based participatory research (CBPR) partnership with an academic team to conceptualize community well-being in the context of environment and human health connections. This paper documents Mi'kmaw Elders' stories of A'se'k before it became contaminated.

Methods: Using narrative inquiry vis-à-vis oral histories, we carried out conversational interviews with 10 Elders from PLFN. These interviews were thematically analyzed and 're-storied' through a process of (w)holistic content analysis.

Results: Our findings present four broad story layers, recounting the themes that emerged through analysis and presenting a broad Mi'kmaw narrative of A'se'k. These story layers share: what A'se'k originally provided, the historical/cultural context of PLFN, changes to land and health after the mill was put in, and reflections on the past and future of A'se'k.

Conclusions: Our research offers a novel contribution to the literature by showing how Mi'kmaw perspectives on the pollution at A'se'k reveal the close connection between Mi'kmaw livelihood, local ecologies, and health and well-being. Our research also provides insights into the way the research relationship developed between the PLNWG and the academic team, providing a pathway for others seeking to decolonize the research landscape.

Keywords

Indigenous health, environmental justice, social justice, oral histories, narrative inquiry, environmental health equity, community-based participatory research, Canada, decolonizing research, Two-Eyed Seeing

FROM A'SE'K TO BOAT HARBOUR: SITING POLLUTING INDUSTRIES ON INDIGENOUS LANDS

Mi'kmaw peoples have inhabited the Canadian Maritimes for millennia. It is where Mi'kmaw origin stories begin and where Mi'kmaw peoples continue to raise families, share knowledge of the land, and live in relationship to it through oral traditions.[1] Indigenous relationships to the territory from time immemorial have led to close connections to the environment; healthy connections manifest in the vitality of Indigenous well-being.[2–6] Indigenous cultures, languages, and knowledges flow from the land; health and well-being flo from cultural strength.[7–10] Healthy lands and healthy peoples include spiritual, emotional, mental, and sociocultural connectedness in many Indigenous contexts; these functions have a profound impact on overall community health, well-being, and resilience.[1–12]

For the Mi'kmaw peoples of Pictou Landing First Nation (PLFN), one place—A'se'k—is a culturally significant tidal estuary adjacent to the community (with an on-reserve population of 476[13]). It was known for its highly productive sub-

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sistence fisheries, and recreational and medicinal functions. In the late 1700s, soon after the arrival of British settlers, A'se'k became known as "Boat Harbour," a site for ship building. Fift years ago, an effluen (wastewater) treatment facility associated with a nearby bleached Kraft pulp mill was established, releasing daily approximately 85 million liters of effluent into A'se'k.

Like many other Indigenous locales across the colonized Canadian landscape, Boat Harbour is a highly contested and politically charged site. Although Mi'kmaw lands and waters have never been the subject of a land cession treaty or a Crown grant (only Peace and Friendship Treaties were signed in the 1700s), when the mill was proposed, the then-Chief of the PLFN signed an agreement for the treatment facility with the province on the promise that A'se'k would remain clean.[14] Soon after the mill became operational (1967), it became clear that the promise was an empty one. Untreated effluen was dumped directly into Boat Harbour without treatment until later that year, resulting in immediate fish kills and significant social, psychological, and cultural impacts on the community. Since then, a legacy of broken government promises has continued, through unfulfilled commitments to relocate the waste treatment facility and remediate A'se'k. As Mascarenhas observes, "whether by conscious design or institutional neglect, [First Nations] communities face some of the worst environmental devastation in the nation."[15p570]

Over the next 20 and more years, the company's emissions standards fell through regulatory gaps (i.e., 'grandfather' clauses), thus not needing to meet contemporary standards until the 1990s. Although the pulp and paper industry has improved its environmental performance improvements in its lifetime, the enduring impacts on the natural environment are vast and continue to pose risks to human health and well-being.[16] Air emissions from such mills include a number of malodourous sulfur compounds, as well as particulate matter, sulfur oxides, nitrogen oxides, and volatile organic compounds.[17–19] A complex mixture of roughly 300 known chemicals can be found in this type of effluen [20] known to be highly toxic and a major source of pollution.[21–27] The impacts on the local ecology have led to fundamental difference in how the PLFN interacts with the land so much so that Mi'kmaw members no longer gather foods and medicines there. A'se'k/Boat Harbour quickly transformed into a place of fear, anxiety, and unrest.

A NEW PARTNERSHIP FOR COMMUNITY HEALTH AND WELL-BEING

The effluen from the mill has compromised the ecological integrity of the once-healthy tidal estuary[28,29] and, as a result, the PLFN lost the use of A'se'k and surrounding landscape. Community concerns around contaminated land, water, and air extend to unease about the potential negative effects on residents' health. Frustrated with government inaction and wary of government and industry reports that they were out of harm's way, in 2010 the PLNWG, a volunteer group of women from across the community that supports community-based activities, fundraising, charitable work, and other emergent projects, began mobilizing around these concerns. First, the PLNWG invited Lewis, a Mi'kmaw woman from Sipekne'katik First Nation, with graduate-level training in environmental studies to discuss the women's concerns and what could be done about it. With the PLNWG's permission, Lewis then invited Castleden, a community-based participatory settler (non-Indigenous) researcher with more than 15 years of experience working with Indigenous peoples, and Bennett, her settler graduate student, to meet with the PLNWG in the community (a 2-hour drive from the university).

A CBPR partnership began to form over the next 16 months, centered on listening to and learning from each other (and shedding tears too—for the land, the Elders, and future generations). This period of relationship building involved monthly meetings in the community "drinking tea,"[30] and a 3-day retreat of social, cultural, recreational, and intellectual interactions. Having determined the women's priorities, we invited a number of scientists with expertise in GIS, air quality, water quality, soil analysis, and ecotoxicology to join our team, asking them to commit to a CBPR partnership through a signed agreement to honor the PLNWG's protocols for engagement and dissemination. From there, we collaboratively wrote a grant proposal, securing funds to conduct the research and continue our relational process of maintaining good hearts and minds across the cross-cultural research team.[31]

Hinging on the important role Mi'kmaw women have played in protecting and preserving the land, water, and air while acting as guardians for future generations, the initial partnership between the PLNWG and the research team acknowledged the need to conceptualize community health

and well-being in the context of environment and human health connections from Indigenous perspectives. Indigenous knowledge holders represent thousands of years of contact and experience with the local environment[32] and so the PLNWG made it clear early on in our research relationship that they were increasingly concerned with documenting community Elders' stories about what A'se'k was like before the effluen treatment facility began operations. The women were concerned that the decades of colonial disruption to Mi'kmaw ways of life put Mi'kmaw oral traditions at risk and as community Elders were passing, so too, were their stories. Thus, the women prioritized this aspect of our CBPR plan. The research we describe herein is one arm of a multiyear research program using Indigenous and Western science to answer the PLNWG's research question: "Are we getting sick from Boat Harbour?" In addressing this question, our scope is not limited to physical health, but extends to exploring the impacts of Boat Harbour on the mental, emotional, and spiritual well-being of the community as a whole. Gathering Elders' stories about A'se'k helped to build a (w)holistic understanding of how Boat Harbour has changed the community's health and sense of well-being.

METHODS

Our CBPR approach "provide[d] a launch pad for the recognition and inclusion of Indigenous epistemologies and community participation."[33p11] This was of critical importance for moving forward, given the track record of unethical research in many Indigenous contexts.[34] CBPR principles framed our theoretical approach to inquiry as well as the methodological choices made in our research partnership.

Like many who endeavor to carryout CBPR research from the academy,[30,34] we encountered our share of institutional hurdles, but with frequent and ongoing dialogue, our research was approved by the University Research Ethics Board and the Mi'kmaw Ethics Watch,[35] an entity specific to the Mi'kmaw Nation that was established to ensure that research involving Mi'kmaw peoples is done in a culturally appropriate way that safeguards Indigenous knowledge.[36] In keeping with the revised *Tri-Council's Policy Statement: Ethical Conduct for Research Involving Humans,*[37] participants opted to use their real names.

Three advisors from within the PLNWG elected to give Bennett (who collected the data) guidance over the course of the study. Two advisors were Elders, fluent Mi'kmaw speakers, and were included as participants, and—equally important—Bennett had established rapport with all of them. Regular community-based meetings helped to refine the path of inquiry and provide updates to the PLNWG throughout the research process. In particular, the advisors provided suggestions on participant recruitment, which resulted in 10 Elders agreeing to participate (eight of whom were women). The also provided guidance on how to appropriately collect data, they shared community and cultural protocols, and they translated interview data as needed. Beyond the integral research guidance, they welcomed Bennett into their homes during the 5-month period of data collection, had many conversations over meals and tea, and offered friendship and familiarity in an environment to which she was an "outsider."[30,38–40]

Story as Method/Narrative Inquiry

Storytelling is an important means by which much Indigenous knowledge is transmitted through generations. The use of story as a research method honors the process of conversation, dialogue, or narrative exchange to value participants' voices in the research process.[41–46] Narrative inquiry, conversational interviewing, and oral histories have thus been considered appropriate methods in many action research contexts,[47] and they align well with honoring the oral traditions of many Indigenous cultures.[42,48] Stories allow us to understand and explore phenomenon through lived experience[45,49] and illuminate voices that are often excluded from dominant narratives. Doing so can act to challenge established "orthodoxies" and "conventional ways of thinking."[43] The suggestion by Blodgett et al. that "conversational interviews provide the researcher and the participants with flexibility to co-create both *what* is said and *how* things are said during the interviews"[50p524] aligned well with our goals for doing CBPR in a good way.[51]

Similar to general theme areas developed by other researchers,[50,52] the PLNWG–academic research team crafte a conversational oral history guide. Members of the PLNWG suggested that it would be most appropriate to have younger community members, who had formed a relationship with Bennett, introduce her to potential participants. Thus, participants were recruited using purposeful and snowball sampling methods guided by the inclusion criteria set out by members of the PLNWG.

The interviews were unfolding dialogues with participants.

Beyond recollections of A'se'k and changes to the environment and human health, conversations included details of participants' lives, their families, and significant moments in their community's history. Four interviews were one-on-one, five involved another member of the PLNWG and/or a participants' family member for all or part of the interview, and in one instance two participants were interviewed at the same time. All interviews were conducted at participants' homes. Many interview participants used Mi'kmaw words and phrases. The interviewer intentionally avoided disrupting the natural flow and later sought translation (if appropriate) from one of the team's advisors, fluent in the Mi'kmaw language.

The PLNWG wanted the interviews to be video-recorded to create a digital archive according to the OCAP® principles[53] of First Nations' ownership, control, access, and possession of research data (*OCAP® is a registered trademark of the First Nations Information Governance Centre [FNIGC]; see www.FNIGC.ca/OCAP)*. Six participants agreed to video, two opted for audio recorded interviews only, and one chose to interview without recording devices (hand-written notes were taken). Although the interviews ranged from 35 to 75 minutes, the time spent together often exceeded multiple hours. For example, Bennett stayed afterward to visit and in some instances went for walks, shared food, or ceremonially smudged with the smoke of sacred medicines, which is practiced by (some, not all) Mi'kmaw peoples and other Indigenous Nations. Interviews were transcribed and copies were hand-delivered to participants, giving them the opportunity to review and make any corrections to the content.

Interview data were analyzed thematically using a constant comparative method (a process of moving back and forth between the data and themes from existing literature),[1–14] through which a number of emergent themes were identifi d and coded. From there, a holistic content analysis was undertaken, where the function of analysis moves toward retelling the story in an attempt to provide an account of participants' lived experiences.[54–56] Specifically, we threaded together temporal dimensions of each story so that these could be understood in relation to each other, which is particularly well-suited for this type of analysis.[57] Over several months, preliminary findings were vetted with both PLNWG and individual participants during in-person meetings, thus allowing for analytic refinement, an important function of CBPR[30]; moreover, the feedback helped to ground our interpretations in a Mi'kmaw ontology and epistemology. Bennett's thesis, upon which this manuscript is based, was defended openly in front of a community audience in PLFN, not the university—a first for that institution.

RESULTS

The initial process of coding the data served as an important level of analysis, but to present the findings along the lines of discrete themes would risk taking elements of the participants' stories out of context from their place in the broader collective narrative.[58] Instead, vignettes of the following four broad story layers emerged as a basis for a holistic narrative of A'se'k. Pieces of narrative from across the participants were then woven together to reconstruct each story layer. By presenting the findings as stories, our goal is to honor the oral tradition of Mi'kmaw culture by enacting interpretive responsibilities on the audience.[45,46,50]

Story Layer 1—"All Seasons, All Purpose": What A'se'k Provided

It was always known as *A'se'k* before it was called Boat Harbour. It was a recreational place for us, but also our livelihood, a playground, and a work area. There was something to do with every season, like an all-purpose place.

"It was thought of as the other room, where food is stored. Like—nature was storing the food there, 'cause it was there all year round." (Mary Irene Nicholas)

There was a time when most of our food was from there. Every family was hunting, fishing, trapping, and gathering. We ate healthier then. The salmon ran in the streams, and so many smelts we would take home buckets and buckets of them. We would go down with our shovels and buckets and dig up clams, cooking them right there on the shore.

"That was safe haven for all of us. Everything that we needed was there. " (Sadie Francis)

We did lots of berry picking there, and gathered other plants and medicines too. Women would collect mayflo - ers and blueberries—sell them in town for a little extra pin money. Older folks knew about the Indian medicines that came from the woods. Going to A'se'k was like a family outing for us. Sometimes there would be a bunch of families gathered, cooking and eating together right there on the shore.

"We would swim and skate, sometimes make a great big bonfire and we'd skate around. Oh my god, it was beautiful—sometimes it's just the moonlight." (Martha Denny)

Story Layer 2—"A'se'k Was a Refuge": Historical/Cultural Context

We have a connection to these places; our ancestors have occupied this space for thousands of years. The spirit of our people is here. We feel connected to our ancestors in this way. Every time our people ate, it came from the land around us. It is what kept you alive, and it is what kept the people around you alive. When you hunted a deer or a moose, it did not belong to you, it belonged to the community.

"The meat was divided accordingly, nobody was left behind. The men would be up all night carving the meat, and people would come by to pick up their share . . . The people. . . . were looking after the community." (Sadie Francis)

After European contact and after the reserve system and Indian Act were in place, a lot of our men were going down to the States for work, or maybe looking for a better life. Some men could find odd jobs around the area, as labourers mostly. It would help get us by.

"Back then they were mostly trying to survive. I watched my dad working so hard to get so little." (Don Francis)

And our kids were being taken away to the Indian Residential School. The Indian Agents would come down to our community, and just take them. But A'se'k, that was like a refuge, a safe place for all of us that they would not venture out to.

When they decided to dump that effluen into A'se'k, everything was supposed to stay 'ok'. We had no reason to assume otherwise, until we learned of the White man's way—*aklasie'wey*. Some people had come down and talked to Chief and Council, duped them into signing that agreement. Some crooked people. Dishonest people. But that is how the Indian Affairs and the non-Native society has been. Their main goal was to get rid of the Indians. It has always been about the almighty dollar for them.

"Well, I guess they didn't want to put it anywhere else in town. Let's put it near the Indians—Native people close by, we'll dump it on them! . . . Let them deal with it. But it's always us that got dumped on. That's how they treated us I guess." (Mary Ellen Denny)

Story Layer 3—"After the Mill Went in . . . ": Changes to Land and Health

At first, there was nothing to it really, just a mill. But then we saw all the fish dying. The rabbits and the deer—they seemed to disappear. And if we did hunt one, they had strange lumps. All those swampy areas that we used to get our cranberries, all that is under water now, and we do not even know if our medicines are good anymore.

"Our air is polluted, our water is polluted, our land is polluted . . . And they're all connected." (Diane Denny)

The pollution is not just in the water, it is in the air too. Sometimes that stink can be so bad we cannot even sit outside. In the beginning it turned our houses black. We found out it was the sulphur drawing the lead out of the paint, so they gave us money to repaint our houses. What is it doing to us? It is everywhere, there is no getting away from it.

"We had to change our diet. The things that we were accustomed to for thousands and thousands of years, those were all of a sudden not available to us anymore. We had to resort to another way of life. And now we have people that have diabetes, heart disease." (Sadie Francis)

When the land went, so did our health. It is not just the rabbits getting those lumps, it is our people now too. Skin cysts and cancer. A lot of kids have breathing problems, asthma, nosebleeds, sinus headaches, and it is like that stink does something to your nose. There seems to be a lot more cancer. Growing up, we never knew what cancer was but all of a sudden there are so many different kinds of cancer down here. Looking at all these health problems, we cannot help but wonder if that pollution is the reason.

Story Layer 4—"Lost, Gone, and Changed": Looking Back, Looking Ahead

It is too bad what happened there; it was such a beautiful place. So now nobody goes down there to hunt or trap, get eels or smelts, snare rabbits or fish. There is no place for kids to walk along the shore, or swim in the summertime. Nothing grows there or lives there anymore, and if it did—we would not trust it. Our community has lost their trust in that food, and our connection seems to have suffered too.

Food from the land was the way it was before Europeans arrived, but in the last couple hundred years it was also a safety net. A'se'k was something our people could fall back on. When the groceries were running low, we always knew

we could get food from there. But when the pollution came, we did not even have that anymore. And now the young people, our youth, they are not out there learning in the woods from their Elders.

Everything is gone for us there, and it is like we are getting poorer while that mill is getting richer. We wonder what could have been . . . just think of the beautiful things we could have done down there. And it is not just us that lost out. Everybody all around here lost out, the non-Native community too. And there has been anger. Th re has been blame. It has divided families, divided our community.

"Everything we used to do, we can't do. What we were brought up on, it's all been taken away." (Don Francis)

We had something good and sacred here. But our stories are slowly being lost in the older generations. We need to tell the younger generations, share our stories and share our knowledge, so that the memory of a clean A'se'k can be preserved. History is not meant to be kept in a closet; it's not doing any good there. It is meant to be shared.

"I had a dream once. I dreamt it was clean, and our community became rich from it. And everybody worked together, in my dream." (Louise Sapier)

DISCUSSION

Substantively, our research offers Mi'kmaw perspectives on the highly contentious "Boat Harbour issue" from Elders who have lived through the loss of A'se'k. For Indigenous peoples, the ability to practice subsistence livelihoods facilitates a connection to the local environment. Many of the Elders discussed community sharing practices, which were an important cultural function in PLFN before the pollution at A'se'k. Such practices are foundational to Mi'kmaw values, upholding kinship ties and connections with Mi'kmaw knowledge systems.[14,59–61] PLNWG members consequently spoke of the links between the pollution at A'se'k and the dramatic decrease of individual and community engagement with the land and waterways. Although sharing continues to function in a contemporary context in PLFN and some members continue to engage in traditional harvesting activities (albeit usually far from their contaminated homeland), it is overwhelmingly clear from the Elders in this study that trust in food and medicines from the land has been compromised radically. The Elders suggested that a lack of engagement with the land is especially true for the younger generation, many of whom do not hunt or fish, or know what foods and medicines are available on Mi'kmaw lands because they do not have a place to engage in these activities. Most important, our data indicate that Boat Harbour is indeed making the community "sick," by highlighting the ways PLFN's loss of A'se'k and surrounding land use has compromised the community's physical, sociocultural, emotional, and spiritual health and well-being.

Methodologically, the relationship building between the PLNWG and the academic members of the team offers an example of working toward CBPR's goals of balancing power and fostering trust between research partners, and also aligns with the calls made by Indigenous scholars, leaders, and community members to further decolonize the research landscape. Our unstructured oral history interview style facilitated a co-creation of knowledge; participants were able to guide the research conversations, and "re-storying" the data together maintained a holistic representation by drawing entirely from the narratives of participants for collective story layers. Th oral history interviewing process also enabled intergenerational knowledge sharing in that younger family members of participants were often present. Finally, although researchers typically destroy data after 5 to 7 years, the recorded interviews that were conducted with these Elders will remain in the hands of the PLNWG, allowing future generations to have the opportunity to engage with their Elders' memories and perspectives. Already, the stories from the Elders and other aspects of the larger research project are providing important teaching resources for PLFN, grounded in (and helping to revive) Mi'kmaw concepts and connections to their lands.

Although our findings reflect the voices of only some PLFN Elders, it is important to recognize that there are other Elders and Indigenous knowledge holders who hold important cultural relationships with A'se'k. This research is, therefore, "one move in a continuing dialogue"[62] and with community researchers continuing to document Elders' oral histories, the story of A'se'k for PLFN will continue to evolve and be shared. As for our partnership, it is now going on 6 years, and we hold annual PLNWG retreats to reflect on where we have come from and establish where we are going next (see www.heclab.com for updates).

Concerning issues of voice and representation in research, the nature of CBPR, and whether it is an inherently emancipatory research tool,[63–65] we note research is not about *giving* voice to participants; they have always, and will always, have a voice. Moreover, as scholars Vannini and Gladue note, "as

researchers, we are not writing to give voice to theoretical ideas hidden in the cracks of "reality" or even to give voice to the marginalized. Rather, we are writing to begin to share Mi'kmaw voices. With this in mind, cross cultural research must begin with the people and end with the people and everything in between."[66p157] Our research partnership addresses the penchant for dismissing Indigenous voices by honoring and illuminating the voices of Elders from PLFN by reconstructing stories about A'se'k from those who remember it as a healthy, thriving, culturally significant place. Since the efflue began flowing, the area has become a source of environmental contamination and serious health concerns that are difficul to measure using Western methodologies alone, but as this study concludes, not only has it negatively impacted the environment, but Boat Harbour has also compromised Mi'kmaw sociocultural, emotional, and spiritual health and well-being.

CONCLUDING COMMENTS

The story has not ended. In 2015, after significant pressure from PLFN and constituents in the county (and perhaps awareness that the results of this study were forthcoming), the provincial government legislated to stop the flow of effluen and remediate the site by 2020. Moreover, in referring to the manner in which the mill was sited 50 years ago as an "injustice," the Provincial Court of Nova Scotia sentenced the Northern Pulp Nova Scotia Corporation (current owner of the mill) with a $225,000 CAD fine in May 2016 for a 2014 offenc concerning 47 million liters of effluen escape; $75,000 CAD of this award went to PLFN for purposes related to conservation and restoration. Precisely how the site will be remediated, and whether it will be remediated according to Mi'kmaw values and PLFN's vision or simply to current Western standards, remains to be seen.

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Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement

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There is growing interest in the possible health threat posed by endocrine-disrupting chemicals (EDCs), which are substances in our environment, food, and consumer products that interfere with hormone biosynthesis, metabolism, or action resulting in a deviation from normal homeostatic control or reproduction. In this first Scientific Statement of The Endocrine Society, we present the evidence that endocrine disruptors have effects on male and female reproduction, breast development and cancer, prostate cancer, neuroendocrinology, thyroid, metabolism and obesity, and cardiovascular endocrinology. Results from animal models, human clinical observations, and epidemiological studies converge to implicate EDCs as a significant concern to public health. The mechanisms of EDCs involve divergent pathways including (but not limited to) estrogenic, antiandrogenic, thyroid, peroxisome proliferator-activated receptor γ, retinoid, and actions through other nuclear receptors; steroidogenic enzymes; neurotransmitter receptors and systems; and many other pathways that are highly conserved in wildlife and humans, and which can be modeled in laboratory *in vitro* and *in vivo* models. Furthermore, EDCs represent a broad class of molecules such as organochlorinated pesticides and industrial chemicals, plastics and plasticizers, fuels, and many other chemicals that are present in the environment or are in widespread use. We make a number of recommendations to increase understanding of effects of EDCs, including enhancing increased basic and clinical research, invoking the precautionary principle, and advocating involvement of individual and scientific society stakeholders in communicating and implementing changes in public policy and awareness. **(*Endocrine Reviews* 30: 293–342, 2009)**

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ISSN Print 0021-972X ISSN Online 1945-7197
Printed in U.S.A.
Copyright © 2009 by The Endocrine Society
doi: 10.1210/er.2009-0002 Received February 2, 2009. Accepted April 17, 2009.

Abbreviations: AGE, Advanced glycation end-product; AhR, aryl hydrocarbon receptor; AR, androgen receptor; BPA, bisphenol A; DDE, dichlorodiphenyldichloroethylene; DDT, dichlorodiphenyltrichloroethane; DES, diethylstilbestrol; DMBA, dimethylbenzanthracene; EDC, endocrine-disrupting compound; ER, estrogen receptor; HPA, hypothalamic-pituitary-adrenal axis; HPG, hypothalamic-pituitary-gonadal axis; HPT, hypothalamic-pituitary-thyroid axis; IUGR, intrauterine growth retardation; IVF, *in vitro* fertilization; MBP, monobutyl phthalate; MBzP, monobenzyl phthalate; NIS, sodium/iodide symporter; PBB, polybrominated biphenyl; PBDE, polybrominated diphenyl ether; PCB, polychlorinated biphenyl; PCOS, polycystic ovarian syndrome; POF, premature ovarian failure; PPARγ, peroxisome proliferator-activated receptor γ; PTU, 6-propyl-2-thiouracil; RXR, retinoic X receptor; TBBPA, tetrabromobisphenol-A; TBG, T_4-binding globulin; TBT, tributyltin; TCDD, 2,3,7,8-tetrachlorodibenzo-p-dioxin; TDS, testicular dysgenesis syndrome; TGCC, testicular germ cell cancer; TPO, thyroperoxidase; TR, thyroid receptor; TRE, thyroid response element; TTR, transthyretin.

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I. General Introduction to Endocrine Disruption

An endocrine-disrupting compound was defined by the U.S. Environmental Protection Agency (EPA) as "an exogenous agent that interferes with synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-borne hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental process." Our understanding of the mechanisms by which endocrine disruptors exert their effect has grown. Endocrine-disrupting chemicals (EDCs) were originally thought to exert actions primarily through nuclear hormone receptors, including estrogen receptors (ERs), androgen receptors (ARs), progesterone receptors, thyroid receptors (TRs), and retinoid receptors, among others. Today, basic scientific research shows that the mechanisms are much broader than originally recognized. Thus, endocrine disruptors act via nuclear receptors, nonnuclear steroid hormone receptors (*e.g.*, membrane ERs), nonsteroid receptors (*e.g.*, neurotransmitter receptors such as the serotonin receptor, dopamine receptor, norepinephrine receptor), orphan receptors [*e.g.*, aryl hydrocarbon receptor (AhR)—an orphan receptor], enzymatic pathways involved in steroid biosynthesis and/or metabolism, and numerous other mechanisms that converge upon endocrine and reproductive systems. Thus, from a physiological perspective, an endocrine-disrupting substance is a compound, either natural or synthetic, which, through environmental or inappropriate developmental exposures, alters the hormonal and homeostatic systems that enable the organism to communicate with and respond to its environment.

The group of molecules identified as endocrine disruptors is highly heterogeneous and includes synthetic chemicals used as industrial solvents/lubricants and their byproducts [polychlorinated biphenyls (PCBs), polybrominated biphenyls (PBBs), dioxins], plastics [bisphenol A (BPA)], plasticizers (phthalates), pesticides [methoxychlor, chlorpyrifos, dichlorodiphenyltrichloroethane (DDT)], fungicides (vinclozolin), and pharmaceutical agents [diethylstilbestrol (DES)].

Natural chemicals found in human and animal food (*e.g.*, phytoestrogens, including genistein and coumestrol) can also act as endocrine disruptors. These substances, whereas generally thought to have relatively low binding affinity to ERs, are widely consumed and are components of infant formula (1, 2). A recent study reported that urinary concentrations of the phytoestrogens genistein and daidzein were about 500-fold higher in infants fed soy formula compared with those fed cow's milk formula (3). Therefore, the potential for endocrine disruption by phytoestrogens needs to be considered.

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A challenge to the field of endocrine disruption is that these substances are diverse and may not appear to share any structural similarity other than usually being small molecular mass (<1000 Daltons) compounds. Thus, it is difficult to predict whether a compound may or may not exert endocrine-disrupting actions. Nevertheless, in very broad terms, EDCs such as dioxins, PCBs, PBBs, and pesticides often contain halogen group substitutions by chlorine and bromine. They often have a phenolic moiety that is thought to mimic natural steroid hormones and enable EDCs to interact with steroid hormone receptors as analogs or antagonists. Even heavy metals and metalloids may have estrogenic activity, suggesting that these compounds are EDCs as well as more generalized toxicants. Several classes of EDCs act as antiandrogens and as thyroid hormone receptor agonists or antagonists, and more recently, androgenic EDCs have been identified.

The sources of exposure to EDCs are diverse and vary widely around the world. The situation is constantly evolving because some EDCs were banned decades ago and others more recently, with significant differences between countries. In this respect, migrating people provide a model to study cessation and/or onset of exposure depending on contamination of the original and new milieus. There are also several historical examples of toxic spills or contamination from PCBs and dioxins that show a direct causal relationship between a chemical and the manifestation of an endocrine or reproductive dysfunction in humans and wildlife. However, these types of single exposures are not representative of more common widespread persistent exposure to a broad mix of indoor and outdoor chemicals and contaminants. Industrialized areas are typically characterized by contamination from a wide range of industrial chemicals that may leach into soil and groundwater. These complex mixtures enter the food chain and accumulate in animals higher up the food chain such as humans, American bald eagles, polar bears, and other predatory animals. Exposure occurs through drinking contaminated water, breathing contaminated air, ingesting food, or contacting contaminated soil. People who work with pesticides, fungicides, and industrial chemicals are at particularly high risk for exposure and thus for developing a reproductive or endocrine abnormality.

Some EDCs were designed to have long half-lives; this was beneficial for their industrial use, but it has turned out to be quite detrimental to wildlife and humans. Because these substances do not decay easily, they may not be metabolized, or they may be metabolized or broken down into more toxic compounds than the parent molecule; even substances that were banned decades ago remain in high levels in the environment, and they can be detected as part of the body burden of virtually every tested individual animal or human (4, 5). In fact, some endocrine disruptors are detectable in so-called "pristine" environments at remote distances from the site they were produced, used, or released due to water and air currents and via migratory animals that spend part of their life in a contaminated area, to become incorporated into the food chain in an otherwise uncontaminated region. Others, such as BPA, may not be as persistent [although recent evidence (*e.g.*, Ref. 6) suggests longer half-lives) but are so widespread in their use that there is prevalent human exposure.

A. Important issues in endocrine disruption

A number of issues have proven to be key to a full understanding of mechanisms of action and consequences of exposure to EDCs. These have been reviewed previously in detail (7), and several of them are listed here in brief.

1. Age at exposure

Exposure of an adult to an EDC may have very different consequences from exposure to a developing fetus or infant. In fact, the field of endocrine disruption has embraced the terminology "the fetal basis of adult disease" (8) to describe observations that the environment of a developing organism, which includes the maternal environment (eutherian mammals), the egg (other vertebrates), and the external environment, interacts with the individual's genes to determine the propensity of that individual to develop a disease or dysfunction later in life. In this Scientific Statement, we extend this concept beyond the fetal period to the early postnatal developmental period when organs continue to undergo substantial development. Thus, we will henceforward use the terminology "the developmental basis of adult disease."

2. Latency from exposure

The developmental basis of adult disease also has implicit in its name the concept that there is a lag between the time of exposure and the manifestation of a disorder. In other words, consequences of developmental exposure may not be immediately apparent early in life but may be manifested in adulthood or during aging.

3. Importance of mixtures

If individuals and populations are exposed to an EDC, it is likely that other environmental pollutants are involved because contamination of environments is rarely due to a single compound. Furthermore, effects of different classes of EDCs may be additive or even synergistic (9).

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4. Nontraditional dose-response dynamics

There are several properties of EDCs that have caused controversy. First, even infinitesimally low levels of exposure—indeed, any level of exposure at all—may cause endocrine or reproductive abnormalities, particularly if exposure occurs during a critical developmental window (10). Surprisingly, low doses may even exert more potent effects than higher doses. Second, EDCs may exert nontraditional dose-response curves, such as inverted-U or U-shaped curves (11). Both of these concepts have been known for hormone and neurotransmitter actions, but only in the past decade have they begun to be appreciated for EDCs.

5. Transgenerational, epigenetic effects

EDCs may affect not only the exposed individual but also the children and subsequent generations. Recent evidence suggests that the mechanism of transmission may in some cases involve the germline (12) and may be nongenomic. That is, effects may be transmitted not due to mutation of the DNA sequence, but rather through modifications to factors that regulate gene expression such as DNA methylation and histone acetylation.

B. The role of endocrinologists in discerning effects of EDCs

The field of endocrine disruption has particular pertinence to endocrinologists. In general, persistent endocrine disruptors have low water solubility and extremely high lipid solubility, leading to their bioaccumulation in adipose tissue. The properties of these substances are particularly well suited for study by endocrinologists because they so often activate or antagonize hormone receptors. There is no endocrine system that is immune to these substances, because of the shared properties of the chemicals and the similarities of the receptors (13) and enzymes involved in the synthesis, release, and degradation of hormones (Fig 1). Therefore, the role of this Scientific Statement is to provide perspectives on representative outcomes of exposures to endocrine disruptors and evidence for their effects in wildlife, laboratory animals, and humans.

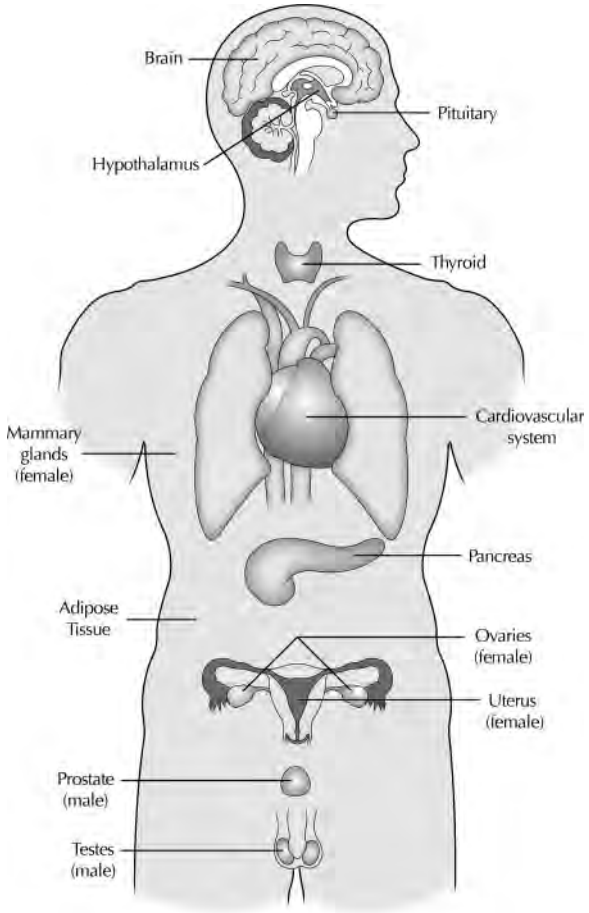

FIG. 1. Model of the endocrine systems targeted by endocrine-disrupting chemicals as discussed in this article. This figure demonstrates that all hormone-sensitive physiological systems are vulnerable to EDCs, including brain and hypothalamic neuroendocrine systems; pituitary; thyroid; cardiovascular system; mammary gland; adipose tissue; pancreas; ovary and uterus in females; and testes and prostate in males.

II. Overview of Endocrine Disruption and Reproductive Health from a Clinical Perspective

A. Clinical aspects of endocrine disruption in humans

For a clinician taking care of an individual patient, there are numerous challenges in ascertaining EDC involvement in a particular disorder. Each person has unique exposure to a variety of both known and unknown EDCs. Individual differences in metabolism and body composition will create considerable variability in the half-life and persistence of EDCs, as well as their degradation in body fluids and tissues. Susceptibility to EDCs may vary according to genetic polymorphisms. In addition, human disorders are more likely the result of chronic exposure to low amounts of mixtures of EDCs. The latency between exposure to EDCs and occurrence of clinical disorders creates further challenges when one attempts to establish a relationship at the level of a given individual.

Epidemiological studies at the level of populations in a country or a region are crucial to alert researchers about geographical or secular trends in prevalence of disorders pointing to possible environmental factors. Registries with data on particular diseases or cell/organ donors may provide valuable contributions. For instance, the observation of adverse trends in male reproductive health together with declining sperm count in Denmark and other countries has led to the hypothesis of environmental con-

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taminants being harmful to reproduction (14). Unfortunately, it is virtually impossible to make direct links between such epidemiological observations and exposure to given chemicals. Regional differences in certain reproductive disorders (infertility, cancer) that may be tied to contamination by compounds used locally such as in agriculture, industrial accident, or product misuse/abuse in subpopulations can also be informative (14, 15). Finally, a comparison of disorders before and after migration to a new environment may reveal exposure and/or susceptibility to exposure to EDCs (16).

As already mentioned, a critical concern is the potential lag between exposure to EDCs and the manifestation of a clinical disorder. In humans, this period may be years or decades. In the case of reproduction, infertility cannot be assessed until the exposed individual has attained a certain age, again resulting in a lag between early exposure and manifestation of a dysfunction. Delayed or early puberty cannot be assessed until this event actually takes place, although timing of puberty could involve programming many years earlier during fetal life. Interestingly, an increased likelihood of early puberty was observed in subjects born with intrauterine growth retardation (IUGR) (17, 18), suggesting a link between developmental programming and reproductive maturation. As discussed below, development of vaginal adenocarcinoma in women exposed fetally to DES (19) and the association of carcinoma *in situ* in the fetal testis with the development of testicular cancer in adulthood (14, 20) are examples of links between the fetal environment and the occurrence of adult disease.

The timing of exposure is key to human disease because there are critical developmental periods during which there may be increased susceptibility to environmental endocrine disruptors. In those cases in which disruption is directed toward programming of a function, *e.g.*, reproductive health, this may interfere with early life organization, followed by a latent period, after which the function becomes activated and the dysfunction can become obvious. For reproductive function in both humans and animals, fetal life is most vulnerable because there are rapid structural and functional events. The roles of sex steroids in sexual differentiation and thyroid hormones in brain development are of paramount importance at that time. Early postnatal life is also a time when maturation is still rapid (*e.g.*, the central nervous system undergoes significant development at this time, including the hypothalamus which controls reproduction; see *Section VII*). The organization of the neuroendocrine control of reproduction is not completed at birth and remains sensitive to the interaction of steroids or EDCs neonatally such as has been shown for the control of ovulation in rodents. Breast or formula feeding could be of particular significance due to the capacity of human milk to concentrate EDCs in the former and the potential high intake of phytoestrogens in soy milk and/or plasticizers in formula-containing cans in the latter. It is apparent that the developmental basis of adult disease is an important concept for understanding endocrine disruption of reproductive function in humans.

B. Clinical dimorphism of EDCs on male and female reproduction

A spectrum of disorders throughout life, some of which are sexually dimorphic, can be related to endocrine disruption (Table 1). Male sexual differentiation is androgen-dependent (and potentially estrogen-dependent), whereas female differentiation occurs largely independently of estrogens and androgens. Therefore, it is expected that different dis-

TABLE 1. Disorders of the human reproductive system possibly involving EDCs in their pathogenesis: A sexually dimorphic life cycle perspective

	Fetal/neonatal	Prepubertal	Pubertal	Adult
Processes	Intrauterine growth Sexual differentiation	Adrenarche	Gonadarche	Spermatogenesis Ovulation Hormonal control of prostate, breast, uterus, and lactation
Male disorders	IUGR (15) Cryptorchidism (14, 20)[a] Hypospadias (14, 20)[a]	Premature pubarche	Small testes and high FSH (18) Early puberty (25) Delayed puberty (25)	Oligospermia (14, 20)[a] Testicular cancer (14, 20)[a] Prostate hyperplasia (24)
Female disorders	IUGR	Premature thelarche (25) Peripheral precocious puberty (17) Premature pubarche (18)	Secondary central precocious puberty (17, 27) PCOS (18, 25) Delayed ovulatory cycles (17, 18)	Vaginal adenocarcinoma (19, 28) Disorders of ovulation (29) Benign breast disease (29, 31) Breast cancer (30, 31) Uterine fibroids (29) Disturbed lactation (29)

[a] Cryptorchidism, hypospadias, oligospermia and testicular cancer are four components of the "testicular dysgenesis syndrome" as a common entity.

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orders are seen in males and females as a result of EDC effects that overall mimic estrogens and/or antagonize androgens.

In the male (Table 2), cryptorchidism, hypospadias, oligospermia, and testicular cancer have been proposed to be linked as the testicular dysgenesis syndrome (TDS) arising from disturbed prenatal testicular development (14, 21). Such links are important because they could mean that several disorders occur at different periods throughout life in a single individual as a result of exposure to a given EDC (or mixture) at a particular period. The epidemiological data relating TDS with environmental disruptors are indirect, and we still lack direct evidence of EDC involvement in the pathogenesis of TDS in humans (see *Section V*). In the rodent, however, a TDS-like condition can be observed after fetal exposure to phthalates (20), and the reduced anogenital distance observed in the rat (22) was observed in a recent epidemiological study on human male newborns (23). Several studies have shown a strong association of low birth weight with hypospadias and cryptorchidism, suggesting that they have a common determinant (15).

Other pathologies in males are linked to EDC exposure. Prostate hyperplasia has been described after exposure to BPA (24). In adolescence, boys born with IUGR have small testes and elevated serum FSH, together with low inhibin B levels (18) that could be related to some of the TDS disorders. Divergent data have been reported on effects of EDCs on pubertal timing in the male (25).

In the female (Table 3), premature thelarche has been reported in girls exposed to phthalates (26), although these data need to be replicated. Sexual precocity presumably of peripheral origin initially and secondarily central could be related to exposure to the insecticide DDT in girls migrating for international adoption (17). A neuroendocrine mechanism is suggested by experiments in a rodent model (27) (see *Section VII*). An association of premature pubarche and ovulatory disorders with EDCs is suggested indirectly by links with IUGR at birth and metabolic syndrome in adulthood (18).

In the adult female, the first evidence of endocrine disruption was provided almost 40 yr ago through observations of uncommon vaginal adenocarcinoma in daughters born 15–22 yr earlier to women treated with the potent synthetic estrogen DES during pregnancy (19). Subsequently, DES effects and mechanisms have been substantiated in animal models (28). Thus, robust clinical observations together with experimental data support the causal role of DES in female reproductive disorders. However, the link between disorders such as premature pubarche and EDCs is so far indirect and weak, based on epidemiological association with both IUGR and ovulatory disorders. The implications of EDCs have been proposed in other disorders of the female reproductive system, including disorders of ovulation and lactation, benign breast disease, breast cancer, endometriosis, and uterine fibroids (29–32).

C. Experimental and clinical evidence of EDCs and potential mechanisms

In Tables 2 and 3, some experimental and clinical observations of disturbed reproductive systems are listed for

TABLE 2. Effects of some specific EDCs on the male reproductive system

EDC	Exposed animal and effects	Possible translation to the clinical condition	Potential mechanisms
Vinclozolin	Fetal rat: hypospadias (36); undescended testes, prepubertal (37); delayed puberty (38), prostate disease among subsequent generations (34)		Epigenetic: altered DNA methylation in germ cell lines (12, 34)
DES	Fetal rats: hypospadias, cryptorchidism, micropenis, increased transmitted susceptibility to malignancies (28)	Hypospadias, cryptorchidism, micropenis, epididymal cysts (28)	Increased ERα expression in epididymis (43) Reduced insulin-like factor 3 (465)
DDT	Adult rats: decreased fertility (466)	Cryptorchidism	
DDE		Cryptorchidism	
Phthalates	Reduced anogenital distance (22)	Reduced anogenital distance (23) and Leydig cell function, hypospadias	Decreased testosterone synthesis (468)
	Cryptorchidism (467)	Cryptorchidism (14, 20)	
	Oligospermia	Reduced fertility (14, 20)	
PCBs	Fetal rat: decreased spermatogenesis, delayed puberty	Reduced penile length, delayed sexual maturation, reduced fertility Fetal: testis cancer	
BPA	Increased prostate size (469) Aberrant development of prostate and urethra (470) Prostate cancer (122) Increased anogenital distanceAltered periductal stroma in the prostate (471)		Increased ERα expression in hypothalamus (42) Increased AR expression in prostate (469)

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TABLE 3. Effects of some specific EDCs on the female reproductive system

EDC	Exposed animal and effects	Possible translation to the clinical condition	Potential mechanisms
Vinclozolin	Fetal rat: multisystem disorders including tumors (12)		Epigenetic: altered DNA methylation in germ cell line (12); reduced ERα expression in uterus (44)
DES	Fetal mouse: transmitted susceptibility to malignancies (39)	Vaginal adenocarcinoma in daughters of women treated with DES during pregnancy (19)	
DDT/DDE	Immature female rat: sexual precocity (27)	Precocious and early puberty (17) Reduced fertility in daughters of exposed women (472) <15 yr: increased breast cancer risk	Neuroendocrine effect through estrogen receptors, kainate receptors, and AhRs (27)
BPA	Inhibited mammary duct development and increased branching (145) Increased mammary gland density, increased number of terminal ends (146) Reduced weight of vagina (473) Endometrial stimulation (473) Early puberty (474, 475)	Miscarriages	Inhibition of apoptotic activity in breast (145) Increased number of progesterone receptor-positive epithelial cells Reduced sulfotransferase inactivation of estradiol (45, 46) Nongenomic activation of ERK1/2 (476)
PCBs	Fetal and early postnatal rat: neuroendocrine effects in two generations, and behavioral changes (296, 477)		Actions on estrogen receptors, neurotransmitter receptors
Dioxins	Fetal rat: altered breast development and increased susceptibility for mammary cancer (478) Early pubertal rat: blocked ovulation		Inhibition of cyclooxygenase2 via AhR (479)
Phthalates		Premature thelarche (25)	

selected EDCs. The evidence from human epidemiological studies is partial and indirect (see *Section V*). Mechanistic studies are ethically and practically very limited in humans and have to rely on data obtained using animal experiments (*in vivo* and *in vitro* models), although these models can have limitations. Clinical and experimental studies correlate DES effects quite convincingly in both sexes. In the male, rodent studies using phthalates and, to a lesser extent, PCBs model TDS entirely or partly. In the female, some rodent studies are consistent with DDT/dichlorodiphenyldichloroethylene (DDE) involvement in sexual precocity.

The following considerations emphasize some of the concepts emerging from the available data.

1. Heritability

There may be transgenerational effects of EDCs due to overt mutation or to more subtle modifications of gene expression independent of mutation (*i.e.*, epigenetic effects). Epigenetic effects of EDCs include context-dependent transmission (*e.g.*, the causal factor persists across generations; Ref. 33) or germline-dependent mechanisms (*i.e.*, the germline itself is affected; Refs. 12, 34, and 35). An example of germline transmission of an epigenetically modified trait is shown in a rat model for the fungicide vinclozolin and is manifested by a higher likelihood of metabolic disorders, tumors, and reproductive dysfunctions in the next four generations (12, 34–38). In the case of DES, there are both human and experimental observations indicating heritability (19, 28, 39).

2. Diversity and complexity of mechanisms

EDCs often act via more than one mechanism. Some EDCs have mixed steroidal properties: for example, a single EDC may be both estrogenic and antiandrogenic. EDCs may be broken down or metabolized to generate subproducts with different properties. For instance, the estrogen agonist DDT is metabolized into the androgen antagonist DDE (27). The balance between estrogenic and androgenic properties of EDCs can be biologically significant because reproduction of both sexes involves an interplay of androgens and estrogens. In humans, early breast development occurs in girls with a highly active variant of CYP3A4, a cytochrome p450 enzyme involved in inactivating testosterone (40), and premature thelarche occurs with antiandrogenic phthalates (25). Similar androgen-estrogen interactions have been reported in DES-treated rats in which reduced androgen secretion or action sensitized the animals to the estrogenic effects of DES (41). Moreover, many organs are targeted by sex steroids and are thereby vulnerable to endocrine disruption, including the hypothalamic-pituitary-gonadal system, breast, uterus, cervix, vagina, brain, and nonreproductive tissues

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such as bone, muscle, and skin (Fig. 1). In the case of humans, a peripheral effect in the reproductive system (*e.g.*, breast development) can result from direct EDC effects (peripheral puberty) and/or endogenous estrogen increase through premature neuroendocrine maturation (central puberty) (17, 27), but these may be difficult to distinguish. For instance, EDC effects can involve altered ERα expression in hypothalamus (42) and epididymis (43) or uterus (44). Along with the direct influence of EDCs on estrogen or androgen actions, they can affect endogenous steroid production through negative and positive feedback, effects that may differ depending on developmental stage. Also, there are multiple levels of interactions with steroid action (receptor or promoters), synthesis (*e.g.*, aromatase stimulation by atrazine), and metabolism [*e.g.*, sulfotransferase (45)]. Finally, there are coexisting mechanisms not directly mediated at the hypothalamic-pituitary-gonadal (HPG) system. For instance, reproductive dysfunction can result from thyroid disruption (46) or nonspecific interference of reduced energy intake (47).

3. Limits of translational models

The *in vivo* animal models may be difficult to extrapolate to humans for several reasons, including species differences in ontogeny of reproductive system and functions, differences in metabolism of sex steroids, difficulty in estimating exposure to mixtures, and variable body burdens. As already mentioned, exposure to EDCs is complex. For example, mixtures are likely to be the usual form of exposure to EDCs, but they are difficult to approximate in experimental models. Moreover, the effects may not be additive; nevertheless, a combination of low doses of substances that individually are inactive may result in a biological perturbation (48). Despite these limitations, considering the substantial conservation of endocrine and reproductive processes across species, it is certainly reasonable to use animal models for understanding human processes, as long as these potential differences are taken into account.

III. Clinical and Translational Impacts of EDCs on Female Reproduction

A. Introduction to female reproductive development and function

Development and function of the female reproductive tract depends on coordinated biological processes that, if altered by endogenous or exogenous factors during critical periods of development or during different life stage, could have significantly adverse effects on women's health and reproductive function and outcomes. For example, the full complement of cell types in the human ovary depends on successful germ cell migration from the yolk sac during the first trimester and differentiation into oocytes with associated somatic cells to form the functional unit of the primordial follicle by the second to third trimesters of gestation. Factors that interfere with germ cell migration or follicle formation can result in abnormal functioning of this tissue with significant reproductive consequences. Also, the oocyte is arrested in the diplotene stage of late prophase until meitic divisions occur beginning at puberty (meiosis I) and after fertilization (meiosis II), and abnormalities in these processes can have a profound impact on reproductive outcomes, such as aneuploidy, premature ovarian failure (POF), and miscarriage. In addition, whereas Mullerian tract formation begins at 8 wk gestation with fusion of the Mullerian ducts and subsequent differentiation into the uterus (endometrium, myometrium), cervix, and upper vagina, uterine differentiation with regard to formation of luminal epithelium, glandular epithelium, and stromal components is mostly a postnatal event, with functionality of response to steroid hormones beginning at puberty. Interference with these processes can predispose women to infertility, ectopic gestation, poor pregnancy outcomes, and other reproductive disorders that may be programmed during development (*e.g.*, endometriosis, uterine fibroids). Thus, abnormal development or alterations at other times in the life cycle can alter anatomy and functionality of the female reproductive tract and thus can alter the reproductive potential of affected individuals and their offspring.

Most female reproductive disorders are well described with regard to clinical presentation, histological evaluation of involved tissues where applicable, and diagnostic classification. However, whereas few are polygenic inherited traits and some are due to infections, the pathogenesis of the vast majority of female reproductive disorders is not well understood. This has hindered a preventive strategy to their development and/or exacerbation, and in some cases limited the development of effective therapies for symptoms and associated morbidities.

A key question arises as to whether EDCs contribute to the development of female reproductive disorders, particularly those occurring during a critical window of susceptibility: *in utero*, neonatally, in childhood, during puberty, and during adulthood. There are increasing data from wildlife studies and laboratory studies with rodents, ungulates, and nonhuman primates that support a role of EDCs in the pathogenesis of several female reproductive disorders, including polycystic ovarian syndrome, aneuploidy, POF, reproductive tract anomalies, uterine fibroids, endometriosis, and ectopic gestation (for reviews, see Refs. 29 and 49–54; also see Table 4). Many of the mechanisms are understood and, moreover, are conserved

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TABLE 4. Female reproductive disorders and their possible relationships to EDCs: Some experimental and human data

Female reproductive disorder	Experimental data	Human epidemiological data
Reproductive tract abnormalities/ malignancies	Mice prenatally exposed to DES have structural abnormalities of the oviduct, uterus, cervix, and vagina, leiomyoma, infertility-subfertility, immune dysfunction, ovarian cysts, ovarian tumors, vaginal adenocarcinoma (480)	*In utero* exposure to DES: abnormal cervical, uterine, and oviduct anatomy (481), vaginal adenocarcinoma (19), subfertility and infertility, ectopic pregnancy (480)
Endometriosis	Adult monkey exposed to TCDD (dioxin): promotion of growth and survival of endometriosis impants (110)	↑ plasma concentrations of DEHP in women with endometriosis *vs.* controls (113); ↑ levels of phthalates (DnBP, BBP, DnOP, DEHP) in Indian women with endometriosis *vs.* controls (114)
Precocious puberty	Immature female rat exposed to DDT: sexual precocity (27)	High levels of the DDT metabolite p,p′-DDE, in plasma from foreign immigrant girls with precocious puberty in Belgium (482)
	Female mouse fetuses exposed to BPA: early puberty (474)	Breastfed girls exposed to high levels of PBB *in utero* (≥7 ppm): earlier age at menarche (483)
Premature thelarche		Higher levels of phthalates and its major metabolite mono-(2-ethylhexyl) phthalate in serum of girls from Puerto Rico with premature breast development (26)
Disturbed lactation	Rodents exposed to atrazine: impaired lactation through prolactin inhibition (484)	Negative correlation between DDE (metabolic product of DDT) and duration of lactation (484)
Breast abnormalities/ cancer	Fetal rats exposed to dioxins (TCDD): altered breast development and ↑ susceptibility for mammary cancer (478)	Limited and conflicting evidence
	Mice exposed to BPA: altered organization of the mammary anlagen, accelerated ductal development, and inhibition of lumen formation in the fetus (128)	M2 polymorphism in the cytochrome P450 1A1 gene modify the association between PCB exposure and risk of breast cancer (51)
	Mice exposed to BPA: increased number of epithelial structures (145, 146)	
	Rats exposed perinatally to BPA: development of preneoplastic lesions (intraductal hyperplasias) and carcinomas *in situ* (148)	
	Rats exposed perinatally to BPA; increased susceptibility to neoplastic development (149)	
	Rats: lactational exposure to BPA: shortening of the latency period and increased tumor multiplicity after carcinogen challenge (150)	
	Mice exposed to BPA: development of preneoplastic lesions (intraductal hyperplasias) (147)	
PCOS	Prenatal exposure to high levels of testosterone results in fetal programming of PCOS traits (60, 61)	Increased levels of serum AGEs in women with PCOS and positive correlation between AGE proteins and testosterone levels (64)
	Rats fed with high *vs.* low AGE diet: ↑ androgens– ↑ ovarian volume and AGE ovarian deposition (461)	In polycystic ovaries, increased immunostaining of colocalized AGEs, RAGEs, and activated nuclear factor-κB (211, 485)
Fertility and fecundity	Mice prenatally exposed to DES (480)	Isolation of persistent organochlorine chemicals from ovarian follicular fluid of women undergoing IVF (51)
		Indications that exposure to pesticides may contribute to female infertility in some occupationally exposed groups (484)

↑, Increased; DEHP, di-(2-ethylhexyl) phthalate; DnBP, di-n-butyl phthalate; BBP, butyl benzyl phthalate; DnOP, di-n-octyl phthalate.

between animals and humans. Herein, we describe some of the clinical implications of these associations.

B. Polycystic ovarian syndrome (PCOS)

PCOS is a heterogeneous syndrome characterized by persistent anovulation, oligo- or amenorrhea, and hyperandrogenism in the absence of thyroid, pituitary, and/or adrenal disease (55–57). At the level of the ovary, there is recruitment and growth of follicles to the small antral stage, without selection of a dominant, preovulatory follicle, leading to accumulation of multiple, small, antral follicles (58). Hyperfunctioning of the theca and relative hypofunctioning of the granulosa cells accompany the acyclicity of the syndrome. Many, but not all women with PCOS have

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relatively high circulating levels of LH, compared with FSH, believed to be due to insensitivity to steroid hormone feedback. However, this does not fully account for the observed increase in thecal androgen production or the relative quiescence and sometimes frank FSH resistance of the granulosa cells. This complex disorder likely has its origins both within and outside the hypothalamic-pituitary-ovarian axis, and metabolic, neuroendocrine, and other endocrine regulators likely contribute to its manifestation. Obesity and insulin resistance occur in about 50% of women with PCOS, and obese women have a 12% risk of having PCOS (59). PCOS has multiple physiological processes (*e.g.*, neuroendocrine functioning and feedback mechanisms, ovarian steroidogenesis, insulin resistance, and obesity) that are regulated by hormonal and metabolic parameters. Hence, endocrine disruption by environmental chemicals may indeed contribute to the pathogenesis of PCOS.

In sheep and rhesus monkeys, prenatal exposure to high levels of testosterone results in fetal programming of PCOS traits (60). Specifically, high levels of testosterone exposure at gestational d 40–60 and 100–115 result in rhesus monkey females who, in adulthood, have anovulatory infertility, hypersecretion of LH, elevated circulating levels of testosterone, neuroendocrine feedback defects, central adiposity and compensatory insulin resistance, and polycystic ovaries with ovarian hyperandrogenism and follicular arrest in adulthood (60, 61). In the sheep model, a similar PCOS phenotype, along with IUGR and compensatory catch-up growth after birth, derives from prenatal exposure to exogenous testosterone (60, 62). In rhesus monkey and sheep, unlike rodents, follicular differentiation is completed during fetal life. Thus, it is plausible that *in utero* exposure of human female fetuses to androgen-like EDCs could result in PCOS in adulthood, along with associated metabolic disorders. Very recent evidence for androgenic properties of personal-care products such as triclocarban (63) add to the possibility of environmental androgens, although a connection to PCOS has not yet been drawn.

There are numerous candidate genes associated with predisposition to developing PCOS in women (57, 64), and how and if these interact with prenatal androgen-like factors to promote the PCOS phenotype in women has not been determined. Nonetheless, PCOS is a debilitating disorder in women, occurring in 6.6% of the reproductive-age population (65–67); it is a leading cause of subfertility and is associated with increased lifetime risks for cardiovascular disease and type II diabetes (55). In addition to these clinical impacts on patients, the cost to the health care system for PCOS diagnosis and treatment is substantial, totaling in 2004 about $4.4 billion in the United States alone (68). These facts underscore the need to understand potential EDC contributions to the development of PCOS in an effort to minimize such exposures and maximize prevention.

Other pathways may be involved in endocrine disruption of PCOS. Women with PCOS have higher levels of the EDC BPA (69), and increased testosterone in these women is consistent with decreased clearance of BPA (70). Although adult exposures do not necessarily imply earlier exposures in life, especially with EDCs of relatively short half-lives, there are data demonstrating nearly 5-fold higher levels of BPA in amniotic fluid compared with other body fluids, suggesting significant prenatal exposure (71). Although a cause and effect of BPA and PCOS have not been demonstrated definitively, the biological plausibility is interesting and worthy of further consideration.

C. Premature ovarian failure, decreased ovarian reserve, aneuploidy, granulosa steroidogenesis

POF (cessation of proper ovarian function before the age of 40) occurs in about 1% of reproductive-age women (72). Although in some cases the causation is known, for the vast majority of women with POF this is not the case, and there are stages of susceptibility during organogenesis and adult exposures that could contribute to POF.

Because the total ovarian follicle complement is established before birth in humans (73), anything that interferes with this, resulting in a decreased ovarian follicle resting pool, can result in POF. For example, disruption of germ cell migration from the genital ridge into the developing gonad results in ovarian dysgenesis. The resting pool undergoes a baseline level of apoptosis, and TNF-α, Fas ligand, and androgens stimulate this in the resting pool, as well as in the growing pool (74). Also, once a cohort of follicles is recruited during a given cycle in women, survival factors (FSH, estradiol, and growth factors, *e.g.*, IGFs) are important for escape from apoptosis of the dominant follicle. Recent data in the mouse show that selective activation of the K-ras pathway in the oocyte results in rapid follicular development and depletion (75). Interestingly, adult and *in utero* exposures of mice to BPA have resulted in damage to oocytes (76, 77). Specifically, adult exposures result in abnormalities in alignment of chromosomes on the meiotic spindle and aneuploidy, which, while not leading to ovarian senescence, does lead to aneuploid gametes and offspring (76). However, BPA given to pregnant dams during midgestation affects the developing ovary with resulting abnormalities in meiotic prophase, including synaptic defects, and mature animals exposed *in utero* have an increase in aneuploid oocytes and embryos (77). Such alterations also lead to cell cycle arrest and oocyte death, thus depleting the complement of normal oocytes (77). Currently, there are no data on *in utero* or

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adult exposure to BPA and aneuploidy in humans, but the possibility that there are parallels is compelling.

Interestingly, mice exposed *in utero* to DES, between d 9–16 gestation, have a dose-dependent decrease in reproductive capacity, including decreased numbers of litters and litter size and decreased numbers of oocytes (30%) ovulated in response to gonadotropin stimulation with all oocytes degenerating in the DES-exposed group, as well as numerous reproductive tract anatomic abnormalities (78). In women with *in utero* exposure to DES, Hatch *et al.* (79) reported an earlier age of menopause between the 43–55 yr olds, and the average age of menopause was 52.2 yr in unexposed women and 51.5 yr in exposed women. The effect of DES increased with cumulative doses and was highest in a cohort of highest *in utero* exposure during the 1950s (79). These observations are consistent with a smaller follicle pool and fewer oocytes ovulated, as in DES-exposed mice after ovulation induction (78).

Of interest are human data that demonstrate unequivocally that adult exposure in women to cigarette smoke results in decreased fecundity, decreased success rates in *in vitro* fertilization (IVF), decreased ovarian reserve (higher basal cycle d 3 FSH and stimulated parameters), earlier menopause by 1–4 yr, and an increased miscarriage rate (80, 81). The mechanism appears to be mediated by the AhR-mediated apoptosis of oocytes, with accelerated loss of ovarian follicles. Interestingly, exposure of rats to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) *in utero* and through the end of reproductive life results in a dose-dependent onset of premature reproductive senescence, likely due to direct effects on ovarian function (82).

Thus, whereas POF may occur in a relatively small percentage of the population, there are several alarming signals that should not be ignored. For example, the age group with the fastest growing rate of involuntary subfertility is 15- to 24-yr-old women (83). Also, the known effects of environmental contaminants on oocyte survival, aneuploidy, decreased ovarian reserve, and infertility described above underscore how much at risk the population may be for reproductive compromise.

With regard to ovarian granulosa steroidogenesis, several EDCs have effects on this process (84). For example, TCDD (10 ppm) decreases FSH-stimulated LH receptor mRNA expression and half-life in cultured granulosa (85). DDE increases vascular endothelial growth factor and IGF-I expression in luteinized granulosa from IVF patients, suggesting a contribution to impaired steroidogenesis and perhaps infertility (86). Recently, Kwintkiewicz and Giudice (87, 88) have shown, in preliminary studies, that BPA decreases proliferation and FSH-induced aromatase expression via activation of peroxisome proliferator-activated receptor γ (PPAR-γ) and increases IGF-I and IGF receptor type I in human granulosa-like tumor cells and luteinized human granulosa from IVF subjects. These data suggest that EDCs may have local effects on ovarian function in adult women.

D. Reproductive tract anomalies

Disruption of female reproductive tract development by the EDC DES is well documented (89). A characteristic T-shaped uterus, abnormal oviductal anatomy and function, and abnormal cervical anatomy are characteristic of this *in utero* exposure, observed in adulthood (90), as well as in female fetuses and neonates exposed *in utero* to DES (91). Some of these effects are believed to occur through ERα (92) and abnormal regulation of Hox genes (93, 94). Clinically, an increased risk of ectopic pregnancy, preterm delivery, miscarriage, and infertility all point to the devastating effect an endocrine disruptor may have on female fertility and reproductive health (89). It is certainly plausible that other EDCs with similar actions as DES could result in some cases of unexplained infertility, ectopic pregnancies, miscarriages, and premature deliveries. Although another major health consequence of DES exposure *in utero* was development of rare vaginal cancer in DES daughters, this may be an extreme response to the dosage of DES or specific to pathways activated by DES itself. Other EDCs may not result in these effects, although they may contribute to the fertility and pregnancy compromises cited above. Of utmost importance clinically is the awareness of DES exposure (and perhaps other EDC exposures) and appropriate physical exam, possible colposcopy of the vagina/cervix, cervical and vaginal cytology annually, and careful monitoring for fertility potential and during pregnancy for ectopic gestation and preterm delivery (89, 95).

E. Uterine leiomyomas

Uterine leiomyomas (fibroids) are benign smooth muscle tumors of the myometrium that can cause morbidity for women, including menorrhagia, abdominal pain, pelvic prolapse, and infertility and miscarriage (96). They are the most common tumor of the reproductive tract in women and comprise the leading cause for hysterectomy and the second leading cause of inpatient surgery in the United States, with health care costs exceeding $2 billion in 2004 (97). The prevalence rate of uterine leiomyomas is approximately 25–50%, with a preponderance occurring in African-American women (97). The greatest risk factor in adult women is prolonged exposure to unopposed estrogen. Whether *in utero* exposure to DES increases a woman's lifetime risk of developing uterine fibroids is controversial, as the method to detect fibroids in two different studies influenced the outcome (98, 99). Specifically, in a

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study of 1731 women exposed to DES and 848 matched unexposed controls, no association was found ($P = 0.68$) when histological confirmation after myomectomy or hysterectomy was used to document uterine fibroids (98). In contrast, when ultrasound was used to determine the presence of fibroids in DES-exposed *vs.* DES-unexposed women, a significant relationship was found (odds ratio, 2.4; 95% confidence interval, 1.1–5.4) in DES-exposed women and uterine fibroids (99). However, there are strong animal data to support development of uterine fibroids in adulthood after *in utero* exposure to EDCs, especially DES (for reviews, see Refs. 49, 50, and 52). Newbold *et al.* (100) reported that CD-1 mice develop uterine leiomyomas if exposed *in utero* or neonatally to DES, whereas unexposed mice do not. Furthermore, the Eker rat, which has a germ-line mutation in the rat homolog of the tuberus sclerosis complex 2 tumor suppressor gene, spontaneously develops uterine leiomyomas (101). The number, size, and growth rate of the fibroids increase significantly when the rat is exposed to DES on postnatal d 3–5 and 10–12, but not 17–19 (102), an effect that can be diminished with prior oophorectomy (102). These data overall strongly suggest developmental programming and gene-environment interactions for the increased risk of uterine lyomyomas in this rat model (103). In addition to mice, the Eker rat, and some dogs, the Baltic gray seal that has high organochlorine body burden also develops uterine leiomyomas (104). As with most environmental causes of abnormalities in the reproductive tract (and other tissues and organs), direct cause and effect relationships are difficult to establish. However, as in many of the other abnormalities in this Scientific Statement, the likelihood of such a relationship is plausible.

F. Endometriosis

Endometriosis is an estrogen-dependent gynecological disorder associated with pelvic pain and infertility. It occurs in 6–10% of women and up to 50% of women with pelvic pain and infertility. In 2002, the total health care costs estimated in the United States for diagnosis and treatment of endometriosis totaled approximately $22 billion (105). There are suggestive animal data of adult exposure to EDCs and development of or exacerbation of existing disease, and there is evidence that *in utero* exposure in humans to DES results in an increased relative risk = 1.9 (95% confidence interval, 1.2–2.8) (106). Most striking are the observations of rhesus monkeys administered different doses of TCDD and their subsequent development of endometriosis (107, 108). Although this study had low sample size and confounding variables that brought into question the relationship between endometriosis and TCDD (49, 52, 109), another study revealed that adult exposure of cynomolgus monkey to TCDD promotes growth and survival of endometriosis implants (110), indicating that this EDC is involved in the progression, if not pathogenesis, of this disorder. Similar data were obtained in rodent models of endometriosis in which human endometrium is transplanted into mouse and rat peritoneum, and the established lesions grew larger when animals were exposed to TCDD *in utero* and as adults (111, 112), underscoring the estrogen (and EDC) dependence of this disorder.

There are also correlative findings of phthalate levels in plasma and endometriosis. For example, Cobellis *et al.* (113) found high plasma concentrations of di-(2-ethylhexyl)-phthalate in women with endometriosis, and an association of phthalate esters with endometriosis was found among Indian women (114). Thus, the evidence is accumulating of correlations between EDCs in the circulation of women with endometriosis, although a cause-and-effect relationship has yet to be established, which is not uncommon in reproductive environmental toxicity.

Endometriosis is believed to be due to retrograde menstruation and transplantation of endometrial fragments and cells into the peritoneal cavity. Because nearly all women have retrograde menstruation but relatively few have endometriosis, the disorder is also believed to involve a dysfunctional immune response, *i.e.*, activated macrophages in the peritoneal cavity with robust secretion of inflammatory cytokines but without clearance of disease. An interesting model of early-life immune insult and developmental immunotoxicity suggests that *in utero* exposures to specific insults may reprogram the immune system, resulting in disorders such as chronic fatigue syndrome, cancer, and autoimmune disorders. Whether this has any relevance to the development or progression of endometriosis in adult women has not been explored but warrants further evaluation. Interestingly, TCDD and a therapy for endometriosis, danazol, both have effects on the adult immune system, although effects on the developing immune system are not known.

Although the infertility associated with endometriosis for the most part can be treated with advanced reproductive technologies, less success has been achieved with treatment of endometriosis-related pain. Because the pathogenesis of the associated pain is not known with certainty, therapies are empiric and include agents directed to minimize inflammation (nonsteroidal antiinflammatory drugs, danazol), progestins and androgens (to oppose estrogen actions), GnRH analogs (to inhibit gonadotropin secretion and thus ovarian estradiol production), and aromatase inhibitors (to inhibit estradiol synthesis by the ovary and endometriotic lesions), as well as surgical ablation or excision of the disease, when possible. Most of these therapies are effective in

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up to 50–60% of affected women, with either intolerable side effects (*e.g.*, profound hypoestrogenism) or recurrence of pain (*e.g.*, after surgery) (115). Thus, prevention is key to this disorder, as is understanding the pathogenesis so that therapies for pain can be devised appropriately and administered.

IV. Endocrine Disruptors, Mammary Gland Development, and Breast Cancer

It has been hypothesized that the significant increase of the incidence of breast cancer in the industrialized world observed during the last 50 yr may be due to exposure to hormonally active chemicals, particularly xenoestrogens (116). A similar increase in the incidence of testicular cancer and malformations of the male genital tract and decreased quantity and quality of human sperm have been observed during the same half century, again suggesting a link to the introduction of these chemicals into the environment (117) (see *Sections II and V*).

A. Windows of vulnerability to carcinogenic agents and "natural" risk factors

The standard risk factors for developing breast cancer include age at menarche, first pregnancy, menopause, lactation, and parity. All of these factors are related to lifetime exposures to ovarian hormones. It is also known that there are developmental periods of enhanced vulnerability (see *Section I*). For example, sensitivity to radiation is highest during puberty. Additionally, pregnancy increases the risk of breast cancer in the short term (118) and decreases it in the long term (119). More recently, epidemiological studies have revealed that the intrauterine environment may also influence the risk to develop breast cancer later in life. Studies comparing human dizygotic twins and single births revealed that the propensity to breast cancer is enhanced in female twins, and this outcome was attributed to excess estrogen exposure in dizygotic twins during gestation (120).

B. Theories of carcinogenesis

A majority of researchers support the idea that cancer is due to the accumulation of mutations in a cell [the somatic mutation theory (121)]. In contrast, supporters of the theory of developmental origins of adult disease are proposing that changes in the epigenome play a central role in carcinogenesis (see *Section VI*).

Both the genetic and epigenetic theories of carcinogenesis imply that cancer originates in a cell that has undergone genetic and/or epigenetic changes, which ultimately results in dysregulated cell proliferation (122). Alternatively, the tissue organization field theory postulates that carcinogenesis represents a problem of tissue organization, comparable to organogenesis gone awry, and that proliferation is the default state of all cells (123–125). According to this theory, carcinogens, as well as teratogens, would disrupt the normal dynamic interaction of neighboring cells and tissues during early development and throughout adulthood (126).

During postnatal life, the mammary gland undergoes massive architectural changes, comparable to those usually associated with organogenesis. These changes occur in response to alterations in endogenous hormone levels such as those associated with puberty and pregnancy and can be induced experimentally by endocrine manipulation. Many studies of endocrine disruptors have illustrated that developmental exposure to these exogenous hormone mimics can alter normal patterns of tissue organization and hence disrupt stromal-epithelial interactions (127, 128). These changes may disturb important regulatory mechanisms and enhance the potential for neoplastic lesions.

C. Susceptibility of the breast during puberty and adulthood

Several epidemiological studies explored the link between exposure to endocrine disruptors and breast cancer incidence. In general, these are case-control studies that usually measure exposure to a single chemical at the time of breast cancer diagnosis. This type of study has produced inconsistent results. Prospective studies that measured exposure several years before cancer diagnosis revealed a positive link between breast cancer and chemical exposure to toxaphene (129) and DDT (130). In particular, a study linked DDT with an increased risk of breast cancer when the exposure was measured before 14 yr of age. This study used samples taken before the banning of DDT for agricultural use and hence represents higher exposures than those measured today. Humans, however, are exposed to a plethora of hormonally active chemicals with different metabolic profiles. Moreover, individuals living in the same area may be exposed to a different mixture of chemicals due to different diets and to migration history. These facts imply that a single chemical cannot be construed as a marker of total exposure. Not surprisingly, one case-control study reported a significant correlation between total xenoestrogen exposure and breast cancer (131).

How xenoestrogen exposure during the period of sexual maturity may result in mammary gland carcinogenesis remains unsolved; this is not surprising because the mechanisms underlying hormonal carcinogenesis are still unknown. One possibility, compatible with all the cancer hypotheses briefly discussed above, is that xenoestrogens may extend the length of the period of ductal growth and alveologenesis during the menstrual cycle. This period is also characterized by proliferative activity in the glandular

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epithelium. For example, ductal cell proliferation in the breast is maximal from the late follicular phase and throughout the luteal phase, *i.e.*, when endogenous estrogen levels are high (132). The ubiquitous presence of xenoestrogens in foods, their persistence, and their lack of binding to the plasma carrier protein SHBG (127) may result in relatively constant levels in blood. These xenoestrogens would act additively with ovarian estrogens and thus advance by a few days the period of ductal growth. Hence, a small and maintained increase of estrogenic activity during the period of low ovarian output could be sufficient to "promote" carcinogenesis by increasing the number of cells that undergo proliferation menstrual cycle after menstrual cycle, an explanation consistent with the somatic mutation theory. An alternative explanation, consistent with the tissue organization field theory, is that estrogens acting as morphogens would enhance tissue remodeling through stroma epithelium interactions and increase the likelihood of producing alterations of tissue architecture. This notion is supported by data showing that recombination of normal mammary epithelial cells with stroma exposed to carcinogenic agents results in the development of epithelial neoplasias (133) and that conversely, recombination of mammary carcinoma cells with stroma from multiparous animals (which are refractory to carcinogens) results in the normalization of the neoplastic phenotype (126).

D. Susceptibility of the mammary gland during the perinatal period

Direct evidence of prenatal estrogen exposure and breast cancer risk is being gathered from the cohort of women born to mothers treated with DES during pregnancy and is discussed above (see *Sections II and III*). These women are now reaching the age at which breast cancer becomes more prevalent. In the cohort of these women who are aged 40 yr and older, there is a 2.5-fold increase in the incidence of breast cancer compared with unexposed women of the same age (134, 135), suggesting that indeed, prenatal exposure to synthetic estrogens may play an important role in the development of breast neoplasms. Consistent with this, experiments in rats showed that prenatal exposure to DES resulted in increased mammary cancer incidence during adulthood (136, 137). These experiments illustrated that rats exposed prenatally to DES and challenged with the chemical carcinogen dimethylbenzanthracene (DMBA) at puberty had a significantly greater incidence of palpable mammary tumors at 10 months of age than animals exposed prenatally to vehicle. In addition, the tumor latency period was shorter in the DES-exposed compared with the vehicle-exposed group (130). Both the epidemiological and experimental data are consistent with the hypothesis that excessive estrogen exposure during development may increase the risk of developing breast cancer.

In utero exposure to tamoxifen, an estrogen antagonist and partial agonist, has also been shown to increase the incidence of mammary tumors when the exposed offspring are challenged with DMBA at puberty. Eighteen weeks after the challenge, 95% of the tamoxifen-exposed animals developed tumors, compared with 50% of the vehicle-treated rats (138). However, in the above-mentioned studies, both DES and tamoxifen were administered at high pharmacological doses to reflect the medical use of these agents, whereas the effects of twinning mentioned above represent a physiological range of endogenous hormone levels to which developing fetuses are exposed.

E. Perinatal exposure to environmentally relevant levels of endocrine disruptors

There is a third type of exposure that needs to be addressed: the inadvertent and continuous exposure of fetuses to environmentally active chemicals, such as dioxins and BPA (Table 4).

1. Dioxins

Depending on the context (time of exposure, organ, presence or absence of estrogens) dioxins have either estrogenic or antiestrogenic effects. Despite cross-talk between the aryl hydrocarbon and ERs (139), the mechanisms underlying these opposite effects have yet to be elucidated. Rats exposed prenatally (gestational d 15) to TCDD and challenged with the chemical carcinogen DMBA at 50 d of age showed increased tumor incidence, increased number of tumors per animal, and shorter latency period than rats exposed prenatally to vehicle and to DMBA at 50 d of age. These TCDD-exposed animals had increased numbers of terminal end buds at puberty (140). Because these structures are believed to be the site where mammary cancer arises, these results were interpreted as evidence that TCDD increased the propensity to cancer by altering mammary gland morphogenesis. Interestingly, Fenton (31) showed that prenatal exposure to TCDD results in impaired development of terminal end buds that remain in the gland for prolonged periods, whereas in the normal animals terminal end buds are transient structures that regress when ductal development is completed.

2. BPA, a ubiquitous xenoestrogen

The ubiquitous use of BPA provides great potential for exposure of both the developing fetus, indirectly through maternal exposure, and the neonate, directly through ingestion of tinned food, infant formula, or maternal milk (11). Indeed, BPA has been measured in maternal and fetal

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plasma and placental tissue at birth in humans (141). A recently published study conducted by the Centers for Disease Control, the first using a reference human population, showed that 92.6% of over 2500 Americans had BPA in their urine (142). Measured urine concentrations were significantly higher in children and adolescents compared with adults. BPA has also been measured in the milk of lactating mothers. These data indicate that the developing human fetus and neonate are readily exposed to this chemical.

In rodents, BPA has been shown to readily cross the placenta (143, 144) and bind α-fetoprotein (the estrogen-binding protein that prevents maternal estrogen from entering the circulation of the fetus) with negligible affinity relative to estradiol; this results in enhanced bioavailability during neonatal development. BPA is present in the mouse fetus and amniotic fluid during maternal exposure in higher concentrations than that of maternal blood.

The U.S. EPA has established the safe daily intake of BPA to be 50 μg/kg body weight/d based on the assumption that the main source of exposure is oral through food ingestion. However, recent publications suggest that food is not the only relevant source of exposure and that the half-life of BPA in humans is longer than expected (6). Numerous publications addressing fetal exposures to BPA have used parenteral administration. This practice was based on one hand on the fact that the fetus is exposed to BPA through the internal milieu of the mother, and on the other hand that parenteral administration via an osmotic minipump allows for a precise and constant level of exposure. Using this route of administration, exposure of a pregnant mouse dam to 25 and 250 ng BPA/kg body weight/d (namely, 2000 and 200 times lower than the safe dose) for 14 d beginning on d 8 gestation has been shown to impact certain aspects of development in their female offspring. When examined on gestational d 18, fetuses of mothers exposed to the higher dose of BPA exhibited altered growth parameters of the mammary gland anlagen. Changes in the appearance of the mammary epithelium were observed, such as decreased cell size and delayed lumen formation, as well as increased ductal area. In the stroma, BPA exposure promoted advanced maturation of the fat pad and altered localization of fibrous collagen (128). Because maturation of the fat pad is the driving event for ductal growth and branching, it is likely that the increased ductal area in BPA-exposed animals is due to the accelerated formation of their fat pads. By postnatal d 10, in the offspring born to mothers exposed to either dose of BPA, the percentage of proliferating epithelial cells was significantly decreased relative to those not exposed. At 30 d of age, the area and number of terminal end buds relative to the gland ductal area increased, whereas cell death in these structures decreased in BPA-exposed offspring compared with controls. It is likely that the reduced cell death in the terminal end buds of BPA-exposed females may be the cause of the observed ductal growth delay because cell death is essential for both the hollowing and the outward growth of the subtending duct. Collectively, these effects observed at puberty may be attributed to an increased sensitivity to estradiol that has been observed in the BPA-exposed animals (145). Because of the new epidemiological data cited above and the effects found in the low-dose animal studies using parenteral exposure, the EPA recommendations need to be reevaluated.

In animals exposed perinatally to BPA, there was also a significant increase of ductal epithelial cells that were positive for progesterone receptor at puberty. These positive cells were localized in clusters, suggesting future branching points. Indeed, lateral branching was significantly enhanced at 4 months of age in offspring born to mothers exposed to 25 ng BPA/kg body weight/d (145). These results are compatible with the notion that increased sensitivity to estrogens drives the induction of progesterone receptors in epithelial cells, leading to an increase in lateral branching. By 6 months of age, perinatally exposed virgin mice exhibit mammary glands that resemble those of a pregnant mouse, as reflected by a significant increase in the percentage of ducts, terminal ends, terminal ducts, and alveolar buds (146). Additionally, intraductal hyperplasias, which are considered preneoplastic lesions, were observed starting at 3 months of age (147).

To explore the links between prenatal BPA exposure and mammary gland neoplasia, a rat model was chosen because it closely resembles the human disease regarding estrogen dependency and histopathology. BPA was administered to pregnant dams at doses of 2.5, 25, 250, and 1000 μg/kg body weight/d. Fetal exposure to BPA, from gestational d 9 to postnatal d 1, resulted in the development of carcinomas *in situ* in the mammary glands of 33% of the rats exposed to 250 μg/kg body weight/d, whereas none of the unexposed animals developed neoplasias (148). These cancers were only observed after the animals had reached young adult age. Fetal exposure to BPA significantly increased the number of precancerous lesions (intraductal proliferation) by three to four times, an effect also observed in puberty and during adult life. The lesions observed in the BPA-exposed animals were highly proliferative and contained abundant ER-positive cells, suggesting that the proliferative activity in these lesions may be estrogen mediated. Comparable preneoplastic lesions were found in a study using a different rat strain (149). Additionally, this study found stromal alterations such as desmoplasia and mast cell invasion; these features are often observed during neoplastic development. Moreover,

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when challenged with a subcarcinogenic dose of nitrosomethylurea, only the BPA-exposed animals developed palpable tumors (carcinomas). The period of vulnerability of the mammary gland to BPA does not cease at the neonatal stage. BPA exposure during lactation followed to exposure to the carcinogen DMBA resulted in mammary tumor multiplicity and reduced tumor latency compared with control animals (exposed solely to DMBA) (150). These results indicate that perinatal exposure to environmentally relevant doses of BPA results in persistent alterations in mammary gland morphogenesis, development of precancerous lesions, and carcinoma *in situ*. Moreover, the altered growth parameters noted in the developing mammary gland on embryonic d 18 suggest that the fetal gland is a direct target of BPA, and that these alterations cause the mammary gland phenotypes observed in perinatally exposed mice at puberty and adulthood.

In summary, exposure to estrogens throughout a woman's life, including the period of intrauterine development, is a risk factor for the development of breast cancer. The increased incidence of breast cancer noted during the last 50 yr may have been caused, in part, by exposure of women to estrogen-mimicking chemicals that have been released into the environment from industrial and commercial sources. Epidemiological studies suggest that exposure to xenoestrogens such as DES during fetal development, to DDT around puberty, and to a mixture of xenoestrogens around menopause increases this risk. Animal studies show that exposure *in utero* to the xenoestrogen BPA increases this risk. Moreover, these animal studies suggest that estrogens act as morphogens and that excessive perinatal exposure results in structural and functional alterations that are further exacerbated by exposure to ovarian steroids at puberty and beyond. These altered structures include preneoplastic lesions, such as intraductal hyperplasias, and carcinomas *in situ*. Additionally, these mammary glands are more vulnerable than their normal counterparts to carcinogenic stimuli. Exposures to other endocrine disruptors that are not estrogenic, such as dioxins, were reported to increase breast cancer incidence in humans and to alter mammary gland development in animal models. Collectively, these data support the notion that endocrine disruptors alter mammary gland morphogenesis and that the resulting dysgenic gland becomes more prone to neoplastic development.

V. Male Reproductive and Developmental Health: The Human Evidence

A. Introduction to male reproductive health

The mechanisms through which environmental chemicals alter the endocrine system are elucidated through experimental animal studies and *in vitro* systems. In epidemiological studies it is generally not possible to explore potential mechanisms. Nevertheless, epidemiological studies are essential to our understanding of the potential risks, or lack thereof, of EDCs on human reproductive function and development.

Human evidence of altered male reproductive and developmental health in relation to EDCs is limited (Table 2). As has been shown in the recent Third National Report by the Center for Disease Control (151), humans are exposed, at a minimum, to hundreds of environmental chemicals, of which dozens are known EDCs. A major limitation of epidemiological studies is that they generally only measure human exposure to a single EDC, or at best to a set of isomers or congeners within a family of EDCs. A fuller understanding of potential human health risks requires studying the complex mixtures to which we are exposed. This limitation, already raised in other sections, should be kept at the forefront as the current epidemiological evidence on health risks from EDCs is presented.

For the purposes of this report, the male reproductive health endpoints under consideration include, among others: 1) disrupted reproductive function, manifest as reduced semen quality and infertility; 2) altered fetal development, manifest as urogenital tract abnormalities, including hypospadias and cryptorchidism; and 3) testicular germ cell cancer (TGCC).

B. Male reproductive function and development

1. TDS: A unifying hypothesis

Skakkebaek *et al.* (21) hypothesized that diminished semen quality, TGCC, and male urogenital tract anomalies may share a common causal pathway. They defined this triad as the TDS. The hypothesis invokes a common pathway by which EDCs, and other environmental chemicals and genetic factors, may lead to abnormal development of the fetal testis, producing testicular dysgenesis that can manifest as an increased risk of urogenital abnormalities in newborn males, as well as altered semen quality and TGCC in young men. As a cautionary note, the manifestations (or symptoms) of TDS have other causes apart from testicular dysgenesis.

It is hypothesized that TDS is due to prenatal Leydig and Sertoli cell dysfunction with secondary androgen insufficiency and impaired germ cell development. This should not be confused with the clinical diagnosis of dysgenetic testes, which is associated with genital ambiguity and a high risk of testicular malignancy (152). The existence of TDS as a distinct clinical entity and of possible associations with EDCs is an area of active research.

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C. Semen quality: Temporal trends and EDC exposure

The epidemiological evidence on temporal trends in semen quality remains inconsistent. Some studies suggest that human semen quality has declined during the previous 50 yr (153–155), whereas other studies have not reported a decline (156–158). Despite the potential importance and relevance of early life exposure to EDCs, the epidemiological evidence on the relationship between semen quality and exposure to EDCs is limited to the assessment of adult exposure to EDCs. In the cases of PCBs, pesticides (persistent and nonpersistent), and phthalates, limited epidemiological evidence supports a relationship between adult exposure and reduced semen quality. However, most studies are cross-sectional in design; thus exposure and semen parameters were assessed at the same point in time. Although there are few studies in humans on the effects of developmental exposures to chemicals and semen quality in adulthood, this has been shown in animal models. Anway and Skinner (12) showed direct as well as transgenerational effects of EDCs on semen quality after intrauterine exposure.

1. Phthalates and semen quality

The diesters of 1,2-benzenedicarboxylic acid (phthalic acid), commonly known as phthalates, are a group of manmade chemicals widely used in industrial applications. They are primarily used as plasticizers in the manufacture of flexible vinyl plastic which, in turn, is used in consumer products, flooring, and wall coverings, food contact applications, and medical devices (159–161). They are also used in personal-care products (*e.g.*, perfumes, lotions, cosmetics), as solvents and plasticizers for cellulose acetate, and in making lacquers, varnishes, and coatings, including those used to provide timed releases in some pharmaceuticals (159, 162, 163).

Human exposure to phthalates is widespread and occurs through ingestion, inhalation, and dermal contact (160–165). Parenteral exposure from medical devices and products containing phthalates are important sources of high exposure to phthalates, primarily di-(2-ethylhexyl) phthalate (DEHP) (161, 166). Phthalates have biological half-lives measured in hours, are rapidly metabolized, and are excreted in urine and feces (160–163). The most common biomonitoring approach for investigating human exposure to phthalates is the measurement of urinary concentrations of phthalate metabolites.

There are few epidemiological studies on phthalates and semen quality. A large study on male partners of subfertile couples from an infertility clinic in Massachusetts (167, 168) found associations between monobutyl phthalate (MBP; the hydrolytic metabolite of dibutyl phthalate) and below World Health Organization (WHO) reference value sperm motility and sperm concentration. There was also a dose-response relationship between monobenzyl phthalate (MBzP, the primary hydrolytic metabolite of butylbenzylphthalate) and below WHO reference value sperm concentration. In contrast to the U.S. study, in a Swedish study there were no relationships of MBP or MBzP with any of the semen parameters (169). Potential reasons explaining why the two studies found differing results include differences in age and fertility of the study populations. The Swedish study population consisted of young men (median age, 18 yr; range, 18–21 yr) from the general population, whereas in the U.S. study the median age of the men from an infertility clinic was 35.5 yr and ranged from 22 to 54 yr. None of the men from the infertility clinic were 21 yr of age or younger. Men presenting to an infertility clinic may be more "susceptible" to reproductive toxicants, including phthalates, than men from the general population. Furthermore, it is also unclear whether middle-aged men, compared with young men, are more susceptible to reproductive toxicants because of an age-related response to the toxicant.

2. PCBs and semen quality

PCBs are a class of synthetic, persistent, lipophilic, halogenated aromatic compounds that were widely used in industrial and consumer products for decades before their production was banned in the late 1970s. PCBs were used in cutting oils, lubricants, and as electrical insulators. As a result of their extensive use and persistence, PCBs remain ubiquitous environmental contaminants. They are biologically concentrated and stored in human adipose tissue. The general population is exposed primarily through ingestion of contaminated foods (*e.g.*, fish, meat, and dairy products), because PCBs can bioaccumulate up the food chain. As a result of their persistence and ubiquity, measurable levels of serum PCBs are found in the majority of the U.S. general population (170). Serum levels of PCBs are an integrated measure of internal dose, reflecting exposure from all sources over the previous years; depending on the congener, the half-life of PCBs in the blood ranges from 1 to 10 or more years (171, 172). Notably, there are 209 different possible chlorine substitutions on the biphenyl backbone of PCBs, with the resulting PCB molecules having different structural, functional, and toxicological properties (173, 174).

The epidemiological evidence on the relationship between PCBs and semen quality support an inverse association of PCBs with reduced semen quality, specifically reduced sperm motility. Such relationships have been consistently reported across studies performed in different countries (India, The Netherlands, Taiwan, Sweden, and the United States). The associations were found across a range of PCB levels, suggesting that there was not a threshold. The PCB levels in these studies ranged from low back-

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ground levels (175–177), to high background levels due to consumption of contaminated fish (178), to even higher exposure levels due to ingestion of contaminated rice oil (179, 180).

3. Dioxins and semen quality

A recently published study of dioxin exposure and semen quality suggested that timing of exposure may have an impact upon the response (181). A chemical plant explosion in 1976 in Seveso, Italy, led to environmental contamination with high levels of TCDD. Exposed men in three age groups (1–9, 10–17, and 18–26 yr of age in 1976) were studied in 1998. Interestingly, the men exposed prepubertally (1 to 9 yr) had an inverse association between serum TCDD concentrations and semen quality, specifically sperm count and motility, whereas the men exposed at ages 10–17 yr had a positive association with semen quality, referred to as stimulatory by the authors. The men exposed at 18–26 yr of age had no associations of TCDD with semen quality. Men exposed at both 1–9 and 10–17 yr of age had lower estradiol and higher FSH concentrations compared with unexposed men. These results suggest that the timing of exposure, *i.e.*, life stage, may have importance in determining the impact of environmental exposures.

4. Nonpersistent pesticides and semen quality

Nonpersistent pesticides (also referred to as "contemporary-use pesticides") are chemical mixtures that are currently available for application to control insects (insecticides), weeds (herbicides), fungi (fungicides) or other pests (*e.g.*, rodenticides), as opposed to pesticides that have been banned from use in most countries (*e.g.*, many of the formerly popular organochlorine pesticides such as DDT). Three common classes of nonpersistent pesticides in use today include organophosphates, carbamates, and pyrethroids. Although environmentally nonpersistent, the extensive use of pest control in these various settings results in a majority of the general population being exposed to some of the more widely used pesticides at low levels. Exposure among the general population occurs primarily through the ingestion of foods that contain low levels of pesticide residue or through inhalation and/or dermal exposure in or around the home and in other indoor environments.

Several epidemiological studies suggest an association between nonpersistent pesticide exposure and altered semen quality. Most of the data are from occupational studies involving simultaneous exposure to several pesticides (182–191). Two recent studies found associations between pesticide exposures representative of the general population and reduced semen quality (192, 193).

In a small study on male partners of pregnant women, Swan *et al.* (192) compared urinary concentrations of pesticide biomarkers in 34 men with sperm concentration, motility, and morphology below the median (defined as cases) to 52 men with above-median semen parameters (defined as controls). They found elevated odds ratios for poorer semen quality in relation to urinary concentrations of alachlor mercapturate, 2-isopropoxy-4-methyl-pyrimidinol (diazinon metabolite), atrazine mercapturate, 1-naphthol (carbaryl and naphthalene metabolite), and 3,5,6-trichloro-2-pyridinol (chlorpyrifos metabolite).

In a study among 272 men from an infertility clinic, Meeker *et al.* (193) found inverse associations between urinary levels of 1-naphthol, a metabolite of both carbaryl and naphthalene, with sperm concentration and motility. They also found a suggestive inverse relationship between the urinary metabolite of chlorpyrifos (3,5,6-trichloro-2-pyridinol) and sperm motility.

In summary, in addition to evidence from occupational studies, there are limited human studies suggesting reduced semen quality in relation to nonoccupational exposure to nonpersistent pesticides, specifically some herbicides and insecticides.

D. Male urogenital tract malformations

Epidemiological studies provide inconclusive evidence on temporal trends in cryptorchidism and hypospadias. Studies show that the prevalence of cryptorchidism is variable and geographically specific (194), with temporal upward trends noted in some studies but not others (15, 195, 196). The prevalence data for cryptorchidism are difficult to interpret because of the limitations of registry-based data and how they are obtained, changes in clinical practice that emphasize earlier diagnosis and treatment, confounding factors such as birth weight and prematurity, and inaccurate diagnosis related to changes in testicular position (spontaneous descent or secondary "ascent") over time (197). Similarly, data for hypospadias prevalence are difficult to interpret. Although prevalence temporally increased in some locations, other reports showed no trends over time (195, 198–200). Ascertainment bias may also easily exist for this anomaly, particularly for milder forms, because both false-negative and false-positive diagnoses may be made in newborns based on circumcision status.

Epidemiological evidence for EDC exposure and cryptorchidism or hypospadias is limited. Maternal serum concentrations of PCBs, DDT, or DDE (primary metabolite of DDT) were weakly associated or not associated with cryptorchidism or hypospadias in offspring (201–204).

The relationship of parental or general community pesticide exposure with hypospadias or cryptorchidism is suggestive (205–210), but there is the need for further

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research that explores maternal and/or paternal exposure to specific pesticides with urogenital anomalies.

In one of the only human studies on phthalates and male genital development, Swan *et al.* (23) determined "anogenital index" (anogenital distance/body weight) and testicular position in young boys (mean age, 16 months) and corresponding maternal levels of urinary phthalate metabolites at three separate clinical sites. In this study, the authors found significant inverse relationships between the highest maternal levels of MBP, MBzP, monoethyl phthalate, and monoisobutyl phthalate and anogenital index (odds ratio for MBP, 10.2; 95% confidence interval, 2.5–42.2), although MEP has not been linked to reproductive anomalies in rodent studies based on oral administration rather than transdermal, which is the route for human exposure via its use in personal-care products (197). The implication of a reduced anogenital index in rats is well defined, but the clinical implications of reduced anogenital index in human male infants is unknown.

In summary, the strongest epidemiological data that link EDC exposure to cryptorchidism and/or hypospadias are those suggesting an association between residency in agricultural areas and/or measures of direct parental exposure to nonorganochlorine pesticides, without providing insight into specific potentially causative agents. However, these data are not necessarily consistent for both anomalies or congruent with observations made in animal experiments. Further studies will be needed to provide a clearer understanding of the role(s) of specific EDCs in the etiology of genital anomalies in man.

E. Testicular germ cell cancer

Epidemiological studies show both geographical variability and dramatic recent upward trends in the incidence rate of TGCC (212–216). The steep temporal rise over a relatively short period of several decades suggests that genetic factors alone cannot explain it. Therefore, environmental and lifestyle factors have been hypothesized to play a role. Evidence for environmental and lifestyle factors is supported by migration studies in which the first generation of immigrants have incidence rates similar to their country of origin (birth), but their offspring had rates similar to men in the country in which they were born and raised (217).

The earliest suggestion of epidemiological evidence related to prenatal estrogen exposure and increased risk of TGCC came from a study in 1979 (218). However, other studies have not consistently confirmed these earlier results (219). At present, the evidence on EDCs and risk of TGCC is very limited. Interestingly, in a novel case-control study on EDCs and TGCC, Hardell *et al.* (220, 221) did not find associations between serum concentrations of organochlorines among cases and controls and risk of TGCC, but instead found that blood organochlorine levels measured in their mothers, decades after their sons' birth, were predictive of increased risk. The organochlorines measured included PCBs, p,p′-DDE (primary long-lived metabolites of DDT), and hexachlorobenzene, a fungicide. The study was small (44 case mothers and 45 control mothers), and the median time from the fetal period until blood sampling for the cases and controls was approximately 30 yr. It is important to keep in mind that despite the long period between the etiological relevant exposure window and measurement of organochlorines, their long half-lives, on the order of years to a decade, makes it possible to estimate historic exposure using the mothers' blood samples. Therefore, the limited studies suggest that *in utero* exposure to environment EDCs represents the relevant etiological window of exposure. If this is borne out to be true, it will mean that epidemiologists need to consider innovative study designs to better assess prenatal exposure windows for endpoints that may not manifest for decades. Prospective pregnancy cohort follow-up studies for TGCC would be difficult and costly to implement because TGCC is a rare cancer and prospective study would require unrealistically large cohorts.

F. Conclusions

This section has tried to provide highlights and insights into the current state of the epidemiological evidence on the relationship between EDCs and male reproductive and developmental health. The overview was not meant to be an exhaustive review of the evidence, but rather a synthesis of the current knowledge in an ever-changing field of inquiry and discovery. Although there is current scientific, public, and governmental interest in the potential health risks of exposure to EDCs, the human evidence on associations of EDCs with altered male reproductive health endpoints remains limited and, in certain instances, inconsistent across studies. This highlights the need for further epidemiological research on these classes of EDCs.

VI. Prostate Cancer

A. Introduction to prostate cancer

Prostate cancer is the most common solid cancer in males and the second leading cause of cancer deaths in American men (222). In addition, benign prostatic hyperplasia is the most common benign neoplasm, occurring in approximately 50% of all men by the age of 60. The basis for these high rates of abnormal prostatic growth is not well understood despite decades of extensive research on the topic. Nonetheless, it is accepted that steroids play a fundamental role in the initiation and progression of prostate cancer, which forms the basis for hormonal treatment strategies. Men who have undergone early castration do

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not develop prostatic carcinoma (223). Charles Huggins received the Nobel Prize for his work revealing that regression of prostate cancer can be initially achieved by castration and androgen blockade (224). In addition to androgens, it has been proposed that estrogens are involved in the etiology of benign prostatic hyperplasia and prostatic cancer (225–227), and the use of antiestrogens has been recently recognized to have a therapeutic role in prostate cancer management (228, 229). The prostate gland contains both ERα and ERβ during development and into adulthood, with ERα primarily found in stromal cells and ERβ in differentiated epithelium (230). It is also believed that prostatic developmental events under the regulation by steroids early in life may be linked to the predisposition of this structure to high rates of disease in adult men (231, 232). Moreover, the prostate gland is particularly sensitive to estrogen exposures during the critical developmental period relative to adult estrogenic responses (233).

The established risk factors for prostate cancer are age and race. African-American men have the highest incidence of prostate cancer worldwide, at rates 2-fold those for Caucasian-American counterparts. Family history (genetics), diet, and environmental factors are also recognized to impact prostate cancer risk. However, in the human population, direct connections between EDCs and prostate cancer risk have not been established. Due to the hormonal basis of this disease and the evidence that dietary compounds high in phytoestrogens (*e.g.*, genistein) can control prostate cancer growth in humans, there is reasonable cause to evaluate and understand any potential relationship between environmental EDCs and prostate cancer risk. Because there are difficulties in directly associating prostate cancer risk in humans with EDC exposures, potential risk(s) will have to be ascertained from research with animal models, particularly those that are responsive to environmentally relevant exposures. The sections below summarize the evidence obtained from epidemiological studies, *in vitro* studies with human prostate cells, and *in vivo* studies in animal models that indicate associations between EDCs and prostate cancer, carcinogenesis, and/or susceptibility (Fig. 1).

B. Evidence and mechanisms for EDC effects on the prostate

1. Farming and pesticides

The most compelling data for a link between prostate cancer and environmental factors outside of diet in humans comes from the established occupational hazard of farming and increased prostate cancer rates (234–236). Although several variables may contribute to this association, chronic or intermittent exposures to pesticides are the most likely explanation (236, 237). A large epidemiology study (Agricultural Health Study) conducted collaboratively between the National Cancer Institute, the National Institute of Environmental Health Sciences, and the EPA examined agricultural lifestyles and health in approximately 90,000 participants in North Carolina and Iowa since 1993 (www.aghealth.org). Evaluation of more than 55,000 pesticide applicators revealed a direct link between increased prostate cancer rates and exposure to methyl bromide, a fungicide with unknown mechanism of action (236). In addition, six pesticides (of 45 common agricultural pesticides) showed significant correlation with exposure and increased prostate cancer rates in men with a familial history of the disease, suggesting gene-environment interactions. These six agents were chlorpyrifos, fonofos, coumaphos, phorate, permethrin, and butylate (236, 238). The first four compounds are thiophosphates that share a common chemical structure. These agents are acetylcholine esterase inhibitors and have not been shown to have direct estrogenic or antiandrogenic activities. However, a literature search found that these compounds have marked capacity to inhibit p450 enzymes. Chlorpyrifos, fonofos, and phorate strongly inhibit CYP1A2 and CYP3A4, which are the major p450s that metabolize estradiol, estrone, and testosterone in the liver (239, 240). Thus it is possible that exposure to these compounds can interfere with metabolism of steroid hormones and, in so doing, disturb the normal hormonal balance that might contribute to increased prostate cancer risk. A similar mechanism of endocrine disruption *in vivo* has been identified for PCBs and polyhalogenated aromatic hydrocarbons (including dioxins, BPA, and dibenzofurans) through marked inhibition of estrogen sulfotransferase, which in turn elevates bioavailable estrogens in target organs (45, 241).

2. Environmental estrogens

In men, chronically elevated estrogens have been associated with increased risk of prostate cancer (227). In rodents, natural estrogens combined with androgens induce prostate cancer (225, 242). For simplicity, we herein refer to environmental estrogens as molecules with identified estrogenic activity (estrogen mimics), primarily through ER activation.

a. DES. *In utero* DES exposure is an important model of endocrine disruption and provides proof-of-principle for exogenous estrogenic agents altering the function and pathology of various end-organs. Maternal usage of DES during pregnancy resulted in more extensive prostatic squamous metaplasia in human male offspring than observed with maternal estradiol alone (243). Although this prostatic metaplasia eventually resolved during postnatal life, ectasia and persistent distortion of ductal ar-

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chitecture remained (244). These findings have led to the postulation that men exposed *in utero* to DES may be at increased risk for prostatic disease later in life (245), although the limited population studies conducted to date have not identified an association (245). Nonetheless, several studies with DES in mouse and rat models have demonstrated significant abnormalities in the adult prostate, including increased susceptibility to adult-onset carcinogenesis after early DES exposures (246–249). It is important to note that developmental exposure to DES, as with other environmental estrogens, has been shown to exhibit a biphasic dose-response curve with regard to several end-organ responses, and this has been shown to be true for prostatic responses as well (250). Low-dose fetal exposure to DES or BPA (see below) resulted in larger prostate size in adulthood compared with controls, an effect associated with increased levels of prostatic ARs. This contrasts with smaller prostate sizes, dysplasia, and aging-associated increases in carcinogenesis found after perinatal high-dose DES exposures as noted above. This differential prostatic response to low *vs.* high doses of DES and other EDCs must be kept in mind when evaluating human exposures to EDCs because the lack of a response at high doses may not translate into a lack of negative effects at low, environmentally relevant doses of EDCs.

b. BPA. BPA is a synthetic monomer used in the production of polycarbonate plastics and epoxy resins and is one of the highest production synthetic compounds worldwide. Importantly, conjugated BPA was detected in the urine of 93% of the U.S. population in a recent screen conducted by the Center for Disease Control. Although the relative binding affinity of BPA for ERα and ERβ and its capacity to activate ER-dependent transcription is approximately 1,000 to 10,000 lower than estradiol or DES (1, 251), BPA was capable of activating an estrogen-responsive luciferase reporter at levels that were 50% of 17β-estradiol activation (252). Thus, whereas BPA may have a significantly lower potency than endogenous estrogens *in vitro*, it is a full agonist for both ERα and ERβ. Furthermore, BPA induces ER through nongenomic pathways with an EC_{50} equivalent to 17β-estradiol, suggesting that *in vivo* estrogenic activity of BPA may be due to nongenomic activation of ER (253, 254).

The carcinogenic potential of BPA was recently evaluated by an expert panel convened by the EPA and the National Institute of Environmental Health Sciences, and the written report, which includes prostate cancer findings, has been published (255). In summary, there is evidence using *in vitro* prostate cell cultures and rodent models showing that BPA can modulate prostate cell proliferation and increase susceptibility of the prostate gland to hormonal carcinogenesis. Using transcriptional assays, BPA (1 nM) was found to activate a mutated AR (AR-T877A) that is frequently found in advanced prostate cancers of patients who relapsed after androgen deprivation therapy (256). Furthermore, BPA exposure led to unscheduled cell cycle progression and cellular proliferation in the absence of androgen in LNCaP cells that expressed this mutant AR. Because BPA had no impact on wild-type AR, these findings demonstrate that the common gain-of-function AR mutant had attained the ability to utilize BPA as an agonist. Importantly, the BPA effects were greatest at lower doses of BPA compared with high-dose exposures. *In vivo* analyses of the impact of BPA on human prostate tumor growth and recurrence was performed utilizing a xenograft model (257). At low doses equivalent to human exposures, prostate tumor size increased after BPA exposure when compared with placebo control mice. Additionally, mice in the BPA cohort demonstrated an earlier rise in prostate-specific antigen (biochemical failure), which indicates that BPA significantly shortened the time to therapeutic relapse. These outcomes underscore the need for further study of the effects of BPA on tumor progression and therapeutic efficacy.

Recent studies using a rat model have shown that early-life exposure to environmentally relevant levels of BPA can increase susceptibility to prostate carcinogenesis, possibly by developmentally reprogramming carcinogenic risk (122, 258). Rats were exposed to low doses of BPA (10 μg/kg body weight) during the early postnatal period when the prostate undergoes morphogenesis. In adulthood, estradiol levels were elevated 3-fold through the use of implants for 16 wk. Rats exposed neonatally showed a significant increase in the incidence (100 *vs.* 40%) and grade of prostatic intraepithelial neoplasia lesions compared with rats neonatally exposed to oil alone. These lesions in BPA-exposed rats exhibited high levels of proliferation and apoptosis suggestive of perturbed homeostasis leading to pathological lesions. Furthermore, prostates from BPA-exposed animals were shown to have permanent epigenetic changes with altered DNA methylation patterns in multiple genes that resulted in altered gene transcription. Together, these findings indicate that BPA may "imprint" the prostate through epigenetic modifications, resulting in predisposition to carcinogenesis.

c. PCBs. PCBs are persistent organic pollutants that are fat-soluble and bioaccumulate in human body fat deposits. Many PCBs have estrogenic or antiandrogenic activity and as such, may perturb the prostate gland. A recent analysis in Swedish men with and without prostate cancer of adipose tissue PCB concentrations revealed a significant association between PCB levels in the higher quadrants and prostate cancer odds ratio, with the most marked associations for PCB 153 and transchlordane (259). An extensive epidemiological study of capacitor manufacturing plant workers exposed to high levels of PCBs revealed a

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strong exposure-response relationship for prostate cancer mortality (260). These results support previous findings of correlations between PCB 153 and 180 and prostate cancer risk in electric utility workers (261, 262). Although estrogenic activity of these compounds is a suspected mode of action, there is also evidence that PCBs inhibit estrogen sulfotransferase activity in the liver and effectively increase bioavailable estrogen in the body (45). Further investigation using animal models is warranted for PCBs and prostate cancer risk.

d. UV filters. Recent reports have shown that UV light filters used to protect against the sun have estrogenic activity (263). In particular, 4-methylbenzylidene camphor and 3-benzidene camphor are ERβ ligands (264). Although there are no studies on these UV filters and human prostate cancer, two reports indicate that early life exposure to these compounds can alter prostate gland development, growth, and gene expression in the rat prostate (263, 265). Thus, it is possible that the fetal prostate in humans may be affected after maternal use of these compounds, although this remains to be examined.

e. Cadmium. Cadmium has been shown to act as a ligand for the ER and function as an estrogenic mimic. Although some large epidemiological studies indicated a relationship between cadmium exposure and rates of prostate cancer, these findings have been challenged in other reports (266). Cadmium has been shown to have proliferative action on human prostate cells *in vitro* through an ER-dependent mechanism, and this exposure was associated with progression to androgen independence (267). In addition, prostatic tumors have been experimentally induced by oral exposure to cadmium (268). Because cadmium bioaccumulates in the body, further epidemiological analysis of cadmium and prostate cancer risk is warranted, particularly in men with occupational exposures.

f. Arsenic. Exposure to arsenic has long been associated with a number of diseases, including cancers (269). More recently, it has been documented that arsenic may mediate some of these effects through endocrine disruption, specifically through interaction with ERs and activation of estrogen-regulated genes (270). A recent report has found that arsenic induced malignant transformation of prostate epithelial cells *in vitro*, driving them toward an androgen-independent state (271). Progression to androgen-independent growth was shown to be mediated through Ras-MAPK pathways, and thus, it is possible that membrane ERs may mediate this effect. Epidemiological studies have shown an association between arsenic exposure and prostate cancer mortality in Taiwan (272), a finding that was substantiated in a more recent study in the United States (273). Thus it remains a possibility that endocrine disruption by arsenic can contribute to prostate cancer risk, and further research on this topic is essential.

3. Antiandrogens

Endocrine disruption that might affect the prostate gland can also be derived through antiandrogenic pathways. Because prostate cancer is an androgen-dependent disease, a brief review of known effects of some of these agents on the prostate gland is presented.

a. Vinclozolin. Vinclozolin is a fungicide that is used as a pesticide on crops. It possesses known antiandrogenic properties through interference with AR activity (274). Rats exposed to vinclozolin during early development were reported to have reduced prostate gland growth and size (275). Recently, maternal exposure to vinclozolin was shown to produce transgenerational effects with adverse consequences on the prostate gland, including atrophy and prostatitis for four generations (34, 276). However, because vinclozolin functions through AR antagonism, it is unexpected that vinclozolin will lead to prostate cancer.

b. DDT/DDE. DDT and its metabolic derivative p,p′-DDE were widely used as pesticides in the United States, and their use is still in effect in other countries. Although many reproductive abnormalities have been found with DDT/DDE, there is no known association between its exposure and prostate cancer risk (277). Again, due to its antiandrogenic actions, it is not expected to drive prostate cancer. A number of key questions remain unresolved but merit future investigation, not just in prostate cancer but in other fields (Boxes 1 and 2). Spanning from the molecular to the clinical, they highlight the need for a better understanding of the pathogenesis of prostate cancer and the potential role of EDCs in this process.

BOX 1. Recommendations for research on prostate cancer

- It remains unclear whether EDC exposures directly induce or promote prostate cancer. If either occurs, it will be necessary to determine the mode of action.
- It will be important to determine whether estrogenic or antiandrogenic EDCs modulate disease risk or progression in the adult male. One possibility may be that EDC exposure may influence prostate cancer susceptibility in subpopulations of men. If so, it would be important to determine the other risk factors that EDCs might synergize with to influence prostate cancer incidence and/or progression.
- It is unknown whether there is an additive or synergistic effect from EDC mixtures and prostate cancer risk or growth.
- It is necessary to determine whether the *in utero* developing human prostate is sensitive to EDCs and whether this may influence the prostate cancer risk in the aging male.
- Epidemiology studies need to be undertaken to evaluate the long-term outcome for prostate cancer incidence, grade, stage, and progression in DES-exposed sons.
- The most appropriate life stages for examining EDC and prostate cancer risk need to be assessed.
- An unexplored and important issue is whether there may be a transgenerational risk for prostate cancer as a function of EDC exposures.
- Are there epigenetic pathways that mediate developmental exposures to EDCs and prostate disease with aging?
- It will be important to establish molecular markers for EDC exposures as they relate to prostate disease risk.

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BOX 2. Recommendations for research and practice regarding EDCs

- Clinical research
  - In newborns with IUGR and/or anomalies of sexual differentiation including cryptorchidism and hypospadias, screen for EDCs in maternal serum and in breast milk, and archive biological samples for further screening.
  - Prioritize a search for early (*i.e.*, neonatal period and infancy) biomarkers of EDC effects and early indicators of exposure to EDCs during fetal life.
  - Identify groups at high or low risk of exposure to EDCs for prospective studies correlating indicators of early exposure with subsequent clinical characteristics throughout infancy, childhood, and adolescence.
  - Search for and study polymorphisms in enzymes (*e.g.*, CYP enzymes) that predispose groups/individuals to greater/lesser vulnerability to EDCs.
  - Develop intervention strategies to decrease or reverse the influence of EDCs on prostate health.
  - Identify the chemical or chemicals in pesticides that negatively impact risk for prostate cancer, breast cancer, endometriosis, and others in humans.
  - Develop markers for total xenoestrogens or antiandrogen exposure in humans.
- Basic science
  - Molecular studies *in vitro* and with *in vivo* animal models are needed to identify pathways for EDC influence on endocrine tissues.
  - The mechanisms by which EDCs affect neuroendocrine systems need to be ascertained. In addition, studies on EDCs on several of these systems are very underrepresented, and these fields need to be expanded.
  - Roles of steroid and nonsteroid pathways need to be better differentiated and ascertained.
  - More information on low-dose effects of EDCs and their mechanisms is needed.
  - The transgenerational, epigenetic effects of EDCs need to be much more broadly studied across different endocrine and reproductive systems.
  - The interaction of EDCs with central nervous system developmental processes dependent on thyroid hormones (*e.g.*, cochlear development) or sex steroids (*e.g.*, hippocampal development) warrant early *in vitro* and *in vivo* studies.
  - The effects in animal stem cells or progenitor cells in different tissues could decipher EDC-sensitive genes possibly used as reporters in early biomarking.
  - Basic science research on effects of EDCs on diabetes and glucose intolerance is merited.
  - There is a gap in knowledge about the mechanisms by which EDCs act as "obesogens," particularly in how these processes develop.
- Epidemiology
  - Large prospective epidemiological studies need to be undertaken to examine the relationships between EDC exposures, particularly agents with estrogenic and antiandrogenic activity, and relevant endpoints as identified in this report. The National Children's Study will be especially critical to this undertaking.
  - Identify populations or subgroups with high exposures to EDCs and conduct exposure-response studies among these populations.
  - Perform epidemiological studies that incorporate measurement of exposure to multiple EDCs, allowing for the study of human health effects from chemical mixtures.
  - Develop and incorporate validated biomarkers of EDC exposures and relevant outcomes into new and ongoing epidemiological studies.
  - Observations from occupational and environmental exposures in humans and their corresponding disease states should inform what animal studies should be performed and which EDCs should be studied, and should be used to inform policy decisions regarding human exposures to EDCs.
- Clinical practice
  - Set up early detection programs for testis cancer in the follow-up management of infertile men with poor semen quality.
  - Take a careful history of onset of reproductive disorders along with an occupational and environmental exposure history.
  - Think "epidemiologically" about the patients: that is, consider possible exposure to EDCs in geographical or community subgroups showing unexpectedly high prevalence of any of the disorders possibly related to EDCs.
  - Clinicians can advise patients about exposures, minimizing risks, and abiding by the "precautionary principle" to preserve their reproductive health and that of generations thereafter.
  - Health care professionals need to be educated in sources and effects of environmental contaminant exposures *in utero* and across the life span.
  - Health care professionals need to have access to straightforward and accurate health information tools to share with patients.
  - Clinicians should be made aware of the potential risks posed by EDCs. This would, for instance, help them to seek evidence for exposure when treating patients presenting with early thelarche or puberty.

VII. Neuroendocrine Targets of EDCs

The central neuroendocrine systems of the body serve as an interface between the brain and the endocrine systems in the rest of the body. These neuroendocrine systems control diverse functions such as reproduction, stress, growth, lactation, metabolism and energy balance (including thyroid), osmoregulation, and other processes involved in homeostasis. Considering that these neuroendocrine systems mediate the ability of the organism to respond to its environment through rapid (neuronal) and more sustained (endocrine) responses, it is not surprising that they are targeted by environmental EDCs (reviewed in Refs. 7, 278, and 279). Furthermore, neuroendocrine cells in the brain have both neuronal and endocrine properties, which is important in the context of endocrine disruption because EDCs can have neurobiological and neurotoxic effects (279), along with the endocrine effects discussed in this Scientific Statement.

The physiological processes controlled by central neuroendocrine systems are highly complex, making an understanding of neuroendocrine disruption a particular challenge. Each of these neuroendocrine systems comprises several interdependent levels of organization: the brain (specifically the hypothalamus), the pituitary gland, and often a target organ. These levels of organization may each produce a unique hormone(s) or a complex protein (*e.g.*, breast milk), and each level also responds to the hormones produced by the other levels via feedback mechanisms (280). Here, we will discuss the evidence for central neuroendocrine systems as targets for

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EDCs (Fig. 1). The bulk of the literature to date has studied primarily the reproductive (HPG) system and secondarily the thyroid neuroendocrine system. The latter will be considered in detail in *Section VIII*, so the former (reproductive neuroendocrinology) will be the focus of the current discussion. Other neuroendocrine systems remain understudied and are only briefly mentioned. Nevertheless, they merit much more investigation in the future.

A. Endocrine disruption of reproductive neuroendocrine systems

1. GnRH neurons

Of the neuroendocrine systems, the reproductive HPG axis is best studied in the arena of endocrine disruption. The control of reproductive neuroendocrine function involves a group of neurons in the basal hypothalamus that synthesize and release the decapeptide GnRH (281). GnRH release drives reproduction throughout the life cycle, and this is the primary stimulus to the rest of the reproductive axis (the pituitary and gonads). GnRH release stimulates gonadotropin release from the anterior pituitary gland, which in turn activates steroidogenesis and gametogenesis in the ovary and testis. Steroid hormones produced by the gonad act on other target tissues that express estrogen, progestin, and/or ARs, a concept that is fundamental to endocrine disruption because so many EDCs act to interfere with steroid hormone actions. A second important concept is that sex steroids also control the hypothalamic GnRH neurons, but this involves indirect effects because GnRH neurons do not express most of the receptors for steroid hormones (282). This introduces the important point that other cells in the brain that express steroid hormone receptors and that regulate GnRH cells through afferent neural inputs are targets for EDCs. These points also relate to evidence that EDCs can act upon neurotransmitter systems that, at first glance, may not seem to have relevance to neuroendocrine control. For example, EDCs have been shown to cause neurotoxicity of noradrenergic, serotonergic, dopaminergic and other neurotransmitter-containing neurons (reviewed in Refs. 2 and 279). Considering that all of these neuronal types have been shown to express steroid hormone receptors and all of these cell types can project to and regulate GnRH neurons (281), this is a mechanism for convergence of effects of EDCs on the link between neural and endocrine systems.

One of the biggest challenges with the neuroendocrine system is gaining access to it. Hypothalamic neuroendocrine cells such as GnRH neurons are located in the hypothalamus at the base of the brain, making them difficult to access in animal models and impossible in humans. The hypothalamic-releasing hormones are not released in sufficiently high quantities to be detectable in peripheral circulation. Therefore, assays of hypothalamic function rely on hormone measurements of their corresponding pituitary hormones. If the pituitary sensitivity to hypothalamic output is compromised, then it is impossible to distinguish a primary hypothalamic or pituitary effect of an EDC. This has necessitated the use of animal models or *in vitro* assays to directly ascertain effects of EDCs on neuroendocrine peptide gene expression or release.

A reliable model for the GnRH system is the hypothalamic GT1 cell lines that have been used for nearly two decades as a proxy for the GnRH neuron *in vivo* (283). For example, PCBs (284) and organochlorine pesticides (methoxychlor, chlorpyrifos) (285) have been tested in this context. Application of these EDCs to GT1 cells caused significant changes in GnRH gene expression, GnRH peptide release, and the morphology of the GT1–7 cells. Interestingly, these substances often acted by nonlinear dose-response curves, with intermediate dosages exerting the greatest effects, typical of hormonally-active substances (286, 287). Moreover, unlike traditional toxicological studies, effects of these environmental contaminants were in many cases stimulatory to the GnRH response. When comparisons were made to estradiol, at least some of the effects of these EDCs mimicked effects of estrogens on GT1 cell morphology, proliferation, and gene expression. In addition, blockade of ERs with ICI 182,780 diminished some of the actions of EDCs. Together, these data suggest that EDCs may directly target GnRH cell lines. Nevertheless, caution must be taken in interpreting these data, because the GT1 cells express some molecules not detectable in the animal's GnRH cell, including some nuclear steroid hormone receptors. Other cell line models for neuroendocrine cells are available and may be useful in screening substances for neuroendocrine disrupting activities.

Studies using explanted hypothalamic dissections in a perifusion model from 15-d-old female rats tested effects of several EDCs on glutamate-evoked GnRH release, the latter model used as a reliable way of stimulating GnRH secretion (288). Of the EDCs tested, o,p′-DDT had the greatest stimulation of glutamate-evoked GnRH release, and BPA had a lesser effect. Not all EDCs were stimulatory; methoxychlor and p,p′-DDE had no effect in this *in vitro* model. Collectively, these data suggest EDC effects on GnRH release in a hypothalamic explant model (288). Finally, antagonists to the ER or AhR blocked effects of DDT, suggesting mediation of these endocrine-disrupting properties by these nuclear receptors and invoking a potential mechanism of action. In another study, this same group showed that DDT, but not DDE, decreased the interpulse interval of GnRH pulses (*i.e.*, increased pulse fre-

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quency), again consistent with stimulatory effects of these EDCs on GnRH release (27).

Mammalian *in vivo* studies also implicate GnRH neurons as targets for EDCs. O'Byrne's laboratory (289) has shown that coumestrol suppresses LH release (a proxy for GnRH) and the GnRH pulse generator. Bourguignon's laboratory (27) reported that DDT accelerated the timing of puberty in female rats and altered the LH response to GnRH, although surprisingly, this was decreased in the DDT animals. Not all aspects of GnRH function are affected by all EDCs: Patisaul *et al.* (290) showed that expression of the immediate early gene fos in GnRH neurons was not altered by neonatal genistein or BPA. By contrast, data from Gore's laboratory (291) suggest that EDCs can stimulate GnRH mRNA levels in laboratory rats. In the rabbit, prenatal vinclozolin (an endocrine-disrupting fungicide) decreased numbers of GnRH neurons in selected brain regions (292). Together, these results suggest actions of EDCs on GnRH neurons, although much more research is necessary to reconcile these data and better understand the mechanisms. These findings are not really surprising, considering that GnRH neurons act as the interface between endocrine and neural systems, but they are important because they show this level of regulation with the HPG axis.

Studies in fish also demonstrate effects of EDCs on the GnRH system. The strongest work has been published by the collaboration of Khan and Thomas (293). Using the Atlantic croaker as an experimental model, these labs showed that PCBs decreased preoptic-hypothalamic GnRH content, pituitary GnRH receptors, and the LH response to GnRH challenge (293). This effect was mimicked by an inhibitor of serotonin synthesis suggesting the possible mediation of effects of PCBs by the serotonergic pathway.

2. EDC effects on sexually dimorphic brain regions and behavior

The regions of the hypothalamus that control reproductive neuroendocrine systems undergo development during specific time periods, in large part due to exposures to endogenous steroid hormones such as estrogens and androgens. Although this is a simplification, it is speculated that the brains of male mammals become masculinized and defeminized due to actions of estradiol and testosterone produced by the developing (embryonic and early postnatal) testis. In female rodents, the best-studied model for endocrine disruption, the ovary is relatively quiescent during these developmental periods, and their brains are thought to be feminized and demasculinized due to the relative absence of exposure to these steroid hormones (reviewed in Ref. 294). However, it is important to note that the human ovary does produce estradiol (295), so there are species differences. Nevertheless, the developmental basis of adult disease applies to the development of the reproductive neuroendocrine system through actions during critical periods of sexual differentiation.

It should be apparent that exogenous hormones that may perturb steroidal actions through actions such as binding to steroid receptors, changing steroid metabolism, and others would have effects on the developing neuroendocrine system in a sexually dimorphic manner. There has been considerable and consistent research that shows that PCBs, phytoestrogens, fungicides, pesticides, and other xenobiotics can disrupt brain sexual differentiation (294). This type of disruption has a high likelihood of affecting both reproductive physiology and behavior later in life, and indeed, there is strong evidence in rodent models that reproductive success is diminished as a consequence (reviewed in Ref. 7). Early life exposure (late embryonic and/or early postnatal) to low doses of PCBs (296–298) or soy (299) significantly and adversely affected mating behaviors in female rats. Early postnatal treatment with coumestrol (a phytoestrogen) diminished masculine and feminine sexual behaviors (300, 301). These results are consistent with a functional outcome for effects of EDCs in the neuroendocrine hypothalamus.

A recently published collaborative study demonstrated significant effects of prenatal vinclozolin on mate preference behavior in F3 descendents. In brief, pregnant rats were treated with vinclozolin or vehicle. The F1 vinclozolin male offspring developed latent disease in adulthood, consistent with the developmental basis of adult disease (35). Moreover, this phenotype was passed on to subsequent generations (through F3) via paternal germline transmission, due to epigenetic modification of specific genes. We evaluated the attractiveness of the male F3 vinclozolin descendents in comparison to F3 vehicle descendants in a mate preference test in which females were given the opportunity to spend time with a descendent of both treatments. The results showed a profound difference, with females spending significantly more time with an F3-vehicle compared with an F3-vinclozolin descendant male (302). These results show differences in behavior, as well as evolutionary impact on mating success, caused by endocrine disruption. Notably, these F3 descendants had no personal body burden or exposure to vinclozolin, and it has been postulated that the basis of the discrimination in the mate choice test was due to a transgenerational, epigenetically transmitted trait (302).

B. Hypothalamic-pituitary-adrenal (HPA) effects of EDCs

As articulated by Harvey *et al.* (303), "The adrenal is arguably *the* neglected organ in endocrine toxicology, and the lack of recognition of the importance of adrenal function in a regulatory endocrine disruption context and the need for an adrenal toxicology assessment strategy has

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been pointed out." Numerous pharmaceuticals can affect the HPA axis, but this phenomenon has not, to our knowledge, been systematically studied for EDCs. Findings that the HPA axis is sensitive to HPG hormones suggest a potential mechanism by which EDCs may disrupt the HPA axis as well. Alternatively, EDCs may act directly upon the glucocorticoid or mineralocorticoid receptors or on steroidogenic pathways. EDCs including PCBs, dioxin, lindane, and others can affect synthesis of adrenal steroids, but specific effects on the neuroendocrine control of HPA function are lacking (303). This is an important area for future research.

C. Thyroid, metabolism, and growth

The hypothalamic-pituitary-thyroid (HPT) axis provides a critical test of the developmental basis of adult disease hypothesis because normal development and the acquisition of adult functions are dependent upon a euthyroid environment in the developing organism (304). Just a few examples are provided in this section because *Section VIII* provides a comprehensive review of endocrine disruption of thyroid systems. In rats, PCB congeners can affect the HPT axis at several levels, including a reduction in the T_4 or TSH response to TRH (305). Low-dose exposure of pregnant rats to polybrominated diphenyl ether (PBDE) on d 6 of gestation reduced T_4 levels in both dams and offspring (the latter measured on postnatal d 22), although it is unknown whether this is due to direct thyroid or neuroendocrine actions (306). Gray seals with higher blubber concentrations of industrial organochlorine compounds have lower total and free T_3 concentrations (307). Considerably more information on the subject of thyroid disruption is provided in *Section VIII*.

The control of metabolism and energy balance extends well beyond the HPT axis. In the context of endocrine disruption, there are reports on effects of fetal DES, the prototypical estrogenic endocrine disruptor, on obesity in adulthood and even on a successive generation of mice (308). Although the exact mechanisms for such effects are not understood, the fact that the hypothalamus contains a complex neural circuitry that regulates energy and metabolic homeostasis suggests the possibility for this being a neuroendocrine action. Further discussion of this topic is in *Sections VIII and IX* of this Scientific Statement.

To our knowledge, there is little published work on neuroendocrine disruption of somatic growth. Although studies in fish show reductions in the gonadosomatic index, animals exposed to refuse or water waste (309), the mechanism for these effects and the respective roles of the growth, as opposed to the reproductive, axes are not known.

D. Hormonal targets of neuroendocrine disruption

There are both hormonally dependent and independent pathways by which EDCs exert neuroendocrine actions. EDCs may act upon nuclear hormone receptors that are expressed in hypothalamic or pituitary cells, thereby exerting feedback effects. Steroid hormone receptors are expressed abundantly in hypothalamus and other brain areas that control neuroendocrine functions (310–312). Along with "classical" nuclear steroid hormone-mediated actions, EDCs may exert actions via membrane steroid receptors (313, 314) (reviewed in Ref. 315). These and other steroid-sensitive pathways are obvious targets by which EDCs act upon neuroendocrine systems.

The neuroendocrine actions of EDCs may occur via nonhormonally mediated mechanisms. Numerous neurotransmitter systems such as dopamine, norepinephrine, serotonin, glutamate, and others are sensitive to endocrine disruption (reviewed in Ref. 2). This point is important because it explains neurological effects of EDCs on cognition, learning, memory, and other nonreproductive behaviors, but it may also relate to reproductive neuroendocrine systems. As already mentioned, these neurotransmitters may coexpress steroid hormone receptors, so this steroid-sensitive circuitry may be an important target of EDC actions on neurotransmission.

Neuroendocrine systems are critically involved in the control of vertebrate homeostasis and physiology. Although we tend to think of them as independent systems, in fact there is considerable cross-talk among them. This is an important consideration in determining effects of EDCs; whereas no discernible effect may be determined in one system, it is important to evaluate the other systems for subtle but physiologically relevant effects. Therefore, there is a great need for additional interdisciplinary research on effects of EDCs in neuroendocrine systems. However, high-throughput assays for neuroendocrine effects of EDCs are difficult to develop due to the nature of these complex physiological systems. For example, it is impossible to test the "developmental basis of adult disease" hypothesis in a cell line. Animal studies are by nature labor intensive, particularly when they necessitate exposures during critical periods and when performed in species that give birth to litters as opposed to individuals, an intrauterine organization that is very different from the situation in humans. Thus, carefully designed neuroendocrine studies on EDCs in rodents need to take the litter composition and intra- and interlitter variability into consideration.

VIII. Thyroid Disruption

A. Introduction to thyroid systems

Thyroid hormone is essential for normal brain development, for the control of metabolism, and for many aspects of normal adult physiology. Therefore, changes in the function of the thyroid gland or interference with the

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ability of thyroid hormone to exert its action may produce effects on development, metabolism, or adult physiology. The goal of this section is to provide a brief overview of the literature regarding the mechanisms by which environmental chemicals may interfere with thyroid hormone action, which will require a brief background of thyroid endocrinology. In addition, we will describe some of the information in humans that indicate the extent to which environmental chemicals may be acting on thyroid hormone signaling in humans.

B. Environmental chemicals impacting thyroid function

A large number of industrial chemicals have been shown to reduce circulating levels of thyroid hormone. Brucker-Davis (316) and Howdeshell (317) have extensively reviewed this topic. Howdeshell categorized these chemicals (more than 150 in all) according to the mechanism by which the chemical was known to cause a reduction in serum thyroid hormone (see Table 1 in Ref. 317 for a full list). This point serves to illustrate clearly that there are many industrial chemicals that can interfere with thyroid function by acting on different points of regulation of thyroid hormone synthesis, release, transport through the blood, metabolism of thyroid hormone, and thyroid hormone clearance. In addition, many natural substances are known to affect thyroid function, including low iodine as well as goitrogens in various foods (318, 319). The current section on thyroid disruption will emphasize the mechanisms by which chemicals are known to interfere with thyroid hormone action and highlight some recent information on the effects of chemicals on thyroid hormone receptors.

The first step in thyroid hormone synthesis is the uptake of iodide into the thyrocyte by the sodium/iodide symporter (NIS) (320). Iodine is essential for thyroid hormone synthesis, and iodine deficiency is an important public health problem worldwide (321). Thus, chemicals that interfere with the NIS may interfere with thyroid hormone synthesis or may exacerbate problems of iodine deficiency. A good example of this is that of perchlorate. This chemical is used as an oxidant in solid rocket propellants, in ordnance, fireworks, airbag deployment systems, and others (322). Because of the environmental stability of perchlorate, it has become a widespread contaminant in drinking and irrigation waters and in food (323), such that perchlorate contamination is nearly ubiquitous in the U.S. population (324). Experimental studies in humans indicate that the serum half-life of perchlorate is about 8 h and that a dose of about 5.2 μg/kg·d is sufficient to begin to reduce iodide uptake into the thyroid gland (325). Thus, it was surprising that Blount *et al.* (326) found that urinary perchlorate levels were associated with serum TSH in the general population of women (not in men). It is perhaps not surprising that this association was greater in women with urinary iodine below 100 μg/liter and stronger still among these women who smoke (327) because cigarettes contain thiocyanates that also inhibit iodine uptake. Because infants are particularly vulnerable to thyroid hormone insufficiency (328) and because perchlorate levels are particularly high in breast milk (329), it is of concern that perchlorate may be affecting thyroid hormone signaling in early infant development in some proportion of the U.S. population (330). However, several studies have failed to identify such a relationship. For example, Amitai *et al.* (331) recently reported that newborn T_4 levels, taken as part of the newborn screening program, were not different on average in babies born in neighborhoods known to be highly contaminated with perchlorate in drinking water compared with babies born in neighborhoods with lower-level perchlorate contamination. These findings are more consistent with a number of studies employing newborn T_4 screening data and location of residence as a proxy measure of perchlorate contamination (for review, see Ref. 322).

There are a number of chemicals that can interfere with iodide uptake by the NIS (332), including chlorate, thiocyanate, and nitrates that are particularly prevalent. It is likely that the effect of one of these chemicals (*e.g.*, perchlorate) on iodide uptake will depend on the presence and concentration of the others and with iodine itself (333).

Iodide, the form of iodine that enters the cell, must be oxidized to a higher oxidation state before it is transferred to the precursor of thyroid hormone, thyroglobulin (334). Of the known biological oxidizing agents, only H_2O_2 and O_2 are capable of oxidizing iodide (335). Organification of iodine is controlled by the enzyme thyroperoxidase (TPO), a heme-containing enzyme. A number of compounds are known to block TPO. A prototypical one is 6-propyl-2-thiouracil (PTU), a methylmercaptoimidazole that has been intensively studied in animals and in humans and is used therapeutically to treat patients with Graves' disease (336). As a class (the 2-mercapto-4-hydroxy-6-propyl-pyrimidines), PTU is representative of compounds found in the environment that can affect thyroid function. PTU is well known to reduce circulating levels of T_4 and T_3 and to increase circulating levels of TSH (405) and has been extensively used in mechanistic research focused on identifying the role of thyroid hormone in brain development. The ability of PTU to reduce circulating thyroid hormone levels has been exploited in the treatment of hyperthyroidism in humans, including in pregnant and lactating women (337). PTU is generally believed to produce deleterious effects in animals by causing a dose-dependent reduction in circulating levels of thyroid hormone. This reduction is caused by the ability of PTU to inhibit directly the function of the TPO enzyme (338).

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Other TPO inhibitors include the isoflavones, especially those found in soy protein (*e.g.*, genistein, coumesterol; reviewed in Ref. 339). In humans, goiter has been reported in infants fed soy formula (340–342). In addition, teenage children diagnosed with autoimmune thyroid disease were found to have twice the rate of occurrence if they had consumed soy formula as infants (343). Boker *et al.* (344) recently reviewed the dietary sources of a variety of isoflavones, showing that these are common dietary components. These isoflavones are also so-called "phytoestrogens," which are highly enriched in some commercial preparations.

C. Environmental chemicals impacting thyroid hormone transport, metabolism, and clearance

Once secreted into the blood, thyroid hormones are carried by specific proteins. In humans, about 75% of T_4 is bound to T_4-binding globulin (TBG), 15–20% is bound to transthyretin (TTR; also called T_4 binding prealbumin or TBPA), and the remaining 5–10% is bound to albumin or is free (0.02%) (345, 346).

The role of serum binding proteins for thyroid hormone in thyroid homeostasis is not well understood. No single serum T_4 binding protein is essential for good health or for the maintenance of a euthyroid state in humans (347). There are a number of clinical situations in which serum binding proteins are elevated or reduced (even completely absent) and the thyroid state is normal. Therefore, despite large increases or decreases in serum total T_4 and T_3 concentrations in some of these patients, serum free hormone and TSH are normal (348). In contrast, there is evidence that the role of serum binding proteins such as TBG is to allow the equal distribution of hormone delivery to a tissue. Mendel *et al.* (349) found that ^{125}I-T_4 was evenly distributed in the rodent liver after a single pass through the tissue only if serum binding proteins were present in the perfusate. However, the identity of the serum binding protein (*e.g.*, TTR *vs.* TBG) did not alter the pattern or intensity of T_4 uptake.

There is some evidence that TTR is important in transport of thyroid hormone across the blood-brain barrier. In large part, this concept is derived from the observation that TTR is produced in the choroid plexus (350–352). However, this concept is not supported by the observation that mice carrying a targeted deletion of the TTR gene have normal concentrations of T_4 in the brain (353, 354). A number of chemicals have been shown to displace T_4 from TTR *in vitro*. In fact, some chemicals bind to TTR with higher affinity than does T_4 itself (355–357); however, the consequences of this binding are not completely clear. One hypothesis is that chemicals can reduce serum total T_4 levels by inhibiting T_4 binding to TTR (358). Perhaps this displacement may also increase T_4 clearance by the liver. However, TTR in the choroid plexus appears to be important for thyroid hormone action in the brain (359), and TTR may mediate transport of environmental chemicals into various compartments such as placenta (360). Thus, chemical binding to the TTR may not only decrease the availability of thyroid hormone to various tissues, it may also selectively target these chemicals for transport and uptake.

Many chemicals are known to decrease the serum half-life of T_4 by inducing liver enzymes that glucuronidate T_4 (361–363). These enzymes uridine diphosphate glucuronyl transferase can be induced by dioxin-like compounds acting on the AhR or through the pregnane X-receptor or constitutive androstane receptor nuclear receptors (364). These chemicals fall into many industrial categories including pesticides of many types (365). The classes of industrial chemicals known to interact with the thyroid system have been reviewed previously and will not be emphasized here (see Refs. 316, 317, 365, and 366).

Once in the serum, thyroid hormones can be taken up into tissues by selective transporters (367) to enter cells. This issue has been particularly investigated because the finding that children with a genetic defect in the MCT8 gene exhibit severe neurological and behavioral disorders (Allan-Herndon-Dudley syndrome; Ref. 368). There are a number of transporters that are likely to be important in the control of thyroid hormone uptake into various tissues and cells. However, little is known— or has been tested— about the ability of specific environmental or industrial chemicals to interfere with T_4 or T_3 transporter function.

Inside the cell, T_4 can be converted to T_3 by the type 1 or type 2 deiodinase. These outer-ring deiodinases are essential for thyroid hormone action (369). For example, the type 2 deiodinase knockout mouse exhibits a form of pituitary resistance to thyroid hormone negative feedback in which both serum T_4 and TSH are elevated (370), indicating that the conversion of T_4 to T_3 in pituitary cells is an important step in thyroid hormone action. A number of environmental chemicals affect deiodinase activity including PCBs (360, 371, 372) and others (317). Environmental chemicals that affect deiodinase activity may have effects that are not entirely consistent with the appearance of "hypothyroidism" and, therefore, may be difficult to recognize in the absence of mechanistic studies.

D. Environmental chemicals impacting the thyroid hormone receptor

1. PCBs

Despite early speculations that environmental chemicals may act as imperfect thyroid hormone analogs (373), few studies had tested this hypothesis until recently. Now,

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several recent reports show that a broad range of chemicals to which humans are routinely, and inadvertently, exposed can bind to TRs and may produce complex effects on thyroid hormone signaling. Perhaps the best example is that of PCBs—industrial chemicals consisting of paired phenyl rings with various degrees of chlorination (374). Although the production of PCBs was banned in the mid 1970s, these contaminants are routinely detected in the environment (375) and in human tissues (376). PCB body burden is associated with lower full-scale IQ, reduced visual recognition memory, attention deficits, and motor deficits (377–381).

PCBs can reduce circulating levels of T_4 in animals (382–384), and some authors propose that PCBs exert neurotoxic effects on the developing brain by causing a state of relative hypothyroidism (385, 386). In addition, PCB body burden has been found to be associated with thyroid hormone in some, but not all, human studies (366, 387). Interestingly, measures of thyroid function at birth are associated with maternal, infant, and delivery factors, and this may explain why some studies fail to identify an association between PCB exposures and measures of thyroid function at birth (388, 389).

The concept that PCBs can exert a neurotoxic effect on the developing brain by causing a state of relative hypothyroidism is supported by the observations that the ototoxic effect of PCB exposure in rats can be partially ameliorated by T_4 replacement (390), and that the cerebellum, a tissue highly sensitive to thyroid hormone insufficiency (391), is targeted by PCB exposure. PCBs alter motor behavior associated with cerebellar function, as well as cerebellar anatomy (392). Interestingly, PCB exposure is associated with an increase in expression of glial fibrillary acidic protein (392), which is also increased by thyroid hormone insufficiency (393). Finally, in young children, the association between PCB body burden and behavioral measures of response inhibition is stronger in those children that have a smaller corpus callosum (394), an area of the brain affected by thyroid hormone (395). Thus, it is possible that PCBs exert at least some neurotoxic effects on the developing cerebellum by causing a state of relative hypothyroidism.

However, PCB exposure does not produce consistent effects on animals that are indicative of thyroid hormone insufficiency, such as body weight gain during development (382) or the timing of eye opening (390). In addition, despite the reduction in serum T_4, PCB exposure increases the expression of several thyroid hormone-responsive genes in the fetal (396, 397) and neonatal (382) brain. These observations are consistent with the hypothesis that at least some individual PCB congeners, or their metabolites, can act as TR agonists *in vivo*. Recently, Kitamura *et al.* (398) reported that nine separate hydroxylated PCB congeners can bind to the rat TR with an IC_{50} as low as 5 μM. In addition, using a human neuroprogenitor cell line, Fritsche *et al.* (399) found that a specific PCB congener could mimic the ability of T_3 in increasing oligodendrocyte differentiation and that this effect was blocked by the selective TR antagonist NH3. Finally, Arulmozhiraja and Morita (400) have identified several PCB congeners that exhibit weak thyroid hormone activity in a yeast two-hybrid assay optimized to identify such activity.

Not all recent reports indicate that PCBs act as agonists on the TR. Kimura-Kuroda *et al.* (401) have found that two separate hydroxylated PCBs interfere with T_3-dependent neurite outgrowth in mouse cerebellar granule cell primary cultures. In addition, Bogazzi *et al.* (402) found that a commercial mixture of PCBs (Aroclor 1254) exhibited specific binding to the rat TRβ at approximately 10 μM. This concentration inhibited TR action on the malic enzyme promoter in a chloramphenicol acetyltransferase assay, and this effect required an intact thyroid response element (TRE). However, the PCB mixture did not alter the ability of TR to bind to the malic enzyme TRE in a gel shift assay. In contrast, Iwasaki *et al.* (403) found that a specific hydroxylated PCB congener inhibits TR-mediated transcriptional activation in a luciferase assay at concentrations as low as 10^{-10} M. This effect was observed in several cell lines, but was not observed using a glucocorticoid response element. Miyazaki *et al.* (404) followed this report by showing that PCBs can dissociate TR:retinoic X receptor (RXR) heterodimers from a TRE.

It is clear that PCBs are neurotoxic in humans and animals and that they can interact directly with the TR. However, the consequences of PCB exposure on TR action appear to be quite complex. This complexity includes acting as an agonist or antagonist and may include TR isoform selectivity inasmuch as most studies have been performed using the TRβ, leaving the TRα relatively unstudied in this context. In addition, considering that there are 209 different chlorine substitution patterns on the biphenyl backbone and that these can be metabolized [hydroxyl and methylsulfonyl metabolites (173, 174)], it is possible that different chemical species exert different effects. Finally, PCBs may exert different actions on TRs depending on associated heterodimer partners, promoter structure, or different cofactors. This complexity will be important to pursue because the effect of PCB exposure in humans is far better studied than for structurally related compounds such as PBBs and PBDEs. Thus, mechanistic studies on PCBs can be more easily and effectively coupled to specific human health outcomes.

2. BPA

BPA (4,4′ isopropylidenediphenol) is produced at a rate of more than 800 million kilograms annually in the United

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States alone (418) and is used primarily in the manufacture of plastics including polycarbonate plastics, epoxy resins that coat food cans, and in dental sealants (406, 407). Howe *et al.* (406) estimated human consumption of BPA from epoxy-lined food cans alone to be about 6.6 μg per person per day. BPA has been reported in concentrations of 1–10 ng/ml in serum of pregnant women, in the amniotic fluid of their fetus, and in cord serum taken at birth (71, 408). Moreover, BPA concentrations of up to 100 ng/g were reported in placenta (408). BPA is also halogenated (brominated or chlorinated) to produce flame retardants. Tetrabromobisphenol A (TBBPA) is the most commonly used, with more than 60,000 tons produced annually (409, 410). Thomsen *et al.* (411) recently reported that brominated flame retardants, including TBBPA, have increased in human serum from 1977–1999 with concentrations in adults ranging from 0.4 to 3.3 ng/g serum lipids. However, infants (0–4 yr) exhibited serum concentrations that ranged from 1.6 to 3.5 times higher (411).

Considering this pattern of human exposure, it is potentially important that BPA has been shown to bind to the TR (412). Although best studied for its actions on the nuclear ER (413), binding with a K_i of approximately 10^{-5} M (414, 415), and more recently for the membrane ER (416), BPA also binds to and antagonizes T_3 activation of the TR (412, 417) with a K_i of approximately 10^{-4} M. As little as 10^{-6} M BPA significantly inhibits TR-mediated gene activation (412). Moreover, Moriyama *et al.* (412) found that BPA reduced T_3-mediated gene expression in culture by enhancing the interaction with nuclear receptor corepressors. Interestingly, Zoeller *et al.* (418) found that developmental exposure to BPA in rats produces an endocrine profile similar to that observed in thyroid resistance syndrome (419). Specifically, T_4 levels were elevated during development in the pups of BPA-treated animals, but TSH levels were not different from controls (418). This profile is consistent with BPA inhibition of TRβ-mediated negative feedback. However, the thyroid hormone-response gene RC3 was elevated in the dentate gyrus of these BPA-treated animals (418). Because the TRα isoform is expressed in the dentate gyrus, the authors concluded that BPA could be a selective TRβ antagonist *in vivo*.

If BPA acts as a TR antagonist *in vivo*, it is predictable that specific developmental events and behaviors would be affected by developmental exposure to BPA. In this regard, Seiwa *et al.* (420) have shown that BPA blocks T_3-induced oligodendrocyte development from precursor cells. In addition, there may be an association between the thyroid resistance syndrome and attention deficit-hyperactivity disorder in humans (421) and in rats (422); therefore, it is potentially important that BPA-exposed rats exhibit attention deficit-hyperactivity disorder-like symptoms (423).

Despite the antagonistic effects of BPA on the TRβ, halogenated BPAs appear to act as TR agonists (417). Both TBBPA and tetrachlorobisphenol A can bind to the thyroid hormone receptor and induce GH3 cell proliferation and GH production (417). Thus, these compounds may exert agonistic effects on the TR, and this could be important during early brain development. For example, thyroid hormone of maternal origin can regulate gene expression in the fetal brain (424–426); one of these genes codes for Hes1 (397). Considering the role of HES proteins in fate specification in the early cortex (427, 428), the observation that industrial chemicals can activate the TR and increase HES expression (397) may indicate that these chemicals can exert subtle effects on early differentiative events.

3. PBDEs

PBDEs may also bind to the thyroid hormone receptor (reviewed in Ref. 429). Marsh *et al.* (430) demonstrated that two hydroxylated PBDEs can bind to both TRα and TRβ, but with a significant preference for TRβ.

IX. Environmental Chemicals, Obesity, and Metabolism

A. Introduction to EDCs and the obesity epidemic

Obesity, defined as body fat greater than 25% in men or greater than 30% in women, is fast becoming a significant human health crisis (431). More than 30% of adults in the United States are defined as clinically obese (431, 432), and an analogous rise is observed in pediatric populations, with a tripled increase in the obesity rate from ages 6–19 yr during the last five decades (433). The prevalence of obesity has risen dramatically in wealthy developed countries, and it is also on the rise in poor nations. The WHO has declared excessive weight as one of the top 10 health risks in the world and has estimated that the number of overweight people in the world is now greater than the number of undernourished. The rise in the incidence in obesity matches the rise in the use and distribution of industrial chemicals that may be playing a role in generation of obesity (434), suggesting that EDCs may be linked to this epidemic.

Obesity has deleterious effects on human health by increasing the risk of associated metabolic abnormalities such as insulin resistance, hyperinsulinemia, hypertension, and dislipidemia—all components of the metabolic syndrome—which constitute, in turn, major risk factors for the development of diabetes mellitus type 2 and coronary heart disease. The etiology of the obesity epidemic has been partly attributed to alterations in food intake, with the prevalence of a Westernized-style diet characterized by high caloric uptake as well as a lack of physical

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activity representative of a sedentary lifestyle. However, the mechanisms still remain unclear, and except for a genetic predisposition and lifestyle modifications, scientific research implies the impact of environmental substances in the generative roots of obesity. Grün and Blumberg (435, 436) have coined the terminology "obesogens" in reference to molecules that inappropriately regulate lipid metabolism and adipogenesis to promote obesity.

Obesity also relates to the fetal (developmental) origins of adult disease. Children of women who experienced famine during pregnancy exhibit symptoms of the metabolic syndrome as adults (437). Moreover, it is becoming evident that an important risk factor for development of this metabolic syndrome is low birthweight (438, 439). These studies indicate that developmental events occurring *in utero* and perhaps in the immediate perinatal period can affect metabolic functions that can lead to the metabolic syndrome in adulthood (431).

B. Environmental estrogens and obesity

White adipose tissue metabolism is under the control of the sympathetic nervous system and is modulated by hormones including sex steroids. The impact of environmental estrogens on adipose tissue may be through direct modulation of lipogenesis, lipolysis, and adipogenesis, or indirect by affecting food consumption and leptin secretion targeting the central nervous system or lipid homeostasis in liver (440).

The estrogenic pharmaceutical chemical DES illuminates the relationship between perinatal exposures and latent development of high body weight and obesity. Moreover, there is a complex relationship between the concentration of estrogen to which pregnant animals are exposed and the weight of the offspring in adulthood (432). Specifically, according to a recent experiment by Newbold *et al.* (432), mice neonatally exposed to DES experience increased body weight in adulthood associated with excess abdominal body fat. Interestingly, the dose of DES determines the chronic manifestation of the observed alterations, with high doses leading to initially decreased body weight and a peripubertal "catch-up" and low doses causing an increase in weight detectable only in adulthood. Moreover, the timing is important because gestational administration in rodents results in the offspring's low birth weight, an unchanged metabolic characteristic throughout life (432). Along with an increase in body fat stores, the adipokines leptin and adiponectin, IL-6 (an inflammatory marker), and triglycerides were all elevated in DES-exposed mice (432).

An *in vitro* study using a culture system of 3T3-L1 preadipocytes showed that 4-nonylphenol and BPA stimulated lipid accumulation, accelerating their differentiation to mature adipocytes in a time- and concentration-dependent way (441). The underlying mechanism appeared to involve up-regulation of gene expression involved in lipid metabolism and adipocyte differentiation. In the second part of the experiment, fat accumulation was observed in human hepatocellular carcinoma cell lines exposed to those endocrine disruptors (441). These findings are consistent with previous *in vitro* studies using mouse fibroblast cell lines in which a link between environmental chemicals including nonylphenol, BPA, and genistein in the development of body weight imbalance was suggested (431, 432).

C. Peroxisome proliferator-activated receptor (PPAR) γ and organotins

PPARγ is a member of the nuclear receptor superfamily and constitutes a major regulator of adipogenesis. It is primarily expressed in adipose tissue, and its activation promotes adipocyte differentiation as well as the induction of lipogenic enzymes. Additionally, it contributes to maintenance of metabolic homeostasis through transcriptional activation of genes implicated in energy balance (442). During its activation, PPARγ forms a heterodimer with RXR-α, and the complex binds to PPAR response elements in the regulatory regions (promoters) of target genes ultimately involved in the regulation of fatty acid storage and the repression of lipolysis.

Experimental evidence highlights that nuclear receptor superfamily and specifically PPARγ are molecular targets for endocrine disruptors, in particular organotin compounds such as tributyltin (TBT) and triphenyltin, which have been widely used in agriculture and industry. Kanayama *et al.* (443) showed that TBT and triphenyltin functioned as agonists of PPARγ and RXR, acting as high-affinity ligands at levels comparable to known endogenous ligands. Moreover, administration of those xenobiotics in preadipocyte cell lines resulted in adipocyte differentiation through PPARγ (443). In mice, TBT induced the differentiation of adipocytes *in vitro* and increased adipose mass *in vivo* by RXR and PPARγ activation (444).

It is possible that PPARγ signaling can interact with that of estrogen to influence adipogenesis. These findings have been reviewed recently (435, 436, 444) and represent an important example of the mechanism by which environmental chemicals can interfere with body weight regulation. In addition, at high doses, TBT can inhibit aromatase enzyme activity in adipose tissue directly, leading to decreased estradiol levels and down-regulation of ER target genes. TBT at moderate to high doses inhibits the activity of 11β-hydroxysteroid dehydrogenase 2, resulting in decreased inactivation of cortisol. It has been hypothesized that the increased local glucocorticoid levels could influence late stages in adipocyte differentiation and thus, metabolic regulation (435, 436).

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D. Phytoestrogens

In recent years, efforts to implement healthier eating habits have resulted in an increased consumption of soy products and supplements and hence, increased exposure to phytoestrogens. Genistein is the principal phytoestrogen in soy and has a wide range of biological actions. It binds to ERα and ERβ but also displays antiestrogenic action (445). At low concentrations, genistein was found to act as estrogen and exert an inhibitory effect on lipogenesis. There are also sex differences in the effect of genistein on adipose deposition and insulin resistance, an effect that involves the ERβ (446). At higher concentrations, genistein promotes lipogenesis through the molecular pathway of PPARγ, an ER-independent pathway (445).

E. Endocrine disruptors, diabetes, and glucose homeostasis

The incidence of diabetes mellitus has tripled over recent decades, with an estimated 177 million people affected worldwide (447). It is speculated that by the year 2030 the prevalence of diabetes will increase to 4.4% worldwide (from 2.8% in 2000) with more than 300 million diabetic adults (448). Regarding the young population, epidemiological studies show an alarming increase in the incidence of diabetes mellitus type 2 (449).

Based on the links between endocrine disruptors and disturbances of reproduction, metabolism, and links to adult dysfunctions and cancer, it is reasonable to propose a connection between EDCs and diabetes as well as prediabetic disturbances. Indeed, epidemiological studies have linked high dioxin levels with increased risk for diabetes or altered glucose metabolism (450). Animal models also support this hypothesis. Alonso-Magdalena *et al.* (447) undertook an *in vivo* experiment to evaluate the impact of BPA on pancreatic β-cell function. Its biological action was compared with 17β-estradiol. The results showed that acute treatments with either estradiol or BPA caused a temporary hyperinsulinemia, whereas longer-term exposure provoked insulin resistance with chronic increased insulin levels, an aggravating factor for the development of diabetes mellitus (447). Recently, in conditioned media from human breast, sc and visceral adipose explants, it was demonstrated that BPA at environmentally relevant doses (0.1 and 1 nM) inhibits the release of adiponectin, an adipocyte-specific hormone that increases insulin sensitivity. Therefore, factors that suppress adiponectin release could aggravate insulin resistance and susceptibility to obesity-related syndromes like metabolic syndrome and type 2 diabetes mellitus. However, the mechanisms by which BPA suppresses adiponectin and the receptors involved remain to be determined (451).

Pancreatic α-cells have also been suggested as potential targets for endocrine disruption. Low doses of BPA and DES were shown to impair the molecular signaling that leads to secretion of glucagon by suppressing intracellular calcium ion oscillations in α-cells in response to low blood glucose levels through a nongenomic mechanism (452).

The above experiments suggest that low doses of endocrine disruptors can disrupt pancreatic physiology, affecting both insulin- and glucagon-secretory cells, leading to changes in the regulation of glucose and lipid metabolism. The underlying mechanisms involve at the very least classical ER-mediated but also nongenomic actions. Further investigations are required to elucidate the potential associations with human health. Importantly, whereas current evidence represents experimental data from laboratory animals or *in vitro* studies, no direct association with humans has yet been established, with the exception of the epidemiological studies discussed above.

F. Endocrine disruptors and cardiovascular systems

The obesity phenotype may lead to a dysmetabolic state with atherogenic, inflammatory, prothrombotic abnormalities that not only accelerate the progression of cardiovascular disease but also create favorable "subsoil" for an acute myocardial infarct (453). Therefore, the cardiovascular system is also a target of environmental chemicals that interfere with intracellular signaling of hormonal and inflammatory pathways.

G. Estrogenic EDCs and cardioprotection

Phytoestrogens have been shown to exert cardioprotective effects. Female rats fed a high phytoestrogen diet exhibited cardioprotection against adverse left ventricular remodeling (454) and reduction of myocardial necrosis, increased myocardial contractility, and decreased occurrence of ventricular arrhythmias. Genistein was also associated with reduced levels of TNF-α and blunted myocardial intercellular adhesion molecule-1 expression (455). Moreover, it was shown that in people at high risk of cardiovascular events, a greater isoflavone intake is associated with better vascular endothelial function and lower carotid atherosclerotic burden (456).

Regarding human populations, there are some epidemiological studies that suggest that high phytoestrogen intake is inversely associated with cardiovascular risk factors and development of cardiovascular disease (457). Moreover, it was shown that in people at high risk of cardiovascular events, a greater isoflavone intake is associated with better vascular endothelial function and lower carotid atherosclerotic burden (456). However, these epidemiological observations need clinical confirmation.

H. Advanced glycation end-products (AGEs)

Recent data clearly suggest that a heterogeneous group of exogenous advanced glycation end-products (AGEs)

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have a negative impact on cardiometabolic tissues. Tobacco use (458) and food cooked at high temperatures, precooked meals, and some beverages contain large amounts of AGEs that are absorbed from the human gastrointestinal tract (459). AGEs cause tissue injury through intracellular generation of free radicals and triggering oxidative stress, through the interaction of AGEs with a multiligand, cell surface receptor called RAGE, and endocrine signaling pathway. There is evidence in experimental animals and humans for a link between exogenous AGEs and an increase in cardiometabolic risk markers. It is notable that mice chronically fed a high-AGE diet, compared with those fed a low-AGE, high-fat diet exhibited relative insulin resistance accompanied by modifications in pancreatic cellular architecture compatible with hyperplasia and hypertrophy and loss of islet of Langerhans structure (460). Another *in vivo* chronic experiment involved feeding intact female rats a high-AGE diet for 6 months. This resulted in increased fasting glucose and insulin levels independent of the degree of obesity as well as hormonal alterations (461). Uribarri *et al.* (462) showed that a single oral administration of an AGE-rich beverage acutely (within 90 min) resulted in temporarily impaired endothelial function assessed by flow-mediated arterial vasodilation, increased serum C-reactive protein, and plasminogen activator inhibitor-1 levels in both diabetic and healthy subjects.

I. Conclusions

The literature demonstrates a role of EDCs in the etiology of complex diseases such as obesity, diabetes mellitus, and cardiovascular disease, yet these processes are still poorly understood. Although the evidence is limited, accumulating data are pointing to the potential role of endocrine disruptors either directly or indirectly in the pathogenesis of adipogenesis and diabetes, the major epidemics of the modern world. Taking into consideration the wide spectrum of industrial chemicals to which an average consumer might be exposed, a rational hypothesis is that the scientific community may inadvertently ignore the effect of several other compounds that might in turn constitute potential "obesogens" or promoters of glycemic disturbances. Further research is required to elucidate all potential interactions between environmental substances and metabolic dysregulation.

X. Recommendations for the Future

A. Linking basic research to clinical practice

It should be clear from this Scientific Statement that there is considerable work to be done. A reconciliation of the basic experimental data with observations in humans needs to be achieved through translation in both directions, from bench to bedside and from bedside (and populations) to bench. An example of how human observation and basic research have successfully converged was provided by DES exposure in humans, which revealed that the human syndrome is faithfully replicated in rodent models. Furthermore, we now know that DES exposure in key developmental life stages can have a spectrum of effects spanning female reproduction, male reproduction, obesity, and breast cancer. It is interesting that in the case of breast cancer, an increased incidence is being reported now that the DES human cohort is reaching the age of breast cancer prevalence. The mouse model predicted this outcome 25 yr before the human data became available. In the case of reproductive cancers, the human and mouse data have since been confirmed in rats, hamsters, and monkeys (463). This is a compelling story from the perspective of both animal models and human exposures on the developmental basis of adult endocrine disease.

Another estrogenic compound, BPA, is also linked to a wide variety of endocrine dysfunction. BPA exposure, particularly in development, increases the risk of mammary cancer, obesity, diabetes, and reproductive and neuroendocrine disorders. The human evidence for BPA is mounting; recently, Lang *et al.* (464) published a cross-sectional analysis on the relationship between concentrations of urinary BPA and chronic disease states in over 1400 adults in the United States. They found a significant correlation between BPA concentrations in urine with cardiovascular disease and abnormal concentrations of liver enzymes. It would be really interesting to be able to relate the relationship of these outcomes with developmental/fetal exposure to BPA and other xenobiotics. However, epidemiological research on fetal exposure would be logistically difficult and costly because exposures must be measured at several different time points, including gestation, whereas the outcome may not be manifest in some cases until 50 or more years after the initial fetal exposure. Given the reproducibility of the human DES syndrome in rodents and recent evidence for commonalities in a relationship between BPA and cardiovascular endocrine disease, it is obvious that more research in animal models is necessary to enrich our knowledge of the mechanisms by which endocrine disruptors increase the risk of disease.

A challenge to understanding the relationship between EDCs and health abnormalities is that EDCs are a "moving target." Individuals and populations are exposed to ever-changing patterns of production and use of these compounds. They also tend to be released into the environment as mixtures, rather than individual chemicals. Therefore, it is important to understand the effects of simultaneous coexposures to these chemicals, which may interact additively, multiplicatively (synergistically), or

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antagonistically (48). There are limited data on the interactions between chemicals within a class or across classes of chemicals. Presently, there are good analytical methods for measuring exposures to a variety of endocrine disruptors in humans. An increased understanding of the potential human health risks of exposure to mixtures of EDC is important but remains very understudied. Hence, measurement of body burden of the most prevalent xenobiotics would probably be the best strategy for finding a link between exposure and effect. Once known, this could be related to mechanistic studies in laboratory models, and future experiments could be designed to evaluate the effects of combinations of common EDCs in the laboratory, with the obvious caveat that it will not be possible to mimic every possible combination and dose. Despite these challenges, evolving and innovative technologies designed to improve the assessment of human exposure and reproductive and endocrine health endpoints should provide enhanced opportunities for improving our understanding of these relationships.

B. Endocrine disruption and the public

At the recent Summit on Environmental Challenges to Reproductive Health and Fertility at the University of California, San Francisco, recommendations were made regarding future research, health care, policy, community action, and occupational health (49). Included in these recommendations were enhancing collaborations among and between researchers and granting agencies and promoting critical research directions, including prenatal exposures in the National Children's Health Study, leveraging specific laboratory data into the National Health and Nutrition Examination Survey study, developing biomarkers of exposure and disease, and increasing the funding for effects of chemicals on the epigenome, developmental programming, transgenerational effects, and cross-talk among endocrine systems and metabolic and immune systems (49). In addition, for health care professionals, being educated in sources and effects of environmental contaminant exposures *in utero* and across the life span, as well as having straightforward health information tools to share this information with patients and for public education in general are recommended.

C. Prevention and the "precautionary principle"

Although more experiments are being performed to find the hows and whys, what should be done to protect humans? The key to minimizing morbidity is preventing the disorders in the first place. However, recommendations for prevention are difficult to make because exposure to one chemical at a given time rarely reflects the current exposure history or ongoing risks of humans during development or at other life stages, and we usually do not know what exposures an individual has had *in utero* or in other life stages.

In the absence of direct information regarding cause and effect, the precautionary principle is critical to enhancing reproductive and endocrine health (49). As endocrinologists, we suggest that The Endocrine Society actively engages in lobbying for regulation seeking to decrease human exposure to the many endocrine-disrupting agents. Scientific societies should also partner to pool their intellectual resources and to increase the ranks of experts with knowledge about EDCs who can communicate to other researchers, clinicians, community advocates, and politicians.

D. Specific recommendations for future research

Although direct causal links between exposures to EDCs and disease states in humans are difficult to draw, results from basic research and epidemiological studies make it clear that more screening for exposures and targeting at-risk groups is a high priority. In addition to enhancing research in these areas, an important and effective approach is prevention of disease. Our chemical policies at local, state, and national levels, as well as globally, need to be formulated, financed, and implemented to ensure the best public health. Additional specific recommendations of this group are shown in Box 2. By communicating these priorities to basic and clinical researchers, physicians, community advocates, and the public at large, we are hopeful that early identification and intervention will be facilitated.

Acknowledgments

We thank Dr. Loretta Doan for the critical role that she played in facilitating all communications of this taskforce; Dr. Alan Schneyer for support and guidance; Ms. Maggie Haworth for expert assistance with publication-related activities; the Research Affairs Core Committee of The Endocrine Society; and The Scientific Statements Taskforce of The Endocrine Society.

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This work was supported by Grants NIH ES07784 (to A.C.G.), NIH ES015584 (to G.S.P.), NIH ES09718 (to R.H.), NIH ES01230, ES015182, ES08314 (to A.M.S.), European Commission (EDEN project, QLRT-2001-00269), Belgian Study Group for Pediatric Endocrinology, Belgian Fonds de la Recherche Scientific Medicale, grants 3.4567.09 and 3.4573.05 (to J.P.B.).

Disclosure Summary: E.D.-K., J.-P.B., L.C.G., R.H., G.S.P., and A.C.G. have nothing to declare. A.M.S. has served as a consultant to Emerson Poynter LLP. R.T.Z. has served on the EPA Scientific Advisory Board, has received honoraria for university lectures, and has served as an expert witness in federal court.

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"Our Ancestors Are in Our Land, Water, and Air": A Two-Eyed Seeing Approach to Researching Environmental Health Concerns with Pictou Landing First Nation

Final Report
2010–2016

Pictou Landing Native Women's Group
and
H. Castleden, D. Lewis, R. Jamieson, M. Gibson,
D. Rainham, R. Russell, D. Martin, and C. Hart

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Final Report

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Prepared for:
Pictou Landing First Nation

How to cite this report: Pictou Landing Native Women's Group (c/o Sheila Francis, Past President), Castleden, H., Lewis, D., Jamieson, R., Gibson, M., Rainham, D., Russell, R., Martin, D., & Hart, C. (2016). "Our Ancestors Are in Our Land, Water, and Air": A Two-Eyed Seeing Approach to Researching Environmental Health Concerns with Pictou Landing First Nation – Final Report.

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Executive Summary

A'se'k, "the other room," is the tidal estuary commonly known today as Boat Harbour, adjacent to Pictou Landing First Nation on the Northumberland Strait of Nova Scotia, Canada. Historically, A'se'k was a gathering place that exemplified the Mi'kmaw ethic of sharing: food, knowledge, and skills were exchanged there between generations and amongst family groups. These uses of the land and its recreational, physical, mental, spiritual, cultural, and emotional purposes have been compromised since a pulp and paper mill was built in 1965 and began operating in 1967.

Almost 50 years later, the effects of the pollution on the surrounding land, air, soils, and water are not fully known and understood. Out of concern for their children, families, and community, the women of the Pictou Landing Native Women's Group (PLNWG) mobilized around the issue of Boat Harbour in 2010, inviting academic members to join them in exploring their question, "Is Boat Harbour making us sick?" It is due to their initial collective and continual organizing that the research this report describes was carried out.

This multi-year community-based participatory project, co-led by Past PLNWG President Sheila Francis and Dr. Heather Castleden (formerly with Dalhousie University, now at Queen's University), employed a Two-Eyed Seeing approach. Dr. Debbie Martin, with her expertise in this approach of bringing Indigenous and Western knowledge systems (ways of seeing the world and ways of doing research) together, was consulted in the development of our research design and continually throughout the project.

Four Research Retreats and five Community Dinners provided opportunities to share and discuss community-relevant concerns of environment and health in a multi-generational and female-centred forum. This, in turn, helped establish, revisit, reconfirm, and revise goals and priorities throughout the research partnership between and within the academic members of the team and the PLNWG. Monthly one-page updates were sent to Pictou Landing First Nation, c/o Chief Andrea Paul.

The Two-Eyed Seeing approach resulted in the use of diverse methods, including documenting oral histories; conducting a comprehensive literature review; establishing a web-based community map; carrying out a Youth Camp; creating digital stories; conducting a community-wide Environmental Health Survey, deploying an array of environmental monitoring techniques including water, air, soil, and sediment sampling and analysis as well as mammal analysis and dendrochronology; and sharing our new knowledge across multiple platforms. The varied methods allowed for a broad assessment of health concerns; they intersect and overlap to inform a wholistic understanding of individual and collective health in Pictou Landing First Nation.

Oral histories, collected in large part by Ms. Ella Bennett, illustrated intergenerational impacts as Elders expressed their concerns over the decline of their community's engagement with the land and waterways that they have witnessed since the start of the pulp and paper mill's operations and use of the Boat Harbour Effluent Treatment Facility. Our literature review, conducted in large part by Ms. Ziyun Wang, found that, unsurprisingly, the limited research to date has focused on physical health impacts and concerns. The review also identified three gaps in the literature: (1) legislation in Nova Scotia has never (and does not) require human health risk assessments; (2) regulations left a gap of more than 20 years when the mill operated without effluent control; and (3) little research has been conducted on the topic of tidal flush.

The Environmental Health Survey, led by Ms. Diana Lewis, assessed community-wide environmental and human health concerns, perceptions, and experiences. The face-to-face survey, conducted by members of the PLNWG, reflected questions that the PLNWG wanted information on and received an exceptional 60% response rate. Findings are highlighted here; a detailed Community Report of the survey results is forthcoming. While it is clear that Pictou Landing First Nation members have been experiencing poorer health outcomes compared to other First Nations people living on reserve both provincially and nationally, they have not been the beneficiaries of the socioeconomic benefits that typically come with, and are often touted as the impetus for, regional industrial development.

Dr. Mark Gibson led air quality sampling in summer 2013 and spring and summer 2014 using passive and real-time samplers across 13 sites. Ammonia, nitrogen dioxide, sulfur dioxide, volatile organic compounds, particulate matter, and dioxins and furans were monitored and all of the air quality data were found to be below the Canadian Council of Ministers of the Environment's (CCME) limits. That said, Dr. Gibson noted that there were certainly challenges to monitoring air quality, including equipment malfunction and the unknown impact on the data of the mill's closure during summer 2014 after the effluent spill.

Dr. Rob Jamieson led water sampling, testing for total suspended solids, conductivity, *E. coli*, nitrogen, phosphorus, a range of metals, biological oxygen demand, dissolved oxygen, pH levels, and dioxins and furans across eight sites. In general, samples from within Boat Harbour were above the limits specified by the Canadian Water Quality Guidelines for the Protection of Aquatic Life. Samples from surrounding sites mostly met guidelines, with the exception of some heavy metals: silver, zinc, iron, and lead.

Dr. Jamieson also led the soil quality analysis. Soil was first sampled at 14 sites and was analyzed for various metals as well as dioxins and furans. Follow-up sampling occurred to confirm the first round's findings and drew from six sites. The soil results indicated

that contaminant concentrations in these samples generally met Canadian guidelines for protection of human and environmental health, and that the samples between Pictou Landing First Nation and the town of Pictou were of similar quality.

Dr. Ron Russell led the ecotoxicology and sediment analysis to determine aquatic toxicity and what chemicals were present in the samples. The sediment analysis revealed the presence of dioxins and furans well above the CCME limits for environmental quality (human health guidelines don't exist). The chemicals, however, are mainly present in the sediment, and contact with Boat Harbour sediments should be avoided. Dr. Russell's determination of aquatic toxicity found that Boat Harbour is unable to support aquatic life due to hyper-eutrophication (causing low oxygen), high water temperature, decreased sunlight penetration, and toxic chemical inputs.

Dr. Russell's mammal analysis found that detectable but low concentrations of dioxins and dioxin-like compounds were found in beaver and muskrat tissues. Liver exhibited consistently higher concentrations than muscle since metabolic detoxification pathways are predominantly found in the liver. Toxicity of dioxins in mammal tissue was approximately the same as plankton and significantly lower than that calculated for sediment. Beaver and muskrat are not part of the commercial food industry; however, the low concentrations of dioxins detected in both muscle and liver of these mammals still exceeded European Union guidelines for commercial meat, indicating local wild meats should not be consumed.

Dr. Russell also conducted an analysis of the June 2014 effluent spill near Boat Harbour. He found that most metals in samples from the effluent exceeded guidelines for the protection of aquatic life, with copper and lead as the worst cases (exceeding the guidelines by greater than 10 times).

Mr. Geoff Kershaw undertook basic dendrochronology, the analysis of tree rings, to determine whether there were impacts to tree growth in the area. Twenty trees were sampled from an old-age white spruce stand near Boat Harbour and, for comparison, 18 trees were sampled from a control site. While the analysis showed statistical differences suggesting unique growth-influencing factors at each site, it is unclear whether these differences are associated with pulp mill activity.

Three key legacies of the project are detailed in this report. First, Dr. Daniel Rainham carried out an interactive community mapping activity for the project, bringing together sites of data collection and stories associated with the data. In doing so, he has created a legacy map that can be explored online to visualize land use in terms of traditional and recreational use over time as well as places relevant to the project (e.g., air sampling sites, soil sampling sites, tree sampling sites, places where community members used to go for traditional medicines and traditional foods).

Second, a capacity-building legacy of the project has been the training and certification of water monitors in Pictou Landing. Ms. Kim Strickland, Ms. Colleen Denny, and Ms. Lucie Francis are trained to use the equipment associated with Wet-Pro, a community-based water monitoring kit received from CURA H2O.

Third, and also related to capacity-building, a Youth Camp took place over two weeks in 2015. Ms. Cecilia Jenning and Ms. Kim Strickland brought five Mi'kmaq youth from Pictou Landing together to learn about the PLNWG's research project and to share their perspectives concerning Boat Harbour in the form of digital stories.

This report is one knowledge-sharing product of many from our work together; more are described herein. The Research Team is proud of this community-owned research.

Foreword by Sheila Francis, Past President
Pictou Landing Native Women's Group

Here it is: Our final report after 6+ years of research, meetings, presentations and laughs!

I must say, this has been a long and emotional journey, not just for me but especially for the women of the community. At the same time, it has been one of empowerment and voice. Many women in our community have shown themselves to be leaders through this project. They have given themselves that opportunity to express their concerns, their fears, and their hopes.

I would like to thank the University members of our Research Team who helped us with the scientific part of this project. Your expertise enabled us to understand the technical aspects and you put it in a language we could understand. But most of all, you brought your humanness. You cried with us. You gave us a safe and compassionate space. You heard us.

I would like to thank Heather Castleden, our Lead Academic Researcher. Right from the start, you were our partner. You did not come in and assert your credentials or your experience. You did not minimize our lack of expertise as scientists. What you brought was what we had never received before – compassion, safety, someone who listened to our concerns and who really cared. I think that was the most important thing we needed to move this project forward so successfully. From the bottom of my heart Heather, I thank you.

To the ladies who played a role in this project:

Whatever conclusions you have taken from this research study, I hope one of them is the fact that you were a part of this study. You led this study. You controlled this study. You are the authors of this study. I hope you will continue to demand and express your concern for your and your family's health, and the health of our community. I hope you will continue to use your voice. I want to thank you for allowing me to represent you. I had to step out of my own comfort zone many times to tell your story, our story, but I would do it again for you. I really love that we worked together, we spent time together, we began to create an understanding for and about each other. I hope we will continue to work as a team. I really appreciate you giving me the chance to move this forward.

All my best!

Sheila Francis

Acknowledgements

Our team wishes to offer its sincerest thanks to everyone from Pictou Landing First Nation for supporting this community-based research project that was led by the Pictou Landing Native Women's Group with Sheila Francis (Past President) serving as the Community Research Lead and Heather Castleden serving as the University Research Lead, joined by Diana Lewis (Dalhousie University), Daniel Rainham (Dalhousie University), Debbie Martin (Dalhousie University), Mark Gibson (Dalhousie University), Rob Jamieson (Dalhousie University), and Ron Russell (Saint Mary's University).

Our deepest and warmest heartfelt thanks to the Elders of the Pictou Landing Native Women's Group for their guidance throughout the project, and to the Community Research Associates from Pictou Landing without whom this work would not have been possible: Kim Strickland and Colleen Denny, and the surveyors who conducted the Environmental Health Survey: Colleen Denny, Kim Strickland, Pam Denny, Haley Bernard, Jordan Francis, Sheila Francis, Fran Nicholas, April Nicholas, Darlene Bachiri, Holly Francis, Heather Mills, Sylvia Francis, and Loretta Sylliboy. Special thanks to Haley Bernard and Lucie Francis for their internship work on the project, Durney Nicholas for trapping mammals for analysis, and Dakota Francis for his work with the Boat Harbour Youth Camp.

Thank you to each student whose graduate work has fulfilled pieces of this project: Diana "Dee" Lewis (PhD, Environmental Health Survey), Ella Bennett (MES, Oral Histories), Ziyun Wang (MREM, Health Canada Literature Review), and Jane McCurdy (MREM, Community Map). Thanks also to the many university-based Research Assistants involved in this project, including Chris Garda, Cecilia Jennings, Codey Bennett, Geoff Kershaw, James Kuchta, Jenny Hayward, Justine Lywood, and Rick Scott, for their integral roles in data collection and beyond. We are also grateful for Emily Skinner and Catherine Hart, who served as consecutive Project Coordinators. Thanks also to the CURA H_2O team, namely, Oliver Wood and Sarah Weston, for supporting the WetPro component of this project. And finally, enormous thanks to Martha Stiegman, Catherine Martin, and Frank Clifford for documenting moments of this project on film throughout its duration.

Funding for this research was provided by a Canadian Institutes of Health Research Operating Grant (# 119395), a Nova Scotia Health Research Foundation Development Initiative Grant and the in-kind contributions of the Health, Environments, and Communities Research Lab (Castleden), the Centre for Water Resources Studies (Jamieson), the Atmospheric Forensics Research Group, (Gibson), the Spatial Intelligence for Health Knowledge Lab (Rainham) and the Biology Laboratory (Russell). In-kind contributions were also provided by the Pictou Landing Native Women's Group.

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Picture Unavailable

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1. Introduction

Mi'kmaw peoples have lived in Mi'kma'ki (now frequently referred to as the Canadian Maritimes) for hundreds of generations. It is where our Mi'kmaw origin stories begin and where we, the Mi'kmaw people, continue to raise our families and live on the land. For those of us from Pictou Landing, A'se'k is "the other room." This tidal estuary is commonly known today as Boat Harbour, Nova Scotia. But historically, A'se'k was our gathering place that exemplified our Mi'kmaw ethic of sharing: food, knowledge, and skills were exchanged there between generations and amongst family groups (see www.plfn.ca).

A'se'k and its recreational, physical, mental, spiritual, and emotional purposes have been compromised since a pulp and paper mill was built nearby and began dumping its effluent into this cherished body of water. For nearly 50 years, we – our Elders, our leaders, all of us – have been trying to redress this environmental and social injustice.

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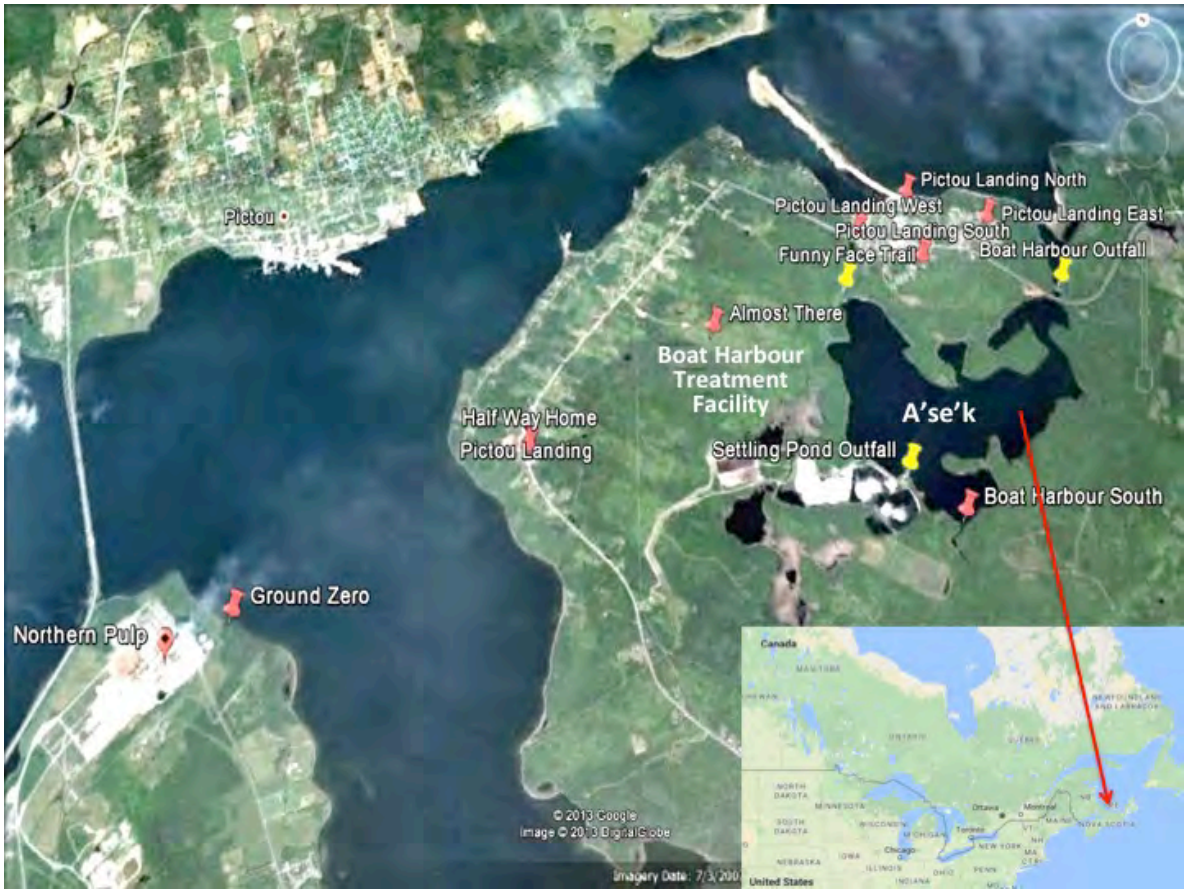
In 2010, the women of the Pictou Landing Native Women's Group (PLNWG) mobilized as a result of our health and environmental concerns related to Boat Harbour, and it is

due to this initial collective and continual effort to organize that the research described in this report was carried out.

To date, more than 200 studies have been completed to learn about what contaminants are in Boat Harbour, of which about 80 studies are relevant today (Nova Scotia Government, 2015). A review of the research that has taken place found that "very few reports" contained information about air, sediment, soil, game animals, vegetation, human activity patterns, fish and shellfish eating habits, and non-human living organisms on land and in water (DCL [2012] as cited in Hoffman et al., 2015).



Scholar Michael Mascarenhas (2007) observes, "whether by conscious design or institutional neglect, [First Nations] communities face some of the worst environmental devastation in the nation" (p. 570), and Boat Harbour is evidently an example of the environmental injustice and health inequity that he describes. The effects of the pollution on the surrounding land, air, soils, and water are not fully known and understood; "while consultants' reports exist, they are patchwork at best, limited by time and resources, lacking in longitudinal quality, and difficult to access, much less interpret" (Castleden & Bennett, 2011).

A Brief History of the Pulp and Paper Mill at Abercrombie Point

In 1957, Scott Paper Company Ltd. acquired lands at Abercrombie Point and established a kraft pulp and paper mill there. In 1967, the mill began operating and dumping its effluent (wastewater) into Boat Harbour; it continues to do so today at a rate of approximately 85 million litres per day (Jacques Whitford Environment & Beak Consultants, 1992). The effluent from the mill was dumped directly into Boat Harbour without being treated until a treatment plant was built on Simpsons Road adjacent to Pictou Landing First Nation in the early 1970s (Nova Scotia Government, 2015). Even so, Scott Paper admitted in a brochure mailed to all Pictou County households in the fall of 1989 that the mill equipment was largely of 1967 technology and, in terms of air emissions, was not designed to meet modern mill standards (Reid, 1989).

Industrial operations like those at the mill at Abercrombie Point involve two stages – kraft pulping and bleaching. Kraft pulping and bleaching typically consume huge amounts of fresh water and considerable quantities of chemicals, meaning the wastewater from the kraft bleaching processes contains various toxic chemicals such as dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), hydrogen sulfite, and mercury (Pokhrel & Viraraghavan, 2004). The Nova Scotia Government acknowledges that there are dioxins and furans in Boat Harbour (2015).

Wastewater treatment at Boat Harbour happens in two stages (previously three; see Stantec, 2004). Once effluent is delivered to the treatment facility by pipeline, primary treatment takes place in the settling basin followed by secondary treatment in the aerated stabilization basin before the water is released into Northumberland

Photo Credits: University of King's College Journalism (2009)

Strait (Stantec, 2011). In 2015, an industrial approval included three main conditions for Northern Pulp (the company that eventually bought Scott Paper): (1) lower annual emission limits for particulate matter and sulfur dioxide beginning January 2016; (2) stack testing of recovery and power boilers doubling to four times a

year; and (3) a restriction of water use, which would lead to a 35% reduction of effluent being dumped into Boat Harbour on a daily basis, and a subsequent 25% reduction by 2020 (Hoffman et al., 2015). After appeals by Northern Pulp about these conditions, a final decision was released in February 2016, which included revisions to the third condition (see Miller, 2016).

Pulp and Paper Mill and Government Interactions with Pictou Landing First Nation

Concerns about how the mill's operations impact the land, air, soil, and water have been expressed since its establishment. Yet Nova Scotia has repeatedly granted approval to the mill to continue its operations. A timeline of interactions between the mill, the province, and Pictou Landing First Nation is presented in Table 1.

Table 1
Pulp and Paper Mill and Government Interactions with Pictou Landing First Nation (Adapted from Hoffman et al., 2015 and New Glasgow News, 2010)

1964	Scott Maritimes decides to build a pulp and paper mill at Abercrombie Point.
1965	Pictou Landing First Nation Chief and Council state concerns about odour. The province and Scott Maritimes take them to a similar mill site in Saint John, New Brunswick, to show another mill with no odour (it was not operating at the time). An agreement-in-principal is signed.
1965	Soon after, a resolution is signed for a lump sum payment of $60,000 to Pictou Landing First Nation for permanent loss of fishing and hunting revenue and other benefits derived from land/estuary use, with a final settlement subject to further negotiations between the province and Indian Affairs.
1967	Mill begins operating.
1986	Pictou Landing First Nation begins action against federal government for breach of fiduciary duty in Boat Harbour.
1991	Federal government negotiates settlement with Pictou Landing First Nation. Province promises to abate adverse effects of effluent when agreement expires in 1995.
1993	The federal government and Pictou Landing First Nation agree to settle out of court for $35 million.
1995	No alternative effluent treatment site identified before agreement expired. Province promises closure of Boat Harbour by December 2005.
2004	Mill ownership transferred to Neenah Paper.
2005	Province and mill request extension to December 2008.
2008-2009	Band Council Chief meets with negotiator and advises province that they will not agree to further licence extensions. Meetings halt following provincial election. When talks resume, transportation minister requests more time to study issues.

Table 1, cont.

2008	Province asks Pictou Landing First Nation not to protest extension of licence to December 2008 and promises not to extend it without consultation, but province extends licence after December 2008 on a month-to-month basis.
2010	Pictou Landing First Nation asks province to terminate licence, effective June 30. After no change, a lawsuit is filed against province and mill.
2014	Effluent leak sparks protest by residents seeking a commitment from province for firm deadlines to find an alternative location for mill's effluent and remediation of Boat Harbour. Pictou Landing First Nation Chief and Nova Scotia's Minister of Environment sign an agreement. Government commits to legally implementing a timeline to stop flow of effluent into Boat Harbour and site's remediation by June 30, 2015. Clean the Air concert raises awareness about mill's emissions. Public consultation on behalf of mill for public to voice opinions related to mill's industrial approval renewal application. Smoke stack precipitator shutdown triggers ministerial order requiring the mill to install new air pollution equipment by May 2015.
2015	New industrial approvals issued by Nova Scotia Environment for improvements in air emissions, water use, and effluent. Mill immediately appeals new industrial approvals claiming that they are tougher than rest of the pulp and paper industry emission standards. US company hired to supply and install new air pollution equipment pulls out of $22 million project before completion. *Boat Harbour Act* is passed, stating that the Boat Harbour Effluent Treatment Facility will close by 2020.
2016	Northern Pulp appeals the industrial approval issued by the province. Nova Scotia subsequently amends its conditions, and Northern Pulp drops the appeal. Nova Scotia court issues a fine to Northern Pulp in the amount of $225,000 for the company's effluent spill in 2014. Of this amount, $75,000 will go to the Mi'kmaw Conservation Group, $75,000 to the Pictou County Rivers Association, and $75,000 to eligible recipients in the area, including residents of Pictou Landing First Nation.

Developing a Community-Academic Research Partnership

After discussions with the Nova Scotia Native Women's Association president, **Cheryl Maloney**, the PLNWG invited **Diana "Dee" Lewis**, a Mi'kmaw woman from Sipekne'katik First Nation with graduate-level training in environmental studies, to

discuss the women's concerns and what could be done about them. Early on, there was discussion about traditional knowledge and the traditional uses of Boat Harbour, and the potential of oral histories and community mapping as ways of exploring this further. With the PLNWG's permission, Lewis then invited **Dr. Heather Castleden**, a community-based participatory Settler (non-Indigenous) researcher from (then) Dalhousie University with 15+ years experience working with Indigenous peoples, and **Ella Bennett**, her Settler graduate student, to meet with the PLNWG in the community in November 2010 to discuss the future of PLNWG's interests in research and action about Boat Harbour. Discussion continued about how some of the questions the PLNWG had about Boat Harbour could be answered through Dee's doctoral research and Ella's Master's research (see Figure 1).

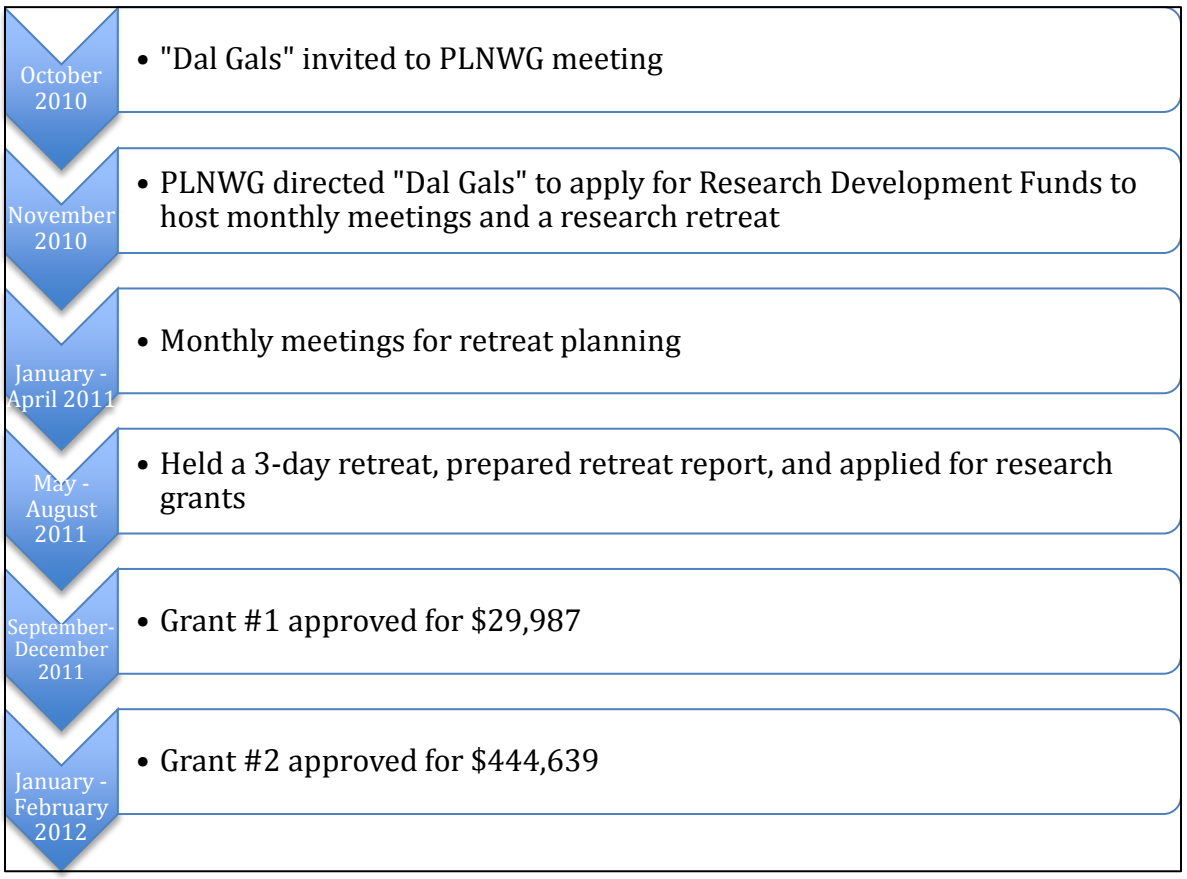


Figure 1. Timeline of our early research partnership.

At this November meeting, three key components of a research relationship between the PLNWG and the trio of researchers, who became known as "the Dal Gals," emerged:

1. The community's health must be the number one priority of the research;

2. The research partnership should result in transparent and impartial research with direction coming from the women, but with the consideration of all community members' input; and
3. The research must have a focus on capacity-building, including training community researchers and involving students from the community.

The research relationship began with meetings that had an atmosphere where the women could share their concerns and goals for community health and wellbeing, as well as discuss ways to move forward on positive environment and health reform; in other words, we "spent the first year drinking tea!" (Castleden, Sloan Morgan, & Lamb, 2012, p. 16).

From the beginning, the research partnership sought to embody what are known as the "4 Rs" of research (Kirkness & Barnhardt, 1991): to be relevant, respectful, responsible, and carry out reciprocal research, with shared decision-making about and ownership of the research plan, the information we collect, how we analyze and make sense of what we collect, and how/when results are shared with others.

Following direction from the PLNWG, Heather applied for and received funding to hold a research retreat (Grant #1). Then, after the first research retreat, and with guidance and support from the PLNWG, Heather led a second grant submission to the Canadian Institutes of Health Research (Grant #2). Included on the team were other researchers: **Dr. Rob Jamieson** (Dalhousie University), **Dr. Mark Gibson** (Dalhousie University), **Dr. Daniel Rainham** (Dalhousie University), **Dr. Debbie Martin** (Dalhousie University), and **Dr. Ron Russell** (Saint Mary's University). The PLNWG and university researchers were then awarded Grant #2 to explore the question: "Is Boat Harbour making us sick?" using Indigenous and Western approaches to the research design.

The approach to health within this community-based project was wholistic; it did not solely focus on physical health like previous research, but equally looked at mental, spiritual, and emotional wellbeing. Central to the project and research partnership was the guiding principle of Two-Eyed Seeing (Figure 2, below).

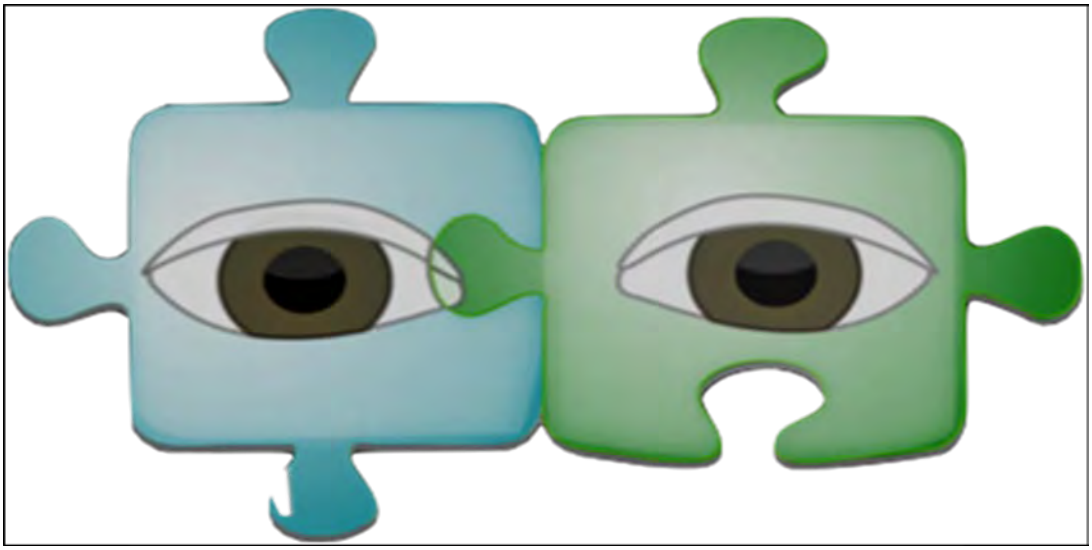


Figure 2. Two-Eyed Seeing illustration (reprinted with permission of Dr. Cheryl Bartlett from http://www.integrativescience.ca/Principles/TwoEyedSeeing/).

The concept of Two-Eyed Seeing is attributed to Mi'kmaw Elders Albert and Murdena Marshall, who live in Eskasoni First Nation, and their colleague Dr. Cheryl Bartlett, a professor emerita of biology and former Tier 1 Canada Research Chair in Integrative Science. Two-Eyed Seeing is "learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing… and learning to use both these eyes together, for the benefit of all" (Bartlett, Marshall, Marshall, & Iwama, 2015, p. 280). Two-Eyed Seeing has been central to the project as the PLNWG and their university partners have sought to conduct relevant, respectful, responsible, and reciprocal research.

2. Research Retreats

Research retreats were held, approximately annually, over the course of the community-university partnership as a means to strengthen and maintain good relationships between all team members and as spaces where important decision-making about the project occurred. Each retreat served different purposes, balancing relationship-building with research design, knowledge sharing, and reporting of findings. They were held in multiple places in Nova Scotia (Halifax, Tatamagouche, Truro) across the life course of the project. Each retreat is briefly described below. Retreat Reports for the first, third, and fourth retreats can be downloaded from www.heclab.com.

First Research Retreat (2011)

"We have the voice, we need the steps to move forward… that's called empowerment."

The first PLNWG Research Retreat was funded through a grant awarded by the Nova Scotia Health Research Foundation. The retreat was titled *Epitik Mawi-ta'jik* and took place from April 29 to May 1, 2011, in Kjipjutuk (Halifax), and it was an important outcome of the evolving research partnership. Six academics and professionals from Atlantic Canada were invited to share their knowledge and expertise with the PLNWG. The retreat gave women from the community the opportunity to gain knowledge, share their concerns, and discuss relevant and accessible research priorities for the future.

Specifically, the goals as stated in the Retreat Report (Castleden & Bennett, 2011) of the *Epitik Mawi-ta'jik* were to:

1. Provide an opportunity to share and discuss community-relevant concerns of environment and health in an inclusive, multi-generational, and female-centred forum;

2. Increase the environmental and health literacy of retreat participants, especially as pertaining to Boat Harbour;
3. Allow participants to acquire and discuss information provided by invited panelists, who have particular backgrounds in environment and health fields; and
4. Establish goals and priorities for a continuing community-based participatory research partnership.

"We can't just respond to research, we need to be the drivers of it!"

"Our women are strong and tough and we're able to do it!"

After a night of social relationship-building, the women gathered for two days of learning and sharing, each day opening and closing with a prayer. The following panelists were invited to give presentations based on their relevant expertise:

1. **Deborah Carver** (*Executive Director of the East Coast Environmental Law Association*) discussed the legal issues surrounding Boat Harbour.
2. **Barbara Clow** (*Executive Director of the Atlantic Centre of Excellence for Women's Health and Associate Professor in the Faculty of Health Professions at Dalhousie University*) discussed the relationship between gender and health in the context of Boat Harbour.
3. **Debbie Martin** (*member of NunatuKavut and Assistant Professor in the School of Health and Human Performance at Dalhousie University*) presented on Indigenous rights and the importance of moving forward acknowledging that health should be examined from all four directions: physical, mental, emotional, and spiritual.

4. **Inka Milewski** (*expert marine biologist*) discussed health and environmental (in)justice.
5. **Daniel Rainham** (*Assistant Professor in the Environmental Science Program at Dalhousie University*) described how his approach could capture meaning and story in a map.
6. **Ron Russell** (*Associate Professor in the Biology Department at St. Mary's University*) presented the language needed to articulate possible impacts of the mill's effluent from a physical science perspective.

In addition to panelist presentations, there was a morning spent developing health and environmental literacy with retreat participants. With a comprehensive list of over 50 concepts, tools, and terms related to health and environment, this session allowed the women to acquire a strong foundation on which to build throughout the retreat and for their collaborative work in the future. Booklets of the terms were also provided for everyone to take home. The women who attended the retreat described it as being extremely important, and the momentum it generated carried forward next steps of the research relationship as established by the PLNWG (for example, the Environmental Health Survey and the submission of Grant #2 to the Canadian Institutes of Health Research).

Second Research Retreat (2012)

"I suffered a lot of injustice, but now in this room, I feel empowered."

The second PLNWG Research Retreat was held at the Tatamagouche Centre (April 28-29, 2012) to establish a good mind and heart across the team. It included prayers, ceremony, and sharing circles; shared food and meals; a traditional medicine walk and an archaeological walk; a screening of the CBC documentary about Boat Harbour; shared laughter and tears, bowling and bonfires; a review of OCAP,[1] TCPS2,[2] and the 4 Rs of research; and the development and confirmation of a Research Agreement. The research team members were taught by invited Elders **Albert** and **Murdena Marshall** from Eskasoni First Nation and **Dr. Cheryl Bartlett** (Professor Emeritus at Cape Breton University) about the Guiding Principle of Two-Eyed Seeing (see end of Introduction for a definition of Two-Eyed Seeing).

[1] Standing for ownership, control, access, and possession, OCAP asserts that First Nations control research in their communities and that they own the information and determine how it will be used. OCAP® is a registered trademark of the First Nations Information Governance Centre (www.FNIGC.ca).

[2] The TCPS2 is the second edition of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.* A joint policy of Canada's three main federal granting agencies in health, social sciences, and natural sciences, it is informed by international ethics practices and provides guidance to researchers working with people.

Indigenous scholar David Newhouse (2008) speaks of the Haudenosaunee concept of Ganigonhi:oh ("a good mind") in regard to the balance between passion and reason; researchers need to balance these as they navigate institutional, professional, personal, and community interests. Participants in the second retreat discussed approaching research with "a good mind" in terms of researchers' roles in water and air sampling, the progress that had been made, and the challenges they encountered. Ron Russell and **Rob Jamieson** also delivered updates on ecotoxicology and water respectively, and Daniel spoke about the status of the community map.

"We don't know how healthy our medicines are – we're afraid to go and collect them."

"This is all I ever wanted: the chance for people to speak up… to be able to sit together and get out feelings out… it's so powerful."

Third Research Retreat (2014)

The third PLNWG Research Retreat was titled *Sharing What We Were Learning: Where We've Come From, Where We Are Going* and took place March 1 and 2, 2014, in Kjipjutuk (Halifax) with 28 women in attendance. The first morning began with a welcome, introductions, and an overview of the research partnership provided by **Sheila Francis** (President, PLNWG) and **Heather Castleden**. **Dee Lewis** gave an update on the Environmental Health Survey, which had concluded on December 31, 2013. There was discussion about the potential for a documentary film about the overall project.

Three things emerged from the discussion about what stories the film could tell: (1) the history of Pictou Landing First Nation and the important role A'se'k played for the community; (2) the unjust placement of the Treatment Facility in the 1960s and broken government promises since then; and (3) the impact of the pollution and loss of use of the land, especially the reverberating impacts on younger generations.[3]

Jordan Francis, a student from Pictou Landing First Nation, and her supervisor, **Irena Knezevic**, presented on a project Jordan had been working on since the previous summer. Jordan's project, part of a larger one conducted through the Food Action and Research Centre (FoodARC) at Mount Saint Vincent University, involved Storysharing and Photovoice sessions with 18 participants. The results of the project showed that the community of Pictou Landing as a whole struggles to obtain affordable, nutritious food and that Boat Harbour has contributed to this struggle because people have felt they don't have access to food from the land since the estuary began receiving wastewater. Jordan also reported that people are hesitant to grow their own food because they don't trust the soil. This research led to the addition of soil sampling to the overall Boat Harbour project.

[3] In 2014-2015, the PLNWG decided to carry out soil analysis in backyards out of interest in having individual and community gardens. The funds allocated to the film were redistributed to do the (expensive) soil analysis. In 2016, Heather and the PLNWG applied for additional funds to complete the film but the application was not successful in the funding competition.

Kim Strickland and **Colleen Denny** delivered a presentation titled *A Day in the Life of a Community Researcher,* in which they talked about their critical involvement in the project to keep things running smoothly. They described their roles in water sampling and air quality monitoring as well as the challenges they had experienced. They also explained how their families motivated them to do this work.

At the end of the first day a photobooth activity was organized where everyone was invited to complete the sentences "A'se'k is…" and "The Boat Harbour project is important to me because..." on a chalkboard and have their photo taken. After a full day, everyone headed downtown to enjoy dinner and a performance at the Grafton Street Dinner Theatre.

On the second day, Rob Jamieson presented on water quality testing he had completed and Ron Russell presented on the aquatic toxicity tests he'd conducted. Ron's results indicate that the water is acutely toxic to creatures, meaning the effects happen in the short term. Because Daniel Rainham and **Mark Gibson** regrettably could

not attend, **Emily Skinner** shared updates about the community mapping and air quality monitoring components of the project. The day concluded with a sharing circle to reflect on the retreat. **Trina Roache** from APTN (Aboriginal Peoples Television Network) also came by the retreat and conducted interviews with some of the women in attendance as part of a three-part television series about Boat Harbour.[4]

Fourth Research Retreat (2015)

The fourth PLNWG Research Retreat took place December 12 and 13 in Wékopekwitk (Truro), Nova Scotia. The PLNWG arrived in the morning on December 12, and the day began with the opportunity to review a draft of this Final Project report as well as a draft Environmental Health Survey Community Report. The meeting opened with a prayer led by **Jackie Alex** as well as a song and drumming by Mi'kmaw filmmaker **Catherine Martin**. With two full days ahead of the group, it was important for the meeting to start, as all other meetings and retreats had, with allowing those present to enter discussions with open hearts and open minds. **Mary Irene Nicholas** also welcomed the group and noted that while this retreat would be the last one held specifically for this project, it signified a new beginning, not an ending.

Heather and Dee began the presentations with an oral history update – Dee had conducted three more in the fall of 2015. They also screened a short film that Ella had made, which was a collage of oral histories about Boat Harbour. The PLNWG decided to make the film available online through the HEC Lab website as well as Pictou Landing First Nation's website. Dee then presented findings from the Environmental Health Survey. The PLNWG offered comments and discussed the benefits and compromises of using microdata from provincial and regional databases, comments which Dee indicated she would continue to consider as she finalized the Community Report.
The afternoon consisted of a Science Panel, comprising Daniel, Rob, Mark, and Ron. Daniel began the panel by illustrating what the community map is capable of showing by turning layers "on" and "off," and in doing so communicating different information around land use and the project. The decision to make the map a legacy of the project was reconfirmed, meaning it will only be editable by way of request to Daniel. The second panellist, Rob Jamieson, reiterated findings from the water quality analysis and reported, for the first time, findings from the soil quality analysis. Mark Gibson delivered an update on the air quality analysis, which included more recent data sets from spring and summer 2014 and the modelling of pollutants. Ron concluded the panel by presenting the ecotoxicology aspect of the project, reiterating his aquatic toxicity report and reporting on the chemical analysis he also conducted. At the time of the retreat, the mammal analysis had not been completed. Throughout discussions

[4] The APTN series can be viewed here: http://aptn.ca/news/2014/03/26/pictou-landing-researches-health-effects-polluted-harbor/.

during the Science Panel, the PLNWG emphasized their concern about the potential danger that the removal of sediment posed as well as perceived negative health impacts of the smell in the area: considerations in the context of future remediation and restoration processes.

At the end of Day 1, we held a sharing circle where participants reflected on the transformational path of this research and emphasized gratefulness for the time, resources, and spirit that each person contributed to this critical work. Retreat attendees then enjoyed dinner at Frank & Gino's who hosted us in their private room, making for a festive night of friendship and food.

On Day 2, Heather provided a budget overview of spending to date and what the remaining funds were committed to. The PLNWG reconfirmed the decision to pursue a documentary film; filmmaker Catherine Martin led the discussion to get a sense of possibilities for the film – as before, the women expressed it was a critical tool to document the story of the PLNWG mobilization and communicate Elders' stories about A'se'k. After the retreat, a grant application was submitted to the Canadian Institutes of Health Research. Unfortunately in July 2016 Heather received notice that the funding application had been rejected; however, there is the possibility of continued efforts to secure film funding.

Other opportunities for future collaborations were discussed, such as a way to connect Elders and youth in the community and the potential formation of a community-based Boat Harbour group, which would include men and youth as well as women. Heather and the PLNWG also took the time to discuss the Canadian Alliance for Healthy Hearts and Minds cohort project that Pictou Landing First Nation was invited to be a part of. It was decided that this would be an initiative taken on by Chief and Council, instead of the PLNWG.

Cecilia Jennings, Kim, and **Lexy Strickland** also presented on the Youth Camp's activities from summer 2015. They screened the youth's powerful and moving digital stories made by **Madison Nicholas**, **Hunter Francis**, and **Alexandria Francis**, as well as one by Cecilia. **Carter Hatfield** and **Laela Denny** also attended the camp. The stories will be made available on the HEC Lab website after the project's final Community Dinner.

In an emotional final roundtable discussion, there was an appreciation for the trust and sharing that this partnership enabled as well as pride in the work that had taken place with an eye forward on what would be next to come.

3. Oral Histories

Oral histories addressed topics of family heritage and future, health and wellbeing, childhood/youth of the storyteller, community, Boat Harbour, reasons for leaving or staying in Pictou Landing First Nation, and memories. The oral history interview guide was adapted from the Community-University Research Montreal Life Stories Project (2007-2012) at the Centre for Oral History and Digital Storytelling, Concordia University. In November 2011, **Ella Bennett** began to document oral histories to reconstruct what Boat Harbour was like before the mill opened. **Hayley Bernard**, while majoring in Mi'kmaq Studies at Cape Breton University, was awarded an undergraduate summer internship by the Atlantic Aboriginal Health Research Program and also collected several oral histories. **Dee Lewis** continued to record oral histories in the fall of 2015 and completed three as of this report's publication (September 2016).

Ella's graduate work, and Haley and Dee's continuing work, documenting oral histories offers Mi'kmaw perspectives on Boat Harbour from Elders who have lived through the loss of A'se'k and surrounding land. Many of the Elders discussed sharing practices in great length. Residents of Pictou Landing First Nation also spoke about the relationship between the pollution at A'se'k and the dramatic decrease of individual and community engagement with their lands and waterways. While sharing practices continue to function in Pictou Landing today and some people continue to engage in traditional harvesting activities (although usually away from Pictou Landing), it was clear from the Elders Ella spoke with that trust in food and medicines from the land has been significantly compromised (Castleden et al., in press). The Elders also suggested that the lack of engagement with the land is especially true for youth. Many youth do not hunt or fish or know what foods and medicines are available on the land where they're from and where they live because they have lost a place to engage in these activities. In this sense, the pulp mill and treatment facility have compromised the community's physical, sociocultural, emotional, and spiritual health and wellbeing.

Ella's thesis, as well as the transcribed oral histories, are available to the community by contacting Sheila Francis.[5]

A'se'k: All Seasons, All Purpose

"That was safe haven for all of us. Everything that we needed was there." ~Sadie Francis

A'se'k: After the Mill Went In

"Well, I guess they didn't want to put it anywhere else in town. Let's put it near the Indians – Native people close by, we'll dump it on them! … Let them deal with it. But it's always us that got dumped on. That's how they treated us I guess…" ~Mary Ellen Denny

A'se'k: No More

"Everything we used to do, we can't do. What we were brought up on, it's all been taken away." ~Don Francis

A'se'k: The Future

"I had a dream once. I dreamt it was clean, and our community became rich from it. And everybody worked together, in my dream…" ~Louise Sapier

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[5] Ella defended her thesis, titled *"We Had Something Good and Sacred Here": Restorying A'Se'k with Pictou Landing First Nation*, in June 2013 in Pictou Landing. It was the first time a Dalhousie University student defended a thesis in a Mi'kmaw community, and residents of Pictou Landing attended. At the defence, she also screened the short film she made that was a compilation of the oral histories she had documented; the film can be viewed online at the HEC Lab website as well as Pictou Landing First Nation's website.

4. Literature Review

Pulling the Plug on Boat Harbour: A Synthesis Review and Gap Analysis of Existing Environmental and Human Health Assessment Including Pictou Landing First Nation (1968-2007) by Ziyun Wang, Master of Resource and Environmental Management

Ziyun Wang, an international graduate student working with **Heather Castleden**, conducted a literature review in 2012 to determine what information about Boat Harbour existed and what was missing. Ziyun systematically reviewed and synthesized 70 government-funded and industry-produced environmental health studies published between 1968 and 2007. Her synthesis focused on 29 reports about health impact assessment and risk assessment in the Boat Harbour ecosystem as they most closely related to the Pictou Landing Native Women's Group's concerns, and resulted in three areas of findings: (1) water quality, (2) air quality, and (3) remediation options.

1. The water quality synthesis includes findings from Health Canada as well as the Canada and Pictou Landing First Nation Joint Environmental and Health Monitoring Committee (JEHMC). JEHMC has been directly sampling from the community drinking water system with three production wells to fulfill Canada's mandatory Environmental Health Program for all Aboriginal communities. Community drinking water has been sampled twice a year and then compared to the Guidelines for Canadian Drinking Water Quality (Health Canada, 2014). The JEHMC also sampled weekly for bacteria between 1998 and 2004. The most recent report (2005) from the JEHMC (provided by the PLNWG) reported there were no negative impacts to the community drinking water quality. Earlier negative observations included a drop in groundwater level, which has led to elevated levels of lead and barium. In addition, there were four instances of bacterial contamination in community drinking water, most likely resulting from activities near the water supply wells or the distribution pipes.

2. In terms of air quality, very few site-specific air quality monitoring events had been conducted at the time of this review. There is therefore very little information available on air pollutants in and around Boat Harbour. Starting in 1991, Nova Scotia Environment began monitoring total reduced sulfur in Pictou County, and the mill implemented additional emission controls in that same year. In February and July of 1995, Environment Canada assessed the levels of dioxins and furans in the ambient air in Pictou Landing First Nation to address community concerns about smog. Environment Canada's (1996) study findings did not find elevated levels of dioxins and furans, so no changes in operations by the mill were required.

3. Remediation options have included the installation of a rock berm in 1991 to control fish kills in the estuary. The rock berm was partially removed in 1993. Two other options were suggested in the 1990s: (1) Diffusing the effluent from the Aerated Stabilization

Basin to the Mackenzie Head and a plan for shoreline remediation, and (2) Opening Boat Harbour to tidal flush (opening it up to the Northumberland Strait again). To date, none of the proposed remediation promises have been enacted.

Three key gaps were found through this review:

1. Legislation in Nova Scotia does not (and has never) required human health risk assessments. There was one conducted in 2004 regarding the decommissioning of the Boat Harbour Effluent Treatment Facility, but as with other assessment processes the focus was only on physical health.

2. Federal pulp and paper effluent regulations left a gap of more than 20 years for the mill to operate without wastewater quality control.

3. There has been little research on the effects of tidal flush on deep water ecosystems. The impact of sediment from Boat Harbour travelling out to the ocean is unknown, and it is likely to be a major one. It is thought that this would speed up the eutrophication process because diluted effluent would increase light availability, meaning algae would be able to grow. Eutrophication is the result of increased algae (and other plant growth) in a water body, which reduces the amount of dissolved oxygen that other life forms (e.g., fish) in the water need to live. To address the concern of sediment release, dredging could be performed; however, our review found literature stating it is likely that only 50% of contaminated sediment could be removed, and that if the wastewater continued to flow into Boat Harbour, then it would not be possible to complete the dredging.

5. Environmental Health Survey

Alaptmeg aqq mawte'meg mst gogwe'l klamon ula utan jajigkaktow/Looking and Gathering Everything so This Community Will Be Healthy – Identifying, Documenting, Mapping, and Mobilizing Environment and Health Knowledge in Pictou Landing: An Environmental Health Survey by Diana Lewis, PhD Candidate

The Environmental Health Survey (EHS) began development in 2010 soon after the Pictou Landing Native Women's Group (PLNWG) had been meeting regularly to fundraise for and support community and cultural activities and to discuss community priorities. They asked to meet with representatives of Dalhousie University to explore the possibility of working together on a health research project to determine whether the community was getting sick from Boat Harbour. The PLNWG envisioned developing a survey instrument that would move beyond anecdotal health stories to reliable data about the community's health.

The overarching goal of the door-to-door EHS was to assess community-wide concerns and perceptions of environmental impacts, health problems, and access to healthcare, as well as the impacts on traditional, cultural, and spiritual activities affecting residents of the community. Prior to the survey, no independent scholarly study had specifically examined the relationship between the environmental contamination at Boat Harbour and its influence on the health of the people who live in Pictou Landing First Nation (PLFN). The EHS serves as the focus of **Diana** (**Dee) Lewis**'s PhD research, and she led the survey development.

The gap in knowledge about Mi'kmaw health is, in part, due to the fact that while Statistics Canada regularly undertakes major national surveys on the health of Canadians, Aboriginal people living on reserve have often been excluded (Mi'kmaq Health Research Group, 2007). In 1997, the Assembly of First Nations began collecting data, developing the First Nations Regional Health Survey (RHS) for longitudinal study of First Nations and Inuit health, and it continues to do so today. The 13 Mi'kmaw communities in Nova Scotia participate in the survey, but the sample size for Pictou Landing is too small to disaggregate the data from the regional data set, and would not show statistical significance even if this were possible. Most importantly, the focus of the previous RHS survey was not on environmental health.

The definition of health used in the survey reflects the National Aboriginal Health Organization's definition that health is a balance between the "physical, mental, emotional and spiritual realms as well as the environment, culture, family, and community" (First Nations Centre, 2007, p. 1). The EHS was revised and adapted from the RHS and "Our Environment, Our Health: A Community-based Participatory

Environmental Health Survey in Richmond, California" (Cohen, Lopez, Malloy, & Morello-Frosch, 2012).

The PLNWG agreed to retain 140 questions from the two surveys which covered a wide range of health questions, including physical, mental, emotional, and spiritual health; as well, 157 new questions were added that were central to the cultural, intergenerational, and spiritual concerns of the community. Dee worked with the women over several months to ensure all of the questions they wanted included in the survey were there, and the questions, in relation to the needs of the community, would be answered. She also consulted with the "Science Guys," **Daniel Rainham, Mark Gibson, Rob Jamieson**, and **Ron Russell**, to include questions that would be helpful to them with their work. The final EHS was a 297-question, 70-page survey instrument that took 90-120 minutes to complete.

The survey collected demographic information (age, education, employment, income – Tables 2 and 3); residence (air quality in home, water quality); health (perceptions of health, chronic conditions, access to health care, skin conditions, allergies, cancers, family history); traditional, cultural, spiritual information (ability to practice, access); residential school attendance; experiences of racism; and measures of quality of life, perceptions, and beliefs. These questions, unlike the RHS, allowed us to get to household-level data, which was the goal of the PLNWG.

Dee trained PLNWG members to administer the household-level Environmental Health Survey, and data collection began in November 2012. The first round of community research assistants to conduct the survey with Pictou Landing residents were **Haley Bernard, Colleen Denny, Pam Denny, Jordan Francis, Sheila Francis,** and **Kim Strickland**. Seven additional surveyors were also trained in the fall of 2013: **Darlene Bachiri, Holly Francis, Sylvia Francis, Heather Mills, April Nicholas, Fran Nicholas,** and

Loretta Sylliboy. The survey concluded on December 31, 2013, with a total of 279 out of a potential 470 survey respondents – an exceptional 60% response rate.

Dee has been able to compare EHS responses with data reported in 2013 in *The Health of the Nova Scotia Mi'kmaq Population* (NS RHS), using Nova Scotia First Nations Regional Health Survey data from 2008/10. She is also using publicly available data from the 2012 *National Report on Adults, Youth and Children Living in First Nation Communities* (N RHS), using national First Nations Regional Health Survey data from 2008/10 (FNIGC, 2012). Dee requested and was granted access to Statistics Canada data at the Atlantic Regional Data Centre at Dalhousie University, including the Canadian Cancer Registry, the Canadian Community Health Survey, the Survey on Living with Chronic Disease in Canada, and the Maternity Experiences Survey. As she continues with her analysis of the data in her PhD thesis, she will compare these data to the EHS and identify trends.

Dee's full analysis will be reported in a complete *Community Report – Environmental Health Survey*. Here, we provide a brief overview of key findings.

Table 2
Environmental Health Survey – Demographics

Variable	Category	Frequency (Total)	%
Gender	Female	150	56
	Male	117	44
		(267)	(100)
Marital status (Adults only 18 years +)	Single, never married	89	51
	Married, common law	62	36
	Separated, divorced, widowed	22	13
		(173)	(100)
Ages	0-11	46	18.1
	12-19 years	47	18.5
	20-29 years	45	17.7
	30-39 years	42	16.6
	40-49 years	28	11.0
	50-59 years	26	10.2
	60 years and older	20	7.9
		(254)	(100)
Highest level of education completed (Adults only 18 years +)	Less than high school	66	39
	High school graduate	54	32
	College/trade school	40	24
	Bachelor	7	4
	Graduate	2	1
		(169)	(100)

Table 3
Environmental Health Survey – Employment and Income

Variable	Category	Frequency (Total)	%
Employment status (Adults only 18 years +)	Employed F/T	37	22
	Employed P/T or seasonal	41	24
	Unemployed	73	43
	Retired	6	4
	Never worked	12	7
		(169)	(100)
Income ($) (if working)	Less than 10,000	16	20
	10,000 to 19,999	23	28
	20,000 to 29,999	19	24
	30,000 to 39,999	13	16
	40,000 to 49,999	2	2
	Over 50,000	8	10
		(81)	(100)
Job category	Management/professional	13	13
	Administrative/sales	16	16
	Trade, transport, equipment operator	9	9
	Fishing, hunting, forestry, mining	24	24
	Care worker	5	5
	Student/Other (research, gardening, security, etc.)	32	32
		(99)	(100)
Source of income (if not working*)	Unemployment insurance	27	21
	Social assistance	59	47
	Pension/disability	8	6
	Child Tax Benefit/CTB and other	18	14
	Social assistance and other	7	6
	Education allowance/other	7	6
		(126)	(100)
If not working, why? (Adults only 18 years +)	Illness/disability	13	12
	Caring for family	19	17
	Seasonal layoff	13	12
	Retired	6	5
	No work available	26	24
	Student/other	33	30
		(110)	(100)

In surveys, self-reported health (Figure 3) is deemed a meaningful and reliable measure of current health that has been tested against mortality rates and results of clinical examinations. Beyond that, perceived self-rated health is accepted as a robust broad indicator of health status and wellbeing, incorporating the physical, emotional, and

personal aspects of health, and over the years it has maintained its reliability as a measure of current health. Moreover, self-rated health has been shown to be valid for use in different cultural groups including Indigenous populations, who have different perceptions of health based on a relational worldview (Chandola & Jenkinson, 2000; Sibthorpe, Anderson, & Cunningham, 2001; Strawbridge & Wallhagen, 1999; Wilson, Rosenberg, & Abonyi, 2011).

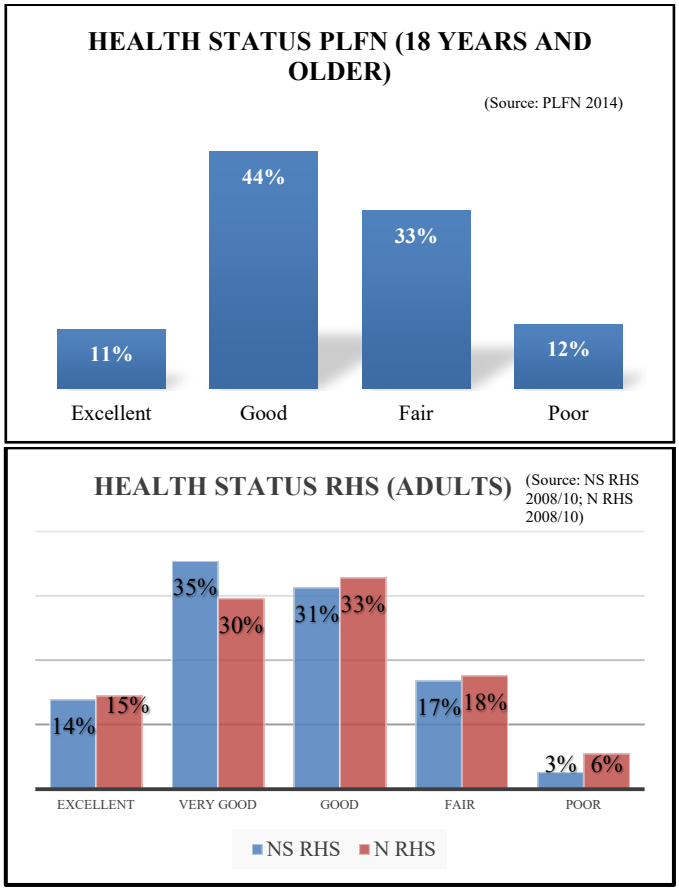


Figure 3. Environmental Health Survey – Self-reported health status (PLFN – Pictou Landing First Nation; NS RHS – Nova Scotia Regional Health Survey; N RHS – National Regional Health Survey).

For all adults aged 18 years and older in PLFN, 55% report their health as good to excellent compared to 81% of Nova Scotia First Nation adults on reserve and 77% of all First Nation adults on reserve nationally. Conversely, 45% of PLFN adult respondents report that their health is fair to poor, while 19% Nova Scotia First Nation adults on reserve and 23% First Nation adults on reserve nationally do.

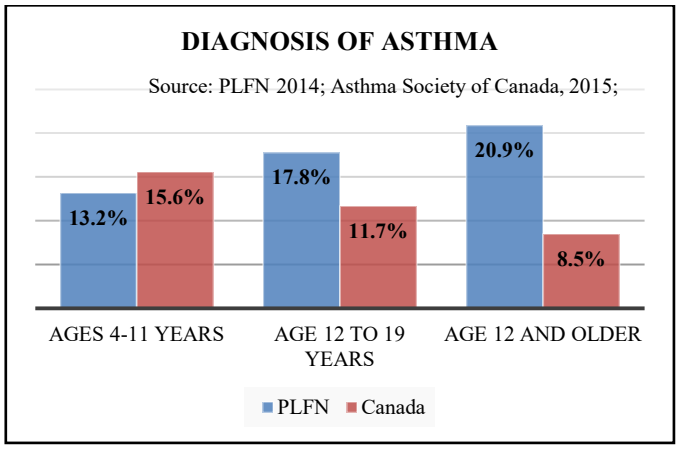


Figure 4. Environmental Health Survey – Asthma (PLFN – Pictou Landing First Nation).

According to the Asthma Society of Canada (2015), asthma is a disease of the lungs in which the airways become blocked or narrowed causing breathing difficulty. It is divided into two types: allergic (extrinsic) asthma and non-allergic (intrinsic) asthma. There are a number of potential causes, including heredity, the environment, and an impaired immune system. Risk factors (triggers) include a family history of asthma/allergies (including eczema and allergic rhinitis), exposure to tobacco smoke, mould, or pollen, and exposure to chemicals, odours, or pollution.

Figure 4 shows that younger Pictou Landing residents reflect similar percentages as other Canadians, but of PLFN youth aged 12 to 19 years, 17.8% have been diagnosed with asthma, compared to 11.7% of Canadian youth ages 12 to 19 years. Almost 2.5 times more PLFN community members age 12 and over have been diagnosed than in the general population. No one under the age of 4 has been diagnosed with asthma.

One trigger for asthma, as noted above, is mould or mildew in the home. Figure 5 shows that PLFN homes have more problems with mould and mildew than other First Nations communities.

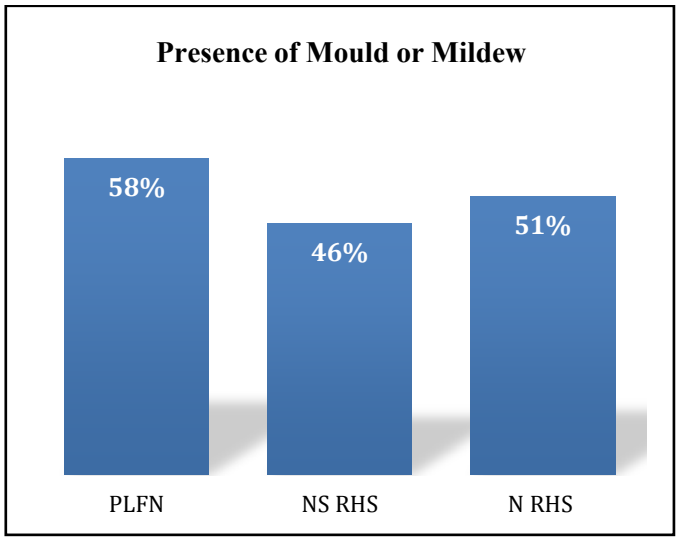


Figure 5. Environmental Health Survey – Mould or mildew in the home (PLFN – Pictou Landing First Nation; NS RHS – Nova Scotia Regional Health Survey; N RHS – National Regional Health Survey).

More than twice as many people from Pictou Landing do not think their water is safe to drink as compared to a national survey of Canadians (Figure 6, top chart). Consequently, more than 80% of PLFN respondents worry that the community water supply will impact their health (Figure 6, middle chart). As a result, 76% of respondents in PLFN drink bottled water compared to 71% of respondents on reserve nationally, and compared to 29% of Canadians in general (Figure 6, bottom chart).

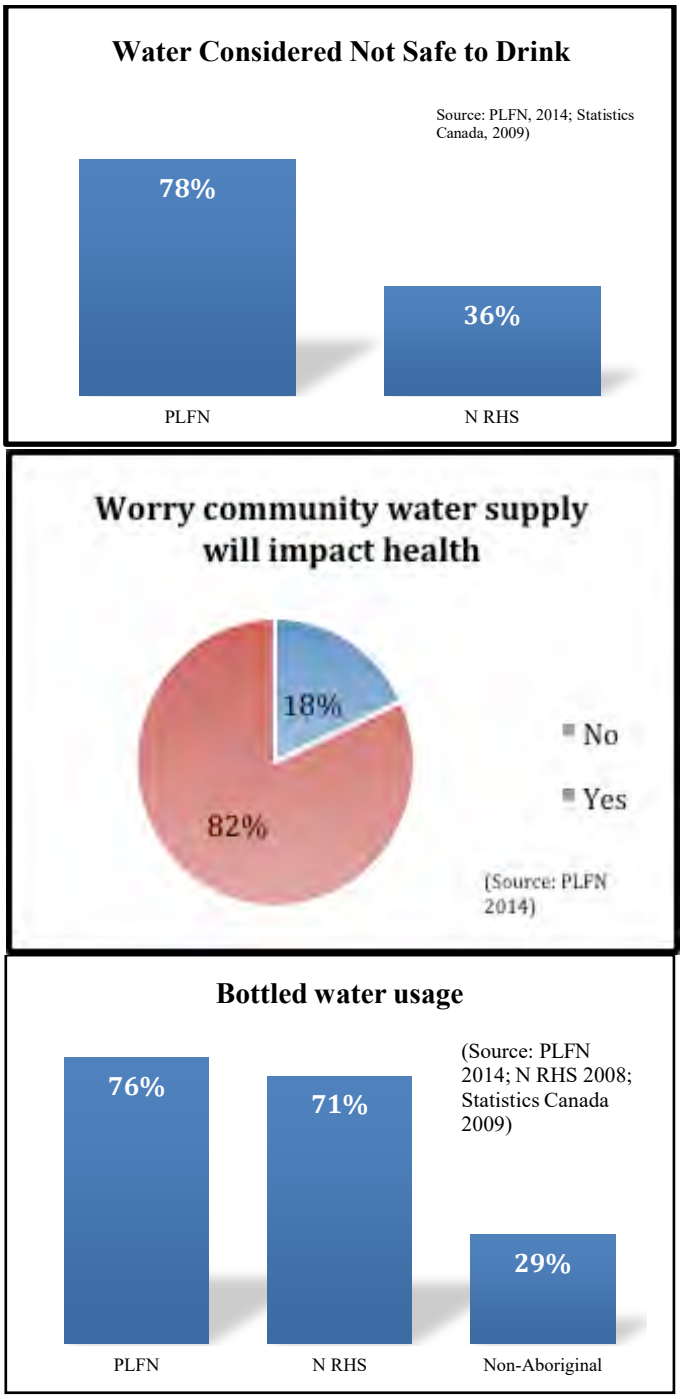


Figure 6. Environmental Health Survey – Safety of drinking water (PLFN – Pictou Landing First Nation; N RHS – National Regional Health Survey).

The Canadian Community Health Survey does not ask about mental health in the same way we asked about it in the EHS survey of PLFN members. However, when asking Canadians 12 years of age or older about their perceived mental health in 2013, 8%

report their mental health as fair to poor (Statistics Canada, 2013).[6] In comparison, 68% of PLFN residents of the same age report that they sometimes or often feel down or depressed.

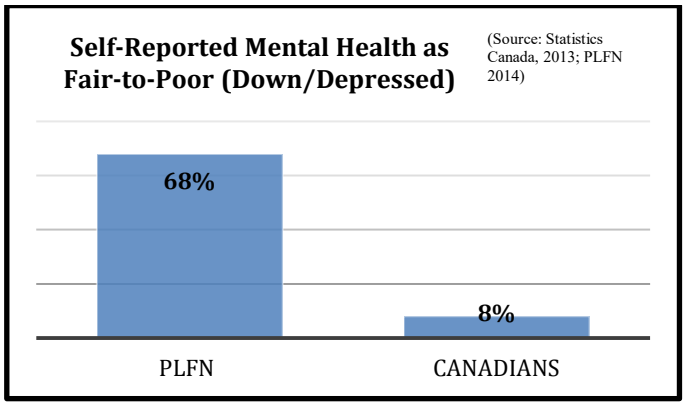


Figure 7. Environmental Health Survey – Mental health (PLFN – Pictou Landing First Nation).

Respondents were asked about whether they practise traditional activities now and whether they had practised these activities in the past (Figure 8) . All activities – use of traditional medicines, eating game, gathering shellfish and berries – showed a significant drop.

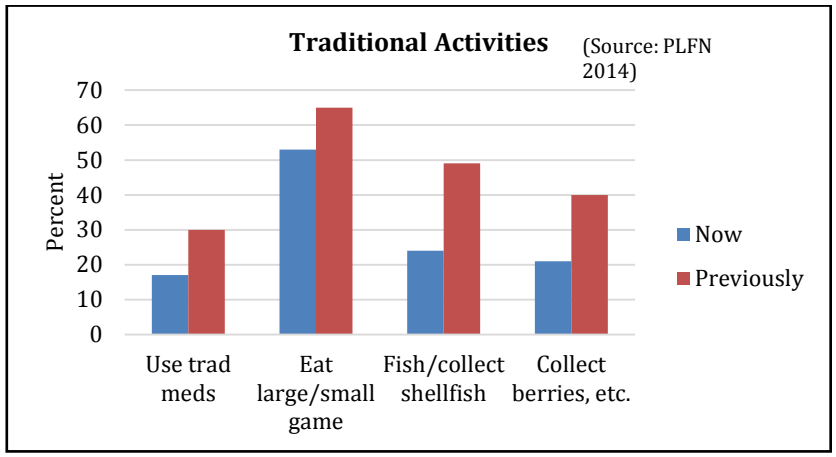


Figure 8. Environmental Health Survey – Traditional practices.

Figure 9 shows that 40% of PLFN members experienced racism in the past year. Racism, and the inevitable stress of being socially excluded, is damaging to health and wellbeing (Reading & Wien, 2009; Ziersch, Gallaher, Baum, & Bentley, 2011). Krieger

[6] Source: Statistics Canada, Canadian Community Health Survey. CANSIM table no(s).: 105-0501 (rates), 105-0503 (age-standardized rates).

(2001) defines racial discrimination as the process by which members of a socially defined racial group are treated unfairly because of membership of that group. Racism can occur at three levels – institutional, interpersonal, and internalized. It is important to understand how racism is constructed and practised, and rather than focusing on the disadvantaged position of the individual, it is also important to consider the impact of "whiteness and its associated privileges" and the inequity that produces (Durey, 2015, p. 197). Being subjected to discrimination and racism, it is now recognized (Castleden, Martin, & Lewis, 2016), has significant impacts on health.

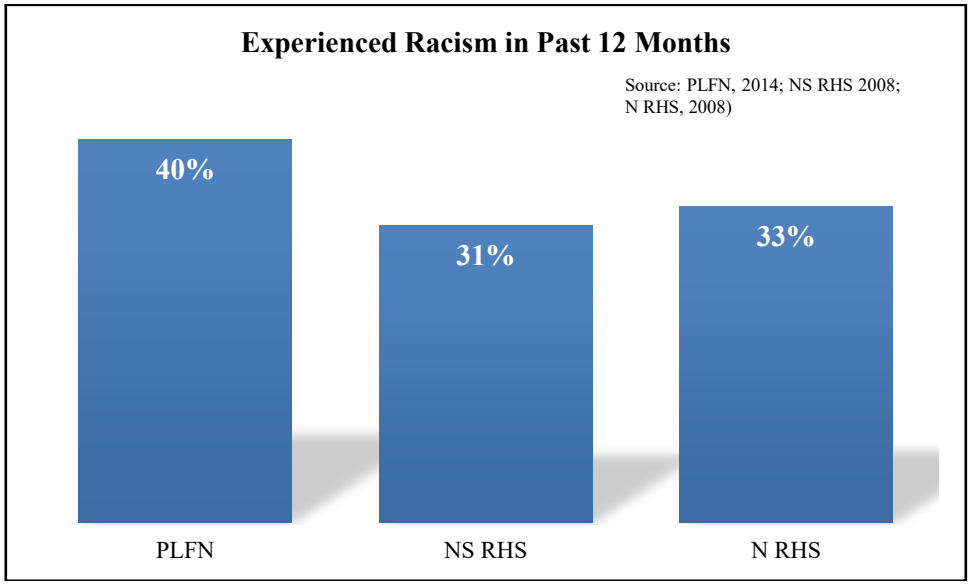
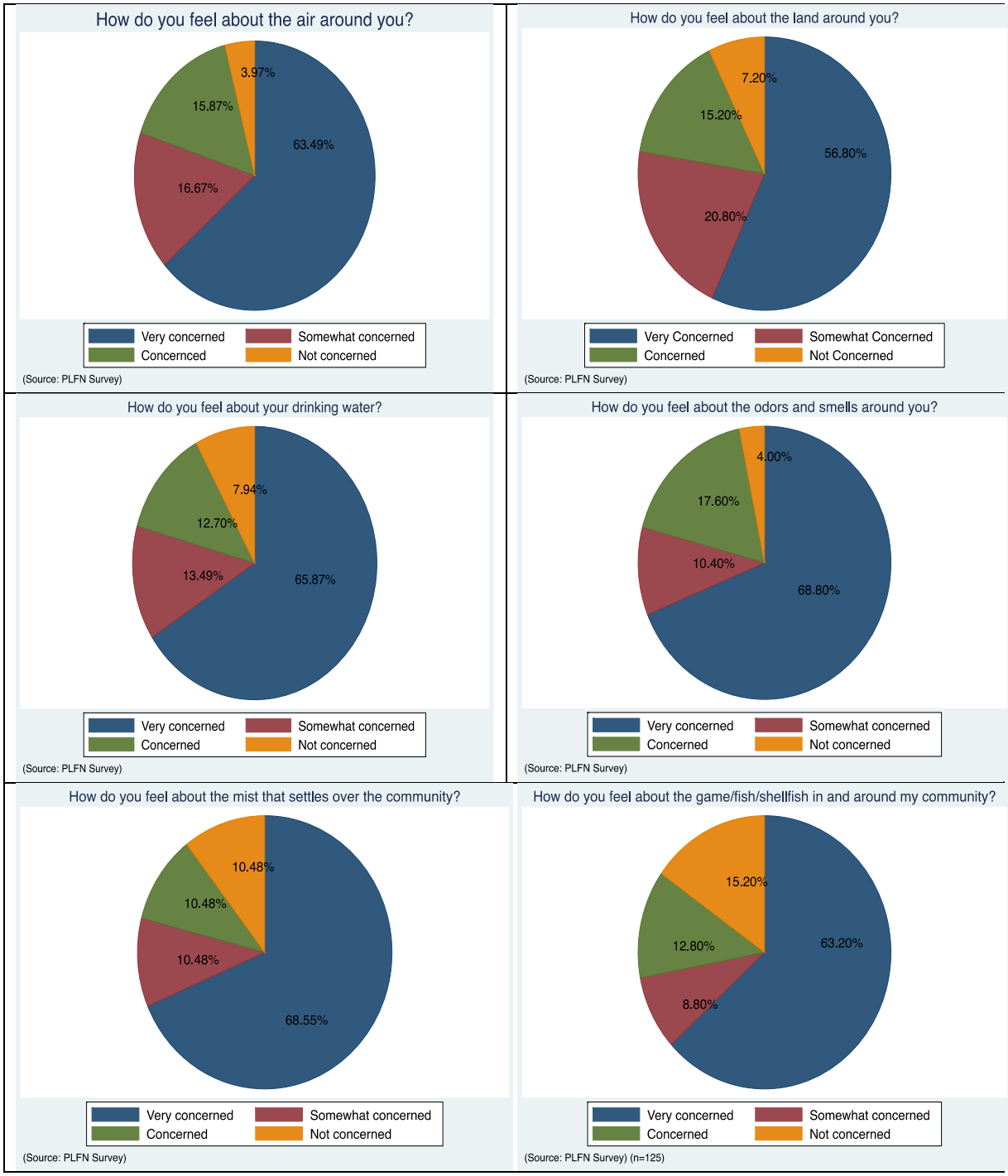
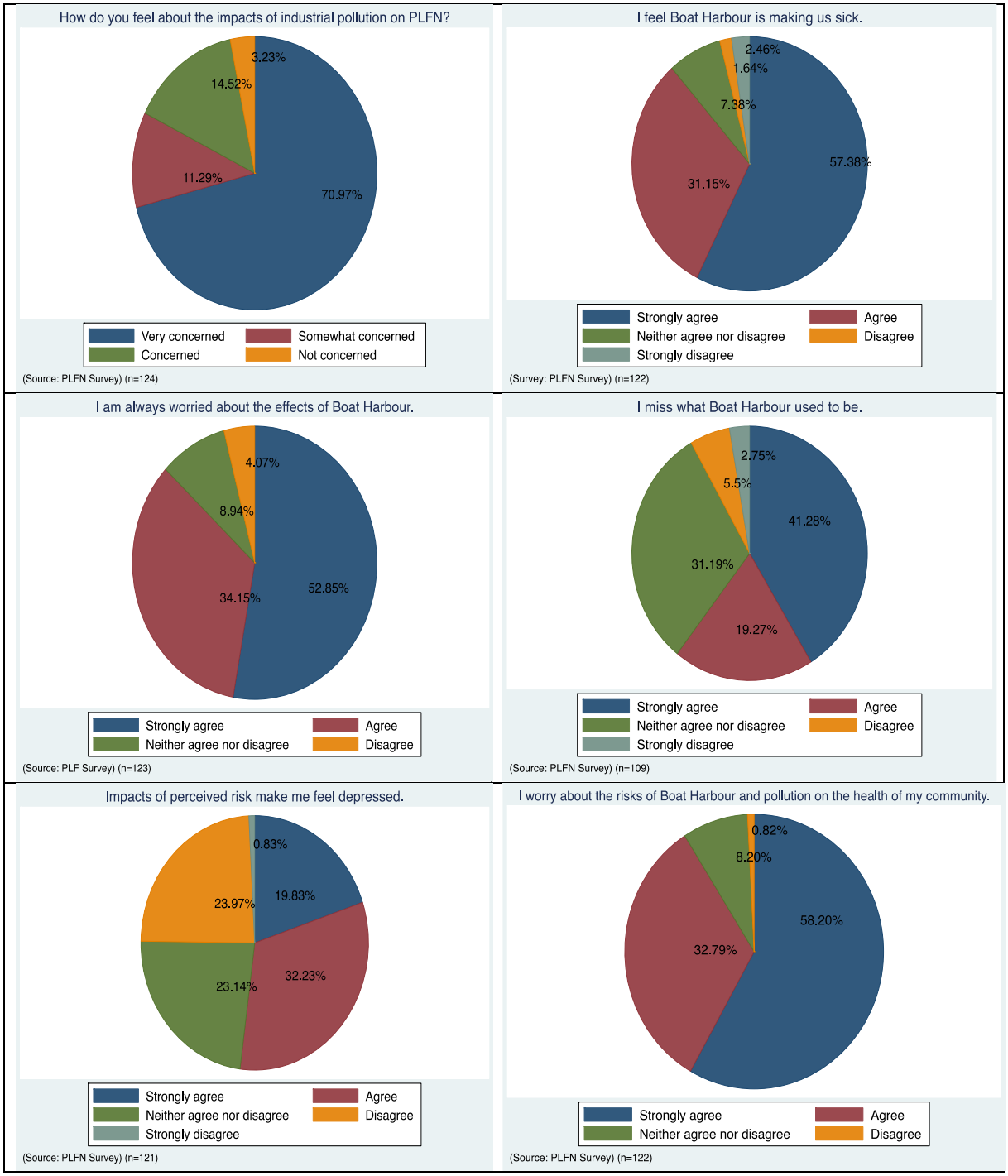


Figure 9. Environmental Health Survey – Racism (PLFN – Pictou Landing First Nation; NS RHS – Nova Scotia Regional Health Survey; N RHS – National Regional Health Survey).

During the collaborative development of the EHS survey questions, the PLNWG expressed concern about the air and water that surrounds their community, the odours that the members are exposed to, and the mist that settles on their land. We therefore developed the survey to determine whether the community as a whole was feeling the same types and levels of concern. As evidenced in the charts (Figures 10-21), it is clear that self-reported perspectives on their local environment convey a high level of concern and worry about the impacts that Boat Harbour is having on the health of the community through many different vectors, with most residents reporting that they agree or strongly agree that Boat Harbour is making them sick.



Figures 10-15. How do you feel about …?



Figures 16-21. How do you feel about …?

Summary

When we compare PLFN adult respondents' self-reports about poor health outcomes with those of other First Nations, both provincially and nationally, PLFN adults are reporting higher rates of poor health. Particularly worth noting is that more than half (approximately 60%) of adults in PLFN miss what Boat Harbour used to be when it was known as A'se'k, even though they may have not experienced A'se'k within their lifetime, having only heard stories that have been passed down to them over the years from their Elders.

Not only are PLFN residents experiencing poorer health outcomes compared to other First Nations, both provincially and nationally, they are at a disadvantage socioeconomically. The majority of households are headed by single parents, with a level of education at high school or less. Half the adult respondents 18 years or older are either unemployed or have never worked, and even if working, almost half exist on incomes below $20,000 a year. Almost half of the households in PLFN exist on social assistance alone. If, indeed, the pulp mill was brought to Nova Scotia to benefit the residents of the region, these benefits have clearly not materialized in the community that may be paying the highest price.

6. Air Quality

The Atmospheric Forensics Research Group's part of the project was led by **Mark Gibson** (Associate Professor, Department of Civil and Resource Engineering, Dalhousie University). PLNWG members **Kim Strickland** and **Colleen Denny** were hired as Community Research Associates to work with Research Assistants **Geoff Kershaw**, **James Kuchta**, and **Codey Bennett** to manage the monitoring equipment and to sample. Air quality data were collected during the summer of 2013, spring of 2014, and summer of 2014. Harsh winters and a loss of power to the equipment that needed electricity to run real-time measurements meant the winters of 2013 and 2014 were excluded, reducing data completeness. Once the air quality monitoring was completed, the results were compared to existing data and regulatory air standards.

A total of 13 samplers (11 passive samplers and 2 real-time samplers) were set up throughout the community to sample indoor and outdoor air quality (see Figure 22).

Figure 22. Map of passive and active air monitoring sites used during the air quality monitoring.

Passive Sampling

Eleven passive samplers were set up around Pictou Landing, Boat Harbour, and downwind between the mill and the community. Wind patterns, the terrain, and distance were all taken into account with site selection. Passive sampling requires the sample to be transported to a lab to be analyzed. Two passive air samplers were used: Ogawas and thermal desorption tubes (TDTs; Figure 23). Ogawas and TDTs were paired at all 11 passive sampling sites, where the Ogawas measured **ammonia, sulfur dioxide**, and **nitrogen dioxide**, and the TDTs measured **volatile organic compounds (VOCs)**.

Figure 23. Deployment of passive samplers: Ogawa (left) and thermal desorption tube (right).

Real-time Sampling

The real-time monitors were set up at two sites (Mary Ellen's and Geoff Hatin' Us) and included monitors called VRae, Dylos, and DustTrak, monitoring the air at the two sites for one week. Real-time sampling allows the sample to be analyzed at the sample location.

· VRae measured **ammonium, nitrogen dioxide**, **sulfur dioxide,** and **hydrogen sulfide** (rotten egg smell). A VRae real-time monitor was set up to measure carbon monoxide, hydrogen sulfide, oxygen, and ammonia but was unsuccessful due to a terminal malfunction of the instrument.
· The Dylos measured the **number of particles** smaller than 2.5 µm (called $PM_{2.5}$) and 10 µm (PM_{10}).

· The DustTrak measured the **concentration** of the tiny dust particles of 2.5 µm, which you breathe in but are too small to see (e.g., nitrogen dioxide, sulfur dioxide, and ammonia). The particles come from a mixture of natural and human-made sources (e.g., sea salt spray, wind-blown dust, wood smoke, smokestacks, vehicle exhaust, aerosolized droplets from the Boat Harbour lagoon).

One 48-hour real-time sample of **dioxins and furans** was taken at two sites. No dioxins or furans were determined in the air at Pictou Landing First Nation. According to the National Pollution Release Inventory (publicly available and self-reported data), Northern Pulp releases 0.008 g-TEQ (toxic equivalency) of dioxins and furans per year, which can be considered a very small amount similar to other industries that also emit dioxins and furans (Environment Canada, 2013). An attempt was made to model the emission of dioxins and furans from the Northern Pulp mill using the publicly available emissions rates. However, because the emission rate is extremely small (2.535×10^{-10} g/sec) the model could not run because the surface concentrations were so low and completely uniform across the model, including Pictou Landing First Nation. This further highlights the low air emissions of dioxins and furans that are reported as being released from Northern Pulp.

Results

Ammonia

The highest ammonia concentration was found at the Settling Pond Outfall, with the second highest ammonia concentration found at Ground Zero (see Figure 24). The lowest ammonia concentrations were upwind of Boat Harbour. This is reasonable evidence to suggest that the elevated ammonia found at the Settling Pond Outfall and at Ground Zero are due to emissions from the mill (Ground Zero) and Boat

Harbour treatment lagoon. However, the ammonia concentrations observed in Pictou Landing First Nation are well below any ambient and occupational exposure limits and do not pose any health concern (Alberta Environment, 2005) – see Table 4. Ambient standards were not found; therefore occupational standards were used here.

Table 4
Ammonia (NH_3) *Concentration Results*

Seasonal mean (average)		Total mean	Maximum NH_3 observed	Human health occupational exposure limit (8 hours)
Summer 2013	4.90 ppb			
Spring 2014	1.09 ppb	4.39 ppb	15.25 ppb	25 ppb
Summer 2014	3.18 ppb			

Figure 24. Spatial map of the average ammonia concentrations observed June 27, 2013 to July 31, 2014.

Sulfur Dioxide

The annual average **sulfur dioxide** concentration from Pictou Landing First Nation was 0.62 ppb, roughly double that found in Sydney and Cape Breton Highlands National Park, but still well below Canada's annual maximum air quality standard (22.9 ppb) – see Table 5.

Table 5
Sulfur Dioxide (SO_2) *Concentration Results*

Seasonal mean (average)		**Total mean**	**Maximum SO_2 observed**	**Canada's annual maximum air quality standard**
Summer 2013	0.70 ppb			
Spring 2014	0.41 ppb	0.62 ppb	5.56 ppb	22.9 ppb
Summer 2014	3.18 ppb			

The sulfur dioxide in Pictou Landing is likely not related to the Boat Harbour lagoon, but can be considered more of a background air pollutant carried from upwind sources that likely include some emissions from the mill and other local sources such as Michelin Tires and residential heating oil combustion.

A possible, but not definitive, reason for the increase in sulfur dioxide observed downwind of the mill is that stack plumes are impacting the ground as one moves away from the mill. This hypothesis is further supported because the prevailing wind is from the direction of the mill.

The sulfur dioxide concentrations are higher at the Boat Harbour Outfall (see Figure 25). This is an unexpected result as there are no strong sources of sulfur dioxide found at this site. However, it could be due to sea breezes carrying sulfur dioxide back onshore. Still, the sulfur dioxide concentrations observed across all sampling sites and sampling seasons are well below the US Environmental Protection Agency's National Air Quality Standards, even the 1-hour maximum level (75 ppb), and the Canadian Council of Ministers of the Environment Canada Wide Standard maximum annual acceptable amount (22.9 ppb).

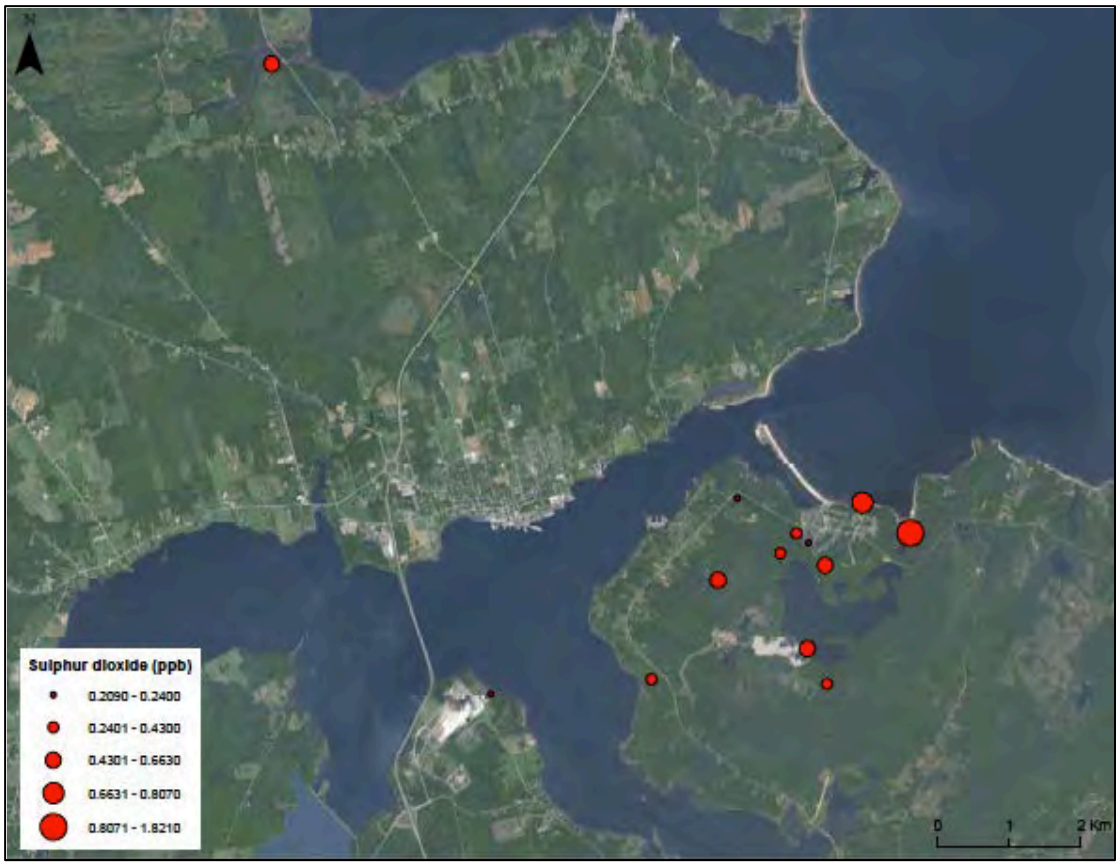


Figure 25. Spatial map of the average surface sulfur dioxide concentrations observed June 27, 2013 to July 31, 2014.

Nitrogen Dioxide

The nitrogen dioxide observed in Pictou Landing First Nation (see Table 6) can be considered to be similar to a city the size of Sydney, but still very low compared to larger cities in Canada that can experience nitrogen dioxide of approximately 10 ppb (metropolitan city roadways range between 22 ppb and 32 ppb; Brook, Dann, Galarneau, Herod, & Charland, 2014). As nitrogen dioxide is strongly linked to high-energy chemical reactions, for example, combustion of fuel for power, space heating, and transport, the nitrogen dioxide observed would be a mixture of background long-range transport into Pictou Landing First Nation likely combined with the mill, Michelin, New Glasgow, Trenton Power Station, residential heating and cooking, and local vehicle traffic. The highest average nitrogen dioxide (2.5-3.5 ppb) is found at the Boat Harbour aeration lagoon outflow (Settling Pond Outfall site; see Figure 26).

Table 6
Nitrogen Dioxide (NO_2) *Concentration Results*

Seasonal mean (average)		Total mean	Maximum NO_2 observed	Canada's maximum desirable annual average
Summer 2013	1.38 ppb			
Spring 2014	0.75 ppb	1.25 ppb	6.02 ppb	32 ppb
Summer 2014	3.18 ppb			

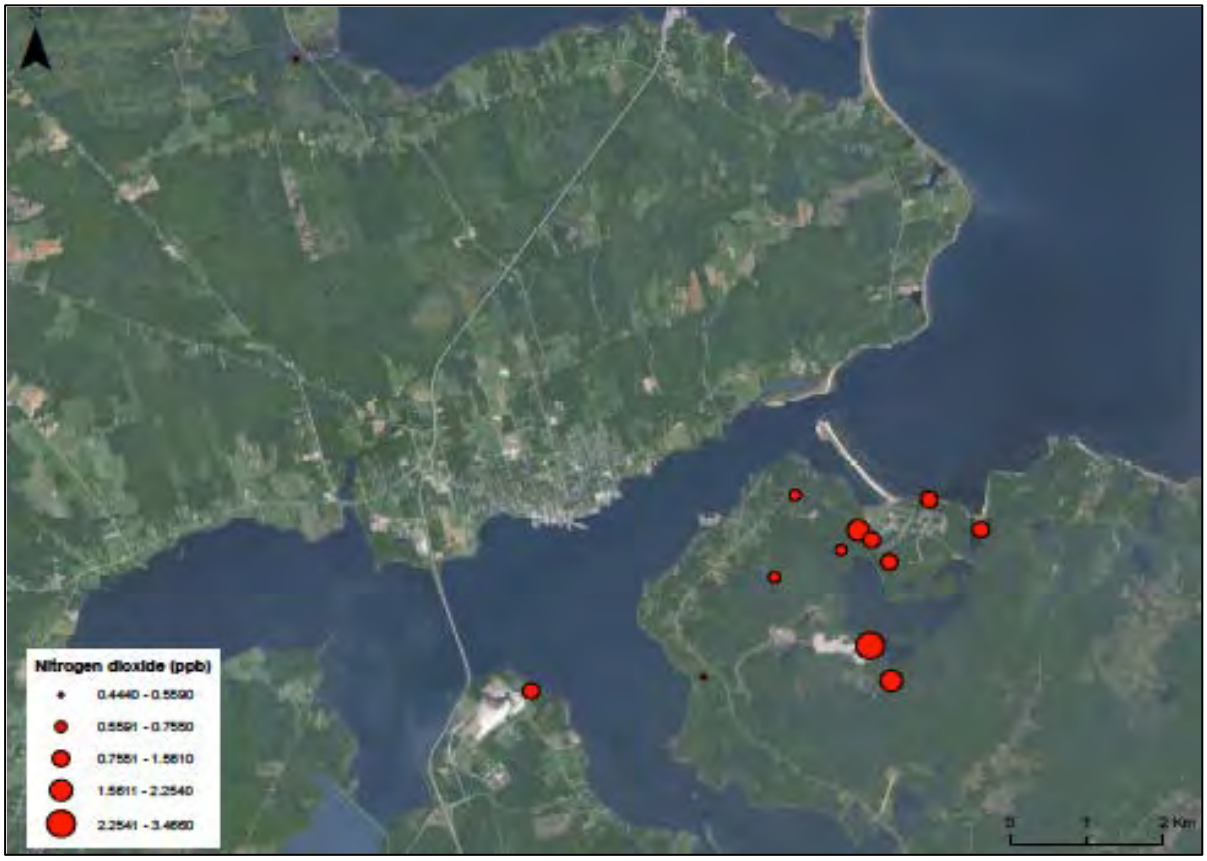


Figure 26. Spatial map of the average surface nitrogen dioxide concentration observed from June 27, 2013 to July 31, 2014.

As nitrogen dioxide is related to combustion, it is highly likely this is either diesel power equipment related to the aeration lagoon or lagoon service vehicles. The mean nitrogen dioxide concentrations are well below Canada's maximum desirable annual average regulations (32 ppb).

Volatile Organic Compounds

To help place the VOCs measured at Pictou Landing into context, two samples of VOCs were collected in Halifax August 17-24, 2013, and August 24-31, 2013, and compared with VOC samples collected between June 28 and July 4, 2013, at Boat Harbour Outfall and Caribou Control. The comparison is shown in Figure 27.

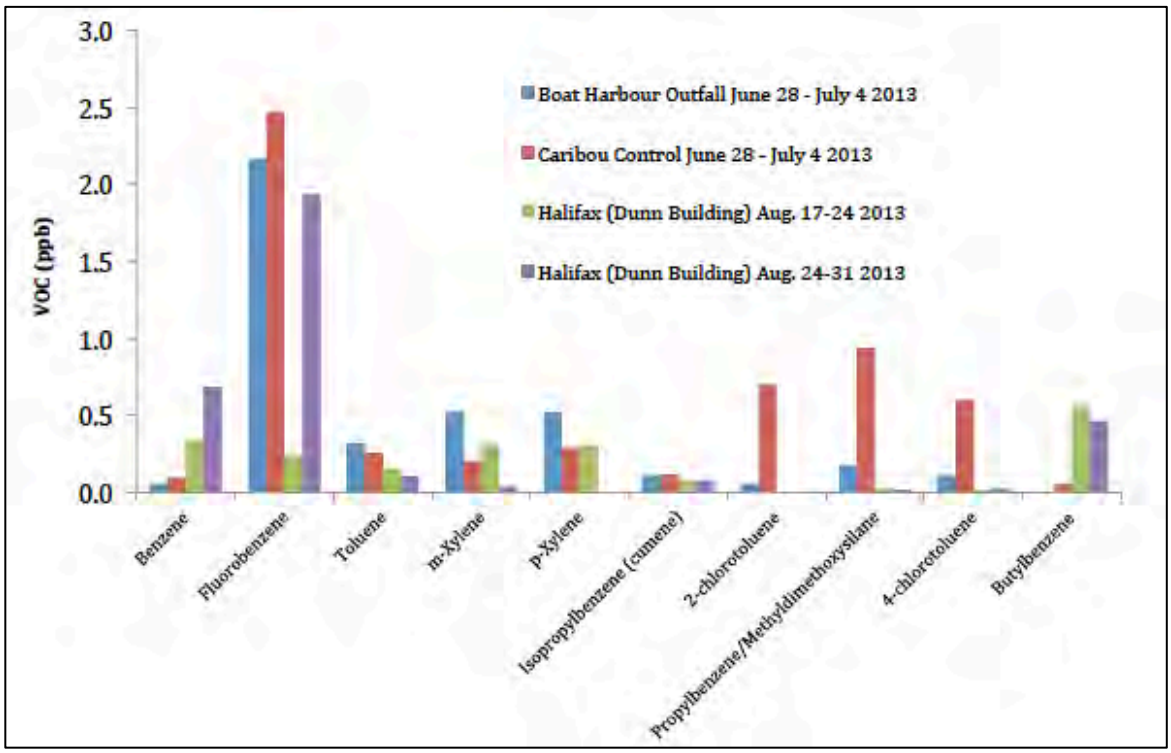


Figure 27. Comparison of volatile organic compounds (VOCs) measured at Pictou Landing First Nation with samples collected in Halifax.

In this regional comparison, five VOCs (fluorobenzene, 2-chlorotoluene, propylbenzene, methyldimethoxysilane, and 4-chlorotoluene) were observed in greater amounts at Caribou Control and Boat Harbour Outfall compared with Halifax. The use of chlorine and fluorine in the kraft pulp and paper process and the large amounts of aromatic substances from the tree pulp and other chemicals are well known. The higher concentrations of these VOCs found at Caribou Control and Boat Harbour are likely related to emissions from the mill and being carried by the prevailing wind to Caribou Control and entering Boat Harbour by the mill's effluent stream. The fact that these chemicals tend to be lower in the Halifax also adds weight to this argument.

The vehicle-related VOCs (benzene, toluene, and xylenes) were strongly associated with proximity to roads within Pictou Landing First Nation. The majority of VOCs that had higher concentrations within Pictou Landing appeared not to be associated with

Boat Harbour. Their source is likely related to vehicle emissions and wood and fossil fuel combustion for space heating and cooking. It is difficult to determine if any of these VOCs are related to the mill at this time. All of the VOCs measured were below ambient/indoor/occupational air quality guidelines.

Particulate Matter

$PM_{2.5}$, which is associated with gas-to-particle conversion or from combustion, accounts for 64% of the PM_{10} mass concentration. Approximately 70% of the $PM_{2.5}$ mass observed in Nova Scotia is from long-range transport from the northeastern United States and southern Ontario, carried to the region by the prevailing wind (Gibson et al., 2015).

Table 7 illustrates through fine particle number counts (associated with combustion and gas-to-particle conversions) and coarse particle number counts (related to wind-blown crystal material and ocean spray) that there are more fine particles per cubic centimetre that can be inhaled into our lungs than coarse particles. However, based upon these data, the concentration of $PM_{2.5}$ and fine number counts are very low when compared to Beijing, where $PM_{2.5}$ regularly reaches 500 $\mu g/m^3$. It can be observed in Table 7 that the maximum observed $PM_{2.5}$ concentration (35.45 $\mu g/m^3$) is greater than the Canada Wide Standard (28 $\mu g/m^3$). However, the maximum observed in Table 7 is for a five-minute average measurement and therefore not directly comparable with the Canada Wide Standard, which is an average of the 12 worst days measured over three years. It is common to see short-term "spikes" in monitoring over short periods of time such as five minutes. Once these are averaged over a day (e.g., 4.35 $\mu g/m^3$ in Table 7), they become much reduced and more comparable to the Canada Wide Standards. To conclude, airborne particulate matter mass and number observed in Pictou Landing First Nation are well below air quality standards where they exist.

Table 7
Particulate Matter (PM) Concentration Results

Particle size	Average observed PM concentration	Minimum observed PM concentration	Maximum observed PM concentration	Air quality guideline
$PM_{2.5}$	4.35 $\mu g/m^3$	0.91 $\mu g/m^3$	35.45 $\mu g/m^3$	28 $\mu g/m^{3*}$
PM_{10}	6.77 $\mu g/m^3$	2.73 $\mu g/m^3$	39.55 $\mu g/m^3$	40 $\mu g/m^{3**}$

***** Guideline is taken from the Canadian ambient air quality guidelines (*Canadian Environmental Protection Act*, 1999)

****** Guideline is European Commission Standard for annual average (Directive 2008/50/EC of the European Parliament); there is no PM_{10} standard in Canada

An analysis of wind direction for PM mass and number concentrations was also performed. The main wind directional dependence for all three PM size fractions is from the NW and SW. The SW wind direction is in line with Boat Harbour but also the town of New Glasgow and the major highway. It is therefore difficult to determine if Boat Harbour is the source of $PM_{10}/_{2.5}/_{1}$ or other upwind local and long-range sources, which warrants further investigation. The $PM_{10}/_{2.5}/_{1}$ associated with NW airflow are in line with Pictou Landing First Nation and the roads therein, so are likely associated with gas combustion.

Since air pollution cannot be monitored everywhere at the same time, American Meteorological Society and United States Environmental Protection Agency Regulatory Model (AERMOD) air dispersion modelling offers a solution by estimating the impact of emissions from point sources on surface air quality within any given modelling area (Gibson et al., 2009, 2013a, 2013b). AERMOD was used to model the air dispersion of $PM_{2.5}$ from the Northern Pulp Mill stacks. The run time of the stacks was assumed to be 24 hours a day for a whole year. The AERMOD results illustrate how Pictou Landing First Nation is impacted by the mill's stack emissions (see Table 8 below).

Table 8
Summary of AERMOD $PM_{2.5}$ Surface Concentrations Attributable to Emissions from the Northern Pulp Mill

AERMOD modelling period	**$PM_{2.5}$ concentration range (µg/m^3)**
1-hr, Annual maximum	2.1 – 96.7
Annual average	0.013 – 0.451
1-hr, Winter maximum	1.0 – 96.7
Winter average	0.009 – 0.440
1-hr, Spring maximum	0.8 – 84.0
Spring average	0.014 – 0.646
1-hr, Summer maximum	0.5 – 54.3
Summer average	0.008 – 0.837
1-hr, Fall maximum	0.9 – 98.2
Fall average	0.014 – 0.440

The AERMOD surface concentrations maps showed that the highest concentrations of $PM_{2.5}$ are seen closer to the stacks; however, some locations farther downwind also show increased $PM_{2.5}$. These locations farther downwind are located on hills that likely intercept the mill stack plume centerline that has the highest $PM_{2.5}$ concentration. The maximum surface $PM_{2.5}$ concentration estimated to be attributed to the mill is 0.837 µg/m^3, and was found during the summer. The maximum annual average was

found to be 0.451 µg/m^3. These concentrations are well below the $PM_{2.5}$ Canada Wide Standard for a 24-hour period of 28 µg/m^3. Therefore, the estimated $PM_{2.5}$ mass concentrations emissions from the mill, based upon reported emissions rates and stack characteristics, are of little impact to Pictou Landing First Nation. However, $PM_{2.5}$ health effects are not just related to the mass concentration but also the chemical, biological, and physical composition of the $PM_{2.5}$. Therefore, detailed information on the composition of the $PM_{2.5}$ modelled from the mill would also be needed to determine the potential health effects of the mill's $PM_{2.5}$ emissions on Pictou Landing residents. The AERMOD air dispersion modelling of $PM_{2.5}$ from the mill showed that there was some ground impact in Pictou Landing First Nation but at very low concentrations.

Despite not being able to obtain air quality data for the winters and falls of 2013 and 2014, a substantial data set was collected. All of the air quality data collected were below US National Ambient Air Quality Standards, the Canada Wide Standard, international standards, and/or occupational exposure standards where they existed. Some of the challenges encountered were inconsistent sampling times which made comparisons based on time problematic. There were also occasional Ogawa and TDT samples that were removed from the sites, and power losses at the active sites were not discovered until much later, leading to missed periods of time for data collection. Indoor air quality could also be a significant source of personal exposure, but the time and resource constraints within this project meant that these data were not collected.

7. Water Quality

Rob Jamieson (Associate Professor and Canada Research Chair, Department of Civil and Resource Engineering, Dalhousie University) led the water quality analysis component of the project. Staff from the Centre for Water Resources Studies, **Rick Scott** and **Justine Lywood**, also supported water sampling that was conducted with **Colleen Denny** and **Kim Strickland**. The findings reflect the water quality data that were collected in various locations around the community and from within Boat Harbour in the summer of 2013 (see Figure 28).

Water quality was sampled at eight locations. For each sample a range of tests were performed back in the lab. Water was tested for total **suspended solids**, **conductivity**, ***E. coli***, **nitrogen**, **phosphorus**, and a range of **metals**. The water was also tested for its **biological oxygen demand**, **dissolved oxygen**, and **pH**. **Dioxins and furans** were tested in two Boat Harbour water samples that were taken on July 24, 2013. Of the six sites, two are located in Boat Harbour (BH1 and BH2), one is located at the mouth of Boat Harbour (BHB), one is located in a brackish zone downstream of the mouth (BHOF), and two are reference sites: one on a spring that discharges into Boat Harbour (FF), and one on a surface water system adjacent to Boat Harbour (FP).

Figure 28. Water sampling sites. *Note:* The pink sites were chosen as reference sites, not affected by Boat Harbour effluent.

What's being sampled?

Suspended solids are all particles in the water column that will not pass through a filter. As levels of total suspended solids increase, a water body begins to lose its ability to support a diversity of aquatic life.

Conductivity was also tested; it is an indirect way to measure the total dissolved solids of the water. A high conductivity indicates that the water is most likely impacted by industrial discharge.

E. coli is a type of fecal coliform bacteria found in the intestines of humans and animals. If present, it points to recent sewage or animal waste contamination that is not necessarily harmful, but which indicates the possibility of other harmful pathogens in the water.

Nitrogen and **phosphorus** are often found to be the limiting factors of plant growth in aquatic systems. The more of these nutrients that are present, the more plant growth can arise which means less oxygen in the water and a more stressful environment for aquatic life.

Metals that were tested for in the water samples included aluminum, silver, arsenic, cadmium, copper, iron, nickel, lead, selenium, uranium, and zinc, with different levels of toxicity. Some, like arsenic, are naturally occurring in Nova Scotia.

Biological oxygen demand is the amount of oxygen consumed by microorganisms in decomposing organic matter in a period of five days. If more oxygen is consumed than is produced, the amount of **dissolved oxygen** declines, which can negatively affect aquatic life.

The **pH** shows if the water is basic or acidic. Changes in pH can affect how chemicals dissolve in the water and whether organisms will be affected by them at all.

Dioxins (polychlorinated dibenzodioxins) and **furans** (polychlorinated dibenzofurans) are highly persistent compounds with a strong affinity for sediments and a high potential for accumulating in biological tissues. Dioxins and furans enter the environment mainly through waste incineration and **pulp and paper processing**, and have been found in very small amounts in all parts of the environment including air, water, soil, sediments, animals, and foods. All animals and humans in Canada are exposed to some level of these substances. Large exposures can lead to a variety of serious health problems (Health Canada, 2006).

Results

In general, the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2007b) **were exceeded by water samples within Boat Harbour** (BH1, BH2, and BHB – marked green in Figure 28) and directly leaving Boat Harbour (BHOF). For the surrounding sample sites, FF and FP, water quality guidelines were met, except in the case of some heavy metals (silver – both sites; zinc – FF only; iron and lead – FP only).

- The amount of total **suspended solids** in Boat Harbour and directly leaving Boat Harbour were above available guidelines for aquatic health, but still within typical guidelines for wastewater effluent.
- **Conductivity** levels in samples from within Boat Harbour and the BHOF sites indicate waters are most likely impacted by industrial discharge.
- ***E. coli*** levels at all sites were within guidelines considered acceptable for recreational use. On two occasions, *E. coli* levels were beyond what is considered safe for irrigation onto food crops (BHB on July 12, FP on July 26).
- The amount of **nitrogen** in water samples was below the water quality guideline for the protection of aquatic life.
- **Phosphorus** national guidelines for the protection of aquatic life do not exist, but there are trigger ranges delineated by the CCME that characterize ecosystems with different phosphorus concentrations. Within Boat Harbour, the concentrations exceed the hyper-eutrophic trigger range. Hyper-eutrophic aquatic systems are characterized by excessive plant and algae growth, poor water clarity, and low dissolved oxygen levels, making it difficult for aquatic life to survive.
- Of the metals tested, **aluminum, iron, lead, silver,** and **zinc** were all above CCME recommended levels for protection of aquatic life.
- **Biological oxygen demand** from within Boat Harbour and BHOF (Boat Harbour Outfall) were generally 5-12 mg/L, which is a typical concentration for effluent leaving a sewage treatment plant, but indicates that Boat Harbour is influenced by organic wastewater discharges.
- **pH** levels were within the accepted range for aquatic life.
- Both water samples tested for **dioxins and furans** were below available guidelines for drinking water quality (10 TEQ). There are no guidelines for the protection of aquatic life.

In summary, the water quality analysis demonstrated that the discharge of pulp and paper mill effluent to Boat Harbour has degraded the quality of water within Boat Harbour, with concentrations of several water quality parameters exceeding available guidelines for the protection of aquatic life. The water quality measured in the reference sites was much better, but a small number of samples still had concentrations of metals that exceeded water quality guidelines for the protection of aquatic life. A number of different industrial sources in the region could be contributing to these background levels of metals found within the reference sites.

8. Soil Quality

In addition to water quality, **Rob Jamieson** led the soil sampling component of the project. Representatives from the Centre for Water Resources Studies, Dalhousie University, collected soil samples from current or potential future sites of vegetable gardens at 13 residential properties around Pictou Landing First Nation (Samples #1-12 and #14) and one reference location near the shore of Boat Harbour (Sample #13) on October 3, 2014. The soil was analyzed for various **metals** as well as **dioxins and furans**, and the results were compared to national guidelines for acceptable concentrations of dioxins, furans, and metals in soil. Metals that were tested for included aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silver, strontium, thallium, tin, uranium, vanadium, and zinc.

On June 25, 2015, additional soil sampling was completed to confirm the 2014 sampling results. Soil samples were collected from two residential properties (Samples #15 and #16), one recreational property in Pictou Landing First Nation (Sample #17), and three reference locations in the town of Pictou (Samples #18-20). The soil samples were again tested for dioxins, furans, and metals.

Three soil subsamples were taken at each property and were then combined to obtain a composite sample. The sampling included the upper layer of the soil (to a depth of 0.2 m) so the results represent only these depths. The sample locations are shown in Figure 29.

Results

The federal guidelines from the Canadian Council of Ministers of the Environment (CCME, 2014) were used to compare the soil sample concentration results to the recommended Canadian guidelines for the protection of human and environmental health.

Metals

For three samples, metal concentrations in the soil exceeded the federal guidelines. Two instances of **arsenic** concentrations above the guideline of 12 mg/kg were found, in Sample #1 (41 mg/kg) and Sample #16 (13 mg/kg). Arsenic is common in the natural geology of many regions in Nova Scotia and therefore the observed concentration may be of natural origin. However, as the levels do exceed the CCME guideline, it would still be advised to avoid using the soil on these two properties for the establishment of vegetable gardens, and to minimize disturbance and contact with the soil.

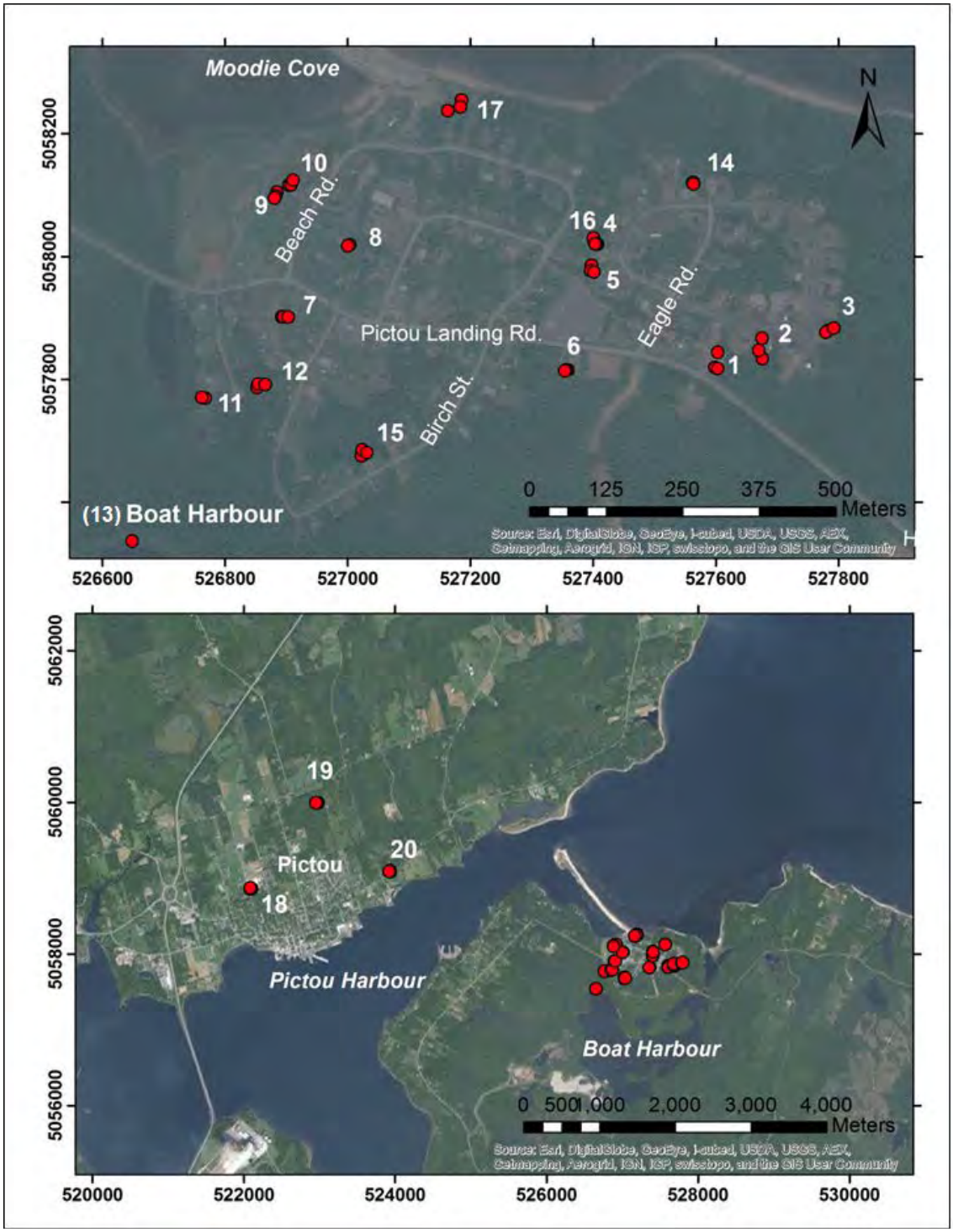


Figure 29. Plan view map of the 2014 and 2015 soil sampling locations in (upper map) Pictou Landing First Nation and (lower map) the town of Pictou.

In addition, **copper** exceeded the guideline level at one site, Sample #4. The copper concentration at that site was 330 mg/kg, well above the CCME environmental quality guideline of 63 mg/kg, but not above the CCME level for human health effects (1100 mg/kg). The source of the copper in Sample #4 is unknown; however, that sample was taken directly from an existing vegetable garden. If fertilizer was added to this garden, there might have been introduced copper from copper sulfate, which is present in some common soil amendments. Site #4 was resampled during the second round of sampling, and the copper concentration was then below the CCME guidelines.

Dioxins and Furans

The results for **dioxins and furans** were compared to the Canadian Soil Quality Guidelines (CCME, 2002). The guideline value is based on background concentrations observed in the environment and not on observed or predicted adverse human health effects. Therefore, any concentrations observed above the dioxin and furan guideline level may not necessarily cause negative human health effects.

In the first round of sampling, two soil samples had slight exceedances of the CCME guideline value for dioxins and furans. The exceedances were observed in Samples #4 and #6, where concentrations were 8.77 and 5.28 TEQ (ng kg^{-1}), respectively. The CCME guideline is 4 ng kg^{-1}. The source of dioxins and furans are unknown in these two samples. The property where Sample #6 was collected had imported fill in the backyard at the sample collection points. It is possible that the slightly elevated concentrations of dioxins and furans may be due to a previous use of the imported fill. Sample #4 (which also had elevated levels of copper in the first sampling round) showed elevated dioxins and furans as well. According to Rob, while the dioxin and furan concentration was above the CCME guidelines, it is typical of the range of soil concentrations found throughout Canada. In personal communication Rob stated: "There are small amounts of these chemicals in soils everywhere due to atmospheric deposition." Site #4 was resampled during the second round of sampling and concentrations of all contaminants, including dioxins and furans, were below the CCME guidelines.

In summary, the soil results indicate **the soil is generally safe** for vegetable harvest intended for human consumption and direct contact in terms of metals and dioxin and furan concentrations. Contaminant concentrations in samples obtained from Pictou Landing First Nation and the background samples from the town of Pictou were similar.

9. Ecotoxicology and Sediment Analysis

Ron Russell (Associate Professor, Department of Biology, Saint Mary's University) led the ecotoxicology analysis, which sought to investigate how living things are affected by Boat Harbour. His objective was to collect and analyze Boat Harbour sediments, plankton, and mammals for a variety of potentially toxic chemicals commonly observed in environmental samples. He also attempted to estimate the toxicity of Boat Harbour water to a variety of common vertebrates and describe the structure of the aquatic ecosystem.

In the summer of 2013, Ron, Community Research Associates **Kim Strickland** and **Colleen Denny,** and Research Assistant **Geoff Kershaw** collected sediment and plankton samples from three locations: (1) near the aeration pond outfall, (2) near the dam, and (3) midway between the previous two locations. They collected three sediment samples at each location; thus, in total they collected nine soil/sediment samples, which underwent chemical analysis to test for **polychlorinated biphenyls (PCBs), historic use pesticides, chlorophenols, brominated diphenyl ethers,** and **polychlorinated dibenzodioxins and furans**. Samples were prepared and analyzed by Research Productivity Consultants (RPC) of Fredericton, New Brunswick. Plankton sampling was intended to provide qualitative data only, and four samples were taken from within Boat Harbour.

Ron also collected about 200 L of water to use in toxicity tests. Ron exposed wood frog tadpoles, green frog tadpoles, recent metamorphs, and adult and young-of-year mummichogs (small killifish) to Boat Harbour water of varying dilutions for 7 days (acute toxicity tests) in Ron's lab. Adult frogs were exposed to 100% and 75% (diluted) Boat Harbour water for over 96 hours.

Additionally, a resident of Pictou Landing, **Durney Nicholas**, trapped a total of 12 muskrats and four beavers around Boat Harbour for tissue sample analysis between November 2014 and January 2015. Tissue samples were taken from these animals and compared to sediments from the bottom of Boat Harbour. Samples were once again prepared and analyzed by RPC.

Guidelines

Federal guidelines from the CCME and Environment Canada were used to compare the pollutant concentrations in sediments with the recommended Canadian guidelines for the protection of aquatic life. Canadian soil guidelines for the protection of human and environmental health and tissue guidelines for the protection of consumers of aquatic wildlife were also used where appropriate (CCME, 2014). Results for total PCBs were compared to sediment guidelines for the protection of aquatic life and soil guidelines for the protection of environmental and human health. Sediment guidelines for chlorophenols are not available. CCME sediment quality guidelines for dioxins and furans for the protection of aquatic life were compared against sediment sample results. There are no consumption guidelines for dioxins in human food in Canada. The European Union has established maximum levels of dioxin and related compounds in the European human food chain. The European Union does not state maximums for wild-caught terrestrial food, but has developed guidelines for a number of domesticated livestock species (EU, 2011). This report distinguishes between muscle and liver dioxin concentrations and considers the toxic contribution of dioxin-like PCBs to the overall toxicity (TEQ) of the meat.

Results

Plankton Community Structure

Boat Harbour exhibits a distinct truncated community profile for plankton where the rotifers are the largest planktonic organisms present in all samples. Common groups such as copepods, cladocerans, ostracods, and insects were absent from all samples. Equally alarming was the low biodiversity observed in these samples. High densities and biomasses of known pollution-tolerant species were observed in the Boat Harbour samples.

Toxicity Tests

Mummichogs are known to be highly tolerant of fluctuating salinities, temperatures, hypoxia, and pollution (Eisler, 1986). For these reasons, they are considered to be the ideal candidate for acute and chronic toxicity experiments. Both adult and young-of-year mummichogs exhibited 100% mortality in the full concentration Boat Harbour water by 168 hr (Figure 30). The young fish reached 100% mortality at 120 hr while the adults endured somewhat longer to 168 hr with the undiluted Boat Harbour water. The adult mummichogs reached about 60% mortality in the 75% dilution water, and about 35% mortality in the 50% dilution water, after 168 hr. Adult mummichog mortality in the 25% dilution water did not differ from the control which contained no Boat Harbour water.

Young mummichogs showed greater mortality earlier in the experiment than adults (Figure 30). Young mummichogs reached 100% mortality in the 75% Boat Harbour water dilution and about 30% mortality in the 25% dilution after 168 hr. It is clear that young fish are less able to persist in Boat Harbour water than adults.

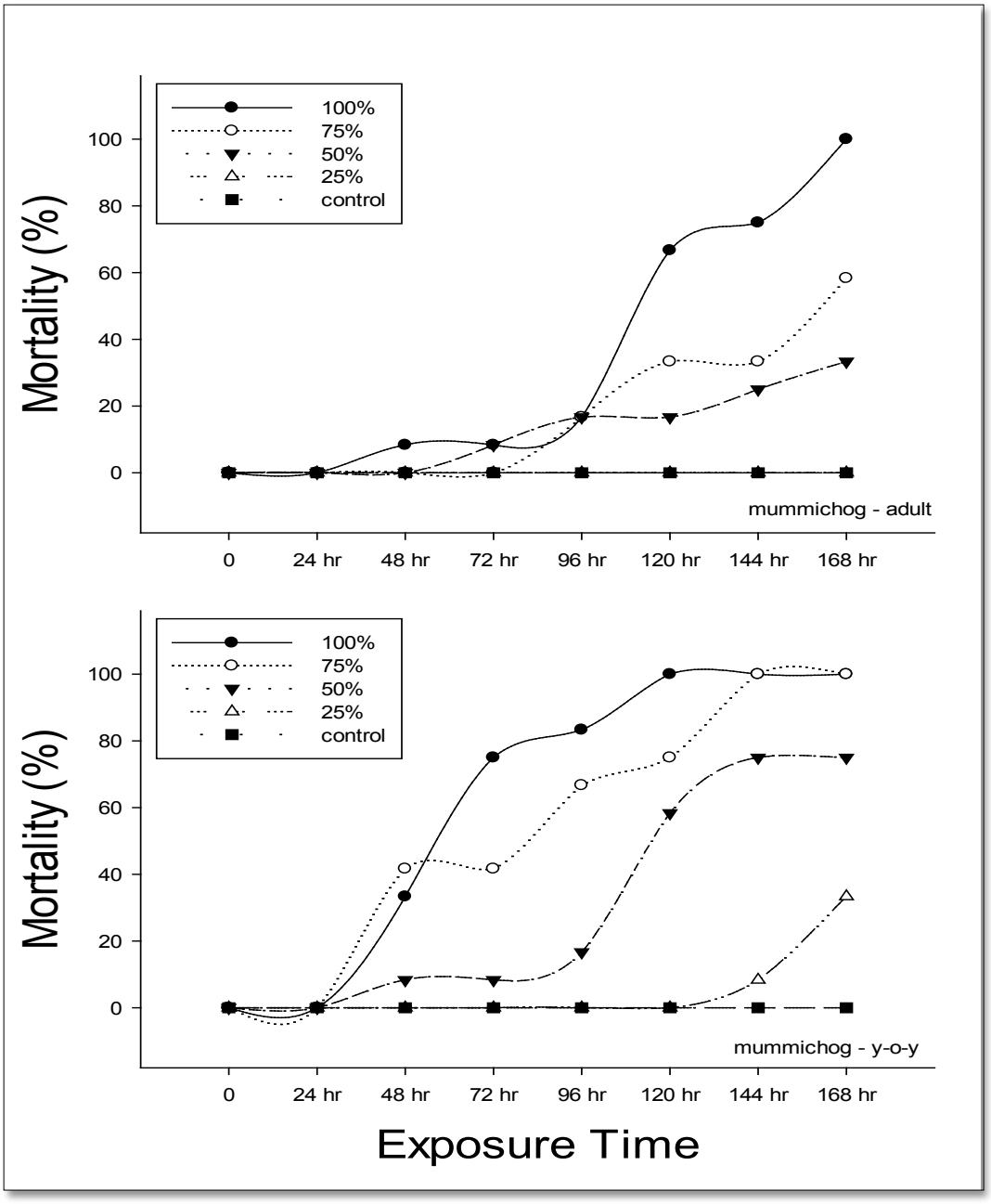


Figure 30. Acute toxicity of Boat Harbour water (undiluted and diluted to 75%, 50%, and 25%) to adult and young-of-year mummichogs.

Wood frogs have a near cosmopolitan distribution in Canada. They are a forest-dwelling species and reproduce in fishless ponds, so they are expected to be common around Boat Harbour; however, none were observed during the course of this study. Wood frog tadpoles reached 100% mortality in all dilutions of Boat Harbour water and reached 100% mortality in the full-concentration Boat Harbour water in less than 48 hr (Figure 31).

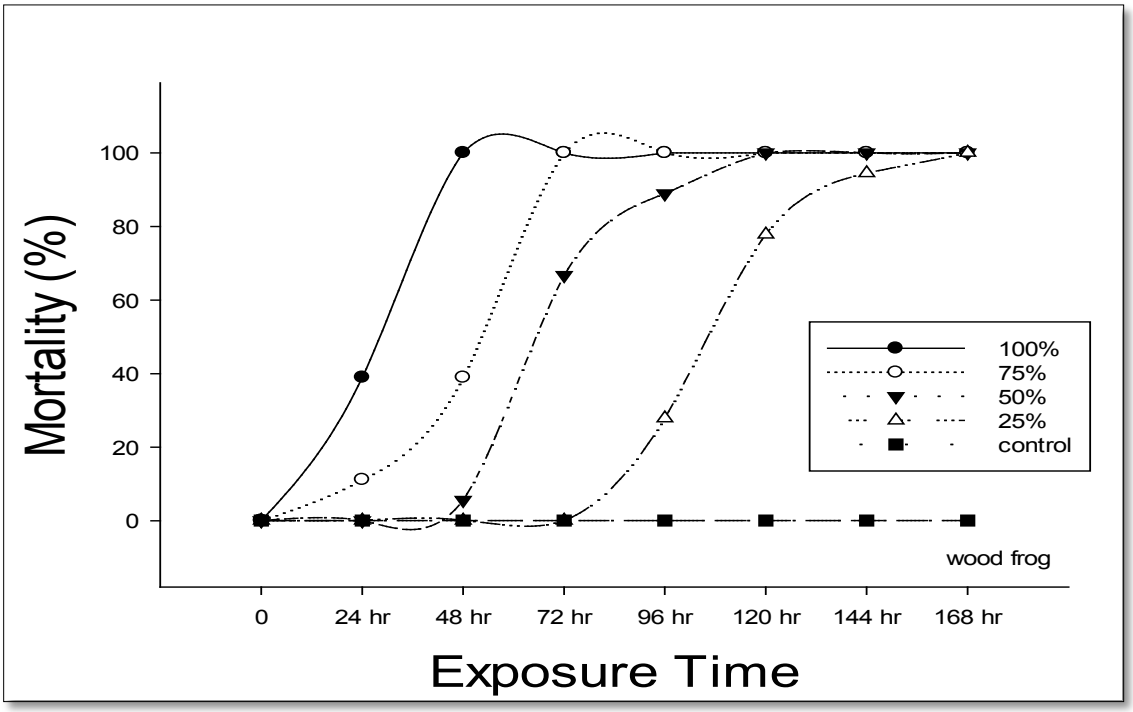


Figure 31. Acute toxicity of Boat Harbour water (undiluted and diluted to 75%, 50%, and 25%) to wood frog tadpoles.

Green frogs are a common and widely distributed species in Nova Scotia. They are tolerant of pollution and a pioneer species so are expected to be present in and around Boat Harbour. Adult green frogs were observed around the lower periphery of Boat Harbour. Stage 25 green frog tadpoles are the first feeding stage in these organisms. Tadpoles at this stage reached 100% mortality in the 100%, 75%, and 50% dilutions in less than 168 hr (Figure 32). The 25% dilution caused about 50% mortality in the same time frame. Stage 30 tadpoles are significantly larger and more fully developed than stage 25 green frog tadpoles. The stage 30 green frog tadpoles were clearly better able to survive, with 100% mortality observed in only the full concentration of Boat Harbour water (Figure 32).

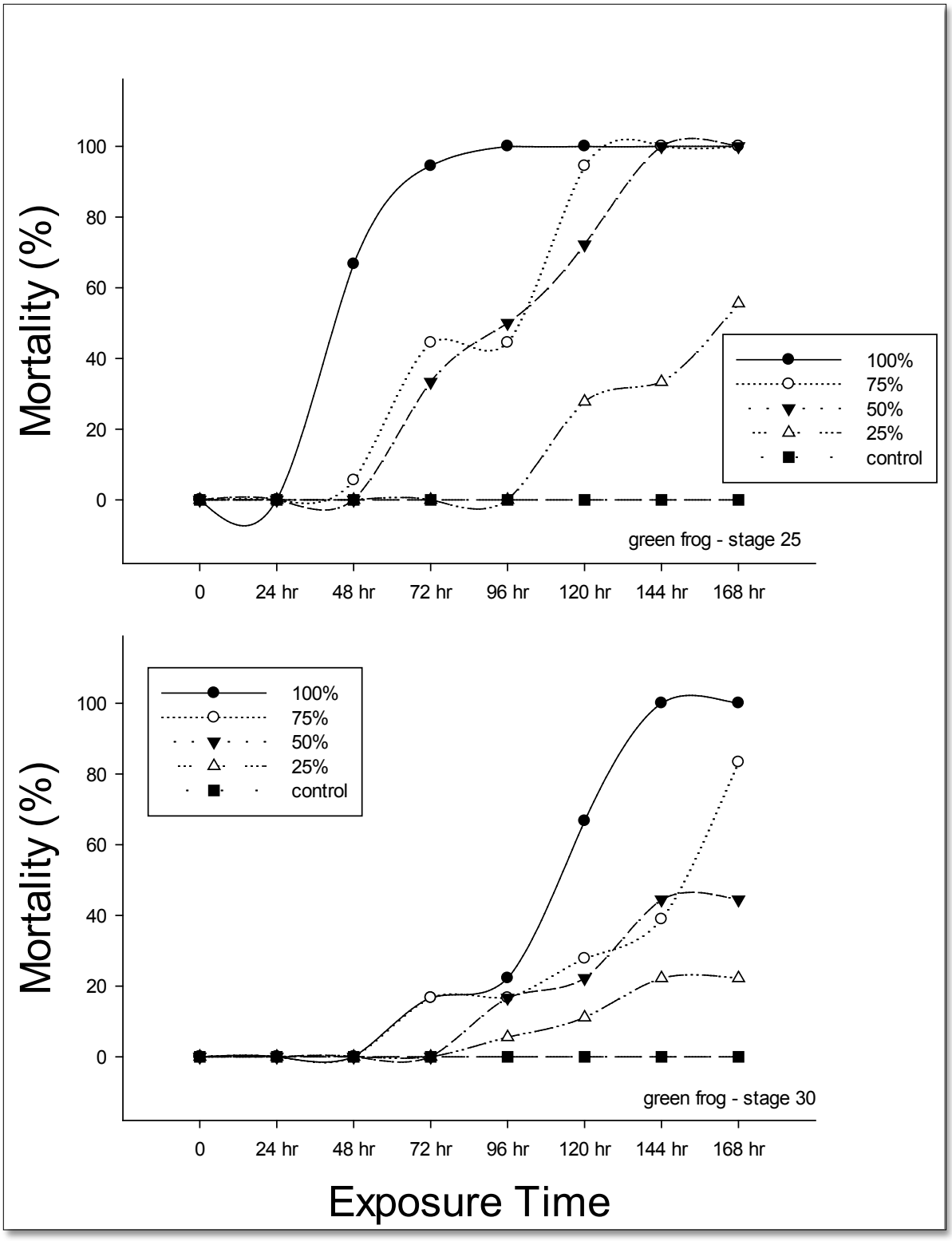


Figure 32. Acute toxicity of Boat Harbour water (undiluted and diluted to 75%, 50%, and 25%) to stage 25 and stage 30 green frog tadpoles.

Bullfrogs are the largest and potentially most tolerant of the amphibians to pollution (Weis, 1975). They are commonly found in rivers and large lakes are thus expected to be present in Boat Harbour. Bullfrogs were never observed in Boat Harbour over the course of this study. Bullfrog tadpoles showed a similar pattern of mortality as green frog tadpoles (Figure 33), with 100% mortality occurring in both the full concentration and 75% concentration treatments.

These data indicate that the three amphibian species probably cannot reproduce in Boat Harbour due to acute toxicity to early life stages.

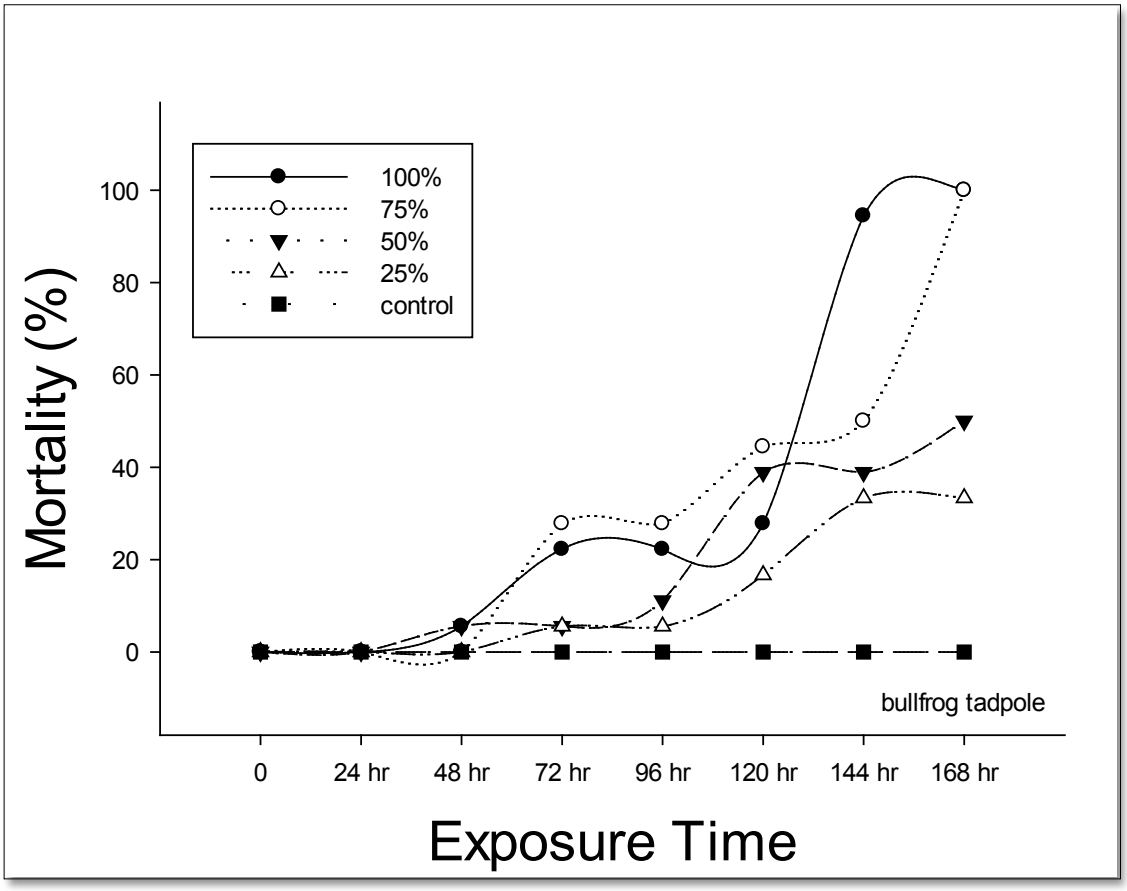


Figure 33. Acute toxicity of Boat Harbour water (undiluted and diluted to 75%, 50%, and 25%) to bullfrog tadpoles.

PCBs in Sediments and Plankton

All PCB concentrations measured in plankton and sediments were below CCME guidelines and are thus of little concern. PCB concentrations in Boat Harbour sediments are best described as background and do not indicate a point source in the area. Dioxin-like PCBs were routinely detected in both sediment and plankton; however, their

contribution to the TEQ was very low, typically less than 1 ng TEQ/kg. This indicates that observed toxic effects were most likely not due to PCB accumulation.

Pesticides in Sediments

All pesticide concentrations in Boat Harbour sediment were below CCME guidelines and below the detection limit of the analytical method of 0.05 mg/kg. This most likely indicates low historic use of pesticides in the Boat Harbour area. Toxicity arising from the past application of pesticides is of low concern.

Chlorophenols in Sediments

Chlorophenol concentrations were low. There are no sediment guidelines for phenols; however, all concentrations measured for phenols in sediments were well below the soil quality guideline of 3.8 mg/kg for phenol and 7.6 mg/kg for pentachlorophenol. Phenols are highly toxic, bleached kraft mill waste products, but there is little accumulation of these compounds in Boat Harbour sediments.

Polybrominated Diphenyl Ethers (PBDEs)

PBDEs were observed in all plankton and sediments samples. All concentrations were below federal sediment quality guidelines (Environment Canada, 2013). Relatively low concentrations of PBDEs were observed in sediments with no apparent pattern among sediment sampling locations. PBDE concentrations were lower yet in plankton and lower again in Boat Harbour mammals. There is no indication of magnification of PBDEs in the Boat Harbour ecosystem.

Polychlorinated Dibenzodioxins and Furans (PCDDs and PCDFs)

The distribution of dioxins and furans in sediments show that concentrations were greatest at the midway location and least near the aeration pond outfall. There is no simple explanation for this distribution. It could be due to historic changes in PCDD and PCDF concentrations in effluent, spatially variable sediment deposition, or the bottom profile of the sampled locations.

The most toxic sediments were found at the midway location, and the least toxic sediments were at the aeration pond outfall. The only conclusion possible is that PCDDs and PCDFs are found in Boat Harbour sediments, but they are not evenly distributed. PCDD and PCDF TEQs exceed both CCME interim sediment quality guidelines and probable effect level guidelines (CCME, 2001). Toxic effects on aquatic life are expected based on the calculated TEQs, and it is clear that the aquatic community is severely degraded.

Mean plankton TEQ for dioxins, dibenzofurans, and dioxin-like PCBs was 0.20 pg TEQ/g wet weight (SD = 0.03 ng TEQ/kg; Table 9), which is less than the CCME guideline. Clearly, PCDDs and PCDFs are accumulating in the Boat Harbour planktonic food web;

however, the severely degraded aquatic community with truncated structure may present few opportunities for these highly bioaccumulative compounds to be magnified with passage through the food web.

Table 9
Dioxins (Including Furans) and Dioxin-like PCB TEQs (ng WHO-TEQ/kg wet weight) in Boat Harbour Plankton

Sample	Dioxins	Dioxin-like PCBs	Dioxins + Dioxin-like PCBs
Plankton #1	0.18	0.02	0.20
Plankton #2	0.24	0.01	0.25
Plankton #3	0.18	0.02	0.20
Mean	0.20	0.02	0.22
Std. Dev.	0.03	0.01	0.03

Table 10 outlines wet weight TEQs for dioxins (including furans) and dioxin-like PCBs for Boat Harbour beaver and muskrat muscle and liver tissues. Dioxin TEQs in beaver muscle were slightly less than dioxin TEQs in plankton. Dioxin TEQs for beaver liver and muskrat muscle and liver were greater than TEQs in plankton; however, standard deviations were large in beaver liver and muskrat tissues, obscuring any real differences between these tissues and plankton. There is no clear evidence for magnification of dioxins and furans in beavers and muskrats.

Table 10
Dioxins (Including Furans) and Dioxin-like PCB TEQs (ng WHO-TEQ/kg wet weight) in Beaver and Muskrat Muscle and Liver

	Dioxins		Dioxin-like PCBs		Dioxins + Dioxin-like PCBs	
Sample	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Beaver muscle	0.11	0.05	0.02	0.01	0.13	0.05
Beaver liver	0.60	0.22	0.07	0.05	0.68	0.27
Muskrat muscle	0.47	0.27	0.01	0.01	0.48	0.27
Muskrat liver	0.63	0.27	0.02	0.01	0.66	0.28

The European Union has specified maximum levels of dioxin and dioxin-like chemicals allowable in human food, but currently no similar guideline exists in Canada. TEQs for dioxins and dioxin-like PCBs are expressed on a per unit lipid basis since these are highly lipid-soluble compounds and are expected to be found predominantly in fatty tissues. Lipid-based TEQs for beaver and muskrat tissues exceed European Union guidelines for all meat except the guideline for beef and mutton (Table 11). Considering variability in the data set, all beaver and muskrat tissue TEQs are within one standard

deviation of the EU guideline. One must use this guideline with caution, since wild-caught foods such as beaver and muskrat do not appear on any guideline, presumably since they are traditionally not found in commercial food preparation and retail marketing.

Table 11
Dioxins (Including Furans) and Dioxin-like PCB TEQs (ng WHO-TEQ/kg lipid weight) in Beaver and Muskrat Muscle and Liver

	Dioxins		Dioxin-like PCBs		Dioxins + Dioxin-like PCBs	
Sample	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Beaver muscle	2.43	0.83	0.47	0.13	2.90	0.94
Beaver liver	13.92	4.31	1.58	0.60	15.50	4.66
Muskrat muscle	8.21	0.79	0.31	0.19	8.53	0.78
Muskrat liver	15.41	6.83	0.59	0.10	16.00	6.92

It is clear that the Boat Harbour aquatic ecosystem is severely degraded, most likely due to a combination of hyper-eutrophication (resulting in low oxygen), high water temperature, decreased sunlight penetration due to heavy coloration, and toxic chemical input. This is not a new observation. Peer (1972) documented significant changes in the marine benthic community downstream of Boat Harbour a mere two years following the opening of the kraft pulp mill at Abercrombie Point. Proposed causes included changes in tidal flow caused by damming the previously tidal estuary and the Middle and West Rivers (Peer, 1972) and promotion of toxicity of pulp mill effluents due to flocculation of material upon entry to the marine environment.

Boat Harbour water is toxic to both fish and amphibians in the lab. None of the experimental groups survived 168 hr (7 days) in undiluted Boat Harbour water; however, adult mummichogs, stage 30 green frog tadpoles, and bullfrog tadpoles all survived over 7 days exposure in dilute Boat Harbour water. While Boat Harbour water may not exhibit acute toxicity over the traditional 96 hr exposure period to adults and more highly developed stages of organisms, it is acutely toxic at early developmental stages as demonstrated by calculated median lethal concentrations. This would prohibit any of the organisms tested from establishing viable populations in Boat Harbour under current environmental conditions. It must be considered that these toxicity tests conducted under laboratory conditions minimized the negative effects of high water temperature and hypoxia that were present in Boat Harbour. The toxicity tests therefore slightly *underestimate* the real conditions in Boat Harbour at the water collection period.

PCBs, persistent pesticides, and chlorophenols were detected at low concentrations or below detection limits in sediment and plankton. All of these compounds are capable of eliciting a wide range of toxic responses in aquatic organisms and humans and thus could contribute to the overall toxicity observed in Boat Harbour. The small concentrations in sediments indicate that these compounds do not pose a significant problem in Boat Harbour, presently or in the future. Sediments can act as a repository for many persistent organic compounds, releasing them into the aquatic environment for many generations (Russell, Hecnar, & Haffner, 1995). Since PCBs and most of the pesticides present in the analysis have been banned in Canada for many years, it is highly unlikely that they will increase in concentration in sediments in the future. Chlorophenols are mostly water-soluble chemicals and do not accumulate to a great degree in sediments.

Polybrominated diphenyl ethers (PBDEs) are structurally similar to PCBs, and like PCBs, they exhibit nervous system toxicity, reproductive and developmental disruption, endocrine disruption, and cancer at high doses (Birnbaum & Staskal, 2004). They are highly persistent in the environment, subject to long-range transport in the atmosphere, and highly bioaccumulative. These compounds were detected in all sediments, plankton, and mammal tissues. Sediment concentrations were below published guidelines and PBDE concentrations in plankton and mammal tissues were low. There was no indication of magnification through food web processes, possibly since the Boat Harbour food web is degraded and there are few opportunities for biomagnification. PBDEs in the environment is a global issue, but these compounds probably do not make a significant contribution to the toxicology concerns at Boat Harbour due to their low concentrations. Due to the persistent nature of highly brominated PBDEs, they will be retained in the sediments for many generations.

Dioxins and dioxin-like compounds were detected in all samples. The TEQ for dioxins was above the interim sediment quality guideline and probable effects level for all sampling locations. Dioxins and dioxin-like compounds are persistent chemicals and are expected to accumulate in sediments and in lipids (fat) of biota. The concentrations of PCDDs and PCDFs measured in Boat Harbour sediments raise concerns.

Dioxin concentrations in plankton were considerably less than concentrations measured in sediments. Boat Harbour plankton are most likely contaminated by the freely dissolved portion of dioxins in the water column and by contaminated suspended particles. Food web effects are not apparent since the Boat Harbour food web is very short. Tertiary (third-level) consumers and successive levels of primary and secondary consumers and producers are absent. There are few opportunities for biological magnification of dioxins by passage through the food web structure, unlike less disturbed ecosystems (Braune & Simon, 2003; Ross et al., 2004), where tertiary predators can accumulate high concentrations of dioxins.

Concentrations of dioxins and dioxin-like compounds in beaver and muskrat tissues were low, but detectable. Liver exhibited consistently higher concentrations than muscle, since metabolic detoxification pathways are predominantly found in the liver. Dioxin TEQs in mammal tissues were approximately the same as plankton and significantly lower than TEQs calculated for sediment.

There are no guidelines for consumption of dioxins and furans in Canadian foods. The CCME soil quality guideline for soil ingestion is 4 ng TEQ/kg (4 pg TEQ/g; CCME, 2002, 2007a) for the protection of environmental and human health. It is recognized that dioxins and dioxin-like compounds are accumulated primarily through the diet (Fries, 1995). Greater than 90% of human exposure to dioxins is through diet, mainly meat, dairy products, fish, and shellfish (WHO, 2014). Health Canada recommends a "tolerable" level of dioxin consumption from all sources of 2.3 pg/kg of body weight/day and 70 pg/kg of body weight/month (Health Canada, 2005). Beaver and muskrat are not part of the commercial food industry; however, dioxins in both muscle and liver of these mammals exceed European Union guidelines for most commercial meats.

Recommendations

There are multiple serious problems with the ecotoxicology of Boat Harbour. Remediation of any single issue could exacerbate other problems, so a remediation plan should consider all problems. The primary organic pollutants of concern in sediments are dioxins and furans. Contact with Boat Harbour sediments should be avoided. The movement of these pollutants off site should be evaluated, particularly potential contamination of downstream marine habitats. Additionally, biological vectors of dioxins and furans moving these pollutants from the aquatic environment to the terrestrial environment should be assessed. Although concentrations of dioxins and furans in tested mammals were low, consumption of beaver and muskrat tissues, particularly liver, could still result in exceeding recommended consumption limits.

10. Tree Core Sampling

In the summer of 2013, **Geoff Kershaw, Colleen Denny,** and **Kim Strickland** cored tree rings for testing and analysis at the Mount Allison Dendrochronology Laboratory (MAD Lab, now the Mistik Askiwin Dendrochronology Laboratory at the University of Saskatchewan).

Dendrochronology is the analysis of tree rings formed in wood as a means of measuring changes in environmental factors that influence a tree's growth (Speer, 2010). Tree core sampling was done because tree rings have been used successfully to document the onset and intensity of chlorinated hydrocarbon pollution elsewhere (Yanosky, Hansen, & Schening, 2001). As well, sulfur compounds are released to the atmosphere in the kraft bleaching process (Ali & Sreekrishnan, 2001), which may cause acid rain and soil acidification issues that negatively affect forest wellbeing (Fox, Kincaid, Nash, Young, & Fritts, 1986; Savva & Berninger, 2010).

Twenty trees were sampled from an old-age (ca. 95 years) white spruce stand by Boat Harbour, with two cores taken at breast height from each tree (total of 40 cores). For comparison, 36 cores from 18 trees were sampled from a comparably aged (ca. 97 years) white spruce stand at the Caribou Control site (see Figure 34). Caribou Control was selected because it had characteristics considered

similar to what Boat Harbour would have been like before the dam and aeration ponds were installed. It was hypothesized that the sites would have similar but distinct histories, as proven with different statistical tests on the changes of yearly growth, and it was also hypothesized that stronger growth suppression would be obvious at the Boat Harbour site.

Figure 34. Tree sampling sites (Boat Harbour and Caribou Control).

Results

While the analysis showed statistical differences suggesting unique growth-influencing factor(s) at each site, it is unclear if these differences are associated with pulp mill activity. For example, causes could include insect outbreaks (Hogg, Brandt, & Kochtubajda, 2005), flooding (Speer, 2010),

coastal ice storms (Lafon & Speer, 2002), or other factors. Also, a growth suppression trend in Boat Harbour tree growth was not observed; instead, the Boat Harbour trees have a tendency to exhibit growth enhancement trends for both raw and standardized chronologies, while Caribou Control does not.

This is contrary to the hypothesis that pollution impacts will result in negative growth effects. As such, there is not sufficient evidence in this analysis to support the hypothesis that pulp mill activity has impacted growth of trees surrounding Boat Harbour. A more thorough assessment would require long-term emissions data from the mill and chemical analysis of tree tissues.

It could be that Caribou Control was not an effective reference and that 10 km was not a large enough buffer between sites (this meshes with **Mark Gibson's** interpretation of the air quality data once his analysis was completed as well). The best potential for establishing greater certainty in tree-ring associations with Northern Pulp pollution would be to expand the number of sites involved in the analysis. Data tracking pulp mill emissions via the main mill stacks and Boat Harbour settling ponds would also enhance our ability to identify pollution's association with tree growth. Dendrochemistry is another potential route for future research because trees internalize pollutants and retain them within their cells as they grow. Using additional sites with a focus on trying to determine any effects of wind direction from the mill site is also recommended.

11. Analysis of the June 2014 Spill

On June 10, 2014, a member of Pictou Landing First Nation discovered a leak at a pipe that was carrying effluent from the Northern Pulp mill to Boat Harbour. The following day, **Ron Russell,** a lab assistant of Ron's, and **Emily Skinner** travelled to Pictou Landing to collect water and plankton samples from the effluent spill site and Boat Harbour dam/bridge. They collected effluent water from the environment and not directly from the pipe. **Kim Strickland** and Emily also collected samples of the effluent from the spill to send to the Centre of Water Resources Studies for testing of biological oxygen demand (BOD), chemical oxygen demand (COD), ammonia-nitrogen, and bacteria (*E. coli*).

The water quality analysis did not detect *E. coli*. Values for BOD, COD, and ammonia-nitrogen were typical for pulp mill effluent. It is suspected that the effluent had probably become diluted before the samples were collected, which took place 24 hours after the discovery of the spill.

The metal concentrations in the effluent were compared to available CCME guidelines for the protection of aquatic life (freshwater). Most metals (aluminum, cadmium, copper, nickel, lead, selenium, silver, zinc) with associated guidelines exceeded said guidelines, with **copper and lead** as the worst cases – exceeding the guidelines by greater than 10 times. The water samples that Ron collected from the pipeline burst had octochloride dioxide (OCDD) in it, but this was likely from atmospheric fallout and was also present in the soil sample. OCDD concentrations detected were high (1350 pg/L). OCDD is the most persistent but least toxic of the influential dioxins. Furthermore, elevated concentrations, as in this sample, indicate an "old" source or environmental sink. The elevated OCDD could also be attributed to atmospheric deposition from a combustion source over time. As noted in the water quality section, there are no CCME water quality guidelines for dioxins at this time.

Samples were collected on June 17, 2014, for **Mark Gibson**'s lab, at least one week after the effluent leak occurred. At the time of sampling, the leak site had been excavated and the effluent had been removed and pumped to a natural pond adjacent to Boat Harbour. It is unknown how much time had passed between the effluent being removed and the sampling. Water was collected at three different locations that were exposed to the effluent. The first was from the small pool at the bottom of the excavated hole where the leak had originated (see Figure 35). The second was collected from the exposed effluent-carrying pipe (see right on Figure 35), and the third was collected from the pond where the effluent had been transferred. The water samples were tested for volatile organic compounds (VOCs). Twenty-four VOCs were detected between the three samples. When the results were compared to the Canadian Council of Ministers of the Environment regulations for freshwater (CCME,

2014), none of the VOCs detected exceeded the regulatory limits, though not all VOCs have associated guidelines.

Figure 35. Collection site for two of the effluent samples.

The VOC results were also compared to reference studies conducted in Halifax. The VOCs that are related to vehicles and combustion were present in both Pictou Landing and Halifax. However, 4-chlorotoluene and 2-chlorotoluene were present only in Pictou Landing from the ruptured effluent pipe. Chlorine and aromatics are present during the kraft and pulp and paper process and these are the likely source of the chlorinated aromatics. Further research could possibly confirm this.

Since the effluent spill, in March 2015, the *Boat Harbour Act* was passed, which legislated the closure of the Boat Harbour treatment facility by January 30, 2020. And on May 11, 2016, Judge Del W. Atwood released his Sentencing Decision for *R. v. Northern Pulp Nova Scotia Corporation,* 2016 NSPC 29. On January 20, Northern Pulp had pleaded guilty to breaching subsection 36(3) and subsection 40(2) of the *Fisheries Act* for the

illegal spill of pulp and paper effluent in water frequented by fish and/or in any other place where the effluent would then enter into water frequented by fish. The judge's opening of his Sentencing Decision is worth noting:

> *The first element of truth and reconciliation is truth. The undeniable truth is that the experience of the Pictou Landing First Nation has been one of subjugation and suppression under the Canadian federation. It shares this history with other First Nations of Canada, as described succinctly in the Report of the Truth and Reconciliation Commission of Canada. An instance of that injustice was the manner in which a pulp mill came to [sic] located at Abercrombie Point in Pictou County fifty years ago; along with the mill was built an effluent-treatment plant in Boat Harbour.*

The spill in June 2014 released an estimated 47,000,000 litres of effluent into the East River/Pictou Harbour from the deteriorating pipe. Afterwards, Northern Pulp responded to and implemented remedial measures put forth by Environment Canada. Additionally, the prosecution's obligation to consult with Pictou Landing First Nation about the spill's impact led to a presentation by Chief Andrea Paul about the impact to the community. Chief Paul discussed the environmental impacts in the context of the area's historical environmental degradation as a result of the pulp and paper mill. She noted that the spill re-victimized Pictou Landing residents and relayed their feelings that they had disappointed the environment; that the burial grounds at Indian Cross Point would be destroyed; and that the commercial, food, and ceremonial fishery would be negatively impacted as well.

The judge's decision included a reflection on her presentation, as he noted:

> *In my view, while the historical account in Chief Paul's statement might extend beyond what counsel assert is admissible, the truth of the damaging impact that the pulp mill at Abercrombie Point and its toxic effluent-treatment site at Boat Harbour has had on the well-being of the Pictou Landing First Nation – and continues to have – is so conspicuous and notorious as to be beyond dispute.* (R. v. Northern Pulp Nova Scotia Corporation, 2016)

Importantly, Judge Atwood noted his decision was a part of transitional justice and that reconciliation would move forward in a small way in light of it. The sentence of the court was that Northern Pulp be fined in the amount of $225,000. It recommended that the fine be distributed by awarding $75,000 to the Mi'kmaw Conservation Group, $75,000 to the Pictou County Rivers Association, and $75,000 to Pictou Landing First Nation to be used to conserve, protect, and restore fish and fish habitat in Pictou County and in other waters fished by Pictou Landing First Nation.

12. Community Mapping

Daniel Rainham (Associate Professor and Elizabeth May Chair in Sustainability and Environmental Health, Environmental Science Program, Dalhousie University) supervised the community mapping actities of his trainee, **Jane McCurdy**, a summer intern through Dalhousie University's Master of Resource and Environmental Management program. They created a "web map" configured with text, photos, video clips, and website links to display traditional, cultural, and spiritual practices and recreational activities connected to community-identified places over time – past, present, and future. The community map shows changes in the way residents of Pictou Landing have interacted with their land over time.

Jane worked with **Heather Castleden** and **Dee Lewis** to read the oral histories documented by **Ella Bennett** to discern places of importance for fishing; hunting; gathering berries, seaweed, and medicines; and other recreational, cultural, and spiritual practices. **Kim Strickland** reviewed the additional oral histories that Dee documented for other places of importance. Dee also reviewed responses to the Environmental Health Survey for important places. The Pictou Landing Native Women's Group (PLNWG) were then able to use printed maps to pinpoint the place names

referenced in the stories to include in the web map. The map has also been geocoded with air, water, sediment, tree, and soil sampling sites as well as trapping sites.

The community map is now embedded in Daniel's website (SILK-Lab: www.silk-lab.org/pictou-landing-first-nation-community-ma) and is to be linked into the Pictou Landing First Nation website as well as Heather Castleden's Research Lab website (www.heclab.com) as a legacy map. As well, Jane prepared a user-friendly guide for navigating the map: "Web Mapping Application: A User Guide for the Pictou Landing First Nation's Community Web Mapping," as well as an amendment called "Steps for Accessing a Web Mapping Application via ArcGIS Online." The User Guide explains that a Web Mapping Application is a "living map," meaning changes can be made to it. The map has background layers, which are called the basemaps and show the geographic area of Pictou Landing First Nation. Other layers can sit on top of the basemaps to display the map's many features. To access the map, you can visit the websites noted above and then explore basemaps and layers of information. Directions for navigating the map have been pulled from Jane McCurdy's User Guide and briefly noted below.

Figure 36 displays the basemap options that are available within the map – click the dropdown arrow next to the *Basemap* icon to view thumbnails of each basemap.

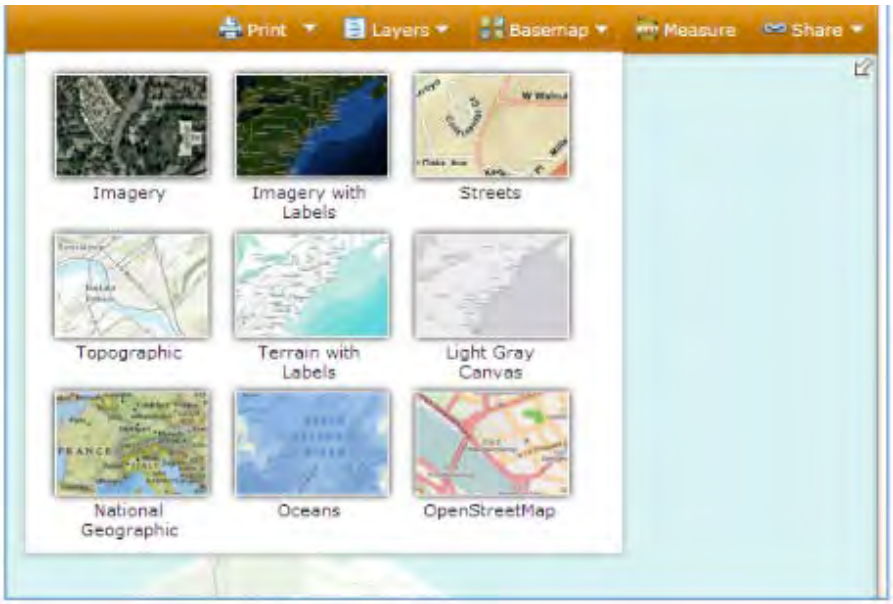


Figure 36. Assortment of basemaps to display as a background for the data.

Figure 37 shows two figures from the User Guide: Figure 2 from the User Guide illustrates that clicking the arrow in the top right-hand corner allows you to either show or hide the *Map Overview*. Figure 3 from the User Guide illustrates how to turn layers on and off – how to select what types of information you want to see displayed at any one

time by the map. In order to select which layers to display, click the dropdown arrow next to the *Layers* icon to check/uncheck the layers you would like to have visible on the map.

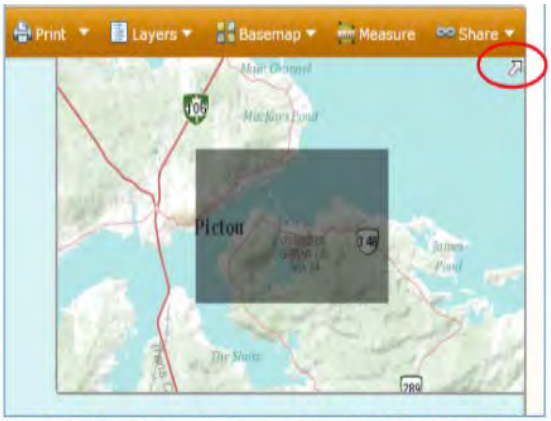


Figure 2: Clicking the arrow in the corner shows and hides Map Overview.

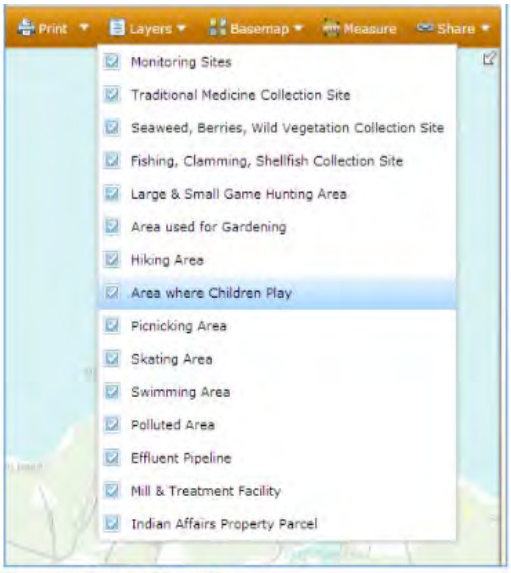


Figure 3: Display of layer list.

Figure 37. Two figures from the Web Mapping Application's User Guide.

Figure 38 shows what a layer of the map looks like and the informational pop-up that is visible when you click on a point of data on the map.

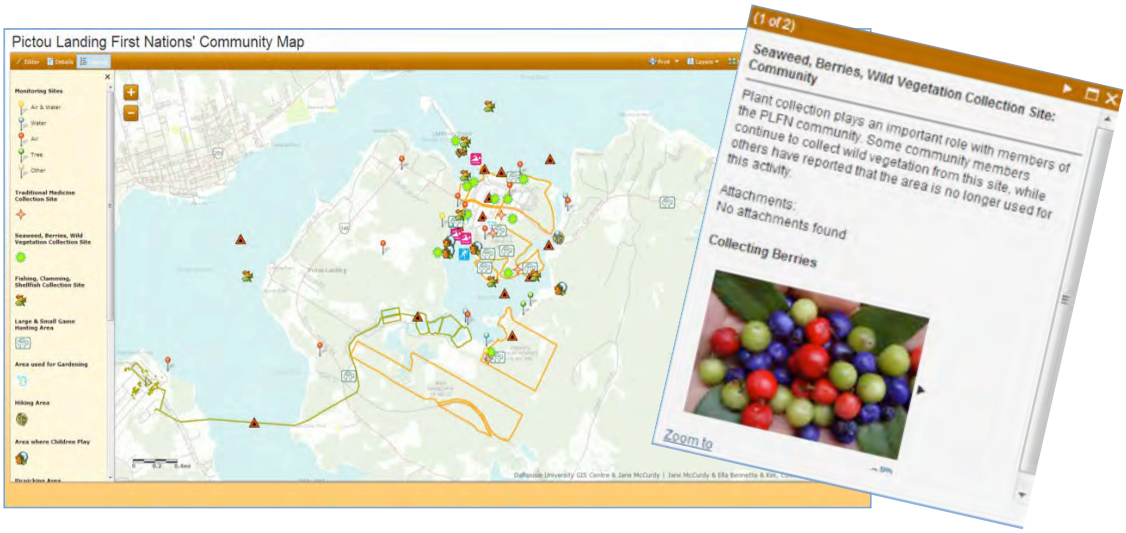


Figure 38. Map layer and informational pop-up.

You can also print and share the map via email, Facebook, or Twitter. And if revisions or additions to the map are needed, the PLNWG can contact Daniel Rainham to do so (Daniel.rainham@dal.ca).

13. Wet-Pro Water Monitoring

The CURA H2O project (Community-Based Water Monitoring and Management, housed at Saint Mary's University; http://curah2o.com) is a community-university research alliance to establish volunteer water monitoring in Nova Scotia; **Heather Castleden** was a member of the CURA H2O team. The project introduces communities to Wet-Pro, which is an online training course in water quality monitoring with an accompanying monitoring equipment toolkit for community-based water monitoring groups. In May 2013, **Sheila Francis, Kim Strickland, Colleen Denny**, **Lucie Francis, Emily Skinner** and **Heather** attended the CURA H2O Community-Based Water Monitoring Program Design and Database workshop at Saint Mary's University to design a water monitoring plan for Pictou Landing. As a result of their training, the PLNWG received a Wet-Pro kit to begin collecting water samples. The Wet-Pro kits have benefited this research as a legacy piece of the project because the community now has three certified water quality monitors: Kim Strickland, Colleen Denny, and Lucie Francis. The PLNWG can access their Wet-Pro kit any time via CURA H2O, which is the steward of this equipment.

Regular monitoring can characterize the health of the ecosystem, detect changes, and establish baseline data including conductivity, pH, and dissolved oxygen.

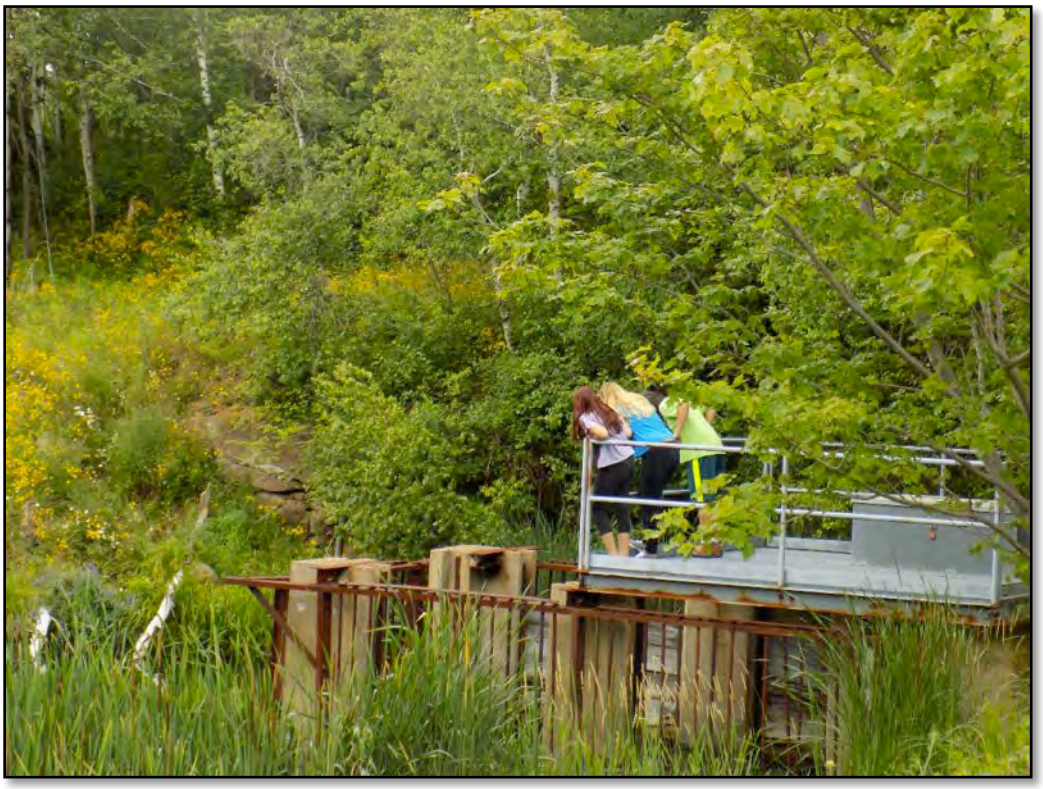
The Wet-Pro Liaisons, **Oliver Woods** and **Sarah Weston**, have supported the Wet-Pro initiative by attending meetings to discuss strategic water monitoring, supporting the individual water monitors, evaluating the functioning of the monitoring equipment from season to season, and facilitating workshops and sampling. For example, Oliver had to replace a probe in the equipment in the summer of 2014. Oliver, Sarah, and **Melissa Healey** also travelled to Pictou Landing in the summer of 2013 to support water testing and site selection with Kim, Colleen, **Chris Garda**, and **Geoff Kershaw**. In May 2014, Kim and Colleen, and subsequently Kim in 2015, attended the Atlantic Watershed Stewardship Showcase as part of the continuing training. The Wet-Pro team at Saint Mary's University are available to ensure water quality monitoring can continue in Pictou Landing and the equipment, while owned by the PLNWG, will continue to be stored there throughout the monitoring off-season. It will be up to the PLNWG to determine whether continued monitoring can and should occur.[7]

[7] "The CURA H2O project officially wrapped up in September 2016, and the Community-Based Environmental Monitoring Network continues to develop and maintain major CURA H2O legacy pieces such as the training course and database. Partnerships with government agencies and major universities continue to examine how this data can be integrated into governmental water management and provide a more comprehensive set of data than would otherwise be available through government resources alone." (http://curah2o.com)

14. Boat Harbour Youth Camp, July 2015

Throughout this research, the importance of multi-generational perspectives in understanding Indigenous health and environmental change was recognized. In the months approaching summer 2015, the Pictou Landing Native Women's Group (PLNWG) indicated it was time to engage and understand the perspectives of the youth, who represent the future leaders and decision-makers of the community and who have only ever experienced Boat Harbour as a toxic waste facility.

Over four days in July 2015, a group of five youth, **Laela Denny, Madison Nicholas, Hunter Francis, Alexandria Francis,** and **Carter Hatfield,** came together for the Boat Harbour Youth Camp, led by **Cecilia Jennings** (Heather Castleden's Master's student), **Kim Strickland**, and **Dakota Francis** (a summer student from Pictou Landing First Nation). The purposes of the camp were (1) to teach youth from Pictou Landing about the PLNWG's research project and (2) to gather perspectives from Pictou Landing First Nation youth about their experiences living with Boat Harbour. The group met for four days over two weeks, during which they learned about community mapping and water sampling, took a field trip to Halifax, and created digital stories.



Camp Structure

Day 1: Community Mapping and Learning About the PLNWG
The camp opened with introductions and watching the *A'se'k* documentary by **Christian Francis** and **Haley Bernard.** The documentary was the starting point for a conversation about the youths' impressions of Boat Harbour and what health means for them as individuals and for the whole community. Then, using GPS units borrowed from Dalhousie University, the group participated in a community mapping workshop. They went for a walk around the community, each taking GPS coordinates at places that represented good and negative effects on their health. Each participant was given a journal to take field notes throughout the camp and also used the journal to record notes about each GPS point.

Dee Lewis visited from Halifax and talked to the group about the PLNWG's participation in the project and screened the *Land & Sea* documentary about Boat Harbour as well as the digital stories made by herself, Kim, **Sheila Francis, Colleen Denny,** and **Darlene Bachiri**.

Day 2: Field Trip to Halifax
The camp group travelled to Dalhousie University, where they visited the Centre for Water Resources Studies. **Jenny Hayward** (Rob Jamieson's research associate) gave a tour of three different environmental engineering labs and talked about some of the sampling that has happened at Boat Harbour.

The group also visited the Health Geomatics Laboratory, where **Daniel Rainham** gave a lesson in map-making. Using the GPS points collected in the community walk during Day 1, each youth began a map to represent their own "health landscapes" in Pictou Landing.

Days 3 & 4: Wet-Pro Sampling and Digital Stories

On the third day, **Emma Wattie** and **Sarah Weston** from CURA H2O (Saint Mary's University) visited Pictou Landing First Nation to teach a Wet-Pro workshop. They taught the youth how to evaluate water quality and take measurements with the Wet-Pro kit. Everyone got a chance to try out the Wet-Pro kit, and the youth sampled and compared water from three sites around Pictou Landing First Nation.

In the afternoon and during the last day, the group worked on their digital stories, writing scripts in their journals, collecting photos from the Internet and from throughout their time at the camp, recording their voice-overs, and making final edits.

Sharing the Stories

For some of the youth participating in the camp, this was the first time they had been asked to share their feelings about Boat Harbour publicly. Three digital stories were made by youth during the camp, by Madison, Hunter, and Alexandria (Cecilia made one

as well). The narratives shared in the videos speak to the sense of loss experienced by youth in Pictou Landing, and the feelings of frustration at a legacy of broken promises. Even though these youth have never lived with a clean Boat Harbour, they carry the desire to be connected with A'se'k.

The youth camp sought to address and engage youth on questions of health and the environment. Overall, the camp opened up a space for learning and discussion among the group of participants. And it offered a chance for knowledge translation and for sharing the work of the PLNWG and research team over the past few years.

15. Knowledge-sharing Activities and Capacity-building

Throughout the project, reporting back to the community was important. Through discussions at Pictou Landing Native Women's Group (PLNWG) meetings, Research Retreats, and Community Dinners, changes were made to research protocols and goals. Examples of how information was shared include: monthly Chief and Council updates; PLNWG meetings; Community Dinners; annual retreats; documentary film and photography projects; Health, Environment, and Communities Research Lab website (heclab.com); media interviews; and a variety of publications including the Pictou Landing First Nation newsletter, academic journal articles, final reports, and booklets.

Event Participation and Conference Presentations

- **Heather Castleden, Dee Lewis,** and **Chief Andrea Paul** attended the Atlantic Policy Congress Atlantic First Nations Health Conference in Moncton, New Brunswick, to present on the process of developing the community-university research partnership in November 2012.

- **Ziyun Wang** presented her analysis of the Health Canada reports to the women at a PLNWG meeting before presenting "Pulling the Plug on Boat Harbor: A Synthesis Review and Gap Analysis of Existing Environmental and Health Studies" for her Master's degree in Environmental Studies in December 2012.

- **Ziyun** also presented at the Annual Atlantic Canadian Association of Geographers Conference in Halifax during the fall of 2012.

- **Dee** delivered a guest lecture titled "Gender and Culture: The Social and Health Impact Assessment in Environmental Assessment" to Heather's Socio-Political Dimensions of Resource and Environmental Management class in the winter of 2012.

- **Dee, Sheila Francis,** and **Heather** were invited to present at the Atlantic Aboriginal Economic Development Integrated Research Program (AAEDIRP) conference titled "Working Alongside Aboriginal Peoples in Research," hosted in Dartmouth February 5-7, 2013. Only Dee and Sheila could attend, and the subject of their presentation was the process of developing the community-university research partnership.

- In the summer of 2013, **Heather** brought her class to Pictou Landing as part of her course, Indigenous Perspectives on Resource and Environmental Management. **Colleen Denny** and **Kim Strickland** gave the group a tour of the community, introduced the project, and discussed their roles as Research Associates.

- **Sheila, Kim, Colleen, Dee**, and **Heather** presented their digital stories at the Community-Campus Partnerships for Health 13th International Conference, "From Rhetoric to Reality: Achieving Authentic, Equitable and Transformative Partnerships" (April 30–May 3, 2014) in Chicago, Illinois. The stories are about their personal journeys and project experiences and can be viewed online at www.heclab.com.

- In June of 2014, **Dee** and **Sheila** travelled to Happy Valley-Goose Bay; they were invited by FemNorthNet to participate in a process with other Indigenous women: those from Labrador who will be increasingly impacted by the Muskrat Falls project, and those from Nova Scotia who will be impacted by the Maritime Link.

- **Heather, Kim, Dee,** and **Darlene Bachiri** attended the International Network in Indigenous Health Knowledge and Development (INIHKD) in partnership with the Manitoba Network Environment for Aboriginal Health Research (NEAHR) Conference in Winnipeg, Manitoba, from October 5 to October 10, 2014.

- **Dee** facilitated a session for Environmental Justice Alliances on November 22, 2014, at St. Francis Xavier University called "Building Alliances and Seeking Reconciliation with Mi'kmaq Women: A Day of Action and Dialogues." **Sheila** served as a panelist. The session included a short overview of the project and a discussion about the issues and strategies to build alliances for positive actions to protect, uphold, and implement Indigenous rights.

- On January 23, 2015, **Dee** presented her PhD thesis proposal at Dalhousie University, titled "Tlilnuo'lti'k – Weji-sqalia'timk – How We Will Be Mi'kmaq on Our Land: Working Together with Pictou Landing First Nation to Redefine a Healthy Community."

- **Sheila, Heather, Kim, Colleen, Dee,** and **Darlene** presented their digital stories as a group at the Citizen Science 2015 Conference held February 11-12, 2015, in San Jose, California.

- **Dee** presented at Environmental Racism and First Nation Women – International Women's Week on March 4, 2015, at the Antigonish Women's Resource Centre.

- **Heather** presented a poster at the Community-Campus Partnerships for Health 15th International Conference, "Journey to Justice: Creating Change Through Partnerships," in New Orleans, Lousiana (May 11–14, 2016), where the poster presentation was awarded second place in the Viewers' Choice Award category.

- **Sheila, Kim, Dee,** and **Lexy Strickland** are scheduled to present at Dalhousie University's Indigenous Speaker Series in September 2016.

Peer-reviewed Academic Articles

- Given the remarkable response rate (approximately 60%) for the Environmental Health Survey, **Dee Lewis** led the development and submission of a manuscript on lessons learned from the process of conducting a survey using community-based participatory research methods. The article, authored by **Dee, Heather Castleden, Sheila Francis, Kim Strickland, Colleen Denny** and the **PLNWG**, is called "Increasing Response Rates on Face-to-face Surveys with Indigenous Communities in Canada: Lessons from Pictou Landing," and it was published by the journal *Progress in Community Health Partnerships* (2016).

- An article titled "'Put It Near the Indians': Indigenous Perspectives on Pulp Mill Contaminants in Their Traditional Territories (Pictou Landing, Canada)," authored by **Heather, Ella Bennett, PLNWG, Dee,** and **Debbie Martin,** has been accepted for publication by the journal *Progress in Community Health Partnerships*.

- A third peer-reviewed article is in preparation regarding the environmental monitoring components of the project: air, water, soil, and ecotoxicology.

Community Dinners

- The first Community Dinner was held on February 16, 2012. This dinner was a celebratory occasion as we had just received notice that our Canadian Institutes of Health Research Operating Grant had been approved.

- A second Community Dinner was held in Pictou Landing First Nation on January 15, 2013, to provide research activity updates. **Kim Strickland** and **Colleen Denny** organized and advertised the event and arranged for dinner to be served to about 40 people who attended.

- A third Community Dinner was held in Pictou Landing on June 18, 2013. More than 80 community members attended the BBQ organized by **Kim** and **Colleen**. Research activity updates were given by **Heather Castleden, Dee Lewis, Jane McCurdy** (on behalf of **Daniel Rainham**), **Mark Gibson, Rob Jamieson,** and **Ron Russell**.

- A fourth Community Dinner was held April 8, 2014. The agenda included a discussion about how the research project came to be and a summary of the first three years of working together, updates about the project components, and a presentation by **Kim** and **Colleen** about their roles as Community Research Associates.

- A fifth and final Community Dinner will be held to release this report to the community.

Awards

- **Haley Bernard** received an internship award from the Atlantic Aboriginal Health Research Program to work on the project in 2012.

- **Lucie Francis** received an internship award from the Atlantic Aboriginal Health Research Program to work on the project in 2012 with **Ron Russell**.

- **Diana Lewis** received a Canadian Institutes of Health Research Doctoral Research Award in May 2013 for three years to continue research with the PLNWG.

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- Information Morning Nova Scotia Interview with **Heather Castleden.** (2014, August 5).

- CBC/Global TV Interview with **Mark Gibson** (2014, August 7). *Northern Pulp newsmaker*. http://www.cbc.ca/player/play/2483990998

- **Martha Stiegman** and **Ella Bennett** filmed many aspects of the research before **Cathy Martin** and **Frank Clifford** joined the team to film research activities. We hope to obtain additional funding for Cathy Martin to produce a documentary using all the filmed material in the future.

Training

- **Dee Lewis** attended the Centre for Environmental Health Equity's National Training Program, "Knowledge Leaders in Children's Environmental Health," held in Vancouver, British Columbia, in 2012.

- **Kim Strickland** and **Colleen Denny** were hired as Community-Based Research Associates on the project on November 1, 2012. Colleen worked as a Research Associate until spring 2014 and Kim continued until June 2016.

- **Lucie Francis** and **Haley Bernard** were both awarded Atlantic Aboriginal Health Research Program summer internships to conduct research activities; respectively, they worked on ecotoxicology and oral histories.

- Thirteen women from the community administered Environmental Health Surveys: **Colleen, Kim, Pam Denny, Haley Bernard, Jordan Francis, Sheila Francis, Fran Nicholas, April Nicholas, Darlene Bachiri, Holly Francis, Heather Mills, Sylvia Francis,** and **Loretta Sylliboy** between 2012 and 2013.

- **Dee** gave two Environmental Impact Assessment (EIA) workshops in Pictou Landing in the fall of 2015 to inform the women about the language used in the Environmental Assessment process and case studies illustrating how they work. The first session involved learning the terminology specific to EIAs, and understanding the differences between types of EIAs and the basics of the process. The second session reviewed relevant case studies to put the previous learning into practice.

Theses, Reports, and Booklets

- "Final Report of Epitik Mawi-ta'jik: Pictou Landing Women's Retreat" (2011), prepared by **Dr. Heather Castleden** and **Ms. Ella Bennett** (School for Resource and Environmental Studies, Dalhousie University).

- "Pulling the Plug on Boat Harbour: A Synthesis and Gap Analysis of Existing Environmental and Human Health Assessments Including Pictou Landing First Nation, 1968-2007" (2012), prepared by **Ms. Ziyun Wang** (School for Resource and Environmental Studies, Dalhousie University).

- "Community Report: Boat Harbour Water Quality" (2013), prepared by **Dr. Rob Jamieson** (Centre for Water Resources Studies, Dalhousie University).

- "The Pictou Landing Native Women's Association: Boat Harbour Project" (2013), prepared by **Mr. Chris Garda** and **Ms. Kim Strickland** (available at www.heclab.com). It is an eight-page brochure with beautiful photographs, a description of the research team, an introduction to the pulp mill's history and the subsequent PLNWG mobilization, Two-Eyed Seeing, and the components of the project (ecotoxicology, air monitoring, oral histories, environmental health surveys, water monitoring, and community mapping).

- "Third Annual Pictou Landing Women's Research Retreat: Final Report" (2014), prepared by **Dr. Heather Castleden, Ms. Ella Bennett,** and **Ms. Emily Skinner** (School for Resource and Environmental Studies, Dalhousie University).

- "Soil Sampling Results for Dioxins, Furans and Metals in Pictou Landing First Nation, NS" (2014), prepared by **Dr. Rob Jamieson** (Centre for Water Resource Studies, Dalhousie University).

- "Our Ancestors Are in Our Land, Water, and Air: A Two-Eyed Seeing Approach to Researching Environmental Health Concerns with Pictou Landing First Nation: Air Quality Report" (2015), prepared by **Dr. Mark Gibson** (Atmospheric Forensics Research Group, Dalhousie University).

- "Sediment and Plankton Sampling for PCBs, Pesticides, Chlorophenols, Polybrominated Diphenyl Ethers, and Polychlorinated Dibenzodioxins and Furans" (2015), prepared by **Dr. Ron Russell** (Department of Biology, Saint Mary's University).

- "Fourth Annual Pictou Landing Women's Research Retreat Report" (2016), prepared by **Ms. Catherine Hart** (Health, Environments, and Communities Research Lab, Department of Geography and Planning, Queen's University).

- "Community Report: Environmental Health Survey" (forthcoming), prepared by **Ms. Diana Lewis** (Health, Environments, and Communities Research Lab, Department of Sociology and Social Anthropology, Dalhousie University).

"Not only are we going to do scientifically sound research… but it's going to come from us!"

(First Research Retreat, 2010)

16. Concluding Comments

Our six-year community-based participatory research project to explore the potential mental, physical, emotional, and spiritual health impacts of Boat Harbour for the members of Pictou Landing First Nation was, at times, arduous, rewarding, emotional, and certainly a transformative experience for those involved. Mobilizing the women of Pictou Landing, through the Pictou Landing Native Women's Group (PLNWG), around an issue that concerned all of our community, is an example of how Mi'kmaw women are revitalizing our roles as leaders and protectors in our community. For the academic members of this research team, it was a privilege and an honour for us to be invited to work with the PLNWG and support the women's research goals.

A'se'k was a place of highly productive subsistence fisheries, with recreational and medicinal functions for the Mi'kmaq of Pictou Landing. Although the land has never been subject to a treaty beyond "Peace and Friendship," 50 years ago the Boat Harbour Treatment Facility began releasing approximately 85 million litres of pulp mill effluent into A'se'k daily. We do not know, with absolute certainty, how much pollution the Mill has released and continues to release into the local environment, but we know that respiratory illness (e.g., asthma) is substantial in the community. When the mill started operating, fish kills were immediate, and significant social, psychological, and cultural impacts continue to affect the community. This is, in part, due to the mill's continued operation and consequent pollution. But it is also due to a legacy of broken government promises through unfulfilled commitments to relocate the waste treatment facility and remediate the estuary. A'se'k/Boat Harbour has, undoubtedly, transformed into a place of dis-ease, anxiety, and unrest (Castleden et al., in press).

While this report marks the conclusion of our research project, it does not mark the conclusion of our relationships and our commitments to each other, and the lands, waters, and air around us. Our story is not over…

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View publication stats

Journal of Steroid Biochemistry & Molecular Biology 127 (2011) 204–215

Contents lists available at SciVerse ScienceDirect

Journal of Steroid Biochemistry and Molecular Biology

journal homepage: www.elsevier.com/locate/jsbmb

Review

Endocrine disrupting chemicals and disease susceptibility

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ARTICLE INFO

Article history:
Received 4 August 2011
Accepted 6 August 2011

Keywords:
Endocrine disrupting chemicals
Hormone
Disease susceptibility
Bisphenol A
Nuclear receptor
Obesogen
Low dose effects
Developmental windows of susceptibility

ABSTRACT

Environmental chemicals have significant impacts on biological systems. Chemical exposures during early stages of development can disrupt normal patterns of development and thus dramatically alter disease susceptibility later in life. Endocrine disrupting chemicals (EDCs) interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological, cardiovascular, metabolic and immune effects in humans. A wide range of substances, both natural and man-made, are thought to cause endocrine disruption, including pharmaceuticals, dioxin and dioxin-like compounds, polychlorinated biphenyls, DDT and other pesticides, and components of plastics such as bisphenol A (BPA) and phthalates. EDCs are found in many everyday products – including plastic bottles, metal food cans, detergents, flame retardants, food additives, toys, cosmetics, and pesticides. EDCs interfere with the synthesis, secretion, transport, activity, or elimination of natural hormones. This interference can block or mimic hormone action, causing a wide range of effects. This review focuses on the mechanisms and modes of action by which EDCs alter hormone signaling. It also includes brief overviews of select disease endpoints associated with endocrine disruption.

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1. Introduction

EDs are synthetic chemicals that were originally designed for a specific action such as a pesticide, plasticizer, or solvent, but now have been found to have a side effect that when absorbed into the body causes them to either mimic or block hormones and disrupt the body's normal functions. This disruption can occur by altering normal hormone levels, inhibiting or stimulating the production and metabolism of hormones, or changing the way hormones travel through the body, thus affecting the functions that these hormones control. EDCs were originally thought to exert their actions solely through nuclear hormone receptors, including estrogen receptors (ERs), androgen receptors (ARs), progesterone receptors, thyroid receptors (TRs), and retinoid receptors, among others (Table 1) [1]. However, recent evidence shows that the mechanisms by which EDCs act are much broader than originally recognized. Indeed,

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0960-0760/$ – see front matter. Published by Elsevier Ltd.
doi:10.1016/j.jsbmb.2011.08.007

Table 1
Select human nuclear receptors and related functions.

Receptor	Abbreviation	Physiological function	Endogenous ligand	Examples of endocrine Disrupting chemicals
Androgen	AR	Male sexual development	Testosterone	Pesticides Phthalates Plasticisers Polyhalogenated compounds
Estrogen	ER α, β GPR30 (non-nuclear)	Female sexual development	Estradiol	Alklyphenols BPA Dioxins Furans Halogenated hydrocarbons Heavy metals
Thyroid hormone	TR α, β	Metabolism Heart rate	Thyroid hormone	BPA Dioxins Furans PBDEs PCBs Perchlorates Pesticides Phalates Phytoestrogens
Progesterone	PR	Female sexual development	Progesterone	BPA Fungicides Herbicides Insecticides
Arylhydrocarbon	AhR	Circadian rhythm Metabolism Neurogenesis Organ development Stress response	Unknown	Dioxins Flavonoids Herbicides Indoles PCBs Pesticides
Peroxisome proliferator-activated	PPAR α, β, λ	Lipid homeostasis	Lipids/fatty acids	BPA Organotins
Glucocordicoid	GR α, β	Development Metabolism Stress response	Cortisol	Arsenic BPA Phthalates

studies have shown that in addition to altering nuclear receptor signaling, EDCs are capable of acting through nonsteroid receptors, transcriptional coactivators, enzymatic pathways involved in steroid biosynthesis and/or metabolism, and numerous other mechanisms that converge upon endocrine and reproductive systems [1,2]. Other less well known mechanisms of action of EDCs include direct effects on genes [3] and their epigenetic impact [4]. These effects are particularly troubling since alterations in genetic programming during early stages of development may have profound effects years later and may also lead to transgenerational inheritance of disease (Fig. 1) [5].

There are several characteristics of the endocrine system that must be understood in order to develop a full understanding of the mechanisms of actions and the consequences of exposure to EDCs. For instance, similar to hormones, EDCs can function at very low doses in a tissue specific manner. EDCs may also exert non-traditional dose–responses due to the complicated dynamics of hormone receptor occupancy and saturation. Thus low doses may have more impact on a target tissue than higher doses, and the effects and dose–response curve may be entirely different. The age at which an individual is exposed to an EDC also has important implications on resulting health consequences. Indeed, it is now clear that exposure to EDCs during development results in different effects than exposures during adulthood. Adults require higher concentrations for EDCs to cause toxicity and their effects only last as long as the EDC is present. Low dose exposure during development can result in disruptions that lasts long after the EDC is gone from the body. For this reason, the field of endocrine disruption coined the term "the fetal basis of adult disease", or FeBAD, to describe the interactions between the developing organism and the environment that determine the propensity of that individual to develop disease later in life [1]. This concept has been extended beyond the fetal period to include the early postnatal developmental period when organs continue to undergo substantial development. DOHaD (developmental origins of health and disease) describes the interactions between the developing organism and the environment that determine the propensity of that individual to develop disease across its lifespan [1].

Evidence in animal models suggests that EDCs may affect not only the exposed individual but also the offspring and subsequent generations. The mechanism of transmission involves non-genomic modifications of the germ line such as changes in DNA methylation and histone acetylation. Altogether, EDCs pose a significant challenge to our industrialized society and to the health of humans and the environment. Indeed, due to their wide commercial use and direct link to adverse human health outcomes, the Endocrine Society published a scientific statement in 2009 indicating that endocrine disruptors pose a "significant concern for public health" [1].

2. Modes of action

2.1. Nuclear receptor signaling

EDCs are structurally similar to many hormones, function at extremely low concentrations, and many have lipophilic properties. EDCs are capable of mimicking natural hormones and maintain similar modes of action, transport, and storage within tissues. The properties of these chemicals, while unintended, make them particularly well suited for activating or antagonizing nuclear hormone receptors. Thus, there is virtually no endocrine system immune to these substances, because of the shared properties and similarities of receptors and enzymes involved in the synthesis, release, and degradation of hormones (Table 1) [1].

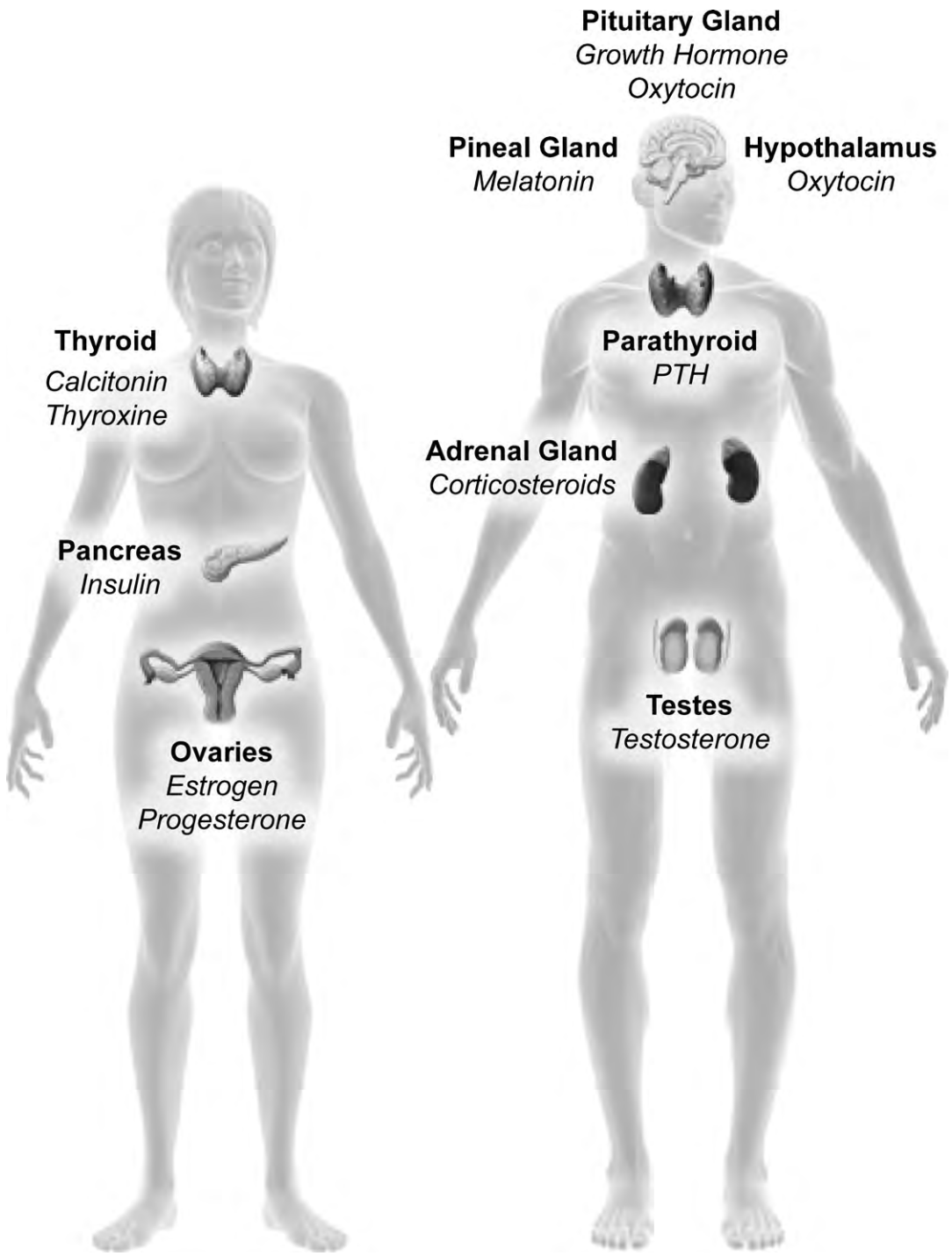

Fig. 1. Model of the endocrine systems targeted by EDCs. This figure illustrates that all major endocrine organs are vulnerable to endocrine disruption, including the HPA axis, reproductive organs, the pancreas, and the thyroid gland. EDCs are also known to impact hormone-dependent metabolic systems and brain function.

The nuclear hormone receptors are a super family of transcription factors that play important roles in both physiology and disease. In humans, there are some 48 nuclear receptors and many remain "orphans" as their endogenous ligands are yet to be determined. Research on the roles of nuclear receptors has been limited largely to the use of synthetic agonists, as well as genetic approaches to alter expression. This contrasts with the estrogen receptors (ERα and ERβ), which have been extensively studied [6]. These receptors remain at the center of endocrine disruption research, as outlined below, and results from these studies may provide a model for how other nuclear receptors interact with hormone mimics.

The estrogens are a group of steroid hormones produced by enzymatic modification of cholesterol. The primary estrogen of the reproductive years in females is 17β-estradiol (estradiol), which is derived from testosterone by aromatase activity. There are a wide range of natural and synthetic molecules that can activate ERα and ERβ. Natural estrogens include those produced by plants (phytoestrogens) and fungi (mycoestrogens). Synthetic ER activators include those intentionally produced for use in humans

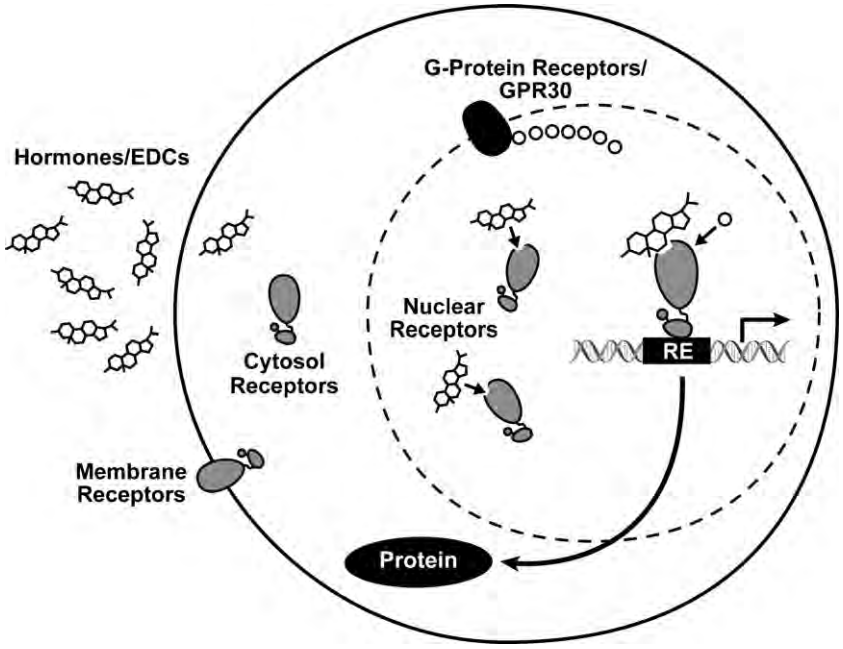

Fig. 2. Illustration of steroid hormone receptor signaling pathway. Hormones, or hormone mimics, bind to membrane or cytosol receptors, which in turn shuttle to the nucleus and attach themselves to response elements (REs), where they work to regulate gene transcription and ultimately protein production. Some receptors reside solely in the nucleus atop REs in inactive forms and become activated upon hormone binding. EDCs can alter this signaling process by binding to steroid receptors and either activating or inhibiting transcriptional response.

(e.g., diethylstilbestrol) as well as chemicals targeted for other uses that have unintended ER-modulating activities (e.g., DDT, methoxychlor). Identifying chemicals that display estrogenic activity is now a major focus of the research done on endocrine disruption.

Estrogenic compounds disrupt normal development via interaction with one of the estrogen receptors. There are three types of receptors for estrogens: the nuclear estrogen receptors (ERs), the membrane bound estrogen receptors (which are variants of the nuclear ERs), and the estrogen G protein-coupled receptor (GPR30), which is a membrane-bound protein with a high affinity toward estrogen. The main function of the ER is as a DNA-binding transcription factor that regulates gene expression and subsequent downstream responses (Fig. 2).

While some EDCs act as estrogen mimics, others have estrogenic activity but they are not true estrogens. For example, BPA was designed as a synthetic estrogen and has been shown to bind to the estrogen receptors (ERα, ERβ, and to the membrane ER), resulting in a cellular signal transduction cascade that is indicative of an estrogen response. [7,8] However, detailed examination of its effects on gene expression in a variety of tissues indicates that, while there is significant overlap, BPA does not stimulate the same suite of genes as estradiol. In addition there is mounting evidence that EDCs such as BPA interact with other nuclear receptors, albeit at higher concentrations. For example, one study found that BPA binds to the thyroid hormone receptor (TR) with a lower affinity than the estrogen receptor [9]. However, others believe BPA acts as an indirect antagonist of thyroid hormone (TH) and that its effects on TH action in vivo are likely dependent on the composition and relative abundance of cofactors available in the cell [10]. Studies have also shown that BPA binds to the ubiquitous aryl hydrocarbon receptor (AhR) [11]. This is not surprising because AhR is thought to be activated by many chemicals and likely mediates toxicity through several signaling pathways [11]. Thus, EDCs are not hormones, but they do display hormone-like properties that can have wide-ranging effects on cellular systems.

The focus of EDC research has been on estrogens, androgens and thyroid agonists and antagonists, but it is now clear that there are EDCs that affect other receptors and metabolic systems. Another nuclear hormone receptor targeted by EDCs is the peroxisome proliferator-activated receptor gamma (PPARγ) [reviewed in 12]. PPARγwas shown to be a key regulator of adipogenesis in vitro and in vivo and is important clinically as a target for drugs that ameliorate insulin resistance in type II diabetes. PPARγ functions as a heterodimer with the retinoid 'X' receptor, RXR; the RXR-PPARγ heterodimer is a ligand modulated transcription factor that directly regulates the expression of its target genes [13]. PPARγ is thought to be the master regulator of adipogenesis because it plays an important role in nearly all aspects of adipocyte biology [reviewed in 14, 15]. Activation of PPARγ2 in preadipocytes induces them to differentiate into adipocytes and PPARγ is required for this process in vitro and in vivo [16,17]. Moreover, expression of PPARγ is sufficient to transform susceptible stem cells into preadipocytes [18]. Activating the PPARγ pathway drives mutipotent stromal stem cells to enter the adipogenic pathway whereas inhibition of PPARγ expression promotes an osteogenic fate [reviewed in 19, 20]. It is known that humans whose diabetes is being treated with rosiglitazone (a drug that activates PPARγ) develop more adipocytes and gain weight [21]. Therefore it is reasonable to hypothesize that chemicals capable of activating PPARγ might have the same effect [reviewed in 22]. More research is needed to determine the extent to which EDCs interact will all nuclear receptors.

2.2. Low dose effects

For many years, toxicologists have relied on the presumption that "the dose makes the poison", first proposed by the Swiss physician and alchemist, Paracelsusin the 1500s. This view predicts that higher doses of a chemical will cause greater harm than low doses. This model is traditionally used by regulators to establish risk assessment profiles of chemicals. It relies on a monotonic dose–response curve generated from high and moderate dose

Fig. 3. Model illustrating early life exposures may cause functional changes at cellular levels that lead to changes in physiological status, and ultimately adult disease.

measurements that are linearly extrapolated downward to predict toxicity at very low doses. However, multiple studies on EDCs contradict this concept and question the adequacy of traditional toxicology testing paradigms for detecting low dose effects of EDCs. Indeed, these reports suggest that, similar to hormones, EDCs are capable of eliciting bi-phasic dose responses for many different endpoints at many levels of organization. These U-shaped and inverted U-shaped non-monotonic dose–response (NMDR) curves are used as evidence that very low concentrations of EDCs can effect endpoints such as cell proliferation and organ development.

NMDR curves have been described for numerous EDCs [23]. However, much controversy surrounds determining internal concentrations, the active metabolites, and the actual daily exposure levels of EDCs. The duration and route of exposure may also have a big influence on how the chemical is metabolized and whether or not the chemical remains biologically active. Additionally, the "low dose" levels at which these chemicals function are lower than those typically used in standard toxicology testing. This makes it difficult for toxicologists to use traditional rodent models to predict relevant endpoints for human exposures, when testing proceeds from a high dose and stops when a "no observed adverse effects level" (NOAEL) is reached.

Despite the controversy surrounding the "low dose" concept, there are several reasons why dose–response curves to toxicants may be non-monotonic. For example, the induction of metabolizing enzymes or conjugation of substrates my result in a U-shaped dose response for some endpoints. A recent study by Gualtieri et al., using Sertoli cells exposed to various doses of BPA (0.5 nM–100 μM), demonstrated that only intermediate doses (10 μM–50 μM), not high or low doses, induced an incremental increase in cell protecting glutathione levels [24]. Their findings show that detoxification through direct conjugation was enhanced at intermediate levels and cell viability was negatively affected at high and low doses where the cells were incapable of eliciting a response mechanism.

Several studies have suggested that non-monotonic responses can be explained by the down-regulation of receptors at higher hormone levels [25,26]. There is also evidence that NMDR curves are generated by the integration of two or more monotonic dose response curves that occur through different pathways affecting a common endpoint with opposing effects [27,28]. Furthermore, adaptive responses through complex cell signaling pathways and feed-back mechanisms could cause non-monotonic effects that are inconsistent with traditional dose–response curves. For example, Bouskine et al. reported that BPA stimulates JKT-1 cell proliferation in vitro in an inverse U-shape dose–response curve [29]. The authors propose that BPA activates two different signaling pathways that are distinct in both signaling mechanism and the time frame of response. In summary, making predictions about the safety of chemicals by testing at moderate or high doses is not appropriate when very low doses of endocrine disruptors can alter biochemical and morphological endpoints in a manner that is not necessarily predicted by exposures at much higher doses [30]. Lastly, it was proposed in a theoretical treatment that non-monotonic systems result from a loss of negative feedback and that such systems can be converted back into monotonic systems by adding back negative feedback [31]. This has important implications for EDCs since it well known that most hormonal signaling pathways are regulated by negative feedback and it has been demonstrated that EDCs differentially affect the stability of nuclear receptor proteins and ligands [reviewed in 32].

2.3. Developmental windows of susceptibility

Adult exposure to endocrine disrupting chemicals is certainly an important factor in adverse health outcomes, however focus on the fetus and/or neonate is of primary concern since developing organisms are extremely sensitive to perturbation by chemicals with hormone-like activity. Adverse effects may be most pronounced in the developing organism and occur at concentrations of the chemical that are far below levels that would be considered harmful in the adult [33,34]. Some of the reasons for this increased sensitivity include the fact that the protective mechanisms that are available to the adult such as DNA repair mechanisms, a competent immune system, detoxifying enzymes, liver metabolism, and the blood/brain barrier are not fully functional in the fetus or newborn. In addition, the developing organism has an increased metabolic rate as compared to an adult which, in some cases, may result in increased toxicity [34]. Finally, prenatal exposure to environmental factors can modify normal cellular and tissue development and function through developmental programming, such that individuals may have a higher risk of reproductive pathologies and metabolic and hormonal disorders later in life. Thus, exposures during critical windows of perinatal development may not manifest until much later in life. While fetal development is commonly known to be a period of increased sensitivity to chemical insult, childhood and adolescence are also marked by continued maturation of key endocrine systems, and are therefore susceptible to chemical exposure. Indeed, the DOHaD hypothesis, first proposed by David Barker in 1997, showed that poor in-utero nutrition resulted in high rates of disease manifested later in life [35]. This concept now includes non-nutritional early life exposures that have been shown to alter the body's physiology. Thus the DOHaD paradigm provides a framework to assess the effect of not only early nutrition but also EDCs on long-term health (Fig. 3) [36].

Of special concern are man-made hormone mimicking chemicals capable of evading defense mechanisms and misdirecting developmental decisions. Recent studies document detectable amounts of a variety of EDCs such as phthalates, polybrominated diphenyl ethers, polycyclic aromatic hydrocarbons, and BPA in pregnant women, fetuses, newborns, young children and adolescents [42–47]. Since each organ system has a different developmental trajectory, and the sensitive window for exposures to cause toxicity varies during tissue development, the effects of exposures are dependent not only on the type and dose of the chemical, but also when the exposure occurs [48]. These studies illustrate that the in utero developmental period is a critically sensitive window of vulnerability. Disruptions during this time-frame can lead to subtle functional changes that may not emerge until later in life [49]. Evidence now suggests that early life exposures to toxic chemicals can be directly associated with subsequent increases in the rates

Table 2
Developmentally induced diseases (**Human**[*]).

System	Disease	Chemicals
Reproductive/endocrine	Breast/prostate cancer	BPA
	Endometriosis	Dioxin, PCBs
	Infertility	Estrogens, pesticides, phthalates
	Diabetes/metabolic syndrome	BPA
	Early puberty[*]	Estrogens, BPA
	Obesity[*]	BPA, organochlorine pesticides, organotins
Immune/autoimmune	Susceptibility to infections	Dioxin
	Autoimmune disease	Dioxin
Pulmono-cardiovascular	Asthma[*]	Air pollution
	Heart disease/Hypertension	BPA
	Stroke	PCBs
Brain/nervous	Alzheimer's disease	Lead
	Parkinson's disease	Pesticides
	ADHD/learning disabilities[*]	PCBs, lead, ethanol, organochlorine pesticides

of many of the most common human diseases and the diseases that have increased the most in the last 20 years including asthma, learning and behavioral problems, early puberty, infertility, breast and prostate cancer, Parkinson's disease, obesity and other diseases (Table 2) [49–51].

Heindel and Newbold [52] described several important principles that demonstrate how early life environmental exposures contribute to increased risks of adult disease. First, chemical exposures can have both tissue-specific and time-specific consequences on growth and development. As long as tissue is developing, it is susceptible to disruptions from environmental exposures. These disruptions can result from changes in gene expression, protein activity, cell communication or other mechanisms. Secondly, the initiating in utero exposure may act alone or in concert with other environmental stressors. That is, the risk of developing disease in adulthood can be due to the combined insults over a lifetime. Thirdly, the pathophysiology may be manifested in a disease that otherwise might not have occurred and disease progression may have variable latent periods. Finally, the effects of environmental chemical exposures can be transgenerational, thus affecting future generations.

2.4. Epigenetic programming

One general mechanism by which prenatal and postnatal exposures could be linked to phenotypic changes later in life is through the alteration of epigenetic marks, which have a central role in determining the functional output of the information that is stored in the genome [37]. The term epigenetics refers to the factors around DNA that regulate its activity but are independent of the DNA sequence. While there are several factors that can modify DNA to alter gene expression, such as histone remodeling and regulation by small non-coding RNAs, we focus here on the ability of environmental chemicals to reprogram DNA through changes in methylation patterns. DNA methylation takes place at the carbon-5 position of cytosine in CpGdinucleotides due to DNA methyltransferases [38]. Methyl-binding proteins then attach to these sites and subsequently attract other chromatin modifying proteins, with the end result being a silencing of the methylated gene. On the other hand, hypomethylated genes tend to be more accessible to transcriptional machinery and can generate increased and inappropriate gene expression (Fig. 4) [39].

During development, the epigenome cycles through a series of precisely timed methylation changes designed to ensure proper development. The appropriate timing and extraordinary accuracy of methylation in the gametes and following fertilization makes this highly concerted system particularly vulnerable to interference from environmental exposures [40]. The highly orchestrated processes that occur during these critical developmental periods gives rise to concerns about vulnerability during early stages of life. For instance, epigenetic marks such as methylation patterns are laid down during development and are responsible for the programming necessary to transform stem cells into differentiated cells and tissues. The loss and subsequent reestablishment of the epigenetic profile in the developing embryo comprise a critically sensitive period during which the system is particularly vulnerable to environmental influences. Exposures to environmental chemicals, many with endocrine activity, can alter the epigenetic programming of both somatic and germ cells inducing subtle functional changes leading to disease later in life and in future generations.

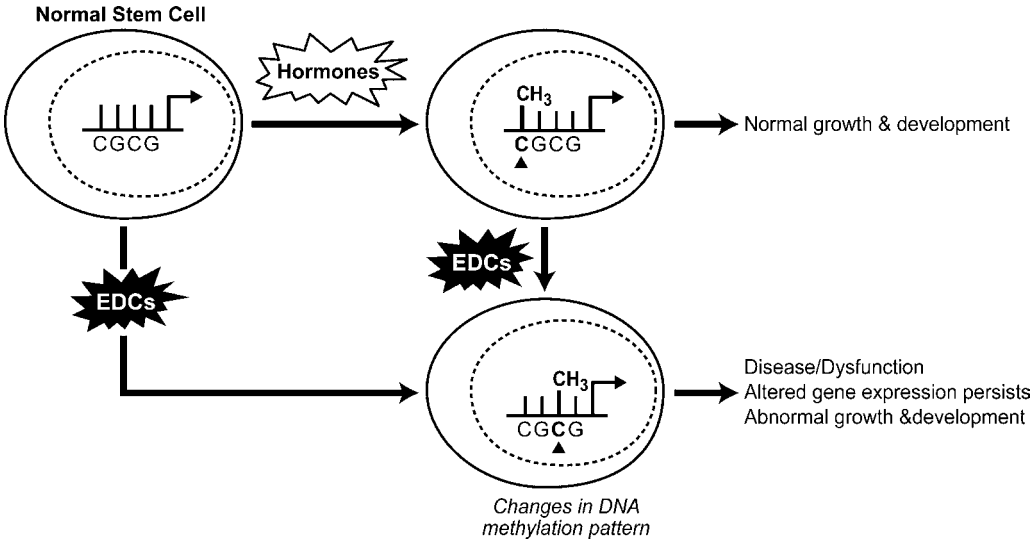

Fig. 4. Model depicting how EDCs can alter methylation patterns and normal epigenetic programming in cells. Alterations in the epigenetic status of somatic cells can lead to disease in developing tissues, whereas changes in the epigenetic programming in stem cells can lead to multi- and transgeneration effects in the offspring.

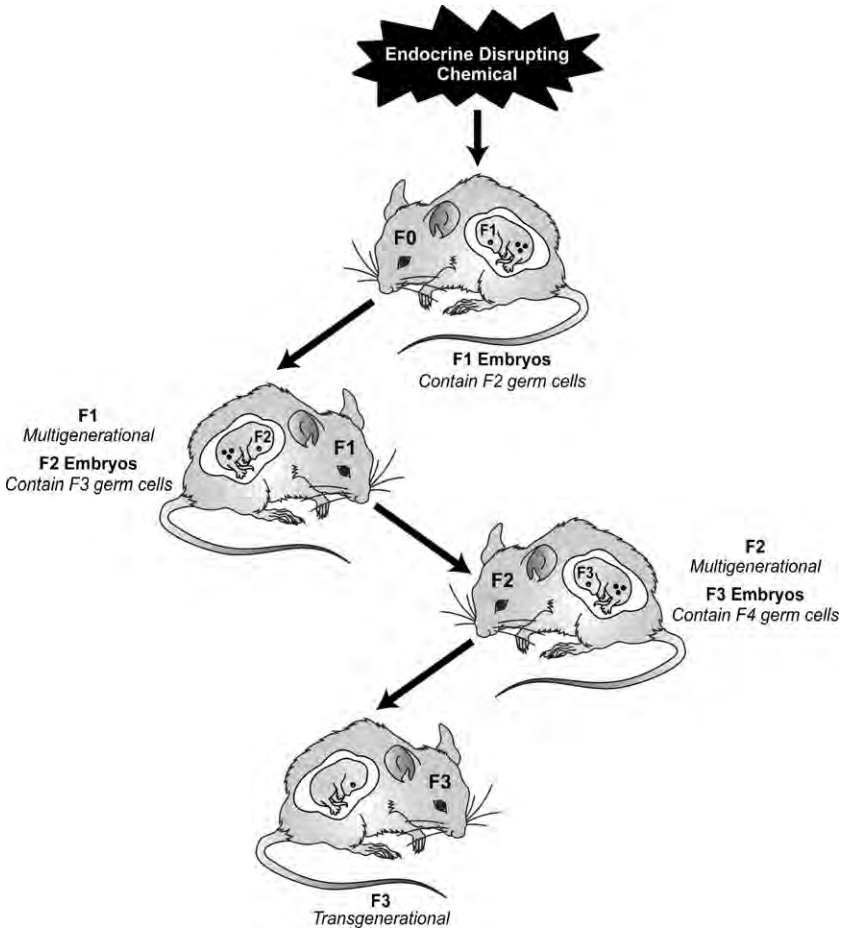

Fig. 5. EDCs many promote epigenetic alterations that influence somatic cells and so the disease status of the individual exposed (F0 generation). In pregnant females, EDC exposure could also cause epigenetic modifications in the next two generations (F1 and F2) through the fetus and its germ line. The effect of such multigenerational exposure in subsequent generations (F3 and beyond) would be considered a transgenerational phenotype.

The exact mechanism whereby environmental chemicals alter the epigenome has not been definitively established. It is known that following fertilization, the DNA methylation pattern in the sperm-derived pronucleus is actively removed (excluding imprinted genes). However, the enzymatic machinery responsible for demethylation is largely unknown. Recently, Activation-Induced cytidine Deaminase (AID) has been found to be highly expressed in primordial germ cells. AID was previously thought to act as a single-stranded DNA deaminase involved in recombination of the immunoglobulin genes during class switching [41]. However, AID activity may also play a role in DNA methylation in primordial germ cells and in the early embryo and in disrupting the action of DNA methytransferase activity during periods of programming. Emerging developments in technology necessary for accurate mapping of the epigenome during developmental periods will undoubtedly lead to a better understanding of the role of endocrine disruptors in disease susceptibility across the lifespan and across generations.

2.5. Transgenerational actions of endocrine disruptors

The majority of environmental factors act on somatic tissues and influence the physiology of the individual exposed [5]. However, in some cases these environmental factors promote a heritable transmission of the disease phenotype through successive generations [5,42,43]. The heritable transmission of this environmentally induced phenotype is referred to as epigenetic transgenerational inheritance. A classic example of a multigenerational phenotype resulting from an environmental chemical involves prenatal exposure to the potent synthetic estrogen diethylstilbestrol (DES), which was prescribed to reduce the risk of pregnancy complications and losses during the 1950s and 1960s [44,45]. Exposure of a gestating female to DES was found to promote an abnormal reproductive tract and gonadal dysfunction in the F1 generation males and females, as well as abnormal female reproductive tract function in the F2 generation [33]. It is interesting that the F1 and F2 generations display different disease phenotypes. Studies are currently underway to determine whether early life exposure to DES promotes multigenerational phenotypes [46,47]. Another example of multigenerational exposure was demonstrated using the anti-androgenic drug, flutamide. Many other chemicals have also been implicated in promoting toxicity for multiple generations, including BPA [48,49], polycyclic hydrocarbons [50,51], cocaine [51], pesticides [52], and phytoestrogens [53–55]. It is important to note that the multigenerational effects mentioned above involving direct exposures and phenotypes are not considered transgenerational because they are not transmitted solely through the germline. Only effects appearing in the F3 generation are considered to be truly transgenerational (Fig. 5) [5].

One of the first studies to demonstrate epigenetic, transgenerational effects of an endocrine disruptor involved the analysis of vinclozolin actions on the male germ line in rats [56]. Vinclozolin is a fungicide commonly used in agriculture that is known for its anti-androgenic endocrine action [57]. In this study Skinner et al. showed that exposing a pregnant rat to vinclozolin or methoxychlor (an estrogeneic pesticide) during embryonic days

8–14 caused defects in spermatogenic capacity, which were transmitted through at least four subsequent generations. Interestingly, the transgenerational phenotypes observed in the animals also included adult onset diseases, such as kidney disease, immune abnormalities, prostate lesions and cancer [56,58]. Subsequently, others have observed changes in behavior and learning capacity following vinclozolin exposure [59–63], including transgenerational changes in mate preferences and anxiety behavior [63]. These transgenerational effects were only seen when the exposure window overlapped with critical developmental processes such as germ cell methylation in the differentiating testis.

3. Selected disease endpoints

3.1. Male reproduction and development

Given the fact that both hormone production and action are regulated in large part by the reproductive tissue, it is not surprising that EDCs contribute to many adverse reproductive health outcomes in developing and adult humans. Epidemiological data has revealed an increase in male reproductive function disorders over the past 50 years, suggesting a correlative relationship with the increasing amounts of EDCs in the environment [64]. In the context of male reproductive health, EDCs have been linked to (1) disrupted reproductive function, displayed as reduced semen quality and infertility; (2) altered fetal development, displayed as urogenital tract abnormalities, including hypospadias and cryptorchidism, and (3) testicular germ cell cancer (TGCC) [1,65]. As previously mentioned, the potential lag between exposure to EDCs and the manifestation of a clinical reproductive disorder is of critical concern. In humans, this period may be years or decades post exposure because sexual maturity and fertility cannot be assessed until the exposed individual has attained a certain age [1].

Skakkebaek et al. [66] have suggested that the incidences of cryptorchidism, hypospadias and poor semen quality are risk factors for one another and that they are all predictive of developing testicular germ cell cancers. This quartet is defined as the testicular dysgenesis syndrome (TDS). They propose that the etiology of TDS lies in the diminished androgen action in fetal developmental periods and has a negative impact on the proper functioning of Sertoli cells (the cells supporting germ cells) and Lydig cells (where androgen synthesis occurs). This hypothesis proposes a strong association between environmental exposures and development of TDS.

Identifying environmental causes of TDS in humans is difficult because developing fetal tissues are inaccessible for examination. Thus, the majority of mechanistic evidence linking EDCs to TDS comes from animal experiments. It is possible to experimentally induce all the elements of TDS, except for germ cell cancer, by exposing pregnant rats to phthalates and other chemicals that block androgen action [67]. This model is referred to as the "phthalate syndrome" model, and it comprises non-descent of testis, malformations of the external genitalia, poor semen quality, and malformations of other sex organs [68]. The causes of phthalate syndrome center on suppression of fetal androgen action, which is the key driver of male reproductive organ development. Phthalates lower levels of testosterone and its derivatives by interfering with the uptake of steroid hormone precursors into fetal Leydig cells where steroid synthesis takes place. The net results are malformations of internal reproductive organs, hypospadias, retained nipples, and feminized anal–genital distance (AGD) [68]. Certain pesticides are able to block the androgen receptor, or interfere with the conversion of testosterone into dihydrotestosterone, thus producing effects similar to phthalate syndrome. Androgen action also is essential for proliferation and development of Sertoli cells, which are necessary for sperm production. Altogether, EDC-mediated disruption of androgen action during fetal development results in reduced fertility later in life [69].

Epidemiological studies have identified an association between chemical exposure (e.g., to phthalates, polychlorinated biphenyls (PCBs), dioxins, and nonpersistent pesticides) and reduced semen quality. In a U.S.-based study, Duty et al. [70] found links between monobutyl phthalate exposure and poor sperm motility and concentrations. A study of dioxin exposure conducted by Mocarelli et al. [71], suggests that timing of exposure has a significant impact on semen quality. This study was based on men exposed to high levels of TCCD as a result of a chemical plant explosion in 1976 in Seveso, Italy. Men exposed prepubertally (1–9 years of age) demonstrated poor semen quality as adults. Interestingly, men exposed between 10–17 and 18–27 years of age showed slightly positive or no differences in semen quality, respectively. Several occupational studies have found associations between pesticide exposure and reduced semen quality [72–78]. In a study on male partners of pregnant women, Swan et al. [79] found elevated odds ratios for poorer semen quality in relation to urinary concentrations of several common pesticides. Meeker et al. [80] also found an inverse relationship between urinary pesticide levels and sperm concentration and motilityin men. While there are clear associations between EDCs and diminished male reproductive health, there is a clear need for further epidemiological studies to identify the classes of chemicals, exposure levels, and the most critical windows of susceptibility important to male reproductive health.

3.2. Female reproduction and development

The ability of EDCs to alter reproductive function and health in females has been clearly demonstrated by the consequences of DES use in pregnant women. The daughters of women given DES while pregnant were shown to have rare cervicovaginal cancers [81,82], decreased fertility and increases in rates of ectopic pregnancy [83], and early menopause [84]. Many of these disorders have been replicated in laboratory animals treated with DES during gestation [44,85–89]. As Newbold points out [87], the lessons learned from 40 years of DES research in humans and animals are that the female fetus is susceptible to environmentally induced reproductive abnormalities, that gonadal organogenesis is sensitive to synthetic hormones and hormone mimics during critical exposure windows, and that reproductive disease may not appear until decades after exposures.

Proper development of ovarian follicles in the fetus is dependent on estrogen exposure during critical periods of development. For instance, mice treated with DES on postnatal day 1–5 develop multioocytic follicles as adults [90]. Therefore, maintaining a homeostatic balance of local and systemic hormones during follicle development is necessary for normal follicle development and germ cell quality [91]. Perturbations in hormone signaling resulting from chemical exposures during developmental periods could contribute to ovarian disorders and declining conception rates in human populations [92]. And while the mechanisms by which EDCs alter follicle development are not fully understood, there is evidence that these chemicals are contributing to increased rates of aneuploidy [93], polycystic ovary syndrome (PCOS) [94,95], premature ovarian failure (POF) [94,95], and altered cyclicity and fecundity [96–100]. For example, studies have shown that prenatal exposure to BPA causes irregular cycles in mice, which is likely due to hypothalamic alterations in the circuitry that controls luteinizing hormone (LH) secretion and ovulation [97,101]. In humans, altered cyclicity has been reported in individuals exposed to organochlorine pesticides. Indeed, cycle irregularities have been noted in women whose mothers were exposed in utero to DES [46].

Uterine fibroids (leiomyomas) are the most common tumor of the female reproductive system [102], occurring in 25–50% of all women. The risk of the development of uterine fibroids increases with age during premenopausal years, but tumors typically regress with the onset of menopause [103]. Obesity, age at menarche and unopposed estrogen signaling have been shown to increase the risks for fibroids [104]. The best characterized animal model for the study of uterine fibroids is the Eker rat. A mutation of the tuberous sclerosis complex 2 (Tsc2) tumor suppressor gene causes females to develop spontaneous uterine fibroids at a high frequency [105]. Studies using this model have shown that exposure to EDCs increases the incidence of fibroids in these animals [106]. Developmental exposure to DES causes rats that are genetically predisposed to uterine tumors to develop even more tumors of a larger size, but fails to induce tumors in wild-type rats. Importantly, DES exposure imparts a hormonal imprint on the developing uterus that causes an increase in estrogen-responsive gene expression [91]. The potential for DES to cause uterine fibroids in humans is less clear. Two studies on DES daughters came to different conclusions. In a study of 2570 women born during the period DES was prescribed, no association was found between prenatal exposure and uterine fibroids [107]. Another study of 1188 women found a significant relationship between DES exposure and uterine fibroids [108]. On analysis of these studies, Baird and Newbold concluded that there was a definitive increase in uterine fibroids in DES daughter and the discrepancies between the studies was due to the differences and sensitivities of the methods used to detect the tumors [108].

In summary, both animal and human studies suggest a role of EDCs in altering female reproductive development. Data from animal experiments show that EDC exposure during critical periods of development, both prenatal and neonatal, can induces functional changes that appear later in life. There are data gaps in understanding the mechanisms by which EDCs carry out their action, but it is clear that to reduce the risk of reproductive disorders we must take action to reduce exposure to these chemicals.

3.3. Obesity and metabolic disorders

There is now compelling evidence linking prenatal exposures to a variety of chemicals with altered developmental programming that may lead to weight gain [22] and metabolic disturbances such as diabetes later in life [109,110]. One well-studied example concerns the effects of maternal tobacco smoking. Babies born to mothers who smoke are typically born with a low birth weight but experience increased risk of obesity, cardiovascular disease and metabolic syndrome later in life, thus some component(s) of tobacco smoke that are transported to the fetus are “obesogens” [111].

Obesogens are functionally defined as chemicals that promote weight gain by acting directly on fat cells (to increase their number or the storage of fat) or indirectly by altering mechanism through which the body regulates appetite and satiety, by altering basal metabolic rate, or by altering energy balance to favor the storage of calories [reviewed in 22, 112]. Many known obesogens are EDCs that can act as direct ligands for nuclear hormone receptors, or affect components in metabolic signaling pathways under hormonal control [22]. Indeed, environmental chemicals such as tributyltin (TBT) and triphenyltin (TPT) are known to stimulate adipogenesis in vitro and in vivo. TBT and TPT are nanomolar affinity ligands for the RXR-PPARγ heterodimer [113,114] and stimulate 3T3-L1 preadipocytes to differentiate into adipocytes [113–115] in a PPARγ-dependent manner [116,117]. The ligand-binding pocket of PPARγ is large and considered to be promiscuous [118]; therefore, it is not surprising that an increasing number of other chemicals with dissimilar structures have been shown to be PPARγ ligands [reviewed in 12]. It is currently unknown how many environmental chemicals activate PPARγ and whether some or all of these will ultimately turn out to be obesogens but there is little doubt that activating PPARγ is an important pathway for adipogenesis and obesity (Fig. 6) [12,22].

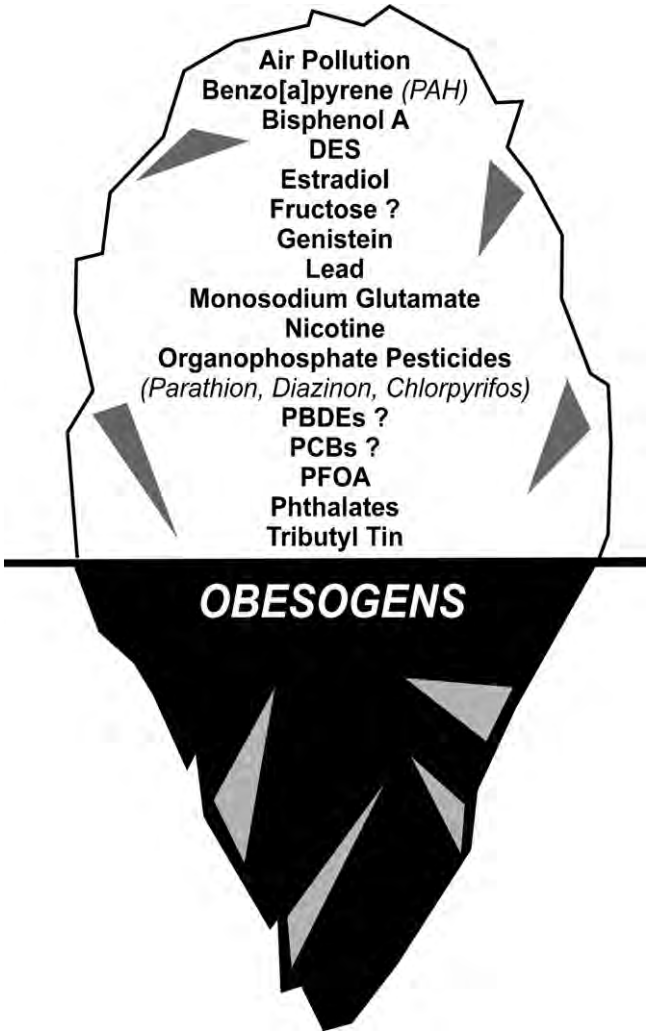

Fig. 6. The iceberg illustration indicates that there is evidence that exposure to certain EDCs during results in obesity in animal models. Only a few chemicals have been thoroughly studied in humans, thus possible that many more chemicals will be found below “the tip of the iceberg” that impact obesity.

Mature adipocytes are generated from multipotent stromal cells (MSCs) found in almost all fetal and adult tissues [119]. MSCs can differentiate into bone, adipose tissue, cartilage, muscle, in vitro and are thought to help maintain these tissues in the adult. Exposure of pregnant mice to TBT or the pharmaceutical obesogen rosiglitazone produced an MSC population that was predisposed to differentiate into adipocytes at the expense of bone [116]. Although the effects of TBT exposure on adults remains unexplored, it is known that rosiglitazone treatment increases weight and fat cell number in humans [120]; therefore, it is likely that TBT has the same effect. Intriguingly, MSCs derived from mice exposed to TBT in utero showed epigenetic alterations in the methylation status of the CpG islands of adipogenic genes such as AP2 and PPARγ which presumably led to the observed increase in the number of preadipocytes in the MSC compartment and in the frequency with which MSCs differentiated into adipocytes upon adipogenic stimulation [116]. Ultimately, it will be quite important to understand

how the setpoint for adipocyte number is programmed in humans and how this can be altered by EDC exposure.

There is growing concern in the scientific community that EDCs may be contributing to the rapid increased rates of diabetes and metabolic syndrome. It is of particular concern that the incidence of both obesity and diabetes are rising rapidly in the young. While there can be no argument that eating calorie-dense, nutrient-poor food in large portions combined with lack of exercise plays an important role, the rapid rise in obesity and diabetes in the young suggests the influence of early life exposures to chemicals may be playing an important role. Indeed, there is a growing body of literature linking exposure to EDCs such as BPA, dioxins, organochlorine and organophosphate pesticides with the incidence of metabolic syndrome and diabetes [109,110,121]. It is know that obesity and diabetes are linked and many of these same chemicals are associated with weight gain/obesity [22,112,122] and diabetes. While the precise metabolic pathways targeted by most of these chemicals are uncertain at present, the data linking EDCs with obesity, metabolic syndrome and diabetes are strong and the number of studies finding positive association is growing. Understanding the molecular mechanisms involved in the role of epigenetics and early life exposures will provide important insights into the etiology of these chronic disorders and should play an important role in designing effective prevention strategies.

4. Conclusion

Humans are exposed to thousands of chemicals during their lifetime, through the air, food, and water. A significant number of these chemicals can be toxic since they can disrupt the endocrine system. Over the past decade, the list of chemicals with endocrine disrupting activity has dramatically increased [123]. Evidence has shown that EDCs compromise the reproductive system, thyroid signaling mechanisms, as well as tissues and organs associated with energy metabolism, glucose control, fat cell development and satiety. Indeed, it is plausible that all endocrine systems are to some degree affected by environmental chemical exposures. Since EDCs activate the same receptors and signaling pathways as hormones and act at low concentrations, they are subject to the same biological regulatory systems as hormones. And since hormones control all aspects of physiology across the lifespan, the same can be expected from EDCs.

Hormones play a critical role in tissue development and the programming of stem cells and tissues during the developmental process. The same can be said for EDCs. The DOHaD paradigm illustrates that many, if not all, diseases have their origin during development. EDCs pose the most risk during the developmental period as they alter programming, which leads to increased susceptibility to disease later in life. Testing for chemicals with endocrine disrupting activity can be challenging as the effects are often subtle (functional changes such as alterations in epigenetic marks, and changes in gene expression), and they can manifest effects later in life, long after the EDC is eliminated from the body. Over the past 40 years, there has been a significant increase in a variety of endocrine-associated diseases including, infertility, premature puberty, ADHD, obesity and diabetes, and endocrine cancers such as prostate, ovarian and breast. It is biologically plausible that EDCs are playing a significant role in these and other diseases.

The notion that EDCs are significantly impacting human health is of great concern. More data is needed to expand the list of tissues affected by EDCs, and more effort is needed to identify and classify the diseases and dysfunctions they are causing in humans and animal models. Nevertheless, current data is sufficient to identify a public health problem that must be addressed. There must be concerted efforts to reduce exposures to EDCs across the lifespan, with particular emphasis in pregnant women and infants. In addition, it is important for scientists to develop biomarkers to measure exposure to EDCs during development periods. These biomarkers could be used to identify windows of susceptibility to EDCs and to develop early therapeutic interventions.

5. Statement

This article may be the work product of an employee or group of employees of the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH), however, the statements, opinions or conclusions contained therein do not necessarily represent the statements, opinions or conclusions of NIEHS, NIH or the United States government.

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PREVENTING BREAST CANCER:

AN ANALYSIS OF CANADA'S REGULATORY REGIME FOR CHEMICALS

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A DISSERTATION SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN ENVIRONMENTAL STUDIES
YORK UNIVERSITY
TORONTO, CANADA

DECEMBER, 2013

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Abstract

Breast cancer is the most commonly diagnosed cancer in women worldwide. The incidence rates are such that one in nine Canadian women will be diagnosed in her lifetime. While social science research has demonstrated the influence of social, political, economic, and environmental factors on health outcomes, many still emphasize the role of traditional risk factors for breast cancer, such as family history or diet. However, these factors are unable to account for the increased incidence of the disease in industrialized countries. This leads to a call for more attention to the environmental links to breast cancer, including the 'everyday exposures' to toxic substances that we experience in our daily lives, which often include mammary carcinogens and endocrine disrupting chemicals. The *Canadian Environmental Protection Act, 1999* and the federal government's *Chemicals Management Plan* are designed to protect the environment and the entire Canadian population from risks associated with exposure to toxic substances. This dissertation research examines the body of Canadian law, policy and practice which encompasses Canada's regulatory regime for toxic substances. The regime is evaluated from a population health and primary prevention perspective. I asked: are the laws, policies and practices governing the everyday exposures to toxic substances in Canada inherently precautionary? And do they enact a primary prevention approach to women's health?

The primary prevention of environmental health outcomes has not been a strong feature of public health policy and legislation in Canada, despite the efforts of environmental breast cancer activists who advocate for a precautionary approach. This research is steeped in politicized debates as it engages with issues central to women's health, risk and the environment. I examine how the issues are communicated and understood, who the policies are designed to protect, and where the burden of risk is presumed to lie. I consider whether the policies capture the need for prevention and action related to women's health. This research seeks to identify gaps in the law, policy and practice and in doing so, concludes that women's health is not adequately protected from detrimental health outcomes as a result of everyday exposures to toxic substances, including breast cancer.

Dedication

I would like to dedicate this dissertation to my father, Reg Sweeney (1949-2007). Our parents instilled us with a strong work ethic and only ever asked that we try our best. Dad, I know you would be proud and I miss you every day.

Acknowledgements

The Faculty of Environmental Studies at York University is one of the only places where I could have conducted this research. This faculty encourages its students to conduct critical work drawing from and across multiple disciplines which was essential for a project linking women's health, toxic substances, risk, and regulation.

I was very fortunate to have the opportunity to work with my supervisor, Dr. Dayna Scott. She was an invaluable resource with her research and expertise in women's and environmental health. I'm grateful for the thoughtful discussions that helped to shape my work. I would also like to thank my committee members, Professor Liora Salter and Dr. Miriam Smith for their feedback throughout the various stages of the program, including comprehensive examinations, the dissertation proposal when I was wisely advised to narrow the scope of my project, and the draft dissertation.

I would like to thank Dr. Liette Gilbert for her support during my time in the program, particularly in my first year when she was the PhD Program Coordinator and teaching ENVS 8102. Her advice was priceless as I was navigating the first year of the program, and I continued to refer to materials from this course throughout my time at York.

I would like to acknowledge the financial support I received in the form of Ontario Graduate Scholarships (2010-2012) and York University's Provost Dissertation scholarship (2012-2013).

I'm very grateful for my time spent at the National Network on Environments and Women's Health. I would like to thank the NNEWH team for their continually inspiring commitment to advancing women's health research. It was a pleasure working closely with Dayna, Anne Rochon Ford, Jyoti Phartiyal, Jim Brophy, Margaret Keith, Michael Gilbertson, and Bob DeMatteo -- all of whom I admire both personally and professionally.

Many thanks to all of the members of my examining committee including Dayna and Miriam, as well as Dr. Aryn Martin (internal external), Dr. Barbara Rahder (chair and Dean's representative), and the external examiner, Dr. Abby Lippman for a critical and engaging discussion which has given me plenty to think about moving forward.

I'm very thankful for support of good friends, both new and old, near and far. In particular, I would like to my colleagues and members of a writing support group including Amanda Di Battista, Sonja Killoran-McKibbin, Andrew Mark, and Catie Ady-Bell. Thanks for the encouragement, as well as sharp eyes and always thoughtful feedback during our time together.

I would especially like to thank my Mom, Reeta Sweeney whose support and encouragement is invaluable and has never wavered. I would like to thank my brother Mark for his support. I want to wish him congratulations on completing his PhD in History from the University of Waterloo in November this year. I'm so proud! We would have never imagined that we'd both be completing PhDs, but I'm glad that we're also still the same people who grew up in Enfield, Nova Scotia. Finally, I would like to acknowledge the memory of my grandmothers who both taught me important life lessons and passed away during my time at York University, Erma Catherine Sweeney (1923-2009) and Mary Christena Sutherland (1923-2012).

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List of Abbreviations

ACEWH - Atlantic Centre of Excellence for Women's Health
BBP – n-butyl benzyl phthalates
BCCEWH - British Columbia Centre for Excellence in Women's Health
BHA - butylated hydroxyanisole
BHT - butylated hydroxytoluene
BPA - bisphenol A
BFR - brominated flame retardants
CEPA - *Canadian Environmental Protection Act*, R.S.C. 1988
CEPA 1999 - *Canadian Environmental Protection Act*, R.S.C. 1999, c. 33
CESAF - Centre of Excellence for Women's Health - Consortium Université de Montréal
CFCs - chlorofluorocarbons
CMP - *Chemicals Management Plan*
CWHN - Canadian Women's Health Network
DBP - di-n-butyl phthalates
DDT - dichlorodiphenyltrichloroethane
DEA - diethylalomine
DEHP - di(2-ethylhexyl) phthalates
DES - diethylstilbestrol
DIBP - diisobutyl phthalates
DMF - N,N-dimethylformamide
EDC - endocrine disrupting chemical
GBA - gender based-analysis
HCBD - hexachlorobutadiene
IARC - International Agency for Research on Cancer
IICA - International Council of Chemicals Associations
LGBT – Lesbian, Gay, Bisexual, and Transgender
LOAEL - Lowest-Observed-Adverse-Effect-Level
NDMA - N-nitrosodimethylamine
NO(A)EL - No-Observed-(Adverse)-Effect-Level
NNEWH - National Network on Environments and Women's Health
NPE - nonylphenol and its ethoxylates
NTP - National Toxicology Program
OECD - Organisation for Economic Co-operation and Development
PAH - polycyclic aromatic hydrocarbons
PBDE - polybrominated diphenyl ether flame retardants
PCB - polychlorinated biphenyls
PCEWH - Prairie Women's Health Centre of Excellence
PEG - polyethylene glycol compounds
PFC - perfluorinated chemicals
PFOS - perfluorooctane sulfonate
PSL1 - first Priority Substances List

PSL2 - second Priority Substances List
REACH - Registration, Evaluation and Authorization of Chemicals
RoHS - Restriction of the use of certain Hazardous Substances in electrical and electric equipment
RQASF - Réseau Québécois d'Action pour la Santé des Femmes (Quebec Womens' Health Action Network)
Siloxane D4 - octamethylcyclotetrasiloxane
Siloxane D5 - cyclopentasiloxane, decamethyl-
SNAc - Significant New Activity
TSCA - *Toxic Substances Control Act* (US)
TSMP - *Toxic Substances Management Policy*
USEPA - United States Environmental Protection Agency
WHCR - Women and Health Care Reform
WHP - Women and Health Protection

Chapter 1

Introduction

Introduction

Advances in medical and environmental science have created an awareness of the relationship between toxic agents and human health (Somers, 2001). Kroll-Smith and Kelly (2008) utilize the term of "ecological impairment" in their examination of the evolution of the relationship between bodies and environments. They consider the historical progression of bodies in environments, including industrial environments and industrial elements in bodies. The authors focus their attention on the 19th century in order to consider how changing environments were believed to have the capacity to alter or change the body. During this time, environment and disease were linked to landscape, topography and changes in climate (Kroll-Smith and Kelly, 2008: 306-07). However, between 1900 and the early 1960s, there was a shift in ideas about the relationship between the body and environment. The field of medicine became professionalized and the germ theory of disease emerged to surpass the role of landscapes, topographies and climates as explanations for health and sickness. Environmental links to disease were dismissed in this phase in favour of germ theory and explanations focused on microbes entering the body. There was a definite shift away from any attention that might have been paid to the increasingly chemical-laden industrial environments with medical, political and public emphasis placed on personal hygiene and self-regulation (Kroll-Smith and Kelly, 2008).

The third period, beginning in the mid-1960s, marks a historically significant transformation around the causality of disease and health outcomes (Chernomas and Donner, 2004). During this period, environments are viewed as "encroaching upon, invading, and indeed poisoning bodies" through human-made, synthetic environments (Kroll-Smith and Kelly, 2008: 309-10). The increase in disease incidence in western society corresponds with the increased mechanization and industrialization beginning in the late 20th century (Brophy et al., forthcoming). The global production of chemicals increased 400-fold from 1930-2000, and the increase in the production and use of toxic substances occurred largely without assessing the potential risks to the environment and human health (Environment Canada and Health Canada, 2004: 27). There is no agreement regarding pathophysiology for most contemporary toxic exposures in western society, and one cannot simply claim to have a disease when there is not a clear etiological explanation of exposures and symptoms. Under this new paradigm, it is common to acknowledge both the complex changes in the relationship between bodies and environments and the implications these relationships have for clinical medicine (Kroll-Smith and Kelly, 2008: 316). Environments are viewed as possible sources of impairment and it is recognized that some bodies that are exposed may experience health problems as a result. Proponents of this view argue that environments, like bodies, can be injured. However, unlike an impaired body that is unlikely to pose a risk to other bodies, *an impaired environment places bodies in danger* (Kroll-Smith and Kelly, 2008: 316-17, emphasis added).

The period in which industrial elements have permeated bodies has generated new scholarship which posits that "the human is always intermeshed with the more-than-human world" and the "substance of the human is ultimately inseparable from 'the environment'" (Alaimo, 2010: 2). The contemporary risks associated with exposure to toxic substances simultaneously embody Rob Nixon's (2011) concept of "slow violence" and Rachel Carson's (1962) "death-by-indirection." In the risk society, risks are defined as the probability of physical harm occurring as a result of technological processes. The dangers associated with an increase in chemical contaminants include risks to bodies that are both pervasive and cumulative. These risks are unlimited across both space and time, as they cross all territorial borders and have the potential to affect future generations (Beck, 1992). These "landscapes of risk" embody the hazards which become inscribed on women's bodies and may result in detrimental health outcomes (Alaimo, 2010). By viewing environments and bodies not as distinct entities, but rather as intricately linked, this discussion provides a place to situate critical research and analysis on environmental health.

"As the 21st century unfolds we are witnessing important changes in, and vigorous debates about, the ways in which people in the industrialized West understand and experience illness" (Moss and Teghtsoonian, 2008: 3). The fullest definition of environmental health problems includes all of the health hazards found in our living and working conditions, including bacteria and viruses in human waste; animal vectors for infectious diseases; surface-water and groundwater pollution; air pollution; chemical and petroleum product spills and explosions; and disasters such as floods, hurricanes,

landslides, and fires which may be natural or caused by humans (Brown, 2007). To narrow the definition to the understanding reflected in most research and policy on environmental health, environmental health problems may be defined as the "health effects caused by toxic substances in people's immediate or proximate surroundings" (Brown, 2007: 1). Brown (2007: 2) prefers to use the term "environmentally induced diseases" as the causation is linked to environmental factors, but the environmental factors may also interact with genetic predispositions or with some personal behaviours. Concerns around environmentally induced diseases focus on acute and chronic exposures to toxic substances which may be linked to cancer, respiratory diseases, and problems associated with the immune and endocrine systems. These health conditions affect the lives of Canadian residents and have implications for the health care system, social services and the economy (Health Canada, 2010a: 32).

Recognizing the carcinogenic, bioaccumulative and persistent nature of environmental contaminants, there is a call for a shift away from the biomedical model of disease which focuses on the diagnosis and treatment of breast cancer and towards research which focuses on environmental causes and primary prevention. My research will contribute to these debates with an explicit focus on preventive health policy in order to augment disease prevention efforts. The Government of Canada has a "duty to protect the environment, including its biological diversity, and human health, from any of the adverse effects of the use and release of toxic substances, pollutants and wastes" under the Administrative Duties of the *Canadian Environmental Protection Act, 1999*. In this research, I conduct an interpretive policy analysis of Canadian environmental law, policy

and practice which encompasses the regulatory regime for toxic substances. I focus specifically on the *Canadian Environmental Protection Act* and the *Chemicals Management Plan*, and frame the research with a cancer prevention lens.

Situating Breast Cancer: Issues of Risk, Responsibility and Prevention

Toxic exposure has provoked a substantial amount of debate and conflict, policymaking, legislation, public awareness, media attention, and social movement activity. It has also prompted vigorous debate between laypeople and professionals, citizens and government and among professionals themselves (Brown, 2007). My research investigates whether the environmental legislation and policies which are designed to protect the environment and human health capture the need for prevention and action related to protecting women's health in Canada. Breast cancer has been a notable touchstone as the "rising incidence of breast cancer in the decades following World War II paralleled the proliferation of synthetic chemicals" (Gray et al., 2009: 45). Because known attributable risk factors cannot account for the increased incidence of breast cancer, particularly in industrialized countries, it has become necessary to consider environmental links to breast cancer including mammary carcinogens and endocrine disrupting chemicals[1] through everyday exposures to industrial chemicals and toxic substances in consumer products (Schwarzman and Janssen, 2010).

[1] Endocrine disrupting chemicals are natural and human-made substances that can mimic or interfere with the function of hormones in the body (NIEHS, 2013b). Endocrine disrupting chemicals can disrupt the endocrine system in three specific ways: i) by mimicking a natural hormone in the body which may result in a signal stronger than the natural hormone or a signal that occurs at the "wrong" time; ii) by binding to a receptor within a cell and preventing the correct hormone from binding and resulting in abnormal reactions within the body; and iii) by blocking cell receptors which interferes with how normal hormones and receptors function in the body (CCOHS, 2013; Labelle, 2000). Endocrine disrupting chemicals are found in a wide range of substances including polychlorinated biphenyls (PCBs), dioxins, pharmaceuticals including

Breast cancer is a public health issue of concern: it is the most commonly diagnosed cancer in women worldwide (WHO, 2013). Breast cancer rates in Canada are among the highest in the world with similar incidence rates as the United States, northern Europe and Australia. Breast cancer is the most common cancer in Canadian women under age 50, ages 50-69 and over age 70, as well as being the most common cancer-related cause of death for women under 50 (CCS and NCIC, 2007). One in nine women will develop breast cancer in her lifetime and approximately sixty-five Canadian women are diagnosed with breast cancer every day. An estimated 23,800 women in Canada will be diagnosed this year and 5,000 will die as a result (BCSC, 2013a).[2]

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diethylstilbestrol (DES), dichlorodiphenyltrichloroethane (DDT) and other pesticides, and plasticizers including bisphenol A (BPA) (CCOHS, 2013; NIEHS, 2013b). These substances may interfere with the endocrine system in humans and wildlife resulting in adverse developmental, reproductive, neurological and immune effects (NIEHS, 2010, 2013b).

[2] It should be noted that breast cancer can occur in men. However, it is rare with men accounting for less than one percent of diagnosed cases (CCS and NCIC, 2007). An important example of environmental exposures and male cases of breast cancer involves Camp Lejeune which is a Marine Corps Base in North Carolina. Marines and Naval personnel, residents, family members and civilians who lived in military base housing at Camp Lejeune were exposed to contaminated water through the release of volatile organic compounds into the drinking water from 1957 to 1987 (TFTPTF, 2010). Camp Lejeune was officially listed as a Superfund site in 1989 under a federal program by the United States Environmental Protection Agency which addresses uncontrolled hazardous waste sites (USEPA, 2013a). Approximately 750,000 to 1,000,000 people were exposed to trichloroethylene, tetrachloroethylene, benzene, and vinyl chloride which are linked to miscarriage, birth defects, childhood leukemia, and other forms of cancer (Ordonez, 2012; Semper Fi: Always Faithful, 2013). Eighty-one cases of male breast cancer have been linked to exposures at Camp Lejeune as of November 2012 resulting in the single largest cluster of male breast cancer (Partain, 2012). A newly released study by the Agency for Toxic Substances and Disease Registry cites a report from 1985 where levels of trichloroethylene were 18,900 parts per billion in a drinking water well at Camp Lejeune, nearly 4,000 times today's maximum allowable limit of 5 parts per billion (Breed, Waggoner and Biesecker, 2013). Leaders of the House and Senate Veterans Affairs Committees stated that this is "possibly the worst example of water contamination" in the history of the United States (Ordonez, 2012). The House of Representatives approved the *Janey Ensminger Act* which provides health care to affected military personnel and their family members if they lived or worked at least thirty days at Camp Lejeune from 1957 to 1987 and their health condition is listed in the Bill as being associated with exposure to the chemical contaminants (Ordonez and Barrett, 2012). For additional information about this case, refer to the Agency for Toxic Substances Disease Registry (2013); The Few, The Proud, The Forgotten (2012); and Williams (2012).

Most illnesses in western society are viewed through a unique dominant epidemiological paradigm which involves a specific set of beliefs and practices about a disease, its causation and treatment that are embedded in science, government and public life (Brown, 2007: 18). The dominant epidemiological paradigm is directly influenced by the biomedical model of disease which focuses on anatomy and physiology, and causes of disease at the cellular, hormonal and genetic levels (Rosser, 2000). This paradigm is characterized by a "hegemonic outlook on disease that emphasizes individual behavioural factors rather than environmental and social factors as keys to disease prevention" (Brown, 2007: 21). The dominant epidemiological paradigm places the onus of responsibility strictly on the individual and does not acknowledge other determinants of health. The dominant epidemiological paradigm involved in studying breast cancer is

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Another case of groundwater contaminated by trichloroethylene occurred in Shannon, Quebec which is located close to and shares an aquifer with a military base. CFB Valcartier used trichloroethylene as an industrial solvent prior to 1980. The trichloroethylene was then stored in human-made open lagoons to allow the substance to evaporate. However, the trichloroethylene leached through the lagoons and contaminated the aquifer and private wells in Shannon. Base officials became aware of the contamination in 1997, but residents of Shannon were not formally informed at this time by the Department of National Defense. Water samples from a private well in 2000 found that trichloroethylene levels were 200 times higher than acceptable levels. Emergency measures were ordered at this time by Quebec Public Health Officials including drinking only bottled water and showering with open windows (CBC Fifth Estate, 2007; Stephen, 2009). It is suggested that the contamination of the water resulted in an increased incidence of cancer in Shannon with as many as 500 cases (CBC, 2009). A class action lawsuit was filed in 2003 against the Government of Canada and the Department of National Defense representing 3,500 residents of Shannon. The lawsuit claims that the government knew about the exposure of residents to trichloroethylene and that they drank the contaminated water for 22 years (CBC, 2009, 2011a, 2011b). *Spieser v. Canada* began in 2011 and took place over 115 days with 74 witnesses including 23 experts in the fields of hydrogeology, toxicology, epidemiology, and oncology. The Honourable Justice Bernard Godbout found that the plaintiff did not meet the burden of proof regarding causation of health outcomes and did not order punitive damages (Gagné and Mosian, 2012). However, compensatory damages were awarded in the amount of $12,000 per person for the "fears, worries, troubles and nuisances associated with the fact of having lost a source of drinking water in such circumstances" (Gagné and Mosian, 2012). The Quebec City Regional Public Health Agency has recently hired eight international experts to examine the 500 cases of cancer. "The expected rate for brain cancer is one in every 20,000. With a population of 5000[,] Shannon had 20 brain-cancer cases. That's 80 times the normal expected rate" (Séguin, 2013). Residents hope to use the findings of this study when the case goes to the Quebec Court of Appeal in 2014 (CBC, 2013a, Séguin, 2013).

based on a biomedical model of disease and attributes causation to individual-level factors, including diet, exercise, age at first parity, and genetics (Brown, 2007; Nash, 2006). This approach places an emphasis on individual-level approaches to prevention, detection and treatment including changes in lifestyle such as diet, utilization of mammographic technology to detect tumours, and treatment options which include surgery, radiation and chemotherapy. The dominant epidemiological paradigm is utilized by the biomedical community and the mainstream breast cancer movement and it frames breast cancer as a preventable disease by placing the onus of responsibility on the individual in terms of managing personal risk factors and behaviours, and downplaying social, structural, political, economic, and environmental factors that influence the disease (Zavestoski et al., 2004; Orsini, 2007).

There are multiple symbolic meanings associated with women's breasts in Western society, including representations of sexual pleasure and desire, nurturing and motherhood. Women's breasts are also now associated with ideas about danger and risk: the "risk of disease, risk of defeminisation, risk of deformity, [and] risk of death" (Klawiter, 2008a: xx). A special issue of the *Canadian Cancer Statistics* report provides a discussion of the risk factors associated with the development of breast cancer which can be categorized as modifiable or non-modifiable. Non-modifiable characteristics include reproductive and hormonal factors, and heredity associated with a family history of the disease and genetic mutations (CCS and NCIC, 2007; PHAC, 2009, 2012). A woman's lifetime exposure to estrogen is tied to her risk of developing breast cancer. For instance, early menstruation beginning at age eleven or younger and late menopause increases the

number of years the breast tissue is exposed to estrogen. As estrogen levels are lowered during pregnancy and breast feeding, full-term pregnancies before the age of twenty are thought to lower a woman's risk of developing breast cancer, whereas pregnancies after the age of thirty-five or never becoming pregnant are linked to an increased risk (National Cancer Institute, 2011). An estimated five to ten percent of breast cancer diagnoses involve a specific genetic and hereditary component such as the "breast cancer genes," $BRCA_1$ and $BRCA_2$ which were discovered during the 1990s (CCS and NCIC, 2007). Other non-modifiable biological risk factors include high breast density which is associated with a higher risk of breast cancer, and previous breast conditions with biopsies showing abnormal cells (PHAC, 2009, 2012).

Modifiable risk factors associated with the development of breast cancer include lifestyle and behavioural risk factors. The predominant view of cancer prevention focuses "almost exclusively on individual lifestyle changes" (Chernomas and Donner, 2004: 4). This view is promoted by Health Canada, the Public Health Agency of Canada, and mainstream cancer and breast cancer organizations including the Canadian Cancer Society, the Canadian Breast Cancer Foundation, the Breast Cancer Society of Canada, and the Canadian Breast Cancer Network (BCSC, 2013b, 2013c; Canadian Cancer Society, 2008, 2013a; CBCF, 2012a, 2012b; CBCN, 2013a; Health Canada, 2012a, PHAC, 2009, 2012). The "risky behaviours" include using tobacco, consuming alcohol, not engaging in physical activity, exposure to the sun, and a diet high in fat, red meat, sugar, and processed foods. The Canadian Cancer Society and the National Cancer

Institute of Canada (2007: 74) conclude that the best opportunities for primary prevention and reducing the risk of developing breast cancer are

> eating a healthy diet and being physically active throughout life (thereby maintaining a healthy body weight), minimizing alcohol consumption and avoiding nonessential hormones. Regular participation in high quality screening programs will further lower the breast cancer burden by reducing mortality and improving prognosis.

This official narrative rarely concedes that the modifiable "lifestyle" factors account for only a fraction of breast cancer incidence. Even the *Canadian Cancer Statistics* report, which acknowledges this, places the onus of responsibility solely on the individual with its emphasis on personal behaviours (CCS and NCIC, 2007).

There is a long history which focuses on the role of lifestyle and personal behaviours in health outcomes. The individualization of health and illness has resulted in a "responsibilization paradigm" (Orsini, 2007: 349). This ideology places the onus of responsibility on the individual and suggests that the risk factors for health are controllable if one makes the appropriate lifestyle choices. If one does not behave accordingly or if one does and still becomes ill, there are elements of blame placed on the individual. The responsibilization paradigm places the individual at the centre of disease prevention where "cancer prevention is depoliticised and reduced to behaviour modification" (Brophy, 2004: 60).

The mainstay of breast cancer prevention remains early detection and treatment (Shah, 2003: 221). However, measures of detection and prevention are often conflated in the discourse surrounding breast cancer. In the United Kingdom, United States and Canada, public health policy has a very clear policy promoting detection over primary

prevention (Potts, 2004a). McCormick et al. (2003: 550) note that the American Cancer Society and the National Cancer Institute have a long history arguing that "mammography is the best form of prevention." The Canadian Task Force on Preventive Health Care[3] provides recommendations around clinical breast exams and mammography for women aged forty to seventy-four who are at an average risk of developing breast cancer, but do not apply to women who are at an increased risk with a personal history of the disease, known $BRCA_1$ or $BRCA_2$ mutations, prior chest wall radiation, or a history of the disease in a first degree relative. Recommendations are not made for women over seventy-five due to a lack of data (Canadian Task Force on Preventive Health Care, 2013b). Prior to a 2011 update on screening guidelines, the Task Force recommended annual screening with a clinical breast exam and mammography for women aged fifty to sixty-nine. Women aged forty to forty-nine were encouraged to receive counselling in order to make their decision around the potential benefits and risks associated with mammographic screening and the age at which they wish to begin testing (Shah, 2003: 221).

> Recent evidence has shown that there is sufficient evidence to exclude the routine teaching of breast self examination (BSE) for the periodic health examination of women aged 40 to 69, and there is insufficient evidence to evaluate its effectiveness in women younger than 40 and older than 70 (Shah, 2003: 222).

[3] The Canadian Task Force on Preventive Health Care is an independent body which consists of fourteen primary care and prevention experts who promote the need for evidence-informed preventive activities in primary care in Canada. The Task Force develops and disseminates practice guidelines for primary and preventive care based on systematic analyses of scientific evidence (Canadian Task Force on Preventive Health Care, 2013a).

The most recent screening guidelines from 2011 recommend routine screening with mammography every two to three years for women aged fifty to sixty-nine and aged seventy to seventy-four. Women aged forty to forty-nine are no longer recommended to engage with routine mammographic screening (Canadian Task Force on Preventive Health Care, 2013b). This new recommendation[4] is based on evidence of false positive test results being higher in this age group which may have "undesirable consequences" and "lead to further investigation, including other unnecessary procedures such as breast removal" (Canadian Task Force on Preventive Health Care, 2013a, 2013b). Breast cancer organizations promote mammography as part of "preventive health care" (CBCF, 2012c). The Breast Cancer Society of Canada (2013a) promotes early detection as a means of prevention, including breast self-exams, clinical breast exams and mammography. However, as advocates note, once a tumour has been detected, prevention has ultimately failed.

The established risk factors such as a family history account for less than half of diagnosed cases (Gray, 2010; Parkin et al., 2011). Breast cancer is a multifactorial disease caused by a combination of hormonal, genetic, lifestyle, and environmental factors (Gray, 2010). It is argued that a truly primary prevention focused approach would involve attempting to prevent the disease before it develops. Primary prevention may be broadly defined as "the protection of health by personal and community-wide efforts…[which] consist of measures aimed at preventing the inception of a pathological

[4] The Canadian Task Force on Preventive Health Care will provide an updated report of recommendations around prevention and screening practices within five years of the 2011 guidelines (Canadian Task Force on Preventive Health Care, 2013b).

process or the occurrence of disease" (Tomatis and Huff, 2001: 458). A primary prevention approach to a multi-factorial disease such as breast cancer would "aim to reduce and eliminate as far as possible, human exposures to all substances or agents that are known to be, or suspected of being, implicated in the disease process" (UK Working Group on the Primary Prevention of Breast Cancer, 2005: 10). A primary prevention focus towards environmental health outcomes as a result of exposure to toxic substances has been historically underrepresented in public health policy and legislation.

A woman's risk of developing breast cancer may be increased by exposure to mammary carcinogens and exogenous estrogenic compounds. Brophy et al. (2012: 2) describe the endocrine disruptor theory which contends that "the timing of exposure is important to varying susceptibility, particularly during critical periods of breast development when breast tissue is less differentiated, but also predicts that effects may occur at low doses." Exogenous exposures may include use of hormone replacement therapy and oral contraceptives, but also includes exposure to environmental contaminants. Exposure to endocrine disrupting chemicals may play a particular role during key periods of development or "windows of susceptibility" including the prenatal period, childhood, puberty, menstruation, pregnancy, and menopause (Birnbaum, 2009; Brophy et al., 2012; Cooper et al., 2000; Diamanti et al., 2009; Gray, 2010; Schug et al., 2011; and Schwarzman and Janssen, 2010).[5]

[5] It should also be noted that the endocrine disrupter discourse contains aspects of heteronormativity. "It seems that the horror associated with the theory of 'feminisation' as a manifestation of underlying endocrine disruption must be tied to its potential for completely disrupting the 'heterosexual matrix'" (Scott, 2009a). Di Chiro (2010: 201) explores how heteronormativity is found within the anti-toxics discourse and rhetoric. Exposure to toxic substances results in undermining or distorting the "natural" including biologies, ecologies, bodies, and reproductive processes. She suggests that this has resulted in a

In the United States, the President's Cancer Panel produced a report in 2009 that calls for reducing the risk of developing cancer associated with the widespread and ubiquitous exposure to toxic substances. The Panel was "particularly concerned to find that the true burden of environmentally induced cancer has been grossly underestimated" (Daghofer, 2010; Reuben, 2010: 5). Director of the Science and Environmental Health Network, Dr. Ted Schettler described the report as an "integrated and comprehensive critique" and suggested that the Panel "underscored that regulatory agencies should reduce exposures even when absolute proof of harm was unavailable," drawing on the precautionary principle (Cone, 2010).

The Interagency Breast Cancer and Environmental Research Coordinating Committee[6] published a report in 2013 that calls for making prevention the key to reducing the burden of breast cancer. This report recognizes environmental contaminants, as well traditional risk factors for breast cancer including lifestyle and behavioural factors and other social determinants of health (IBCERCC, 2013). Jeanne Rizzo, co-chair of the Committee and President and CEO of the Breast Cancer Fund, states that the report demonstrates that research and programs "focused on preventing breast cancer need as much attention as treatment and a cure" (Goldman, 2013). Rizzo notes that

> [w]e're extending life with breast cancer, making it a chronic disease, but we're not preventing it. We have to take a look at early life exposures, in utero,

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"sex panic" in which heterosexist and queerphobic arguments reinforce "what and who are constructed as normal and natural" (Di Chiro, 2010: 202). For an in-depth exploration of queer ecologies, refer to *Queer Ecologies: Sex, Nature, Politics, Desire*, edited by Mortimer-Sandilands and Erickson (2010).

[6] The Interagency Breast Cancer and Environmental Research Coordinating Committee was established by the United States Secretary of Health and Human Services after Congress passed the *Breast Cancer and Environmental Research Act* in October 2008. The Committee consisted of federal and non-federal representatives (NIEHS, 2013a).

> childhood, puberty, pregnancy and lactation. Those are the periods when you get set up for breast cancer. How does a pregnant woman protect her child? How do we create policy so that she doesn't have to be a toxicologist when she goes shopping? (Grady, 2013).

The Committee found that identifying and mitigating the environmental causes of breast cancer is the key to reducing the number of new cases and recommends a breast cancer prevention strategy to prioritize and increase government funding in breast cancer prevention (Forman, 2013; IBCERCC, 2013; Rizzo, 2013). "Prevention requires we close the knowledge-to-action gap and translate science into preventive public health actions that can impact breast cancer incidence in the future" (Rizzo, 2013).

Canadian Environmental Law, Policy and Practice

Health Canada and Environment Canada are jointly responsible for the risk assessment and management associated with toxic substances. The first *Canadian Environmental Protection Act* in 1988 included two broad categories of substances. The first was the 28,000 "existing substances" that were manufactured, imported or in commercial use in Canada between January 1, 1984 and December 31, 1986. The majority of these substances had not been evaluated for potential detrimental effects on human health and the environment and were placed on the so-called Domestic Substances List. The second category included substances which were new to Canadian society and commerce and were not part of the Domestic Substances List. It was required that an assessment be conducted on all new substances for their potential impact on human health and the environment before their introduction to the Canadian market. One of the guiding principles of the original *Canadian Environmental Protection Act, 1988* was the "management of pollution" (House of Commons Standing Committee on Environment

and Sustainable Development, 1995). However, there was a shift in focus in the *Canadian Environmental Protection Act, 1999* in which "pollution prevention" became the cornerstone in order to achieve the highest level of environmental quality for the health of Canadian citizens (Environment Canada, 2010a). Section 73 of the revised Act required that all existing substances on the Domestic Substances List be categorized according to which substances presented the greatest potential for exposure for individuals in Canada, and which were considered persistent, bioaccumulative and 'inherently toxic' to human beings or nonhuman organisms. The categorization of the Domestic Substances List was completed between 2000 and 2006 and the results determined that 4,300 of the 23,000 substances examined were classified as priorities for further action. The newly implemented *Chemicals Management Plan* identified five hundred chemicals classified as the highest priorities for immediate action (Health Canada, 2010a: 33). The *Chemicals Management Plan* is designed to assess and manage the risk of all chemical substances categorized as potentially harmful to human health or the environment under the *Canadian Environmental Protection Act* by 2020.

Analyzing the *Canadian Environmental Protection Act* and the *Chemicals Management Plan* from a primary prevention perspective has allowed me to tie together my interests in women's health, risk and disease prevention. It is suggested that the traditional focus of Canadian health policy has been on health care policy with an emphasis on the treatment of diseases and injuries, rather than on disease prevention. As others have noted, "[t]here is clear recognition that we need to move from a system focused predominantly on health care to one more oriented to improved health status"

(Miller Chenier, 2002: 13). My research is aligned with the argument that comprehensive preventive health policy has the potential to contribute to efforts in disease control and population health outcomes.

Research Design and Methodology

This research utilizes a population health approach framing breast cancer with a primary prevention perspective and as a disease influenced by social conditions (Chernomas and Donner, 2004). The nature of critical analysis of social problems requires an interdisciplinary approach and I draw upon theory and methods utilized in sociology and social anthropology, health, gender studies, and environmental studies. Policy analysis may be considered to be an "applied social science discipline which uses multiple methods of inquiry and arguments to produce and transform policy-relevant information that may be utilized in political settings to resolve policy problems" (Dunn, 1981: 35; Fischer, 2003: 1).

The primary data sources for this research are documents related to Canada's regulatory regime for toxic substances. I draw upon government publications, grey literature and media coverage in analyzing environmental law, policy and practice with a particular focus on the *Canadian Environmental Protection Act* and the *Chemicals Management Plan.* My goal in this research is to determine not only what policies exist, but also to examine how the issues are communicated and understood, who the policies are designed to protect, and where the burden for assuming risk is presumed to lie. I question whether the policies capture the need for prevention and action related to protecting women's health, whether the precautionary principle is implemented, and if

they enact primary prevention in approaches to women's health. I explore whether issues of sex and gender are accounted for in the legislation and policies which is of particular relevance in issues related to women's health outcomes. I investigate issues which are contested in nature including environmental links to disease and the debate surrounding exposure-based approaches and hazard-based approaches to risk assessment. I also examine the shifting and contested concept of toxicity which I follow from its inception to its current form under the regulatory regime. During the research process, I seek to identify gaps in the law, policy and practice which do not adequately protect women's health.

The sources of qualitative data for this research include documents from the Canadian federal government; environmental, women's health, cancer, and breast cancer organizations including mainstream organizations and members of the environmental breast cancer social movement; and relevant media coverage. The data sources include:

Government Publications: Website searches include all documents related to breast cancer and all other relevant documents from Environment Canada, Health Canada, the Government of Canada and the *Canada Gazette* (1988-2012) related to the *Canadian Environmental Protection Act* and *Chemicals Management Plan.* Additional documents related to environmental health, cancer, breast cancer, human biomonitoring, public health policy, health impact assessments, environmental assessments and health, toxic substances, environmental contaminants, exposure and human health, as well as initiatives such as the Canadian Partnership for Tomorrow Project (a pan-Canadian project to learn more about causes of cancer and other chronic diseases) and Cancer 2020 (an action plan for cancer prevention and detection) are included. Any documents that could not be obtained directly from government websites, archives, university or public libraries were requested in electronic format or hard copy.

Grey Literature: Grey literature searches include websites of organizations including but not limited to the Atlantic Centre of Excellence for Women's Health, Breast Cancer Action, Breast Cancer Action Montreal, the Breast Cancer Society of Canada, the Breast Cancer Fund, the British Columbia Centre of Excellence for Women's Health, the Canadian Breast Cancer Foundation, the Canadian Breast Cancer Network, the Canadian

Cancer Society, the Canadian Environmental Network, the Canadian Environmental Law Association, the Canadian Network for Human Health and the Environment, the Canadian Women's Health Network, the Centre for Environmental Health Equity, the David Suzuki Foundation, Ecojustice, Environmental Defence, the Environmental Working Group, FemmeToxic, the National Network on Environments and Women's Health, the Prairie Women's Health Centre of Excellence, Prevent Cancer Now, the Quebec Women's Health Action Network, Women and Health Care Reform, Women and Health Protection, and the Women's Healthy Environments Network. Any documents that could not be obtained directly from websites of organizations were requested in electronic format or hard copy. Search terms included but were not limited to: [Canadian Environmental Protection Act], [CEPA], [Chemicals Management Plan], [CMP], [environment and health], [environment], [toxic], [toxic substances], [breast cancer], [breast cancer and environment], [disease prevention], and [prevention].

Media Coverage: Media coverage for this research includes coverage from 1988-2012 in Canadian national newspaper *The Globe and Mail* and the *CBC News Archives* using York University newspaper search engines (Canadian Newsstand and Factiva). Search terms included but were not limited to: [Canadian Environmental Protection Act], [CEPA], [Chemicals Management Plan], [CMP], [environment and health], [breast cancer], [environment and breast cancer], [toxic], and [toxic substances]. Other relevant news media coverage emerged from the *Toronto Star*, *CTV News*, the *Huffington Post*, the *New York Times*, as well as other news sources up to July 2013.

These policy documents were examined and analyzed through multiple readings of the texts and interpretive policy analysis. Interpretive approaches to policy analysis consider both *what* specific policies mean and *how* the policies work by exploring the processes through which meanings of policy are communicated and questioning who the intended audiences are. This process also questions what context-specific meanings are embedded in relevant policy documents which include symbolic language, objects and actions (Salter, forthcoming; Yanow, 1996, 2000: 8).

In conducting interpretive policy analysis, it is necessary to identify groups of policy documents and stakeholders in order to determine how a policy and policy process are understood. A question of central importance and consideration is how the policy issue is being framed by the various parties to the debate. Policy frames may be

expressed through language in order to shape perceptions and understandings. In this case, frames are used to create a framework in which to interpret policy-related documents. Frames may be used to direct attention towards some elements while also specifically diverting attention from other elements (Yanow, 2000: 11-12). It is necessary to "map the 'architecture' of debate relative to the policy issue under investigation, by identifying the language and its entailments (understandings, actions, meanings) used by different communities in their framing of the issue" (Yanow, 2000: 12-13). This process is of particular relevance in order to understand the varying perspectives involved in this research. Different groups of policy actors frame the issues in distinct ways related to issues of risk, exposure to toxic substances, and health outcomes including breast cancer.

My method involves four specific steps in conducting interpretive policy analysis. The first step involves identifying the policy documents that hold significant meaning for policy-relevant actors, stakeholders and interpretive communities for a given policy issue. These documents include but were not limited to the *Environmental Contaminants Act,* the Lalonde Report, the *Canadian Environmental Protection Act, 1988* and *1999* and its review processes, the *Chemicals Management Plan* and other documents related to public health, breast cancer, risk, and toxic substances. The second step involves identifying the communities relevant to the policy issue that create or interpret the policy documents and meanings. The relevant communities in this research include but are not limited to the Government of Canada, Environment Canada, Health Canada, stakeholders in the review process of the *Canadian Environmental Protection Act*, and women's health, cancer and breast cancer organizations. It is possible to have multiple interpretive communities and

multiple interpretations of policy documents and the first two steps may be conducted concurrently as the policy documents and interpretive communities are intricately linked and each step leads back to each other (Yanow, 2000: 20). The third step in this process in continuing to analyze the policy documents involves the identification of the discourses utilized by the various interpretive communities in order to determine the meanings that are considered to be important. Finally, the fourth step involves identifying the meanings that are in conflict between or among interpretive communities and their conceptual sources. This process has the potential to demonstrate the implications of different meanings and interpretations for policy formulation and outcomes (Fischer, 2003; Yanow, 2000: 20). Building on these steps, additional questions that I asked throughout the interpretive analysis process include:

- Who are the subjects and what are the objects? What are the relationships between them?
- What information is present in the documents? What information is absent in the documents?
- Who made the decisions about what information is included or excluded in the documents?
- Who produced the documents? What is the nature of their role and relationship in the context of the document and the broader policy context?
- How was the document produced? What are the processes and who are the people involved?
- How is the information related to the broader policy context? (Ginger, 2006: 346-47).

The process and questions involved in conducting interpretive policy analysis allows for engaging with the policy documents in order to determine whether Canadian law, policy

and practice is inhekrently precautionary and enacts a primary prevention approach to women's health.

Overview of the Dissertation

This research will provide important policy lessons in its examination of Canadian law, policy and practice, with an explicit focus on primary prevention which is supported by current research linking breast cancer and toxic substances. The research results will be of interest to those studying environmental health, as well as to the policy sector and non-governmental organizations. It contributes to the larger body of breast cancer research with analysis and discussion around the issues of gender, risk and precaution by examining the impact of policy on disease prevention and its implication for the health of women across Canada.

This chapter provided an introduction to the overall context within which the research is situated including issues of risk, responsibility and precaution related to breast cancer. Chapter two provides a literature review which draws upon concepts, methods and theories which are situated in interdisciplinary but related fields including environmental studies, sociology, medical anthropology, health, and gender studies. It provides the theoretical underpinning and framework for this dissertation research in three substantive areas including i) sex- and gender-based analysis, ii) social movement theory and health social movements, and iii) risk and the risk society. Sex- and gender-based analysis has emerged as an important methodology in conducting health research. This chapter provides an overview of sex- and gender-based analysis and this lens is applied throughout the dissertation research. The chapter then introduces traditional

social movement theory in order to position more recent health social movement theory and its relationship to the multi-faceted and diverse breast cancer social movement. The history of breast cancer includes two specific disease regimes -- the regime of medicalization which began in the 1900s and the regime of biomedicalization which emerged in the 1970s and 1980s -- in which the disease is medically managed in individual bodies and publicly administered across populations. The role of biosociality played a significant role in the formation of shared experiences among patients and the creation of a breast cancer social movement through engagement with the practices of science, public health and medicine which enabled the formation of shared experiences among patients and the creation of a breast cancer social movement (Klawiter, 2008).[7] The nature of breast cancer calls for examining questions and constructions of risk related to the development of the disease and everyday exposures to toxic substances. These questions of risk are engaged with by exploring Beck's (1992) theory of the risk society which views contemporary risks as unique hazards which are created and managed through social, cultural and political factors. The risk society perspective is augmented with considerations from environmental justice literature in order to provide the overarching framework for the dissertation as it connects issues of risk, toxic substances and environmental health.

Chapter three offers an overview of the evolution of legislation and public health policy which were designed to protect Canadian citizens from exposure to toxic

[7] While it would have been interesting to explore the way that the regulatory regime, perhaps even its failures, have enabled the formation of the breast social movement and the environmental breast cancer movement specifically, it is beyond the scope of this dissertation.

substances. It draws upon legislation, government publications and grey literature in order to provide a descriptive history of Canadian policy from the 1970s when environmental issues were emerging as widespread concerns to the present. The chapter begins with the influential Lalonde Report, *A New Perspective on the Health of Canadians* which provided a new approach for addressing health outcomes. It then presents the first environmental legislation, the *Environmental Contaminants Act* and the introduction of the *Canadian Environmental Protection Act, 1988.* The revised *Canadian Environmental Protection Act* was implemented in 1999. The Act was promoted as reflecting a shift in the regulatory approach from pollution management to pollution prevention and it is still the primary piece of legislation which governs environmental protection in Canada. Finally, the chapter presents the *Chemicals Management Plan* which was introduced in 2006 and is the most recent tool for the assessment and management of risks associated with toxic substances. The review of environmental health policy presented in this chapter is necessary in order for the more in-depth and critical analysis which follows in chapters four and five.

Chapters four and five examine the relationship between theory and practice in Canadian law, policy and practice and the potential for protecting women's health. Chapter four examines the history of the concept of "toxicity" in Canadian legislation, how it has evolved and its contested nature. The assessment of toxicity is grounded in the current risk assessment processes which are based in toxicology, and rely on exposure estimates and an inherent assumption of threshold effects. The chapter provides a brief overview of the siloxane D5 case which raises important questions about the regulation

of toxic substances, the contested nature of risk and toxicity, and the influence of socioeconomic interests. It then introduces the concept of the precautionary principle, along with a growing concern about the effects of endocrine disrupting chemicals, and questions whether the precautionary principle is implemented in risk management processes. The chapter concludes by examining the debate between exposure-based and hazard-based risk assessments which is central to the evaluation of whether Canadian law, policy and practice is enacting a primary prevention approach related to women's health.

Chapter five draws upon government publications, grey literature and media coverage in order to explore questions and tensions around risk, precaution and prevention. It begins with a discussion of the role and implementation of sex- and gender-based analysis in Canadian health policy. The chapter then poses a series of questions in order to explore issues of risk and responsibility. Where is the burden of risk in preventing health outcomes presumed to lie? The responsibilization trend and the practices of precautionary consumption both fit comfortably into the dominant epidemiological paradigm of breast cancer. Both place the onus of responsibility for risk and disease prevention on the individual. These dynamics are explored in-depth. Who is at risk and who are the policies designed to protect? The *Canadian Environmental Protection Act, 1999* does not specifically address any populations of concern. While children are identified as a population of concern by Health Canada, women are not viewed as an at-risk or susceptible population of concern under the legislation and policy. While bisphenol A (BPA) has been regulated in baby bottles in Canada, this regulation is

explored and critiqued. Occupational exposures to toxic substances including BPA are considered, as well as the challenges related to issues of accountability and compensation. It examines the messaging and campaigns around breast cancer by women's health and cancer organizations including the mainstream Canadian organizations and members of the environmental breast cancer movement. It concludes by discussing the impact of broad federal funding cuts on citizen participation in legislation and policy, and organizations which conducted critical, feminist research, policy and advocacy work.

Finally, chapter six calls for a paradigm shift from a reactionary to a preventative approach to health policy. It concludes that the Canadian regulatory regime is not truly precautionary and does not enact a primary prevention approach. The chapter addresses the specific gaps in the law, policy and practice that would need to be addressed in order to truly protect women's health from detrimental health outcomes such as breast cancer.

Chapter 2

Literature Review: Situating Interdisciplinary Research

Introduction[8]

The nature of environmental health research is necessarily interdisciplinary. As Moss and Teghtsoonian (2008: 3) suggest, "we are witnessing important changes in, and vigorous debates about, the ways in which people in the industrialized West understand and experience illness" in the twenty-first century. In order to understand the complex issues involved in this field, it is necessary to draw upon concepts, methods and theories situated in related literatures including environmental studies, sociology, medical anthropology, health, and gender studies. This chapter will provide the theoretical underpinning and framework for the research. The chapter begins with an introduction to sex- and gender-based analysis and the importance of applying this lens in health research and policy analysis which is reflected throughout the dissertation. The chapter then introduces traditional social movement theory in order to situate the emergence of contemporary health social movements with a specific focus on breast cancer. It investigates the history of breast cancer as a disease and the emergence of the distinct factions of the breast cancer social movement which have different understandings and engagements with issues related to gender, race, class, and sexuality, and varying relationships to science, biomedicine and cause-related marketing. Finally, the chapter

[8] Please note that sections of this chapter were previously published and are reproduced here in revised form with slight modifications. See Sweeney, E. (2012a). "Tracing the Role of Gender in the History of Breast Cancer Social Movements." *Women's Health and Urban Life,* 11(1); and Killoran-McKibbin, S. and E. Sweeney. "Selling Pink: Feminizing the Non-Profit Industrial Complex Through Ribbons and LemonAid" which is under review in a Women's Studies journal.

explores Beck's (1992) theory of the risk society which provides an overarching framework for the dissertation by engaging with issues of risk, exposure to toxic substances, environmental health, and the risk a woman has of developing breast cancer. In this chapter, there is a call for a paradigm shift from the dominant epidemiological paradigm of breast cancer to the promotion of primary prevention within public health, regulation and policy which is grounded in the environmental breast cancer movement.

Sex- and Gender-Based Analysis

Greaves (2009) notes that gender was first introduced into health research by social philosophers and social scientists. Since then it has become an important consideration in health research, policy, programming, and service development, particularly as the health determinants model gains more widespread acceptance and support, and gender has been identified as a key determinant.[9] The analysis of sex and gender in health research has emerged as an increasingly important methodology which

[9] The history of health determinants in Canada influenced both the direction of research about population health and the development of government policies designed to improve health. The Lalonde Report which is discussed in detail in Chapter 3 is cited as the first stage of health promotion in Canada and was founded upon the health field concept (Glouberman and Millar, 2003; Lalonde, 1974). Different health organizations and researchers identify various determinants which have a direct impact on the health status of a given population (Benoit and Shumka, 2009). Health Canada first identified nine determinants of health in 1994 as part of a focus on population health and in response to the critique of health promotion strategies. The original nine determinants included income and social status; social support networks; education; employment and working conditions; physical environments; biology and genetic endowment; personal health practices and coping skills; healthy child development; and health services (Health Canada, 2002). The Public Health Agency of Canada (2011) utilizes twelve determinants of health including income and social status; social support networks; education and literacy; employment/working conditions; social environments; physical environments; personal health practices and coping skills; healthy child development; biological and genetic endowment; health services; gender; and culture. The World Health Organization (2011) promotes ten health determinants including income and social status; social support networks; education; economic environment; social environment; physical environment; personal individual characteristics and behaviour; genetics; health services; and gender. In Dennis Raphael's most recent work, he offers fourteen determinants including income and income distribution; education; unemployment and job security; employment and working conditions; early childhood development; food insecurity; social exclusion; social safety networks; health services; Aboriginal status; gender; race; and disability (Raphael and Mikkohen, 2010).

necessitates the consideration of impacts on both men and women, as well as identifying the shortcomings which emerge as a result. The "integration of a sex- and gender-based analysis makes for better science and more inclusive policies" (Lewis, 2011: 5).

The foundation of sex- and gender-based analysis is the understanding that both biology *and* social experiences, and thus sex *and* gender, impact the health status of Canadian citizens. In order to conduct thoughtful and effective health research, it is necessary to clarify the concepts behind sex and gender. Sex typically refers to biological and genetic characteristics which are manifested in one's anatomy, physiology and hormones. Sex includes the "specific capacities of our bodies, and affects the propensity and trajectory of diseases and health conditions" (Greaves, 2009: 3). While sex plays an important role in reproductive health, there are also important considerations in terms of male and female bodies differing in their susceptibility to disease and differing in reactions to substances including alcohol, tobacco, over-the-counter, prescription or illegal drugs because of differences in metabolism, blood chemistry and body fat composition (Batt, 2007; Clow et al., 2009). For example, women may be at higher risk for health issues related to exposure to environmental contaminants which tend to concentrate in body fat and are often related to estrogen receptors, and women tend to have a higher ratio of body fat and estrogen levels than men (Assembly of First Nations Environmental Stewardship Unit, 2009; Clow et al., 2009; Nickerson, 2006; Women's College Hospital, 2013). It is important to ask questions about levels of susceptibility, body size or sex-linked differences which raises additional issues related to sex-specific variations in disease, health and illness (Clow et al., 2009: 11).

Gender should not be confused or conflated with sex as it is a social construct that "extends beyond the boundaries of biologically defined categories of sex" (Benoit and Shumka, 2009: 7). Gender includes the social, cultural and economic factors that influence the socially constructed roles and relationships, personality traits, attitudes, behaviours, values, and influence that a particular society assigns to women, men and other gender groups such as transgendered and two spirited persons (Clow et al., 2009: 11; Greaves, 2009: 3). The consideration of gender in health research is especially critical as it can "determine different exposures to certain risks, different treatment-seeking patterns, or differential impacts of social and economic determinants of health" (Hankivsky, 2007a: 155). Matters related to gender are relevant in every society and affect every population and individual. As sex has been treated as having two distinct categories of male or female, traditionally gender has also been treated in this manner in categories of masculinity or femininity. However, this binary is inadequate and does not account for a continuum of characteristics and behaviours. There are also people who do not identify as male or female or reject those categories entirely (Clow et al., 2009: 12).

Clow et al. (2009: 12-14) and Johnson et al. (2009) offer four specific dimensions of gender including gender identity, gender roles, gender relations, and institutionalized gender which may have an impact on the health outcomes of a given population.

- *Gender identity* involves one's sense of being a "woman" or a "man" and is developed within the prescriptions related to the "appropriate expression" of gender for the biological sex (Clow et al., 2009; Johnson et al., 2009). It should be noted that in some instances or in some cultures, gender identity does not fall into dichotomous categories (Benoit and Shumka, 2009);

- *Gender roles* include the ways in which gender identities are expressed and the behavioural norms within societies which influence individuals' actions,

expectations and experiences in their daily lives (Clow et al., 2009: 12; Johnson et al., 2009). Gender norms may shape the illness experience, as well as what health care issues are researched, what health care services are available, and the quality of patient care (Benoit and Shumka, 2009: 7);

- *Gender relations* involve interactions and how people are treated based on their ascribed gender. For instance, there is a stereotype that women need to be "protected" and this may affect the ways in which women experience illness and approaches to treatment[10] (Clow et al., 2009: 13; Johnson et al., 2009); and

- *Institutionalized gender* involves the experiences, roles and relationships which are framed by social institutions such as the media, education, legal, and health care systems, and religious and political establishments. These institutions influence the social norms that "define, reproduce and often justify different expectations and opportunities" for women, men, girls, and boys, such as "social and family roles, job segregation, job limitations, dress codes, health practices, and differential access to resources such as money, food or political power" (Clow et al., 2009: 13; Johnson et al., 2009).

Clow et al. (2009) add the concepts of equity and diversity to sex and gender as key considerations in sex- and gender-based analysis. Equity refers to the inequalities and gender oppression that may result in detrimental health outcomes. Diversity concerns recognize that experiences with gender identity, gender roles, gender relations, and institutionalized gender are specific,

> particular to a certain time and place, and social, cultural, economic and political situation...and because gender differences and inequalities in a particular place combine with the effects of other forms of social division such as class and ethnicity, not all women or all men experience gender-related health problems or issues in the same way (Clow et al., 2009: 14).

The four core concepts of sex, gender, equity, and diversity create a framework for exploring and understanding experiences of health and illness, and evaluating the extent

[10] For an example of gender relations and health care, refer to the section on *The History of Breast Cancer and Disease Regimes* in this chapter for a discussion linking breast cancer and hysteria, as well as issues of informed consent with male physicians and husbands making treatment decisions on behalf of breast cancer patients.

to which a society's responses are "equal, fair, effective and efficient" (Clow et al., 2009: 16; Greaves, 2009).

Sex- and gender-based analysis involves more than understanding the differences or similarities *between* women and men, but also examines the differences *among* groups of women and men (Greaves 2009). A sex- and gender-based analysis also considers other determinants of health and explores how diversity within and between subgroups of women and men may affect health outcomes. Thus, the intersection of sex and gender are considered alongside issues of age, race, ethnicity, culture, geographic location, sexual orientation, and socioeconomic status (Tudiver, 2009).[11]

A health determinants framework may be used from an empirical, theoretical or policy perspective and attempts to understand the myriad of "interrelated social, cultural, environmental and biological factors that affect the health of individuals and communities" (Benoit and Shumka, 2009: 1). A health determinants framework acknowledges the interaction between predisposing genetic and biological factors, and social and cultural influences that impact individual attitudes and behaviours to positively or negatively affect health. The purpose of this framework is not merely to understand how various factors individually affect the health of a population, but to also understand

[11] Importantly, sex- and gender-based analysis can allow for further analyses engaging questions of sexuality and sexual orientation. Sex, gender and sexuality intersect in numerous ways, impacting various populations differently. Research indicates higher incidence rates of breast cancer among certain groups who are differentially affected by the intersection of sex, gender and sexuality. For instance, research suggests that lesbian women have increased rates of breast cancer, possibly as a result of reproductive factors such as being less likely to have given birth, or more likely to have done so later in life; or other factors such as body mass index and alcohol consumption; and barriers to screening and poor patient-provider communication within the healthcare system. For additional information, refer to Boehmer (2002), Brandenburg et al. (2007), Brown and Tracy (2008), Dribble et al. (2004), Kavanaugh-Lynch et al. (2002), and O'Hanlan et al. (2002).

why there are differences in health status and health outcomes and the influence of an unequal distribution of resources (Benoit and Shumka, 2009: 2).

The health determinants literature often fails to include sex and gender as determinants of health or includes one but not the other, though it should be noted that sex may also be viewed as a biological determinant which may be why some lists of social determinants of health do not include it. Sex and gender have often been conflated, used interchangeably and applied as one variable in health research rather than as constructs which cross-cut other variables in influencing health status (Benoit and Shumka, 2009; Tudiver, 2009). In their discussion about gender and determinants of health, Benoit and Shumka (2009: 5-6) note a systemic bias as a result of the historical health research that was based solely on the experiences of men and an inability to disentangle biological and social conditions which influence health outcomes. Thus, gender is now acknowledged as an important variable in policy analysis. Gender-based analysis requires "a solid knowledge of gender trends in society and the collection of information that furthers the understanding of the ways that gender interacts with policy, how policy may reinforce existing power structures based on gender, or how policy may reproduce gender inequalities (Hankivsky, 2007b: 114-15). Benoit and Shumka (2009: 11) offer a gender-inspired health determinants model which assigns equal importance of sex and gender to other fundamental health determinants. This model demonstrates causal connections between *fundamental macro-level determinants* including sex, gender,

socioeconomic status,[12] race, ethnicity, immigrant status, age, and geographic location; *access to key meso-level resources* such as employment status, education, childcare, safe neighbourhoods, and health services; *proximal micro-level determinants* such as smoking, diet and exercise; and *morbidity and mortality* as health outcomes. It is argued that sex- and gender-based analysis is essential for improving the health of Canadians in conducting health research and in the development and implementation of health programs and policies. Applying this lens is particularly relevant in research on women's health and is utilized throughout the dissertation.

Social Movement Theory

The history of breast cancer as a disease and the associated social movements must be examined in order to understand the influence of sociocultural, political, economic, and environmental factors. Women are often key actors in the mobilization around public health issues, including breast cancer (Williams et al., 1995). The tradition of hiddenness and invisibility with breast cancer led women to seek support from each other and to "form associations that could serve as the basis for organizing and taking action to improve treatment and to increase public awareness" (Schulzke, 2011: 43). The

[12] In addition to including sex and gender as fundamental determinants of health, this model recognizes how inequalities in health are associated with social class or socioeconomic status as measured by education, occupation and income which is consistent with discussions of the importance of socioeconomic status in Health Canada's *Health Policy Research Bulletins* (Health Canada, 2004a; 2005a; 2005b; 2007a; 2009a). This perspective considers a community's physical, social and public policy environments in relation to health status. Research demonstrates that health risks are not evenly distributed across the population but rather are disproportionately affecting those living with low socioeconomic status. Place can be thought of as a "geographic area where men, women, boys and girls all live in their diversity" (Health Canada, 2007a: 7). However, in order to properly analyze the complexities involved in the relationships between people, place and health, place ought to be viewed as more than simply geographical locations. Place may be conceptualized as "environments consisting of physical, cultural, political, economic and social components, with each component contributing in complex ways to the differential health risks experienced by a population" (Health Canada, 2007a: 8).

public awareness related to breast cancer as a disease along with a perception of susceptibility and risk act to mobilize support for collective action (Brown et al., 2002). Despite being organized around one specific disease, breast cancer is also one of the broadest of health social movements drawing from multiple influences and crossing institutional domains, disease regimes, fields of contention, and cultures of action (Klawiter, 2008a: 248).

Social movement theory provides a useful lens for examining breast cancer as a health social movement. Social movements have the potential to increase public awareness, provide political challenges towards government, issue scientific challenges to medicine and science and for changes in organizations such as health-related charities, and influence the distribution of power and authority among organizations within a movement (McCormick et al., 2003: 573). The success of a social movement hinges on the ability to strike a balance between the need to have the platform and priorities institutionalized so that broad and enduring changes can be made, and the need to remain flexible so as to generate the pressures necessary for adaptation. The movement's goals must be embraced by the prevailing power structure, but the movement must also maintain its ability to pressure and successfully influence governing institutions when new actions are required or more ambitious policies need to be pursued (Bryner, 2001).

This section will first provide a brief overview of traditional social movement theory before focusing on health social movement theory more specifically. I will examine the history of breast cancer as a disease which will be discussed in terms of disease regimes related to medicalization and biomedicalization (Klawiter, 2008a). The

groundwork for the breast cancer social movement began in the 1970s with public education work and the women's health movement, followed by HIV/AIDS activism in the 1980s which provided a new model for public impact on health policy, and the formation of national coalitions and significant lobbying efforts for increased research in the 1990s (Finley, 1995). Feminist, postcolonial and queer theories have pushed the boundaries of concepts such as woman, sex, and gender and highlight the importance of analyses in health that "contextualize women in their diverse social and economic circumstances and understand gender as inseparable from other forms of social difference such as race, ethnicity, culture, class, sexual orientation, gender identity and ability" (Morrow et al., 2007: 9). The three distinct cultures of action in the breast cancer social movement which emerged in the 1990s in the Bay Area of San Francisco are examined in depth (Klawiter, 2008a). The cultures of action and specifically the environmental breast cancer movement remain influential and provide important context for a primary prevention approach to the disease.

Traditional Social Movement Theory

Staggenborg (2007: 2) offers key questions to be considered in the study of social movements including why movements originate when they do, how they attract and maintain support, how they present issues and formulate strategies and tactics, how they structure organizations, how they change cultures, why they generate opposition and sometimes decline, and how and why they succeed or fail in achieving their objectives. Social movements are key agents for change in society. The development of the modern social movement was made possible by the development of the nation-state which is

noted as the most important and often only actor with the capacity to act on claims (Meyer, 2000: 39). Instances of change at the level of legislation and policy as a result of social movements may be rare, but changes more commonly occur that are local and cultural in nature. Social movements problematize the way in which we live our lives and call for changes in thought and action. Social movements are natural experiments in power, legitimation and democracy and the dynamics of social movements allow for the examination of the broader political structures of society (Crossley, 2002).

Tarrow (1994: 3-4) defines social movements as "collective challenges by people with common purposes and solidarity in sustained interaction with elites, opponents and authorities." Social movement theorists make the distinction between social movement groups and other organized groups such as political parties and interest groups by regarding social movements as challengers that are outside of the established power structure, whereas political parties and interest groups may have some degree of access as insiders. A social movement community consists of networks of individuals, cultural groups, alternative institutions, institutional supporters, and political movement organizations. The interactions of social movements involve social movement participants, the target of the social movement, the public, and other actors relevant to a specific movement. Social movements are sustained through multiple campaigns or multiple episodes of collective action within a single campaign (Staggenborg, 2007: 5-6). While the most common denominator of social movements is interest, it is the participants' recognition of their common interests that provides the potential for mobilization and collective action. It is by sustaining the collective action against

opponents that a contentious episode can become a social movement and it is the common purpose, collective identities, and an identifiable challenge that allows this process to occur (Tarrow, 1994).

Issues of collective identity play a key role in the development of social movements and in the experiences of participants. Collective identity involves an "individual's cognitive, moral, and emotional connection with a broader community. It is a perception of a shared status or relation, which may be imagined rather than experienced directly, and it is distinct from personal identities, although it may form part of a personal identity" (Brown et al., 2004: 60). The collective identity may be embedded within a specific social movement organization, within the social movement itself, and within the solidarity group involved. It is expressed through styles of dress, language, demeanour, and discourse and is not static but rather the result of fluid processes (Boehmer, 2000). Social movements can demonstrate how experiential knowledge and expertise are integral to collective identities which are involved in social, legal and political claims made by a social movement (Orsini and Smith, 2010).

Meyer (2000: 39-41) notes four elements which distinguish social movements from other social and political phenomena. The first element involves social movements making claims on the state or another authority which is viewed as having the capacity to address the grievances of participants. The second element is the challenging of cultural codes and the transformation of the lives of participants which allows for the acknowledgement and utilization of experiential knowledge. Social movements use tactics including demonstrations, boycotts, pickets, civil disobedience, and political

violence, in addition to those offered and accepted by mainstream politics, such as public education campaigns. Finally, social movements involve a diverse range of organizations and individuals working towards the same general goals, though it is noted that the boundaries of a movement are fluid.

Traditional social movement scholars in Europe and North America have utilized a number of theoretical approaches which were developed independently of one another, with *collective behaviour*, *resource mobilization* and *political process theory* emerging in the United States and *new social movement theory* originating in Europe (Staggenborg, 2007). The social movement theory emerging from the United States was founded upon the idea that instances of collective behaviour were influenced by particular psychological and societal factors, and that rational actors were able to propel social movements by strategically mobilizing resources or political forms. In comparison, the traditional European social movement theory has more focus on the impact of socioeconomic structures, as well as with ideology and identity in terms of collective action (Dobrowolsky, 2008: 164). It has been noted that the efficacy of social movements only becomes apparent over time, through the challenging of cultural codes and conventions. Social movements suggest to the broader society that "alternative frameworks of meaning are possible and that the operational logic of power apparatuses is not the only possible 'rationality'" (Epstein, 1998: 346).

Collective Behaviour Theory

Collective behaviour theory emerged in the United States and theorists claim that collective behaviour occurs during a period of social disruption as opposed to being part

of a standard political process (Crossley, 2002). While there are different approaches to collective behaviour theory, Staggenborg (2007) notes several commonalities. It is believed that instances of collective behaviour occur as a result of cultural or structural breakdown or strain, such as instances of rapid social change or a dramatic event. Instances of collective behaviour exist outside of institutionalized structures and there is an emphasis placed on the role of social psychology and shared beliefs and among participants (Staggenborg, 2007: 12).

The theory of mass society is based on Durkheimian theory and proposes that collective behaviour emerges as an extreme response to social isolation. The mass society exists within conditions in which there are few groups which link individuals to mainstream society such as religious or community organizations. It is suggested that individuals experience feelings of alienation and anxiety as a result of isolation from social and political institutions creating susceptibility for recruitment by social movements, such as the German Nazis. However, it has since been proven that it is not isolated individuals who are most likely to participate in social movements, but rather those who are already involved in social networks and organizations (Staggenborg, 2007: 14).

The Chicago School approach to collective behaviour was developed in the 1920s by American sociologists who studied symbolic interactionism which focused on how actors create meanings through social interaction. Proponents of the Chicago School approach contend that collective behaviour emerges when established systems of meaning and sources of information have broken down creating situations in which

participants create new meanings to guide behaviours. There is an emphasis on how participants act collectively and create new goals, culture and organizational structures in the form of social change (Staggenborg, 2007: 12-13). Another approach to collective behaviour includes Smelser's theory from 1962 which offers a model with six interrelated determinants, including conditions of structural conduciveness to encourage specific types of behaviour; structural strain which creates a sense of deprivation; the growth and spread of generalized belief which creates meaning for participants; precipitating factors related to the generalized belief which create a specific target for action; mobilization for action; and finally, acts of social control which may attempt to prevent the collective behaviour. Both the Chicago School approach and Smelser's theory have been critiqued for placing too much emphasis on structural strains on society, when "strains may be a fairly constant feature of societies and the rise of movements may be better explained by factors such as political opportunities, resources and organization" (Staggenborg, 2007: 13-14; Klawiter, 2008a).

Resource Mobilization and Political Process Theories

North American social movement theory began to move away from concerns of collective behaviour theory in the 1970s. The resource mobilization and political process theories found that the collective behaviour theories did not adequately account for the new wave of protests that emerged in the 1960s (Klawiter, 2008a). Whereas the collective behaviour theory focused on the motivations of individuals as a psychological phenomenon, the newer perspectives framed social movements as political phenomena where individual participants are viewed as rational actors with clearly defined goals and

motivation. According to this perspective, social movements "arise out of pre-existing organization, engaging in both institutionalized and non-institutionalized forms of action" (Staggenborg, 2007: 16). In addition to political movement organizations, it is argued that other types of mobilizing institutions are involved in the recruitment of participants, including formal and informal networks, groups and organizations (Staggenborg, 2007).

Resource mobilization theory emphasizes the importance of resources, organization and opportunities for collective action in the mobilization of social movements. The availability of resources is believed to be of great importance to the success of social movements in this approach. Resources include both tangible assets such as funding, as well as intangible resources such as the availability and level of commitment among participants. Resources used and created by social movements may include moral resources such as legitimacy; cultural resources including strategic knowledge; social-organizational resources including infrastructures, networks and organizational structures; human resources which includes both the labour and experience of activists; and material resources such as capital and office space (Staggenborg, 2007: 16). It is noted that these resources may not necessarily come from aggrieved groups who benefit from the social movement, but rather from conscience constituents who contribute to movements but do not personally benefit from the results of the movement (McCarthy and Zald, 1987). However, Melucci (1985: 197-98) suggests that the resource mobilization approach avoids a macro-level analysis and does not allow for the consideration of the "cultural orientation of the emerging social conflicts."

The political process approach to social movement theory was advanced by Tilly, Zald, McAdam, McCarthy, and Tarrow. It was developed from resource mobilization theory and also influenced by new social movement theory from Europe (McCarthy and Zald, 1987; Smith, 2008; Tarrow, 1994). Political process theory identifies both opportunities and constraints related to the mobilization of social movements and the potential influence on the emergence and activities of social movements (Brown et al., 2004). This approach emphasizes the interactions of participants with the state and the role of political opportunities as occasions for collective action; social movements are most likely to occur when activists feel that conditions are favourable (Klawiter, 2008a; Smith, 2008; Staggenborg, 2007).

In political process theory, the nation-state is framed as the "primary enabler, suppressor, and target of social movements" (Klawiter, 2008a: 11). Social movements are not only influenced by political processes but can create opportunities for the movement itself and for other social movements (Staggenborg, 2007). The strong program of political process theory posited that political opportunities did not directly cause social movements, but that social movements develop as a result of and would not succeed without political opportunities (Klawiter, 2008a). The weak program utilizes Snow's (2007) concept of "framing processes" which frames and assigns meaning in the process of interpreting relevant events in the mobilization of participants. It is described as a conscious and strategic effort of participants to develop a shared understanding in the legitimation and mobilization of collective action (Klawiter, 2008a: 12; Snow, 2007:

384).[13] The use of frames was to respond to critics who note that resource mobilization theory and weak political process theory did not account for the importance of cultural factors in the development of social movements, including ideas and perceptions. Political process theory has been critiqued for overestimating the role of the nation-state as a primary target for social movements and contentious politics (Klawiter, 2008a).

New Social Movement Theory

New social movement theory was developed from a history of European tradition, Marxist analysis and critical theory. Key theorists involved in new social movement theory include Melucci, Habermas and Touraine and it emphasizes social movements in a post-industrial, advanced capitalist society including the environmental, gay and lesbian, student, and women's social movements which emerged in the 1960s and 1970s (Brown et al., 2004; Klawiter, 2008a; Staggenborg, 2007). As post-industrial societies produce an integration of economic, political, and cultural structures (Melucci, 1985), it is argued that new social movements differ from movements in the industrial society, such as the labour movement in terms of structure, types of constituents and overall ideology. New social movement theorists emphasize collective identity, and the shared experiences and values which lend themselves to collective agency (Staggenborg, 2007: 20-21).

Whereas previous social movement research in Europe reflected Marxist theory, an important factor in new social movement theory is the intentional dismissal of class as a central concern (Orsini, 2008). Unlike political process theory which focused its

[13] Snow's (2007) "framing processes" should be distinguished from the policy frames in chapter one's discussion of interpretive policy analysis. While framing processes assign meaning and shared understanding in mobilization processes, policy frames create a framework in which to interpret policy-related documents and the meanings used by different policy actors and communities (Yanow, 2000).

attention on formal politics and the nation-state, new social movement theory proposed a need for a more thorough understanding of the large-scale transformations that occurred in advanced, post-industrial capitalist societies and argued that the expansion of the state into the private sphere produced new kinds of social movements (Klawiter, 2008a: 16-17). New social movement theory is "postmodern, postmaterial, or uninterested in the economy of the state," drawing on framing processes to understand the conflict which reflects participants' engagement with issues of collective identity rather than specific economic interests (Orsini, 2008: 342).

Key outcomes of new social movement theory include new types of values, identities and organizations (Staggenborg, 2007: 23). Williams et al. (1995: 115) note that many new social movements include issues related to inequality that were not considered in earlier class-related movements, including gender, sexuality, ethnicity, age, and disability. However, the authors note that class is still an important factor when studying social movements, such as the environmental movement. For instance, the environmental movement has largely consisted of a white, middle-class membership, whereas often those most at risk for related health problems are "working class" (Williams et al., 1995).

Critiques of Traditional Social Movement Theory

Dobrowolsky (2008) suggests that while each of the traditional approaches to social movement theory has strengths and weaknesses, these approaches do not consider that social movements negotiate both issues of strategy and identity. It is argued that politics must be discussed as both a way in which traditional political theory is

understood and also as a location for larger political discourse; while social movements are affected by politics, they may also affect politics (Dobrowolsky, 2008: 164). It is suggested that social movements can be understood in terms of macro- and micro-processes (Orsini, 2008; Staggenborg, 2007). Macro-processes may involve three related concerns including systematic explanations of the rise of social actors and participants, the clarification of the relationship between the state and civil society, and the processes related to the formation of collective identities. Micro-processes include the dynamics involved in the mobilization processes, the organization of the social movement, and the role of individual participants (Orsini, 2008: 342). While new social movement theory may address the macro-level processes, resource mobilization theory may be more able to address the micro-level processes. Civil society should be viewed as both the target and terrain of collective action (Orsini, 2008).

Melucci (1985: 795) contends that the field of social movement theory must transition from empirical generalizations towards analytical definitions and defines a social movement as a "form of collective action (a) based on solidarity, (b) carrying on a conflict, [and] (c) breaking the limits of the system in which the action occurs." He argues that analysis of social movements should focus on the systemic relationships more so than the logic of participants, but also recognizing the structural conditions and the importance of organization as a critical site of observation as social movements operate within systems of opportunities and constraints (Melucci, 1985). To address the question of why movements originate when they do and how they attract and maintain support, Staggenborg (2007) contends that social movements do not develop quickly and are often

linked in some way to earlier movements. The development of a social movement is directly influenced by processes of mobilization in which a "group that shares grievances or interests gain collective control over resources" and recruitment of individuals which is "part of a broader process of mobilization involving the commitment of individual resources, such as time, money, and skills, to a cause" (Staggenborg, 2007: 26). It is important to note that mobilization and recruitment are not static, but ongoing processes that are influenced by large-scale socioeconomic and political changes, opportunities and threats, critical events, pre-existing or emergent organizations, leadership, resources, and frames (Staggenborg, 2007: 28).

In the 1990s, many theorists drew from studies of the sociology of culture, gender, emotions, and identity as they placed a greater emphasis on the importance of agency in social movement theory. The social constructionist approach allows for a greater understanding of the "the expressive, emotive, discursive, interpretive, identity- and solidarity-building activities in which social movement actors engage" (Klawiter, 2008a: 10). However, continuing the recognition of the importance of structural factors on participants themselves and social movements more broadly, it is noted that structural factors shape both the external world and the internal world, including us as participants and subjects, as "selves" (Klawiter, 2008a: 11).

Health Social Movements

Narrowing the focus from social movement research more broadly to health research specifically, health social movements offer an important opportunity to challenge political power, professional authority and develop personal collective identity

(Brown and Zavestoski, 2005). Health social movements may be defined as "collective challenges to medical policy, public health policy, belief systems, research[,] and practice which include an array of formal and informal organizations, supporters, networks of cooperation and media" (Brown and Zavestoski, 2005: 1). While not considered by most political process theorists, health social movements have become central to research conducted by medical sociologists and anthropologists in order to understand the ongoing transformation of bodies, biomedicine and health care, and subsequently our experiences of health, risk, disability, illness, and disease (Klawiter, 2008a: 289). Health social movements have very different goals than those found in traditional social movement theory. While the focus of traditional social movements has been at the level of state policy, health social movements often focus on targets at other levels, such as the health care system, biomedicine and traditional approaches to health, public health policy, and the recognition of experiential knowledge and the illness experience. Health social movements challenge power and authority, as well as our understanding about individual and collective identities (Orsini and Smith, 2010: 40).

Brown and Zavestoski (2005: 9) note three ways in particular in which health social movements are able to affect contemporary society. First, health social movements have the potential to produce changes in the public health care system in terms of health care delivery, social policy and regulation. Secondly, health social movements can affect contemporary society through changes produced in the field of medical science, including promoting new and innovative hypotheses and methodological approaches to research, as well as advocating for changes in funding priorities. Finally, health social movements can

influence society by calling for processes of democracy within institutions that influence medical research and policy-making. Health social movements act as a "critical counter-authority aimed at democratizing and reshaping social policy and regulation in a way that transforms the socioeconomic and political conditions that underlie distributions of health and disease among populations" (Brown and Zavestoski, 2005: 14).

Concepts from resource mobilization, political process and framing theories are utilized in the conception of health social movements. The resource mobilization theory acknowledges knowledge, experience and networks as important resources to be utilized by health social movements; the political process theory may explain the processes utilized in health movements related to political opportunities; and framing processes include the importance of the use of emotions, grievance and experiential knowledge (Brown et al., 2004). However, the traditional approaches to social movement theory do not account for the role of class which is an important consideration in terms of access to health care, as well as health outcomes (Brown et al., 2004).

Health social movements most often address i) access to, or provision of, health-care services; ii) health inequality and inequity based on race, ethnicity, gender, class and/or sexuality; and iii) disease, illness experience, disability and contested illness (Brown, 2007: 26). The purpose of health access social movements is to seek equitable access to healthcare, as well as improved delivery of services. Examples of health access social movements include the US mobilizations for national healthcare reform and extension of health insurance to the uninsured (Brown, 2007). Groups associated with constituency-based health social movements address disproportionate outcomes and

oversight by the scientific community while addressing health inequality and inequity related to issues of race, ethnicity, gender, class, and/or sexuality differences. Constituency-based movements include the women's health movement, the gay and lesbian movement, and the environmental justice movement (Brown, 2007).

Until recently, the majority of health social movements focused more on expanding access to and improving the quality of health care which is reflected in the health access and constituency-based movements. The third category, embodied health movements, does address some issues of health care access but focuses more on the personal understanding and experience of illness (Brown and Zavestoski, 2005: 3). Embodied health movements include the tobacco control, HIV/AIDS and breast cancer movements (Brown, 2007). Embodied health movements address the experience of disease, disability or illness by challenging science on etiology, diagnosis, treatment, and prevention. These movements also focus on contested illness that may be unexplained by current medical knowledge or illnesses that have environmental explanations which are often disputed. Contested illness is defined as that which is "dismissed as illegitimate, - framed as 'difficult,' psychosomatic, or even non-existent - by researchers, health practitioners, and policy-makers operating within conventional paradigms of knowledge" (Moss and Teghtsoonian, 2008: 7). Research on contestation addresses illness not only through diagnosis and treatment, but also examines the mechanisms though which social practices, discourses and institutional processes shape conventional understandings of illness (Moss and Teghtsoonian, 2008). It is argued that virtually all diseases that can be attributed to environmental causes are highly contested because of the scientific

limitations related to the burden of proof and potential liability issues (Brown, Kroll-Smith and Gunter, 2000; Shriver and Kennedy, 2005). The status of illnesses as contested since the Second World War has arisen from several sources including i) the illnesses themselves stemming from the production use and disposal practices of the past half century; ii) a reflection of the growing uncertainty over the specific causes and expression symptoms; and iii) the popular participation in science and politics making the identification of illness and its causes much more public (Brown, 2007: 230).

Participants in embodied health movements organize to achieve medical recognition of contested illnesses, research and treatment.[14] Interestingly, members of these groups may also include people who are not ill themselves but see themselves at risk for the disease, as well as those who experience the disease through family connections. Brown et al. (2004: 54-55, 2012a: 18-21) provide an overview of the ideal characteristics and tactics that embodied health movements are unique in possessing. They include: i) introducing the biological body to social movements; ii) challenging existing medical and/or scientific knowledge and practice; and iii) activists' involvement

[14] While breast cancer and other environment-related illnesses such as multiple chemical sensitivity are contested illnesses, there are important differences surrounding the concepts of visibility and acceptability. When considering multiple chemical sensitivity, the contested nature lies not only with environmental links to disease but in the challenges of acceptance and in fact, to the very existence of the disease itself. Sufferers with multiple chemical sensitivity experience struggles with legitimacy and lack an accepted sick role due to insufficient scientific credibility. This is not the case when considering the diagnosis and treatment of breast cancer which is well established within biomedicine and the dominant epidemiological paradigm. The current treatment options for breast cancer, including surgery, radiation and chemotherapy are the same regardless of the etiology of disease; no one is disputing its existence or challenging its associated illness experience. There are clear parallels of invisibility between multiple chemical sensitivity and breast cancer in the invisibility of the environmental risks themselves which are often impossible to detect through human senses (Shriver and Kennedy, 2005), and subsequently impossible to avoid. For further discussion of contested illness and multiple chemical sensitivity, refer to Alaimo (2010), Ashford and Miller (1998), Dumit (2006), Kroll-Smith and Floyd (1997), Lipson (2004), Moss and Teghtsoonian (2008), Nash (2006), Shriver and Kennedy (2005), and Shriver, White and Kebede (1998).

and collaboration with scientists and health professionals in pursuing treatment, prevention, research, and expanded funding.

The first characteristic involves the experience of the disease within the body producing a particular "disease identity" which may or may not be stigmatized. The disease identity represents the intersection of the social construction of illness with the lived personal experience of a biological disease process. It is important to note that those with the disease experience are in a unique position of living with the disease process, the personal experiences, interpersonal effects, and the social ramifications of the illness (Brown et al., 2004: 55-56). Brown et al. (2004: 56) argue that the significance of the experience in the embodiment of a disease is reflected in the options available to an embodied health social movement when it is mobilized. Those who experience the disease identity can either work within or against the system which produces the scientific and medical knowledge (Brown et al., 2004, 2012a). That system plays a direct role in determining whether an illness is contested or not. The ability to work within or against this system may be impacted by a number of factors including whether or not the disease is contested. The personal experiences possessed by those with a disease identity within an embodied health movement prove valuable in terms of a lived experience and perspective that is not available to others, as well as instilling a moral credibility to the social movement within both the public and scientific realms (Brown et al., 2004: 56). A collective illness identity emerges when individuals develop a "cognitive, moral, and emotional connection" with other illness sufferers (Brown et al., 2004: 60).

The second tactic used by embodied health movements involves challenging the existing medical and/or scientific knowledge and practice. Embodied health movements are ultimately tied to the production of scientific knowledge and to changes in practice as social movement participants seek support for their illness claims from these institutions. What differentiates embodied health movements from other social movements in the challenge to medical and scientific knowledge is the involvement and utilization of experiential knowledge related to environments, bodies and illnesses (Brown et al., 2004: 56). The third tactic specific to embodied health movements involves the collaboration of activists with scientists and health professionals. Participants in this social movement must simultaneously challenge and collaborate with the fields of science, medicine and public health (Brown et al., 2012a: 19). This collaboration occurs as activists attempt to pursue treatment, prevention, research, and expanded funding for their illness (Brown et al., 2004: 54-55).

While embodied health movements may be unique in possessing each of the three traits, they are also similar to other social movements as mobilization is dependent on the emergence of a collective identity. In the case of illnesses, the initial approach involves working within established social institutions. However, if science and biomedicine fail to recognize the illness experience and offer accounts of the disease that activists do not accept, they may adopt an identity of an aggrieved illness sufferer and proceed with collective action (Brown, 2007: 27-28). The concepts of collective identity and disease identity are combined to provide a discussion about the politicized collective illness identity in which the collective identity is “linked to a broader social critique that views

structural inequalities and the uneven distribution of social power as responsible for the causes and/or triggers of the disease" (Brown et al., 2004: 60, 2012a: 22). One of the factors involved in the development of a politicized collective illness identity is a common experience with government, medical and scientific institutions which create the dominant epidemiological paradigm. The critique situated within the politicized collective illness identity removes the onus of responsibility for both the treatment and prevention of disease from the individual and places it on social institutions. Activists criticize the biomedical model which they argue treats disease as a discrete entity occupying the body and in turn, the body as a discrete entity which is separate from the person occupying it (Brown et al., 2004: 61, 67, 2012a). The characteristics of embodied health movements are reflected in breast cancer social movements which will be examined in depth in the following section after addressing the historical context.

The History of Breast Cancer and Disease Regimes

It is necessary to consider the history of breast cancer and its disease regimes in order to fully understand the contemporary context of the disease. Historically, ideas about women's risk for developing cancer were entangled with ideas about women's "essential nature" (Jasen, 2002: 20). During the Enlightenment period (1750s-early 1800s), the association between menopause and cancer was supported by humoral theory which promoted the idea that the breasts become engorged and developed tumours after menstruation ceased and the body became "uncleansed." Disease theory during this time observed that health status was negotiated by the body and mind, with a level of responsibility placed on the individual themselves (Jasen, 2002). The belief in

psychosomatic causes of disease was especially strong at this time, as "[w]omen, made of frail fibers, were seen to have easily impressionable souls and unquiet hearts readily carried away by lively imagination" (Bronfen, 1998: 114).

During the Victorian era (mid 1800s-1900), there was a shift towards research at the cellular level, although the association between breast cancer and hysteria was still common in medical literature in the late 19th century. Interestingly, it was during this era that public silence surrounding breast cancer became deeply entrenched. This silence was perpetuated by the notion that deaths caused by cancer were a social taboo in middle- and upper-class society, as well as being compounded by the breast's association with sexuality and as a violation of the mother's nourishing breast (Jasen, 2002: 28-29; Ehrenreich and English, 2011).

Klawiter (2008a) provides an important contribution to the literature surrounding breast cancer social movements with an alternative approach which focuses on the disease regimes in which breast cancer was medically managed in individuals and publicly administered in populations. Disease regimes are defined as consisting of the "institutionalized practices, authoritative discourses, emotional vocabularies, visual images, and social scripts through which diseases are socially constructed, medically managed, publicly administered, and subjectively experienced" (Klawiter, 2008a: 33). A disease regime includes interlinked practices through which a disease is medically managed in individual bodies and publicly administered across populations.

When the concept is applied to examine the regimes of medicalization and biomedicalization related to breast cancer (Klawiter, 2008a, 2008b), disease regimes of

breast cancer are mapped along the two axes of biopower. The first axis, the biopolitics of populations involves the public administration of disease and includes the discourses and practices of public health such as health promotion, education, population surveillance, epidemiology, and environmental health sciences. The second axis of biopower, the anatomo-politics of individual bodies involves the medical management of disease through the discourses and practices of clinical medicine including screening, diagnosis, treatment, and clinical research (Klawiter, 2008a: 33). Rather than the voluntary subjects of disease regimes such as scientists, physicians, healthcare professionals, Klawiter (2008a) focuses on the involuntary subjects who are recruited and incorporated into the regime through its discourses and practices. It is important to note that involuntary does not mean unwilling, rather disease regimes are most effective when the subjects are willing and able to participate in the processes.

The first regime of breast cancer, the regime of medicalization, occurred during the early 1900s after a shift in impressions of the human body. Humoral medicine was gradually replaced by scientific medicine which was founded upon new "technologies of seeing" including the microscope and medical dissection (Klawiter, 2008a). The research on breast cancer during the first half of the 20th century placed a significant emphasis on the natural pathology of the breast and away from causal factors outside the body, including dangers of "civilization" or trauma to the breast (Jasen, 2002). Though this process was initially resisted by both women and their physicians, it was during this time period that breast cancer became distinguished from other cancers, with its own origins

which could be treated through surgery. By framing breast cancer as a curable disease, this regime re-framed breast cancer patients as potentially curable (Klawiter, 2008a: 75).

As scientific medicine was institutionalized, it became an elite profession with largely white, upper-class, Christian men acting as its practitioners. The regime of medicalization transformed the power dynamic between physicians and patients in the clinical relationship, creating a new social script of the "sick role" which located the power and authority with male physicians and placed female patients in a position of compliance. The patient's narrative about her illness experience no longer held significant value, but rather the diagnosis came from the physician who now focused on the body's interior while subsequently creating new meanings of illness and reinforcing and reproducing the dominant gender order (Klawiter, 2008a: 62-63).

It was during the interwar period that a war on cancer was declared by government and the medical profession in which "only neglected cancer is incurable" (Jasen, 2002: 36; King, 2008). Breast cancer patients who were subjects of the medicalization regime were shaped and influenced in particular ways including i) experiences within their diagnoses and treatments; ii) the norms of non-disclosure rooted within interactions between physicians, surgeons and patients; and iii) the normalization processes which encouraged "cured" women to return to their daily activities and pass as "normal" women (Klawiter, 2008a: 75). The regime of medicalization was deeply entrenched in the gender roles and norms of this time period. Women were blamed for failing to be vigilant in detecting breast lumps with surgeons and pathologists promoting the "notion that women's greatest risk lay in the failure to be vigilant in detecting and

reporting suspicious lumps" (Jasen, 2002: 36). Male surgeons and occasionally the patient's husbands made the decisions regarding treatments, often without consulting the patient and, at the same time, requiring her compliance and obedience (Jasen, 2002; King, 2008; Klawiter, 2008a).

Breast cancer was diagnosed through surgical biopsy during the regime of medicalization, and because breast cancer was viewed as a localized disease, the Halsted radical mastectomy became the dominant treatment among North American surgeons. Until the early 1970s, rather than performing two separate procedures, a radical mastectomy was performed if the biopsy results were malignant, while the patient remained unconscious (Klawiter, 2008a: 76). The radical mastectomy involved removing the entire breast in addition to the chest wall muscles, lymph glands and fat located under the skin (Ley, 2009). When the breast cancer patient awoke from the biopsy and radical mastectomy, she awoke "not as a cancer patient but as a mastectomee who had been successfully treated for a condition that was not called by name, at least not in front of the patient" (Klawiter, 2008a: 77). The sick role which emerged in this regime segregated and isolated those who were ill from those who were not and did not allow for the forming of a collectivity. The sick role "channels deviance so that the two most dangerous potentialities [to the medical establishment], namely, group formation and successful establishment of the claim to legitimacy, are avoided" (Parsons, 1951: 477; Klawiter, 2008b). For instance, in the case of new mastectomees, patients were required to leave the temporary sick role and return to their regular lives and responsibilities immediately. The "formation of disease-related identities, solidarities, social networks,

and other forms of biosociality[15] was thus heavily constrained by and within the regime of medicalization" (Klawiter, 2008a: 37).

A second regime of breast cancer, the regime of biomedicalization emerged during the 1970s and 1980s with new developments in biomedical research and cancer epidemiology. This regime moved discourses and practices of risk to the forefront and included changes in the practices of education, and measures and promotion of early detection, diagnosis, disclosure, treatment, and rehabilitation. In considering the public administration of disease, this included the development of new screening practices and the construction of all women, regardless of whether they are symptomatic or not, into risky subjects who are responsible for the status of their own health and must participate in the screening practices (Klawiter, 2008a: 86).

During the late 1970s, feminist health activists began to agitate against the one-step biopsy and Halsted radical mastectomy, calling it paternalistic and patriarchal. They argued that the procedures denied women the right to be informed of their diagnoses and to participate in the decision making process (Boehmer, 2000; Ley, 2009). The processes involved in the medical management of disease in the regime of biomedicalization include the emergence of informed consent, the refinement of surgical procedures, increased use of adjuvant therapies, redefining the roles and responsibilities of patients and physicians, and the development of rehabilitation programs which addressed the experiences of isolation among breast cancer patients (Klawiter, 2008a).

[15] Biosociality signifies the ways in which the practices of science, public health and medicine enable the formation of new subjects and social groups (Klawiter, 2008a: 27).

Historically breast cancer was a private, even secretive disease associated with feelings of shame. Breast cancer emerged into the public domain in the 1970s through the influence of feminism and the women's movement,[16] as well as the role of the media and the public breast cancer cases of prominent women such as Shirley Temple Black, Betty Ford and Happy Rockefeller who encouraged early detection and intervention (King, 2008; Ley, 2009; Sherwin, 2006). While these prominent women were willing to speak publicly about their experiences with breast cancer, it is important to note that their positions of privilege and status influenced their ability to do so.

Breast cancer was now framed as a disease for which every woman is at risk and required continual vigilance by individual women. Measures of surveillance and detection were heavily promoted as the "moral duty" of women, including engaging in breast self-exams, clinical examinations and mammographic screening. The temporary sick role for symptomatic women from the regime of medicalization was replaced by a permanent risk role for all women (Klawiter, 2008a: 38). While the processes involved in the regime of biomedicalization did not improve breast cancer incidence or mortality rates during the 1970s or 1980s, the subjects and social relations of the disease regime were transformed. This created the conditions for biosociality and collective action among the "risky subjects" within this regime, including asymptomatic women, women

[16] In addition to the women's health movement and feminism, the breast cancer social movement has been significantly influenced by the HIV/AIDS movement. Despite differences in the history, biological and social epidemiology of breast cancer and HIV/AIDS, it was the politicization of HIV/AIDS that paved the way for the politicization of breast cancer and the participation of women who had not previously been active in social movements (Boehmer, 2000; Epstein, 1998). For a complete discussion of the relationship of activism between breast cancer and HIV/AIDS, refer to Ulrike Boehmer's (2000) book *The Personal and the Political: Women's Activism in Response to the Breast Cancer and AIDS Epidemics*.

in treatment for breast cancer, women at risk of recurrence, and women in remission (Klawiter, 2008a: 39-40).

The women's health movement was grounded during the third wave of the feminist movement.[17] Specifically, the cancer movement in Canada and the United States became organized around a feminist analysis, taking the position that cancer is a political issue. Boehmer (2000: 99) points to a collective feminist identity which is negotiated between politically experienced feminists and women with no prior political engagement. Since the early 1990s there has been an ongoing cultural transformation in which understandings of breast cancer have shifted from that of a historically stigmatizing disease of individuals suffering in isolation, to that of a neglected epidemic at the center of public debate and political organizing. It has become common for many women with breast cancer to dismiss the label of "patient" and embrace an identity associated with being a "survivor" (King, 2008: x). This cultural transformation led to the development of three distinct cultures of action in the San Francisco Bay Area (Klawiter, 2008a).

Breast Cancer and Cultures of Action

Klawiter (2008a: 44) uses cultures of action as a "heuristic device for conceptualizing and mapping patterns of similarity and difference within social movements." Cultures of action are produced by individuals, groups, agencies, organizations, councils, corporations, and coalitions and involve shared goals, assumptions and discourses among interactions involving allies and opponents. They

[17] During the third wave of feminism, the women's health movement focused specifically on the politics of reproduction, including issues surrounding sexuality, birth control, pregnancy, childbirth, breast-feeding, forced sterilizations, unnecessary hysterectomies, and the safety of pharmaceutical technologies including the birth control pill, hormone therapy and the DES (diethylstilbestrol) controversy (Klawiter, 2008a: 167).

change over time as a result of influence from the actions of members and relationships with other cultures of action, as well as the shifting dynamics in the discourses and practices the culture of action is attempting to influence (Klawiter, 2008a; Zavestoski et al., 2004). Cultures of action "are not simple constellations of ideas, frames, cognitions, or identities. Rather, they enact, embody, and articulate (visually and verbally) particular visions of what is and what ought to be" (Klawiter, 2008a: 44).

During the same time period in the 1990s, three different cultures of action emerged within the Bay Area of San Francisco. Moffett (2003: 290) contends that breast cancer advocacy groups have three goals in particular, including: i) raising awareness about breast cancer and promoting the use of biomedical processes, such as mammographic technologies; ii) providing emotional support for women in varying stages of the disease and their treatment; and iii) raising funds or promoting that funds be allocated towards scientific research for breast cancer. These goals are reflected in Klawiter's (2008a) first culture of action; however it is not the case in the second or third. Each specific culture of action employs different discourses related to breast cancer, promotes different identities and body politics, and supports different agendas and priorities. Each culture of action also draws upon distinct understandings of gender, race, class, and sexuality, and has diverse perceptions of and relationships to science and biomedicine, capitalism, corporate philanthropy and cause-related marketing, and the pharmaceutical industry (Klawiter, 2008a: 45).

1) Culture of Early Detection and Screening Activism

The discourse surrounding breast health began to emerge in the early 1990s; these discussions were linked exclusively to breast cancer screening as part of awareness and early detection campaigns. This is evidenced by the focus of the *culture of early detection and screening activism* which emerged in the San Francisco Bay Area and drew upon the strong evidence and science related to the detection and treatment of breast cancer (Brown et al., 2002; Klawiter, 2008a). Similar to the breast cancer awareness campaigns of the 1970s and 1980s, this culture of action involves the promotion of breast self-examination, clinical breast exams and mammographic screening as life-saving technologies while simultaneously placing the onus of responsibility to comply with screening for early detection on individual women. The unique aspects which emerged during the 1990s and distinguished this culture of action from previous campaigns include three developments in particular: i) the interpenetration of the state, private industry and breast cancer screening advocacy; ii) the rise of mass-participation fund-raising events; and iii) growing pressure to expand mammographic screening to medically marginalized communities (Klawiter, 2008a: 131-32).

The early detection and screening activism culture of action challenged the assumption in social movement theory that social movements have clear boundaries which can be distinguished from the state, private industry and philanthropic organizations, and those social movements must engage in contentious forms of protest (Tarrow, 1994). In addition to individuals, this particular culture of action involved public agencies, professional organizations, health care organizations, and private

industry. Rather than engaging in the contentious forms of protest embraced by the other cultures of action in this area, a culture of consensus emerged which "privileged the identity of 'breast cancer survivor' and tied this identity to the physical display of heteronormative femininity" (Klawiter, 2008a: 134).

The discourse utilized in this culture of action focused exclusively on a lack of awareness about breast cancer and the financial, cultural and physical barriers to screening. Concerns about access to mammographic screening for medically marginalized women, particularly low-income, uninsured women of colour became a priority at this time (Klawiter, 2008a). It is important to note that this was not unique to the San Francisco Bay Area, but was also occurring nationally and internationally. Parallels can be drawn between these issues in the United States and similar concerns about access to mammographic screening in rural and geographically isolated areas of Canada.

The promotion of mammography within this culture of action increased women's concern about their individual risk of developing breast cancer. The discovery of the "breast cancer genes," $BRCA_1$ and $BRCA_2$ during the 1990s altered the discussion surrounding women's risk of breast cancer and the options available in determining this risk. An estimated 5-10 percent of breast cancer diagnoses involve hereditary forms of cancer and women may seek to engage with the health care system to obtain this information through genetic testing regardless of their risk profile (Bottorff et al., 2002; Bouchard et al., 2004; Rees et al., 2001). It is suggested that testing for $BRCA_1$ and $BRCA_2$ genetic mutations may be the first widespread utilization of pre-symptomatic

genetic testing transforming general medicine into predictive medicine (Bouchard et al., 2004). Although the majority of breast cancer diagnoses do not involve genetic mutation, its presence does increase the risk of an invasive breast cancer diagnosis[18] (Klawiter, 2008a). Women with $BRCA_1$ and $BRCA_2$ genetic mutations are faced with uncertainty about if and when they will develop breast cancer and how to manage this risk (Lippman, 1998; Rees et al., 2001). The preventive measures offered by geneticists and physicians to patients with $BRCA_1$ and $BRCA_2$ genes include increased surveillance, breast self-examination, mammography screening, chemoprevention, and prophylactic surgery in the form of a preventive mastectomy (Bouchard et al., 2004).

Genetic screening contributes to the biomedicalization regime of breast cancer and the framing of all women as "risky subjects" (Klawiter, 2008a: 262). Due to the widespread prevalence of cancer in western society, Jain (2007a) contends that everyone lives with some degree of prognosis. The effects of genetic screening for breast cancer are not limited to the individual being tested, but also have an impact on close relatives who are living and those who have not yet been conceived. The knowledge of genetic mutations linked to breast cancer increases the experience of risk and anxiety among both the carrier and his or her extended family (Klawiter, 2008a: 262).

While prophylactic surgery has a strong history in the regime of medicalization, the option of chemoprevention emerged in the late 1990s. The Breast Cancer Prevention Trial included 13,338 Canadian and American women, and tested the breast cancer treatment drug tamoxifen against a placebo in "high risk" women who had a 1.7 percent

[18] The increase in risk of developing invasive breast cancer with the presence of $BRCA_1$ and $BRCA_2$ genes is between 36-85 percent depending to which study one refers (Klawiter, 2008a: 262).

or higher risk of being diagnosed with breast cancer in the next five years. This percentage was the average risk a 60-year old woman had of developing breast cancer in the United States. The results of this clinical trial indicated that the group of women receiving tamoxifen were approximately half as likely to develop invasive breast cancer as the control group (Batt, 2002; Klawiter, 2008a). There was extensive media coverage around this issue at the time suggesting that "[w]e know for the first time in history that we can prevent cancer through pharmaceuticals" (Batt, 2001). The subsequent decision by the United States Food and Drug Administration to approve tamoxifen for supplemental and preventive use in healthy women considered to be at "high risk" was considered controversial by women's health organizations. The decision was critiqued in terms of the promotion of the drug by pharmaceutical company, Astra Zeneca, to physicians and direct-to-consumer advertisements targeting women. By focusing on medication for the "prevention" of breast cancer, the advertisements removed focus from the causes of the disease. The decision was also critiqued as data indicated that women taking tamoxifen were twice as likely to develop endometrial cancer, three times more likely to develop pulmonary embolisms, and fifty percent more likely to suffer a stroke (Batt and Lippman, 2010; Klawiter, 2008a: 263-66). In fact, the use of tamoxifen on healthy women was described as "disease substitution" due to the number of other life-threatening illnesses associated with taking the drug (Batt and Lippman, 2010: 49; Fosket, 2004: 293). These policies assume that risks associated with health should be "managed rather than reduced or eliminated" (CWHN, 2003).

The representative symbol associated with the culture of early detection and screening activism is the now well-known pink ribbon -- the gold-standard in cause-related marketing. Cause-related marketing emerged in the mid-1980s as a strategic marketing tool which allowed companies to simultaneously associate themselves with a particular cause while concurrently increasing profits and developing reputations as good corporate citizens (King, 2008: 9). During this time, cause-related marketing transformed from short-term promotions of one to two months with charitable organizations towards long-term commitments which directly link the company to a particular "cause" in the minds of consumers. Marketing professionals are clear that while the long-term strategy may be viewed by the public as less opportunistic than short-term campaigns, cause-related marketing campaigns themselves are and should be seen as "first and foremost a strategy for selling products, rather than an altruistic or philanthropic activity" (King, 2008: 10).

The now widely recognizable and corporate-influenced pink ribbon has its origins within a grassroots movement. Inspired by the red ribbon associated with the HIV/AIDS movement, Charlotte Haley began distributing peach ribbons to raise awareness about breast cancer and funds for the prevention of the disease (Harvey and Strahilevitz, 2009; Moffett, 2003). She distributed postcards with the peach ribbons that stated: "The National Cancer Institute's annual budget is $1.8 billion, only 5 percent goes for cancer prevention. Help us wake up our legislators and America by wearing this ribbon" (BCA, 2011a). However, Haley was not interested in commercializing her efforts and refused to partner with cosmetics company, Estée Lauder. Based on focus group research, Estée

Lauder created, produced and marketed the *pink* ribbon, with the colour choice representing heterosexual femininity and hope (Estée Lauder, 2010; Jain, 2007b).

Demonstrating the principles of cause-related marketing, breast cancer awareness became linked to corporations during the 1990s. Industries such as fitness, fashion and cosmetics used breast cancer as a way to differentiate their products from others, while increasing their visibility in relation to female consumers, elevating their corporate image, and increasing profit-margins (Harvey and Strahilevitz, 2009; King, 2008, 2010). The combination of cause-related marketing and breast cancer has resulted in a clear case of cause-related consumption with the successful pink ribbon and National Breast Cancer Awareness Month campaigns that encourage the public to make purchases in order to "support breast cancer." Fundraising events such as Run/Race for the Cure involve hundreds of thousands of participants across Canada and the United States each year. These events exclusively promote positive messages combining images of feminine triumph, strength, positivity, hope, and beauty (Batt, 1994; Klawiter, 2008a).

There was an interesting dynamic during this time in which women had developed a personal relationship to breast cancer, either as a patient themselves or knowing someone else with breast cancer. The pervasiveness of awareness campaigns resulted in the commercialization of breast cancer presenting the disease through a very specific and narrow lens. The decades of early detection promotion had created a category of white, middle-class women as both "risky subjects" and consumers (Klawiter, 2008a: 132). This culture of action benefits from the cause-related marketing, pink ribbon and philanthropic activities related to breast cancer while blurring the

boundaries between social movements, the state and private industry. The tangible successes of this movement lie in addressing the unequal access to mammographic screening in medically marginalized communities. This culture of action operates on a discourse of hope which advertises a sense of control for women through participation in early detection and screening activism, despite being risky subjects (Klawiter, 2008a).

2) Culture of Patient Empowerment and Feminist Treatment Activism

The second culture of action that emerged in the Bay Area, *patient empowerment and feminist treatment activism*, occurred during a time when cancer was viewed as an "acceptable epidemic" and was in conflict with the culture of early detection and screening activism (Klawiter, 2008a: 164). Participants in this movement were influenced by the women's health movement and the lesbian community and worked towards creating a discourse that was feminist, anti-racist, not exclusively heterosexual, accommodating towards people with (dis)abilities, and recognized non-Western alternative therapies (Klawiter, 2008a: 170). By addressing and combining concerns of racism, classism and sexism, participants in this culture of action believe that breast cancer is influenced as much by factors of economic, social and cultural factors as genetics. Thus, for them, addressing issues of breast health requires engaging with these plural environments (Davis and Webster, 2002; Eisenstein, 2001; Potts, 2004a).

This culture of action constructed a feminist discourse to emphasize the importance of empowerment for breast cancer patients. The feminist cancer organizations in the Bay Area, such as Breast Cancer Action and the Breast Cancer Fund, promoted the empowerment of women with breast cancer, and challenged the positive discourse of

'survival.' They scorned the unscarred feminine bodies that were utilized and promoted in the mainstream media and within the culture of screening and activism underlying a heteronormative framework (Klawiter, 2008a). Feminist activists challenge the "cheery deary" positive discourse promoted by pink ribbon activists with

> narratives that drew attention to the false promises and misrepresentation of the cancer establishment, to the ineffectiveness of mammographic screening, the unreliability and toxicity of treatments, the chronic nature of the disease for many women, the inadequacy of research, the lack of scientific understanding and medical progress on the disease, the emphasis on individual risk factors, and the low priority given to cancer prevention (Klawiter, 2008a: 175).

They created social spaces which promoted alternative images, discourses and ways of embodying breast cancer (Ehrenreich, 2001; King, 2010; Klawiter, 2008a).

The culture of patient empowerment and feminist breast cancer activism was founded upon a culture of caring and compassion for women diagnosed with breast cancer, and thus involved advocating for direct services and support. While the feminist cancer activists supported the promotion of universal access to mammographic screening for all women, this culture of action also challenged the idea that unpleasant emotions such as sorrow, grief and aggression should be suppressed. Rather than buying into the symbolic pink ribbon, feminist cancer activists wore "Cancer Sucks" buttons. They showed photographs of bald, one-breasted women while arguing that the survival discourse and "pretty pink ribbons distorted the ugly realities of the disease" (Klawiter, 2008a: 169; Matuschka, 2012; Sulik, 2011).

3) Culture of Cancer Prevention and Environmental Risk

The third culture of action that emerged in the Bay Area in the 1990s, the *culture of cancer prevention and environmental risk*, frames breast cancer as a 21st century

phenomenon by engaging with issues of environmental health (Klawiter, 2008a). Breast cancer is framed as representing the hazards associated with industrialization emblazoned onto women's bodies (Sherwin, 2006: 18). Historically, social movements have relied not on science but on ethical and moral appeals to promote change. Couch and Kroll-Smith (2000: 384) find that contemporary environmental social movements are organized around more than a populist appeal to ethical or moral rights. Rather, activists believe we are endangered by the production, use and disposal of environmental contaminants and utilize scientific, technical and medical expert knowledge with moral and ethical arguments about the right to a safe environment. These movements combine resources from civic rights and environmental justice movements with toxicology, risk assessment and biomedicine in order to frame claims which aim to change the actions or policies of institutions.

The culture of cancer prevention and environmental risk utilized the appeal of the discourse of early detection to challenge the personal lifestyle and responsibility surrounding the dominant epidemiological paradigm of breast cancer in order to promote a message of cancer prevention (Klawiter, 2008a). This culture of action recognizes that the lifestyle choices and behaviours women are encouraged to engage with in order to prevent breast cancer, such as diet, exercise and age at which she has her first child, are significantly influenced by her socioeconomic status and her cultural environment, and do not account for factors that are beyond her personal control (Leopold, 1999). King (2010: 107) argues that this discourse which locates risk factors in individual behaviours "operates more to detract attention away from external variables that might be implicated

in high incidence rates (industrial pollution, for instance), rather than to demonize women with breast cancer." The idea of bodies existing separately from their environments distorts the complexity involved and there is a call for a recognition of "the interpenetration of bodies and their overlapping environments" (Eisenstein, 2001: 84). The environmental breast cancer movement has worked towards four goals in particular: i) to broaden public awareness of potential environmental causes of breast cancer; ii) to increase research into environmental causes of breast cancer; iii) to create policy which could prevent environmental causes of breast cancer; and iv) to increase activist participation in research (Brown, 2007: 44; Brown et al., 2004: 66-67; McCormick et al., 2003: 546).

In this perspective, "the gendered experience of breast cancer leads...[activists] to experience their disease not as a personal trouble to be dealt with through lifestyle changes, but as a condition caused by social and environmental factors that are shaped by powerful social institutions" (Zavestoski et al., 2004: 569). As Sulik (2011: 372) argues, "[t]he cultural equation of breasts, and having breasts, with women's heterosexual identity enables pink ribbon products to trivialize and ignore the realities of breast cancer while simultaneously degrading women and putting them in their place." Similar to the feminist breast cancer activists, the environmental breast cancer movement problematizes the heterosexual norms of femininity that are utilized in the media's portrayal of breast cancer. This portrayal is furthered by the involvement of the beauty and fashion industries in the events and campaigns associated with National Breast Cancer

Awareness Month, and the mainstream breast cancer movement's promotion of heteronormative femininities (Brown, 2007; Jain, 2007b).

Zavestoski et al. (2004: 565) note three specific considerations related to gender which create difficulties in the attempts by activists' to transform popular and medical notions of breast cancer and situate them into a broader social and environmental context. The constraints include depictions of activists as "hysterical women" which has its roots in the 19th century medical literature linking breast cancer and hysteria (Jasen, 2002). The second element includes a marginalized illness experience of breast cancer where women are socialized and encouraged to present themselves as having "normal" bodies. The "struggle for normalcy often begins as soon as the disease is detected, intensifies as treatment becomes more aggressive, and continues long after the disease is cured" (Schulzke, 2011: 37). Finally, the third element involves the sexualization of breast cancer through the media. There are varying degrees of sexualization used in breast cancer cause-related marketing campaigns, including those that are overtly sexualized with images objectifying women's breasts and slogans that include "great breasts are worth fighting for," "save the ta-tas," and "don't let cancer steal second base" (Sulik, 2011; Save the Ta-Tas, 2012; Total Pro Sports, 2010; Zazzle, 2009). While this sexualization results in greater media coverage, it also parallels the experience of breast cancer with the loss of one's sexual identity which shifts attention away from important structural critiques (Zavestoski et al., 2004: 576). In this case, important questions which should be asked include "what is being bought and sold in advertisements, and in the name of 'the cause'?"

Couch and Kroll-Smith (2000: 388) find that in this movement, there are "people who find the authoritative voices of science and medicine unable to make sense of their bodies and environments. Importantly, they are doing more than questioning the use of expert knowledge. Indeed, they often become experts themselves." It is in this respect that, despite constraints, there are also a number of ways that gender can enable the efforts of activists including: i) a unique perspective on health and illness as a result of women's marginalization; ii) a holistic view of social change involving knowledge, personal experience and action; and iii) solidarity and social networks which result from a shared sense of subordination (Zavestoski et al., 2004: 564). Perhaps most importantly, activists utilize their embodied knowledge and lay expertise which creates a unique perspective while they work to "transform personal experience into scientific knowledge and then into political action" (Zavestoski et al., 2004: 572).

It is argued that scientific challenges and policy implications are far more complex with contemporary contested illnesses. Past examples of contested illnesses include black lung disease attributed to coal mining and asbestosis or mesothelioma attributed to asbestos exposure. These diseases became established through lay discovery and unions, occupational health and safety organizations and sympathetic scientists who challenged the dominant epidemiological paradigm to demonstrate a path of causation (Brown, 2007; Markowitz and Rosner, 2002). For instance, an active trade union health and safety movement worked towards exposing workplace hazards in Ontario (Brophy et al., 2007: 238). This movement resulted in the provincial government establishing a Royal Commission in the early 1980s in order to examine the health and safety issues

arising from the use of asbestos in Ontario (Brophy et al., 2007; Dupré et al., 1984). Between 1980-2002, approximately 1,487 cases of mesothelioma were diagnosed among men in Ontario (Brophy et al., 2007). However, it is Sarnia, Ontario that is the "epicentre of asbestos disease" (Wordsworth, 2012: 32). Hospital data for Sarnia from the 1990s demonstrates that the overall cancer rate was approximately thirty-four percent higher than the provincial average, the lung cancer rate was fifty percent higher, the mesothelioma rate was five times higher, and the asbestosis rate was nine times higher (Mittelstaedt, 2004). It is suggested that the statistics around asbestos-related disease incidence are likely to be underestimated based on an under-diagnosis and poor record keeping related to occupational health issues (Brophy et al., 2007; Mittelstaedt, 2004).[19] While the economic cost of protecting coal miners and people working with asbestos fell primarily on industry, members of the culture of cancer prevention and environmental risk suggest that the environmental causes implicated in breast cancer are linked to "the heart of the entire economic system and require massive policy shifts" (Brown 2007: 229).

Activists utilized confrontational politics and public protests in their attempts to challenge private industry, local and state government, the other cultures of action, and public attitudes and perceptions. While the culture of early detection and screening activism uses the pink ribbon as its representative symbol, the culture of cancer prevention and environmental risk utilizes a poison skull to demonstrate the health

[19] For additional discussion of asbestos exposure in Ontario, refer to Brophy et al. (2007), Dupré et al. (1984), Landsberg (2012), Mittelstaedt (2004), and Wordsworth (2012).

hazards associated with environmental contaminants. They posit that the economic interest in maximizing profits often conflict with efforts of disease prevention (Leopold, 1999; Potts, 2004b). Wilkinson (2007: 424) speaks to the explicit links with the commercialization of breast cancer. She specifically addresses the breast cancer "industry," and the profits associated with mammographic screening services, radiotherapy and chemotherapy, and drug treatments.

The National Breast Cancer Awareness Month and the pink ribbon campaign is a clear example of successful cause-related marketing and associated corporations such as Avon, Revlon, General Motors, and Nike maintain a safe distance from feminist and environmental breast cancer activism (Moffett, 2003). The primary sponsor of this campaign, AstraZeneca, is critiqued by environmental breast cancer movement activists because in addition to manufacturing tamoxifen, it also produces pesticides, including the carcinogen acetochlor and one of its manufacturing plants is reportedly the third largest source of airborne carcinogenic pollution in the United States (Sulik, 2011; Wilkinson, 2007: 424). AstraZeneca also has the authority to approve or disapprove all printed materials used in campaigns during Breast Cancer Awareness Month and, not surprisingly, this literature does not include mention of the potential role of environmental contaminants in causing breast cancer (Sherwin, 2006; Wilkinson, 2007).

There is very little transparency when examining the percentage of revenues corporations donate from purchases of pink ribbon products during Breast Cancer Awareness Month to breast cancer research, treatment, screening, prevention, or education (Harvey and Strahilevitz, 2009; Moffett, 2003). Questions that may be asked

when purchasing pink ribbon products include: is there a cap on the amount of money the company will donate and has the maximum amount already been met; is the company contributing to the increasing incidence rates of breast cancer through everyday exposures to their products; and what organization will receive the funds and how will they be used (BCA, 2011a). Indeed, King (2010: 108) argues that there is "nothing inherently uncontroversial about breast cancer….[T]he disease has been manufactured as such over two decades of organizing that has gradually been incorporated into conservative political agendas, the programs of large nonprofits in partnerships with the cancer industries, and corporate marketing strategies." Activists in the culture of cancer prevention and environmental risk problematize, critique and question three aspects of the National Breast Cancer Awareness Month in particular. The first is that it legitimizes and promotes early detection programs as the only public health approach to breast cancer and does not recognize a causal link between environmental contaminants and breast cancer. The second is that the very multinational corporations that participate are also contributing to the development of cancer through the production of toxic products including pesticides, plastics and their industrial by-products, such as dioxin. The third is that certain corporations, such as pharmaceutical companies, profit from both the diagnosis *and* the treatment of breast cancer, and this information is concealed from the public (Klawiter, 2008a: 201).

Jain (2007b: 519) contends that the use of cause-related marketing in pink ribbon campaigns to increase profits and build name recognition among consumers, while "cover[ing] up their production of carcinogens bears the name 'pinkwashing'...which

obscures the links among the production, suffering and obfuscation of disease." The term "pinkwashing" is used to describe a company or organization that claims to care about breast cancer by promoting a pink ribbon product, but at the same time produces, manufactures and/or sells products that are linked to disease (BCA, 2011a).[20] Pink ribbon culture has become more than a successful cause-related marketing campaign:

> [I]t has become a distinct cultural system that is integrated into the fabric of [North] American life. Grounded in advocacy, deeply held beliefs about gender and femininity, mass-mediated consumption, and the cancer industry, pink ribbon culture has transformed breast cancer from an important social problem that requires complicated social and medical solutions to a popular item for public consumption (Sulik, 2011: 9).

Each of the three cultures of action, the culture of early detection and screening activism, the culture of patient empowerment and feminist treatment activism, and the culture of cancer prevention and environmental risk provided important contributions to the breast cancer social movement which can be seen throughout the United States and Canada. The breast cancer movement provides a unique example of activists' efforts that utilize ideologies from health, environment and women's movements (McCormick et al., 2003). The cultures of action which emerged in the 1990s helped to shape the breast cancer social movement into one of the most popular and influential movements of the last twenty-five years (Klawiter, 2008a). As the breast cancer social movement is

[20] It should be noted that the concept of "pinkwashing" is also being used to describe the practice of a state, corporation or organization using "gay rights rhetoric" in order to present a particular image and to detract from other practices (Dhoot, 2012). Sarah Schulman published a widely cited op-ed in the *New York Times* grounding this global practice in Israel with a deliberate juxtaposition of Israeli LBGT citizens and Palestinian citizens (Schulman, 2011). In this context, pinkwashing can draw upon the "emotional legacy of homophobia" in its framing of LGBT citizens in order to distract from other, more controversial aspects of state behaviour (Schulman, 2011). For additional information on pinkwashing and the LGBT community, refer to Dhoot (2012), Fung (2013), Ng (2013), and Schulman (2011).

ongoing and diverse, it is important to consider the varying constructions of risk in relation to the development of the disease, everyday exposures to toxic substances and outcomes for women's health.

Risk and the Risk Society

Risk is a pervasive concept related to human existence in contemporary western societies (Lupton, 1999). Sociocultural perspectives on risk emphasize the social and cultural contexts in which risk is understood, factors that approaches rooted in the natural sciences and biomedicine are criticized for neglecting. In an interdisciplinary perspective, risk is viewed as a cultural and political concept associated with ideas about choice, responsibility and blame. Lupton (1999) points to categories of risk[21] which concern individuals and institutions in contemporary western societies that are indicative of the broader sociocultural, political and economic context in which they exist including environmental risks such as pollution, radiation and chemical contaminants. This specific category of risk should be considered along with its relationship to health outcomes.

When considering the ontology of risk, Rigakos and Law (2009) contend that risk by its own definition does not exist, rather it is an unrealized potentiality which is fulfilled when it is measured by researchers or observed by lay populations. Risk embodies the "potentiality for a negative occurrence which must be understood for the

[21] The six categories of risk include environmental risks such as pollution, radiation and chemical contaminants; lifestyle risks such as those linked to the consumption of food and drugs; medical risks related to medical care and treatment; interpersonal risks related to personal relationships, sexuality and gender roles; economic risks including under- and unemployment; and criminal risks as a result of being a participant in or potential victim of illegal activities (Lupton, 1999: 13-4). For the purposes of this research, I am primarily concerned with the category of environmental risks and their relationship with health outcomes.

purposes of avoidance or control" (Rigakos and Law, 2009: 80). While realists tend to agree about the epistemology of risk as rooted in science and real in existence, there is discord when considering the specific nature of this reality, the ontology of risk and potential involvement of social and cultural dynamics (Rigakos and Law, 2009). Lupton (1999) offers a continuum which demonstrates the epistemology of approaches to risk. The perspectives based in the natural sciences and biomedicine have a realist epistemology in which risk is an objective hazard that can be measured independently of social and cultural processes. In contrast, sociocultural perspectives often frame the discussions of risk "by identifying underlying cultural structures, hierarchies and categories that serve to define risk knowledges and practices" (Lupton, 1999: 25-26). Thus, in several of these perspectives, risk is considered to be more of a subjective phenomenon than an objectively measurable one. Finally, the risk society perspective views risk as an objective and real hazard that is mediated, perceived and responded to through social, cultural and political processes (Lupton, 1999: 35).

Beck (1992) combines objectivism and cultural relativism in his approach to risk. He views risks as real in existence but points to the weakness of an objectivist, realist approach founded in the natural sciences because in a quest for objectivity, it fails to recognize the ways in which 'scientific facts,' like other perspectives on risk, are "situated and interpreted in cultural and political contexts" (Lupton, 1999: 60). A cultural relativist approach emphasizes the contextual aspects of risk responses and recognizes that what concerns a particular social group in a specific historical context may not concern another. However, Beck (1992) argues that such an approach fails to recognize

the unique nature of contemporary environmental risks in western society. Thus he seeks to integrate both perspectives into a sociological approach to risk which incorporates a scientific objectivist perspective recognizing that risks do exist, and a cultural relativist perspective which recognizes that nature and causes of risk are conceptualized differently in contemporary western societies than in previous eras (Lupton, 1999: 61).

According to the risk society perspective as theorized by Beck, risk is viewed as the probability of physical harm due to technological processes and as a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself (Beck, 1992: 4, 21). The risk society perspective describes a phase of development in society in which the social, political, ecological, and individual risk created by the momentum of innovation increasingly elude the control and protective institutions of industrial society (Beck, 1992, 1995). Unlike the risks of early industrialism, contemporary nuclear, chemical, ecological, and biological threats are unlimited across both space and time, as they cross international borders and have the potential to affect future generations (Beck, 1992). Therefore, risks are more difficult to calculate, manage and avoid than in past eras (Lupton, 1999).

Beck (1992) and Giddens (1990) argue that contemporary society is characterized by a critique of the processes of modernity, and thus industrial society itself. This society is no longer unproblematically viewed as producing "goods," such as wealth and employment, but is now seen to produce many of the dangers from which we feel threatened, including environmental pollution and contaminants. The production and management of risk is framed as a human responsibility and the central institutions of

contemporary society, including government, industry and science, are singled out as the main producers of risk (Beck, 1992, 1995, 1996; Giddens, 1990). Beck (1995) reserves the term "risk society" for the contemporary era and notes distinct features of risk in late industrialism compared with pre- and early industrialism. One significant difference is that the type of risk, including environmental contamination and radiation, differs in contemporary societies than in previous eras. Since the Second World War contemporary western societies have been confronted with threats to human life on an unprecedented and previously unknown scale. Beck (1995) contrasts the calculability of risk with those from pre-industrial eras which included plague and famine, but also magic, gods and demons which were incalculable as they were believed to be caused by external and supernatural causes. During early industrialism, risks became calculable through the instatement of insurance and compensation schemes (Beck, 1995). However, the modernist rules of causation and the processes of risk calculation fail in the risk society as contemporary risks may be minimized through technology but it is not possible to eliminate the risk entirely (Beck, 1995: 76-77; Lupton, 1999).

The transition into a period of threats to social, economic and political order is presented as a challenge to the present and future, and as a justification of the risk society itself. The entry into the risk society occurs at the moment when hazards which are now decided and produced by society undermine the established safety systems of the state's existing risk calculations (Beck, 1996). In the past risks were traced to a lack of hygienic technology, such as in the case of noxious fumes in 19th century London sewers. Interestingly, today many hazards are both imperceptible to the senses and are a result of

industrial overproduction. There are risks associated with modernization itself and because of the continually evolving forms of technology, the calculability of the consequences of risk becomes impossible (Beck, 1992). Unlike the risks of early industrialism, contemporary nuclear, chemical, ecological, and biological threats found in the risk society are i) not limitable, either spatially or temporally; ii) not accountable according to the prevailing rules of causality, guilt and liability; and iii) neither compensable nor insurable (Beck, 1995: 2; 1996: 31). The known and unintended consequences in the risk society have emerged as previously unknown entities in history and western society (Beck, 1992).

The risk society describes a period of time in which the hazards produced in the growth of industrial society become predominant (Beck, 1996: 28-29). The risk society constitutes "the end of the antithesis between nature and society" so that nature can no longer be understood separately from society and contemporary cultural activity or society from nature (Beck, 1992: 80; Adam, 1996). These risks include radioactivity, which completely evades human perceptive abilities, as well as toxic substances and pollutants in the air, water and food sources, and their short-and long-term effects on plants, animals and people. The risks produce

> systematic and often irreversible harm, generally remain invisible, are based on causal interpretations, and thus initially only exist in terms of the (scientific or anti-scientific) knowledge about them. They can thus be changed, magnified, dramatized or minimized within knowledge, and to that extent they are particularly open to social definition and construction. Hence the mass media and the scientific and legal professions in charge of defining risk become key social and political positions (Beck, 1992: 23).

Beck (1996) identifies two phases when considering industrial society and the risk society. The first phase involves the systematic production of self-endangerment and its consequences but which are not a topic of public debate or political conflict. This scenario is altered when the hazards of industrial society dominate public, political and private debates. At this time, the institutions of industrial society, including government, science and industry, produce and legitimize hazards which they cannot control. Industrial society sees and criticizes itself as a risk society. Society still makes decisions and acts on the pattern of the old industrial society; however, at this time debates and conflicts which originate in the dynamic of the risk society are now being applied to interest organizations, the legal system and politics (Beck, 1996: 27-28). It is important to note that the risk society is still at the same time an industrial society because it is mainly industry, in conjunction with science, that is involved in the creation of the risks involved in the risk society (Beck, 1992: 3).

Three observations have been made about the risk society in particular. The physical risks are always created within social systems, such as organizations and institutions which are supposed to manage and control the risky activity. Therefore, the magnitude of the physical risks is a direct function of the quality of social relations and processes. The primary risk is social dependency upon institutions; these institutional actors may be inaccessible to the people affected by the risks in question (Beck, 1992: 4). Giddens (1990) also sees modern institutions as playing a key role in the risk and uncertainty associated with contemporary western societies. He points to both the pace and scope of change as unique to this time period. The rapidity of change in conditions is

extreme and demonstrated in the case of technology which is pervasive and reflected in the global nature of risks (Giddens, 1990: 6). These risks negate the standard separation between past, present and future and create an uncertainty of the implications for future generations (Adam, 1996).

The aspects of risk related to value-laden social constructs create an appropriate venue for reflexive inquiry (Rigakos and Law, 2009). The concept of reflexive modernization may be introduced when considering the stages of industrial society, the risk society and their consequences. The concept of risk is "directly bound to the concept of reflexive modernization" (Beck, 1992: 21). The shift towards reflexivity is an unintended side effect of the contemporary industrialized society and the risks produced. It is the "process of modernity coming to examine and critique itself" (Lupton, 1999: 66). Reflexive modernization does not signify reflection, but rather self-confrontation with the consequences of the risk society that cannot adequately be addressed and overcome in the system of industrial society. The risks cannot be measured by industrial society's own institutionalized standards (Beck, 1996: 28). The concept of risk is linked to reflexivity because "anxieties about contemporary risks pose questions about current practices" (Lupton, 1999: 66). The risk society becomes reflexive through processes including the awareness of the global nature of risk triggering new impulses towards the development of co-operative international institutions and the boundaries of the political being removed, leading to worldwide alliances (Lupton, 1999: 66).

Through these processes, the risk society becomes a "world risk society" where the public sphere of debate and action is globalized (Lupton, 1999). Processes of

globalization, including the pervasiveness of technology are unique to the late 20th and early 21st centuries and connect diverse populations creating a world risk society. The historical dualistic discussions of nature and culture and people's relation to environments indicate that nature is separate from cultural activity. Traditional social science understandings of nature and culture are impacted by the dissolution of the boundaries between people and their physical environments, as well as geographical boundaries in the risk society (Adam, 1996: 89-90). The risks produced through industrial processes are not just environmental problems but represent an institutional crisis as the institutions in which the public places its trust, including government, industry and science, fail to protect our health (Beck, 1995). Beck (1995: 2) argues that "[t]hreats are produced industrially, externalized economically, individualized juridically, legitimized scientifically, and minimized politically." In this view of the world risk society, there is a global citizenship in which traditional means of defining identity linked to locality are exchanged for a focus on the world-wide perspective, as environmental risks are an invisible reality and create a global future and common experience regardless of geographical location (Adam, 1996; Lupton, 1999).

The globalization of risk creates far-reaching consequences. Both Beck (1992) and Giddens (1990) contend that the nature of globalized risks does not respect the class divide or geographical boundaries of the world. In an elimination of the "other," the nature of globalized risk transcends social and economic considerations. It is possible to frame risks such as radioactivity, nuclear technology and toxic substances as not respecting geographical boundaries and affecting the global population regardless of

location or socioeconomic status. The pervasiveness of environmental risks and the geographical span demonstrates that locally-produced risks can result in globally-produced consequences (Mythen, 2004: 32). Unlike Beck, Giddens (1990: 125-26) does acknowledge that risks are "differentially distributed between the privileged and the underprivileged," but neither proponent of the risk society provides an in-depth analysis of how issues of class may still be prevalent in the risk society.

The increased social awareness of the detrimental impact of human practices on the environment leads to the social cognition and environmental impact of risk becoming a global issue. This leads to Beck's claim that risks within the risk society dissolve hierarchies of class and geography (Mythen, 2004: 32). However, this does not allow for the recognition that these global risks often affect already marginalized or historically-oppressed populations disproportionately and the risks are experienced in profoundly different ways. Marshall (1999: 269) observes that historically, corporations have located hazardous industries in communities of low socioeconomic status, choosing "the path of least resistance." In fact, the environmental justice and environmental racism literature situated in the social sciences demonstrates that communities of low socioeconomic status are systematically and disproportionately affected by technological hazards such as toxic contamination, oil spills and radioactive waste storage (Marshall, 1999; Scholsberg, 2007). The unequal distribution of environmental risks cannot be adequately understood through a framework which emphasizes one factor to the exclusion of other relevant factors (Brulle and Pellow, 2006). Environmental justice is the first framework to explicitly link environment, race, class, gender, and social justice concerns and the

disproportionate burden faced by at-risk populations[22] (Taylor, 2000: 42). A critique grounded in environmental justice is able to consider the lived experience and experiential knowledge of those most affected by the risks which is clearly missing from the risk society. Proponents of environmental justice in social movements call for i) equity in the distribution of environmental risk; ii) acknowledgement of the diversity of participants and experiences of affected communities; and iii) participation in the political processes which create and manage environmental policy and thus, assess and manage the associated risks (Scholsberg, 2007: 517). Environmental breast cancer activists' efforts to

> integrate the needs of socially and economically marginalized women into the environmental breast cancer movement have not only broadened the movement's demographic base, however, but also highlight the ways in which gender, race, and class shape understandings of the environmental breast cancer problem, the strategies for addressing it, and disease prevention efforts more generally (Ley, 2009: 138).

The intersection of sex and gender with other determinants of women's health is of particular relevance when considering potential outcomes related to environmental health, contaminants and breast cancer (Hankivsky et al., 2010).

The risk society perspective offers an overarching theoretical framework for this research that acknowledges risks and a causal relationship with environmental health. However, there are important gaps in this perspective and the framework is augmented with environmental justice literature which allows for a broader consideration of the

[22] For additional discussion of environmental justice and health concerns, refer to Brown et al. (2012), Buzzelli (2008), Dhillon and Young (2010), Fletcher (2003), Hoover et al. (2012), MacDonald and Rang (2007), and Scott (2009a).

globalization of risks, the politics of risks and hazards, and the pitfalls associated with the individualization of risk and illness (Hess, 2004).

Beck (1995) distinguishes two stages in the ecological conflict in the risk society. The first stage is a struggle to uncover the risks and their environment and health implications which must be exposed despite industrial expansion and progress. The second stage occurs when knowledge about the risk is accepted in principle, but there is no remediation and thus a conflict surrounding issues of accountability arises. Beck (1995: 8) contends that

> the ecological issue, considered politically and sociologically, focuses at heart on a *systematic, legalized violation of fundamental civil rights*—the citizen's right to life and freedom from bodily harm. This violation is not going on incidentally, accidentally, or individually, but in broad daylight, as part of the development of industry, prosperity, and technical rationality in the glare of the mass media and in an alert democracy of citizen's groups (emphasis in original text).

Beck (1992: 71) suggests that if risks are not recognized scientifically then they do not exist legally, medically, technologically, or socially and subsequently are not prevented, treated or compensated for.

Conclusions

The theoretical framework for this research draws from seemingly disparate bodies of literature and concepts including sex- and gender-based analysis, social movement theory, and the risk society perspective. In my view, each is necessary for conducting an effective analysis of Canada's body of law, policy and practice related to toxic substances, and for prioritizing a primary prevention approach to breast cancer. First, breast cancer is a disease that primarily affects women, and there is a growing body of evidence that suggests at least some of its incidence is related to endocrine disrupting

chemicals understood to affect bodies in ways profoundly influenced by sex and gender considerations. The fact that sex- and gender-based analysis has not been a central feature of the law, policy or practice governing the regulation of toxics justifies its inclusion into the analytical approach taken here. Second, the culture of cancer prevention and environmental risk which emerged in San Francisco and the related and widespread environmental breast cancer movement has shaped the way that the law, policy and practices related to toxic substances have been understood. By acknowledging the risks associated with everyday exposures to toxic substances and the associated detrimental health outcomes, including the development of breast cancer, and by making these political issues, those social movements have generated a widespread call for a shift away from the dominant epidemiological paradigm of breast cancer. And third, the influence of the biomedicalization regime has resulted in all women being framed as permanently at risk for developing the disease and as responsible for their own health outcomes. This "risk role" can be understood through the risk society perspective which acknowledges the unique nature of contemporary risks which are produced and managed through social, cultural and political factors.

There are three axes along which struggles for a paradigm shift against the dominant epidemiological paradigm occur and which reflect the varying levels of prevention, risk factors and public participation in research.[23] The first axis is concerned

[23] Brown et al. (2006) argue that challenges to the breast cancer dominant epidemiological paradigm are located primarily within the United States as a result of the strength of the breast cancer movement and particularly the environmental breast cancer movement. However, I would suggest that the challenges to the dominant epidemiological paradigm are also occurring in other western countries, including Canada.

with the level of prevention and whether the focus of research involves treatment, intervention or prevention (Brown et al., 2006). Degrees of prevention include primary, secondary and tertiary prevention and are well-utilized in the field of health promotion. Primary prevention promotes the prevention of disease among specific populations and is most relevant for this research in its potential to truly prevent disease from a public health context. In an environmental health framework, these strategies would include the objective of reducing human exposure to environmental contaminants and are consistent with the efforts of the culture of action of cancer prevention and environmental risk (Brown et al., 2006: 511-12; Klawiter, 2008a). Secondary prevention efforts promote access to screening measures, early detection of disease and timely intervention. For breast cancer, measures of secondary prevention include breast self-examination, biopsy and mammography (Brown et al., 2006: 512). Aspects of secondary prevention efforts reflect the efforts of both the culture of early detection and screening activism and the culture of patient empowerment and feminist treatment activism (Klawiter, 2008a). Finally, tertiary prevention efforts attempt to minimize the health effects of disease. Efforts of tertiary prevention in breast cancer involve the traditional interventions including surgery, radiation, chemotherapy, and medication (Brown et al., 2006: 512).

While the first axis focuses on health interventions and levels of prevention, the second axis focuses on research itself, both at the level of the individual and the community. The traditional biomedical approach to disease focuses on individual risk factors, including biological, genetic and lifestyle factors. In contrast to an approach which focuses on individual characteristics, models from health promotion, political

economy of health, and social production of disease question how economic, political and environmental factors may influence health outcomes. In this framework, disease prevention occurs through changes in industrial production practices rather than individual behaviour or forms of medical treatment. A more broadly-based population approach focuses on the relationship between bodies and macro-level structures and asks why some groups of women have higher incidence rates of breast cancer than other groups. These considerations are not accounted for in an individual approach to breast cancer (Brown et al., 2006: 517-18). Brown et al. (2006: 518) contend that "[i]n terms of intervention, the population based approach is more radical because it implies the need for mass environmental control measures or the alteration of socioeconomic norms that give rise to widespread hazardous exposures and collective behaviors that enhance the vulnerability of certain communities to disease."

The third axis within the struggle for a paradigm shift in the breast cancer dominant epidemiological paradigm pertains to the involvement of lay activists in the research process. Brown et al. (2006) use a continuum to illustrate this process. On one end of the continuum, research is conducted independently, and laypersons may participate as subjects in a study but without the possibility of contributing to the research questions, methodology, data analysis, or the dissemination process. On the opposite end of this continuum, laypersons are actively involved and collaborate in the research process by providing important and substantive contributions. The "magnitude of lay involvement in breast cancer research signifies the broad societal importance of the

disease itself and is representative of campaigns for public representation in other illnesses as well" (Brown et al., 2006: 525).

Breast cancer is an important area of research for developing critical theory, policy and practice (Wilkinson, 2007). Breast cancer in contemporary society has distinct similarities to the disease a hundred years ago. In both time periods, the medically accepted forms of treatment carry significant risks, and cannot offer a guaranteed cure for the disease. Similarly, in both time periods, there are concerns surrounding the effectiveness of disease prevention (Leopold, 1999). Considering the history of breast cancer clearly demonstrates how something that appears to be an objective concept is influenced by cultural factors, and the influence of contemporary beliefs about gender, the mind, bodies, and personal responsibility has implications for discussions of illness (Jasen, 2002: 42).

It has become clear from sociocultural perspectives on risk that understandings of disease and health cannot be separated from the social and political contexts in which they arise (Nash, 2006). Risk is a pervasive concept related to human existence in contemporary western societies and is associated with notions of choice, responsibility and blame (Lupton, 1999). In the risk society,

> [r]isks lie across the distinction between theory and practice, across the borders of specialities and disciplines, across specialized competences and institutional responsibilities, across the distinction between value and fact (and thus between ethics and science), and across the realms of politics, the public sphere, science and the economy, which are seemingly undivided institutions (Beck, 1992: 70).

The incidence of harm related to toxic substances in the risk society is "not only significant, intentional, and expected, but [is] also...inherent to our practices of

production and consumption" (Scott, 2008: 296). Therefore, environmental health issues are so strongly contested because they are so intricately linked to the production and consumption processes in contemporary western society (Beck, 1992; Brown, 2007).

Definitions of illness are continually shifting and evolving with social forces playing an integral role in the social construction of illness (Shriver, White and Kebede, 1998). The acceptance of environmental causation of disease is further complicated by issues of uncertainty and the problems of knowing which are consistent themes in discussions of contested illnesses, including breast cancer. Ley (2009: 36-37) contends that the issue of uncertainty creates difficulty in calling for more protective environmental policies within a regulatory system that "demands proof of harm before taking action." Contemporary environments are filled with manufactured risks created by corporations and government which are difficult to measure, predict and control (Brown, Kroll-Smith and Gunter, 2000; Giddens, 1990). The inherent uncertainty associated with these risks is grounded in the interests of those responsible for their production. As Adam (1996: 97) argues, "insistence on certainty and 'proof' for situations characterized by indeterminacy, unpredictability and multiple time-lags is central to much of the political complacency about environmental problems." There are problems associated with the i) rapid changes occurring in the contemporary environment, and ii) the limited capacity of experts and their systems for fully assessing and evaluating these changes (Brown, Kroll-Smith and Gunter, 2000). The latency period between exposure and identifiable symptoms could be months, years or even decades which complicates the question of proof with respect to the causal connection between toxic substances and illnesses such

as breast cancer. This temporal gap, combined with the mobility of individuals in contemporary society, makes it difficult to connect symptoms with particular locations and exposures and further complicates attempts to challenge contemporary assumptions about the separation of bodies and contaminated environments (Nash, 2006: 181).

Brown, Kroll-Smith and Gunter (2000) provide some important considerations surrounding the uncertainty related to environmental health controversies and contested illnesses. There is uncertainty surrounding the body's past exposures to potentially hazardous environments, the potentially synergistic effects, and the lack of a history of exposure during interactions with the medical profession. There has traditionally been a great deal of uncertainty around the low-dose response relationship in toxicology and the difficulty producing data about the effects of chronic, low-level toxic exposures on human health (Brown, Kroll-Smith and Gunter, 2000). However, a number of recent publications focus on the health effects of low-dose exposures to toxic substances, and endocrine disrupting chemicals in particular. When the original *State of the Science of Endocrine Disrupting Chemicals* report was published in 2002 (WHO, ILO and UNEP, 2002), the evidence linking endocrine disrupting chemicals to human health outcomes was described as "weak" (Bienkowski, 2013a). The state of the science has evolved considerably in the past ten years and the newly published report concludes that endocrine disrupting chemicals "have the capacity to interfere with tissue and organ development and function, and therefore may alter susceptibility to different types of diseases throughout life. This is a global threat that needs to be resolved" (UNEP and WHO, 2012: xv).

Similarly, the European Environment Agency has developed a working definition of the precautionary principle since the publication of the first *Late Lessons from Early Warnings* report in 2001 (EEA, 2001) to reflect advances in science and research over the past decade and recognizing the implications of toxic substances for the environment and human health.

> The precautionary principle provides justification for public policy and other actions in situations of scientific complexity, uncertainty and ignorance, where there may be a need to act in order to avoid, or reduce, potentially serious or irreversible threats to health and/or the environment, using an appropriate strength of scientific evidence, and taking into account the pros and cons of action and inaction and their distribution (EEA, 2013: 681).

Finally, regarding the toxicology concept that "the dose makes the poison" in the traditional dose-response relationship, recent research has demonstrated that low-dose exposures of endocrine disrupting chemicals can have effects that are not predicted at higher doses (Vandenberg et al., 2012).

The final uncertainty described by Brown, Kroll-Smith and Gunter (2000: 11) involves problems associated with diagnosis as the authors suggest that physicians often do not possess the technology or knowledge to determine a causal link between exposure to environmental contaminants and a specific disease. While this uncertainty still exists and environmental links to health remain contested, there is a clear need for precaution and prevention of disease, especially in the context of women's health. The increasing number of chronic diseases in contemporary society, including breast cancer, cannot be adequately addressed within the individualist paradigm for the management of infectious diseases (Davis and Webster, 2002). Breast cancer is clearly influenced by sociocultural, political, economic, and environmental factors and advocating for increased research

without changing the environmental regulatory system is not enough to protect women's health (Ley, 2009: 82).

Chapter 3

The History of Environmental Health Policy in Canada

Introduction

This chapter will provide a descriptive history of Canadian policy related to environmental health drawing from federal legislation including the *Environmental Contaminants Act* and the *Canadian Environmental Protection Act*; government publications from the 1970s to the present, including Environment Canada and Health Canada; and grey literature from environmental and health organizations. This chapter considers the evolution of legislation and public health policy designed to protect Canadian citizens from exposure to toxic substances and the associated adverse health outcomes.

The chapter begins its overview of the history of health policy in Canada with the influential Lalonde Report written in 1974, one of the first policy documents to recognize the interacting influences on health outcomes, including the environment. It then moves to the *Environmental Contaminants Act*, which was the first piece of federal environmental legislation, followed by the the *Canadian Environmental Protection Act, 1988*. Here, an extensive review of the Act was paralleled by the implementation of the *Toxic Substances Management Policy*. This is followed by a discussion of the revised *Canadian Environmental Protection Act* which received Royal Assent in 1999, its review process, and the 2006 *Chemicals Management Plan*. The *Chemicals Management Plan* is the most recent tool for the assessment and management of toxic substances and the risks to the environment and human health. The detailed policy history that follows provides

the foundation necessary for the more in-depth and critical analysis in chapters four and five which examines the relationship between theory and practice in Canada's regulatory regime for toxics and the potential for protecting Canadian women's health, their risk for developing breast cancer and the potential for preventing the disease.

An Overview of the History of Health Policy in Canada

As discussed in chapter two, issues of health, especially those related to breast cancer and disease regimes, have historically been viewed as private matters rather than of public concern. Health issues were regarded primarily as the responsibility of the family and possibly charitable or religious institutions, whereas government intervention was limited. From 1867 to 1919, the Department of Agriculture was responsible for any health-related concerns in Canada (Ham, 2001). The first federal health department was established in 1919 and reconstituted in 1993 during which time its responsibilities included conducting public health studies, the regulation of food and drugs, the inspection of medical devices, the administration of health care insurance, and the dissemination of general information services related to health conditions and practices (Maioni, 2004; Miller Chenier, 2002).

A working document was published in 1974 which is frequently cited as revolutionizing understandings about health, identifying the need for intersectoral collaboration, and acknowledging the importance of multiple interventions in order to properly address the determinants of health (Canadian Population Health Initiative, 2002; Glouberman and Millar, 2003). Marc Lalonde, Minister of National Health and Welfare under the Liberal government, wrote *A New Perspective on the Health of Canadians*

which focused on the state of Canadians' health and proposed a new approach for addressing health outcomes (Lalonde, 1974). The health status of the Canadian population was framed as one of the significant problem areas with health outcomes including life expectancy, rates of mortality and morbidity, and causes of death (Lalonde, 1974: 19). Due to the lack of consensus regarding an established conceptual framework in the analysis of health, Lalonde (1974: 31) proposed the utilization of a "health field" concept that was developed by considering the underlying factors associated with the health status of Canadian citizens. The health field includes four broad elements and is proposed as a tool for the analysis of health problems, as well as determining the health needs of Canadians and how those needs might be properly addressed.

The first element proposed by Lalonde (1974: 31) is *human biology*, "all those aspects of health, both physical and mental, which are developed within the human body as a consequence of the basic biology of man and the organic make-up of the individual" (Lalonde, 1974: 31). Human biology is linked to a variety of health issues including genetic disorders and chronic diseases such as diabetes, arthritis and cancer. The second element utilized in the health field concept is the *environment* which involves "matters related to health which are external to the human body and over which the individual has little or no control" (Lalonde, 1974: 32). It was recognized at this time that health status can be impacted by both social and physical environments and that individuals cannot prevent health hazards associated with the pollution and contamination of air, water and food supplies (Lalonde, 1974).

The third category of the health field involves the *lifestyle* of individuals and the decisions and behaviours which impact their health status. The language used in the discussion of lifestyle factors is contradictory: placing blame on the individual for creating self-imposed risks which may contribute to illness or death such as smoking cigarettes and consuming alcohol, while simultaneously labelling the individual as a "victim" (Lalonde, 1974: 32). The final category within the health field involves the *health care organization* which consists of the "quantity, quality, arrangement, nature and relationships of people and resources in the provision of health care" (Lalonde, 1974: 32). The health care organization is more commonly referred to as the health care system and includes related institutions, professionals, practices, and treatments (Lalonde, 1974).

Prior to the 1970s most efforts to improve health status in Canadian society and the majority of direct health expenditures focused on the health care organization. However, as Lalonde (1974: 32) notes, the main causes of sickness and death in Canada are rooted in human biology, environment and lifestyle. A significant challenge encountered when attempting to improve the health status of the Canadian population is that the power to do so is dispersed among individual citizens, governments, health professions, and institutions. The Lalonde Report suggests that this creates fragmented responsibility and imbalanced approaches. The comprehensive nature of the health field concept allows for health problems to be traced to one or a combination of the four elements and to examine their significance and interaction (Lalonde, 1974).[24]

[24] The influential Lalonde Report and the emphasis on interacting influences on health outcomes was a precursor to the rise of research focused on the social determinants of health that emerged in the 1980s and continues to evolve in 2013 (O'Neill et al, 2007; Mikkonen and Raphael, 2010; Raphael, 2003).

At the time of the Lalonde Report, the Government of Canada was committed to pursuing two broad objectives related to health outcomes: reducing mental and physical health hazards for citizens considered to be at increased risk, and improving accessibility of good mental and physical health care for individuals that encounter barriers to accessing such care (Lalonde, 1974). In order to achieve these objectives, five specific strategies were proposed:

> 1) a *health promotion strategy* to inform, influence and assist individuals and organizations to accept additional responsibility and become active participants in matters related to mental and physical health;
>
> 2) a *regulatory strategy* to use federal regulatory powers to reduce hazards related to mental and physical health, as well as promoting similar practices at the provincial level;
>
> 3) a *research strategy* to discover and apply information related to mental and physical health problems;
>
> 4) a *health care efficiency strategy* to assist the provinces in reorganizing the delivery of mental and physical health care to address issues of cost and accessibility; and
>
> 5) a *goal-setting strategy* designed to develop goals for improving the mental and physical health status of Canadians and the efficiency of the health care system overall (Lalonde, 1974: 66).

Health promotion in Canada is rooted in the Lalonde Report's proposal that human biology, lifestyle, environment, and the health care organization have a direct influence on the health status of Canadian citizens (Health Canada, 2002a; Lalonde, 1974). The five objectives were designed to create a participatory framework where health promotion is distinguished from both health protection and disease prevention. While *health protection* efforts are concerned with maintaining health status by addressing

intermediate health threats, and *disease prevention* attempts to anticipate and avoid imminent health threats, *health promotion* moves beyond maintaining health to improving health status and focuses on long-term health gains (Health Canada, 2002a). There was a rapid growth of interventions including health education in public schools, and social marketing public awareness campaigns focused on tobacco use, exercise and healthy diets in an attempt to influence individual knowledge, attitudes and behaviours (Health Canada, 2002a; PHAC, 1997). These early health promotion initiatives focused directly on the lifestyle component and the related links between health status and personal risk behaviours (Boyce, 2002) creating a precedent for individual responsibility for health outcomes.

However, by the early 1980s there was increasing concern about the limitations of health promotion campaigns that focused solely on lifestyle, individual choices and personal behaviours. In *Achieving Health for All*, Jake Epp, Minister of National Health and Welfare under the Progressive Conservative government, utilized a population-based approach to health as a complement to the healthcare system, and to identify aspects in health policy and practice that resulted in disparities and negative health outcomes among Canadian citizens (Epp, 1986; Parliament of Canada, 2008a). Epp (1986) called for an integration of concepts from public health, health education and public policy towards health promotion in order to reduce inequities, increase prevention efforts and enhance Canadian's capacity to cope. It was argued that framing the causal relationship between lifestyle and behaviour with health outcomes does not adequately account for interacting factors that also play a significant role (Epp, 1986: 5). Instead, Epp (1986: 7)

recommended three mechanisms for effective health promotion: i) *self-care*, the decisions and actions individuals can take in the interest of their own health and well-being; ii) *mutual aid*, the actions one can take to assist others; and iii) *healthy environments*, the creation of conditions and surroundings that are conducive to good health (Epp, 1986: 7; Health Canada, 2004b). Environmental change is framed as the most complex and difficult of the three mechanisms necessary for effective health promotion. Epp (1986: 9) concluded that it is "time to clearly articulate a direction which is designed expressly to promote the health of Canadians."

The first international conference on health promotion was held in Ottawa in November 1986 and was co-sponsored by the World Health Organization, the Canadian Public Health Association, and Health and Welfare Canada. The five key strategies involved in the framework of health promotion included building healthy public policy, creating supportive environments, strengthening community action, developing personal skills, and reorienting health services (World Health Organization, 1986). A significant outcome of the conference was the publication of the *Ottawa Charter for Health Promotion* which has since become influential in the practice of health promotion both across Canada and internationally (PHAC, 1997; WHO, 1986). A perspective grounded in population health research emerged which recognized the impact of structural conditions such as poverty and discrimination on health status. Structural factors were now being considered along with environmental factors including the physical, social, cultural, and economic environments that impact the health of the Canadian population (Health Canada, 2002a). While Canada emerged as a public leader in health promotion at

this time, there was a disconnect between public health policy and emerging environmental legislation.

Environmental Contaminants Act

Unlike health protection statutes such as the *Food and Drugs Act*[25] which dates back to 1920, legislation designed to protect the Canadian environment has been developed more recently. The Department of the Environment was established in 1972 and the first piece of legislation that focused on environmental protection, the *Environmental Contaminants Act*, was promulgated in 1975 under the Liberal government.[26] The *Environmental Contaminants Act* was administered to address the environmental and health risks posed by toxic chemicals, under the rubric of "toxic substances management." It also developed a domestic response to international initiatives at the level of the Organisation for Economic Co-operation and Development (OECD) to manage the risks associated with polychlorinated biphenyls (PCBs) (Leiss, 2001; Meek and Armstrong, 2007: 592).

There was an increase in concern about the causal relationship between the environment and human health at this time. Public awareness surrounding this relationship was influenced by widespread media coverage of events such as the industrial dumpsite at Love Canal, New York in 1978; a nuclear power plant accident at

[25] The *Food and Drugs Act* was established in 1920 and focused on preventing adulteration, unsanitary production, fraudulent labelling, and subsequently licensing requirements for drugs. By 1951, pharmaceutical manufacturers were legally required to obtain regulatory approval before marketing their drugs. However, the thalidomide tragedy of the early 1960s resulted in a strengthening of Health Canada's regulatory abilities (Health Canada, 2010: 17).

[26] Environmental Contaminants Act, R.S.C. 1975.

Three Mile Island, Pennsylvania in 1979; a gas leak in Bhopal, India in 1984; and the world's worst nuclear power accident at Chernobyl, in the former USSR in 1986. A discussion of new "environmental risks," featuring aspects of collective risk, long latency periods, and irreversible impacts was distinguished from traditional environmental problems such as floods, earthquakes and tornadoes. The new risks included suspected carcinogens, mutagens and heavy metals which pose "long-term, serious threats of uncertain likelihood to health and life" (Page, 1978: 218). Researchers at the time emphasized that research findings demonstrated "that the release of certain chemicals into [hu]man's environment…[could] lead to the production of cancer, birth defects, genetic damage and a range of acute and chronic diseases" (Nemetz et al., 1981: 3).

Concern surrounding the visibility of environmental risks is consistent with Beck's (1992) later work on the risk society. It may be argued that the nature of environmental risks are visible because of the potential negative outcomes associated with a particular risk. However, Page (1978) proposes that the visibility of environmental risk is also impacted by a number of different factors and in particular ways. An important consideration is that environmental risks lack visibility when considering the potential for lengthy latency periods between exposure and health outcomes. It is suggested that the low dose concentrations of environmental pollutants result in a lack of visibility. The acknowledgement of the risk associated with the environment may also be affected by one risk receiving more attention than another, such as a recognized carcinogen over a suspected carcinogen or a contested contaminant (Page, 1978: 222-23). The identification of new environmental problems include the production of synthetic

chemicals which may be toxic, carcinogenic, mutagenic, or teratogenic. These new risks are described as being "less susceptible to management through existing regulatory, legal and economic institutions" (Page, 1978: 207-8).

The *Environmental Contaminants Act* did not require either assessment or testing of environmental contaminants for potential impact on human health or the environment prior to their release into the Canadian environment. Under the Act, if the Minister of the Environment and the Minister of National Health and Welfare believed that a substance may enter the environment in quantities or concentrations that may constitute a danger to human health or the environment, they possessed the authority to i) require commercial producers of that substance or class of substances to provide the government with notification of activities and information about the substances; and ii) require producers and importers to conduct tests which the Ministers may reasonably require (Nemetz et al., 1981: 123). Thus, industry was only required to submit testing information about environmental contaminants if the Ministers had reason to believe that a substance may enter the environment in amounts that are a danger to human health or the environment based on existing information (Meek and Armstrong, 2007).

Toner (2002: 76-77) contends that the Liberal government's lack of enforcement was a result of their "lack of political will" to challenge: i) claims from the provinces that federal regulatory efforts were a jurisdictional infringement; and ii) claims from industry stakeholders that environmental regulation would result in an undue burden and in job loss. Like other federal statutes, the *Environmental Contaminants Act* could only be meaningful and effective when specific regulations were made under it (Nemetz et al.,

1981: 124). In this context, Environment Canada lacked the resources to effectively administer the *Environmental Contaminants Act*. For instance, Environment Canada only assessed five chemicals over a period of ten years (Leiss, 2001: 202-03). A Consultative Committee was established in 1985 to review proposals to strengthen the *Environmental Contaminants Act* (Environment Canada, 2002; Environmental Contaminants Act Consultative Committee, 1986). Consistent with Page's (1978) assessment of new environmental risk problems, the legislative review determined that the *Environmental Contaminants Act* was unable to adequately address the scope of problems associated with environmental contaminants.

> Not only has the number of chemicals increased dramatically over the past 20 years or so, but so have the quantities of them that are produced. Global production of organic chemicals, for example, increased from about 1 million tonnes a year in the 1930s to 7 million in 1950, 63 million in 1970 and about 250 million in 1985. Annual production now tends to double every seven or eight years (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 22).

The Canadian Environmental Protection Act, 1988 (CEPA)

After a process involving extensive public consultation and task force recommendations, including the legislative review conducted by the Environmental Contaminants Act Consultative Committee, a bill was drafted to provide a revised approach and include multiple aspects of environmental protection under one statute. A more comprehensive approach to chemicals management was recommended in order to manage the complete life cycle of toxic substances from the "cradle to grave" (Douglas and Hébert, 1998; House of Commons Standing Committee on Environment and Sustainable Development, 1995; Toner, 2002). Bill C-74, the *Canadian Environmental*

Protection Act[27] was introduced to the House of Commons in June 1987 under the Progressive Conservative government. Extensive amendments were made to Bill C-74 in Committee over the following year and the Bill was passed and became active legislation on June 30, 1988 (House of Commons Standing Committee on Environment and Sustainable Development, 1995; McRobert and Cooper, 2000).

Lucien Bouchard, Minister of the Environment in 1988 promoted the need for a "strong federal role" in environmental protection:

> If there is a special role for the federal government, it is the development of national environmental protection standards and practices. The very nature of environmental problems demands this. Too often, the solutions adopted to control polluting emissions or hazardous waste, for example, differ from province to province…Ottawa must play a key role in the harmonization of standards and methods (Harrison, 1996: 121).

CEPA became Canada's primary legislation aimed at protecting the environment. In addition to the *Environmental Contaminants Act*, CEPA also replaced or combined environmental protection statutes including the *Clean Air Act*, the *Ocean Dumping Control Act*, and parts of both the *Canada Water Act* and the *Department of the Environment Act* into one single piece of larger legislation (Meek and Armstrong, 2007: 592). Part II of CEPA created a regulatory regime that allowed the Government of Canada to control toxic substances, including processes of manufacturing, importation and disposal. One of CEPA's guiding principles is the management of pollution, and Environment Canada and Health Canada[28] became jointly responsible for the risk

[27] Canadian Environmental Protection Act, R.S.C. 1988; herein after described as CEPA.

[28] Health Canada promotes its commitment to improving the lives of Canadian citizens and to making Canada's population among the healthiest in the world in terms of longevity, lifestyle and effective use of the public health care system (Health Canada, 2008a: 1). The objectives of the federal department include

assessment and management of toxic substances (Health Canada, 1995: 19). A substance is defined in section 3 as any distinguishable kind of organic or inorganic matter, whether animate or inanimate. Under section 11, a substance will be considered toxic if it enters or may enter the environment in a quantity or concentration under conditions that i) have or may have an immediate or long-term effect on the environment; ii) constitute or may constitute a danger to the environment on which life depends; or iii) constitute or may constitute a danger in Canada to human life or health. The inclusion of the word "may" when considering the danger to human life or health reflects a change in the language which allows for the potential of harm from that used in the *Environmental Contaminants Act*.

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preventing and reducing risks to the individual health of Canadians and the overall environment; promoting healthier lifestyles; ensuring high quality health services that are both efficient and accessible; integrating renewal of the health care system with longer term plans in the areas of health prevention, promotion and protection; and reducing health inequalities to help Canadian citizens make informed decisions about their health (Health Canada, 2007b). Health Canada (2008a: 31-3) offers four strategic outcomes that guide their attempt to provide long-term benefits to Canadians:

i) *An accessible and sustainable health system responsive to the health needs of Canadians* in order to promote the national coordination and development of a knowledge base to address health and health care priorities. Health Canada seeks to facilitate health system adaptation towards change in technology, society, industry, and the environment in order to protect Canadian citizens from health risks and provide access to quality health care;

ii) *Access to safe and effective health products, food and information for healthy choices* to protect the health and safety of Canadian citizens. Scientific and technical expertise is emphasized in research conducted to contribute to evidence-based decision-making and regulation. Evidence-based decision-making has gained increased attention within the health policy environment and Health Canada seeks to advance evidence-based policy and regulatory decision-making within the department (Dobrow et al, 2004; Health Canada, 2008a);

iii) *Reduced health and environmental risks from products and substances, and sustainable living and working environments*. Health Canada aims to advance scientific research and utilize evidence-based research to develop health promotion and harm prevention programs, policies and regulations; and

iv) *Improve health outcomes and the reduction of health inequalities between First Nations and Inuit and other Canadians*. Health Canada will use science and research to accurately define health risks, trends and emerging issues related to the health status of First Nations and Inuit Canadians in order to support the effective design and delivery of health programs.

While toxicity is understood to involve the "inherent capability of a substance to cause harm" and does not include considerations of exposure, section 11 of CEPA equates toxicity with risk and the understanding that "harm to the environment or human health is a function of both the intrinsic toxicity…and the extent of exposure" (Health Canada, 1994: 2). The inclusion of the exposure component in determining if a substance is classified as toxic under CEPA means that a substance "cannot be regulated merely for having the inherent potential to cause harm; it must also be shown to be entering or likely to enter the environment at levels sufficient to cause harm" (Cooper et al., 2000: 202). Health Canada (1994: 2) finds that the definition of toxic under section 11 allows for principles of health risk assessment, but that the three risk assessment endpoints do not address any aspects of risk management including: i) a finding of "toxic" under CEPA; ii) a finding of "not considered to be toxic" under CEPA; or iii) a finding of "insufficient information to conclude whether or not the compound is toxic."

CEPA includes two broad categories of substances. Under section 25, the Minister of the Environment was required to compile a list of substances for the first category, the Domestic Substances List. The Domestic Substances List includes existing substances that were manufactured or imported into Canada in a quantity of not less than 100 kilograms in any one calendar year, or were in commerce or used for commercial manufacturing purposes in Canada between January 1, 1984 and December 31, 1986. Due to limitations in the notification and information gathering provisions of the prior legislation, the *Environmental Contaminants Act*, the majority of the 23,000 existing substances, also known as "legacy chemicals," were put into the marketplace without any

risk assessment that evaluated them for potential detrimental effects on human health and the environment (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 22).

CEPA also required the Minister of the Environment to compile a list of substances which were new to Canadian society and commerce after 1986 and were not part of the Domestic Substances List. The Non-Domestic Substances List is based on the United States Environmental Protection Agency's *Toxic Substances Control Act* (TSCA) Chemical Substances Inventory for 1985 and includes more than 58,000 substances (Environment Canada, 2010b). It required that an assessment be conducted on all new substances for their potential impact on human health and the environment before their introduction into the Canadian market (House of Commons Standing Committee on Environment and Sustainable Development, 1995). Substances on the Non-Domestic Substances List are subject to less onerous notification requirements than the Domestic Substances List (Lucas, 1999; Environment Canada, 2010b).

Both the Domestic Substances List and Non-Domestic Substances List were published in a Supplement of the *Canada Gazette* on January 25, 1991 (Lucas, 1998: 155), and the Domestic Substances List was published in Part II, the Official Regulations of the *Canada Gazette* on May 4, 1994 (Health Canada, 2003a: 22). Under section 33, if a substance is determined to be toxic by meeting the requirements outlined in section 11, the Minister of the Environment and Minister of Health can recommend to the Governor in Council that the substance be placed on the Toxic Substances List in Schedule 1 of the Act. Twenty-six substances were originally placed on the Toxic Substances List under

CEPA, including asbestos, benzene, mercury, lead, and chlorofluorocarbons (CFCs) (Environment Canada, 2010c; Health Canada, 1994).[29]

Section 12 of CEPA required that the Minister of Health and Minister of the Environment establish a Priority Substances List which "identifies substances to be assessed on a priority basis to determine whether they are toxic" under CEPA and where the substances pose a risk to the environment or the health of Canadians (Environment Canada, 2011a). A priority substance may involve a chemical, a group or class of chemicals, effluents, or wastes (Environment Canada, 2011a). The requirements of the Priority Substances Assessment Program include an in-depth assessment of the substance to determine the risks to the environment and human health. The assessment reports must include the characteristics of the substance, how it enters the environment, and the effects of and risks to human health and the environment as a result of exposure to the substance (Environment Canada, n/da). A report and summary must be published in the *Canada Gazette* with the decision of the Minister of Health and the Minister of the Environment regarding a whether a substance on the Priority Substances List will be listed as toxic under Schedule 1 of CEPA. The assessment must be completed within five years of publication in the *Canada Gazette* and if it has not been completed, a Canadian citizen can file a notice of objection to the Minister of the Environment requesting a review

[29] The twenty-six substances placed on the Schedule 1 List of Toxic Substances of CEPA included asbestos, 1, 1, 1-trichloroethane, benzene, bis(chloromethyl) ether, bromochlorodifluoromethane, bromofluorocarbons, bromotrifluoromethane, chlorobiphenyls, chlorofluorocarbon, chloromethyl methyl ether, dibenzo-para-dioxin, dibenzofuran, dibromotetrafluoroethane, dodecachloropentacyclo [5.3.0.02,6.03,9.04,8] decane (Mirex), fuel containing toxic substances that are dangerous goods within the meaning of section 2 of the *Transportation of Dangerous Goods Act*, 1992*,* hydrobromofluorocarbons, hydrochlorofluorocarbons, lead, mercury, methyl bromide, polybrominated biphenyls, polychlorinated dibenzo-para-dioxins, polychlorinated dibenzofurans, polychlorinated terphenyls, tetrachloromethane (carbon tetrachloride), and vinyl chloride (Environment Canada, 2010c).

board inquire whether the substance under consideration is toxic or capable of becoming toxic (sections 14 and 89(5)).

Environmental assessments and human health assessments were completed under the Priority Substances Assessments Program (Environment Canada, 2008). The first Priority Substances List (PSL1) was published in the *Canada Gazette* on February 11, 1989 and included 44 substances or groups of substances (Health Canada, 1994).[30] If a substance on the Priority Substances List was found to be "not toxic" under CEPA, the substance was deleted from the list as was the case for methyl tertiarybutyl ether and toluene (Lucas, 1998: 155). Twenty-five substances of the original 44 that were assessed under the first Priority Substances List met the criteria for being classified in CEPA. Based on the recommendations of a multi-stakeholder Expert Advisory Panel, those 25 substances were added to the second Priority Substances List (PSL2) of CEPA (Environment Canada, n/da; Environment Canada, 2008).

The second Priority Substances List was published in the *Canada Gazette* on December 16, 1995 and contained 25 substances or classes of substances including single

[30] The substances on the first Priority Substances List include 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2-dichlorobenzene, 1,2-dichloroethane, 1,4-dichlorobenzene, 3,3'-dichlorobenzidine, 3,5-dimethylaniline, benzene, benzidine, bis (2-chloroethyl) ether, bis (2-ethylhexyl) phthalate, bis (chloromethyl) ether, chlorinated paraffins, chlorinated wastewater effluents, chlorobenzene, chloromethyl methyl ether, creosote-contaminated sites, dibutyl phthalate, dichloromethane, di-n-octyl phthalate, effluents from pulp mills using bleaching, hexachlorobenzene, hexavalent chromium compounds, inorganic arsenic compounds, inorganic cadmium compounds, inorganic fluorides, methyl methacrylate, methyl tertiary-butyl ether, organotin compounds, oxidic, sulphidic and soluble, inorganic nickel compounds, pentachlorobenzene, polychlorinated dibenzodioxins, polychlorinated dibenzofurans, polycyclic aromatic hydrocarbons, refractory ceramic fibre, styrene, tetrachlorobenzenes, tetrachloroethylene, trichlorobenzenes, trichloroethylene, toluene, used crankcase oils, and xylenes (Environment Canada, 2008).

chemicals, mixtures and effluents.[31] Environment Canada and Health Canada have completed risk assessments that consider the impact on both the environment and human health for the second Priority Substances List. The draft assessment reports are available for a 60-day comment period to the public and then revised and a final copy is published with the determination of whether a substance is considered to be toxic under CEPA (Environment Canada, 2006). If a substance is determined to be toxic under CEPA, the Minister of the Environment and Minister of Health can choose from risk management control options including environmental quality or releases, guidelines, codes of conduct, or specific regulations controlling the release, handling, storage, transportation, or disposal of a toxic substance. The proposed regulation must be published in Part I of the *Canada Gazette* (Lucas, 1998: 156).

There is a legislative requirement that the Government of Canada must review CEPA every five years under a process that involves public consultation (section 139 of the Act). The House of Commons Standing Committee of Environment and Sustainable Development was tasked with conducting the first review of CEPA on June 10, 1994. The five years of the review period are described as being "characterized by highly charged tension among champions of health, environment, labour and other public

[31] The substances on the second Priority Substances List include acetaldehyde, acrolein, acrylonitrile, aluminum chloride, aluminum nitrate and aluminum sulphate, ammonia in the aquatic environment, 1,3-butadiene, butylbenzylphthalate (BBP), carbon disulfide, chloroform, N,N-dimethylformamide (DMF), ethylene glycol, ethylene oxide, formaldehyde, hexachlorobutadiene (HCBD), inorganic chloramines, 2-methoxy ethanol, 2-ethoxy ethanol, 2-butoxy ethanol, N-nitrosodimethylamine (NDMA), nonylphenol and its ethoxylates (NPE), phenol, releases from primary and secondary copper smelters and copper refineries, releases from primary and secondary zinc smelters and zinc refineries, releases of radionuclides from nuclear facilities (effects on non-human species), respirable particulate matter less than or equal to 10 microns, road salts, and textile mill effluents (Environment Canada, 2006).

interests, the government, and the regulated chemical and other affected industries" (Kwasniak, 1999).

Toxic Substances Management Policy

During the CEPA review period, the *Toxic Substances Management Policy* was developed by the Liberal government after consultations with stakeholders held between September 1994 and April 1995 (Environment Canada, 1995). The *Toxic Substances Management Policy* was released in June 1995 and is still operational today. According to Environment Canada (1995: 1), it is designed around a "preventive and precautionary approach to deal with all substances that enter the environment" which may negatively impact the environment or human health. This policy is intended to guide regulatory and non-regulatory programs within federal jurisdiction, and is designed to help determine the risk assessment and management processes for toxic substances in Canada. The risk assessment process under the *Toxic Substances Management Policy* estimates the degree and likelihood of adverse effects as a result of exposure to a toxic substance in the environment. Risk management under this policy involves selecting and implementing management options around a particular risk associated with toxic substances while considering a range of legal, economic and social factors (Environment Canada, 1995: 7).

A toxic substance will be considered for systematic assessment if a federal, provincial, or international program or a Canadian citizen identifies a substance as potentially harmful to the environment and/or human health (Environment Canada, 1995). The key objectives of the *Toxic Substances Management Policy* include the assessment and management of two specific groups of substances. In order to be

classified as a Track 1 substance, the substance must meet four criteria including being toxic under CEPA, persistent, bioaccumulative, and anthropogenic. The precise details of the criteria include:

- *CEPA-toxic*: A substance is considered toxic if it meets the criteria as defined in section 11 of CEPA where a substance is entering or may enter the environment in a concentration or under conditions that i) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; ii) constitute or may constitute a danger to the environment on which life depends; or iii) constitute or may constitute a danger in Canada to human life or health;

- *Persistence*: A substance can be defined as persistent in air, water, sediment, or soil where environmental persistence refers to the "length of time in environmental media and is usually defined in terms of half-life – the time required for the concentration of a substance to diminish to half its original value" (Environment Canada, 1995: 8);

- *Bioaccumulation:* A substance can be considered bioaccumulative through a process in which the "substance accumulates in a living organism either from the surrounding medium or through food containing the substance" (Environment Canada, 1995: 8); and

- *Predominantly Anthropogenic:* A substance must be primarily produced as a result of human activity as opposed to contributions to the environmental medium from natural sources (Environment Canada, 1995: 8).

It is noted that persistence and bioaccumulation ranges may vary as they are influenced by factors such as the intrinsic properties of a substance, conditions in the environment, and the ecosystem under consideration. Thus, expert judgment and weight of scientific evidence are used to determine if the four criteria are fulfilled (Environment Canada, 1995: 9).

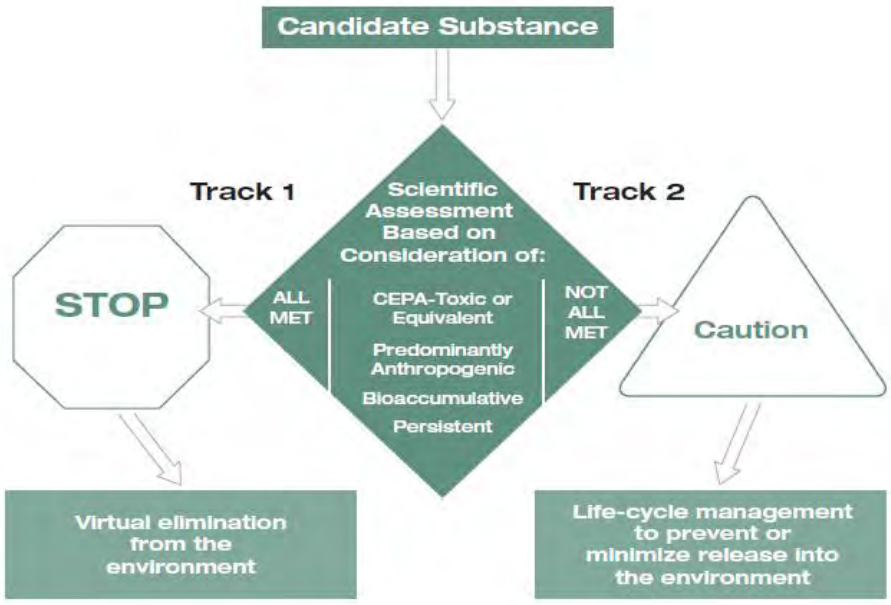
The *Toxic Substances Management Policy* proposes pollution prevention strategies to avoid the measurable release of Track 1 substances in order to minimize exposure to the environment and human health. If a Track 1 substance meets the required

criteria and cannot be adequately managed throughout its lifecycle, it may qualify for "virtual elimination." The persistence and bioaccumulation criteria for individual chemical substances cannot be used for complex mixtures or groups of substances. However, a Track 1 substance that is present in a complex mixture can be a candidate for virtual elimination if the assessment and management process accounts for this (Environment Canada, 1995: 9). The *Toxic Substances Management Policy* proposes to achieve virtual elimination by "addressing sources of release to the environment or by removing or managing the substance if it is already in the environment" (Environment Canada, 1995: 5). This policy places the onus of responsibility on the producers or users of a Track 1 substance to prove that it will not be released into the Canadian environment in measurable concentrations during its life cycle. While the policy claims the objective of the virtual elimination of a substance from the environment is established regardless of socioeconomic factors, it also clearly states that "management plans such as targets and schedules to achieve that long-term objective will be based on analyses of environmental and human health risks as well as social, economic and technical considerations" (Environment Canada, 1995: 5). Track 1 substances are to be monitored in the environment to ensure the compliance with and effectiveness of the risk management process (Environment Canada, 1995).

The second category of chemicals addressed by the *Toxic Substances Management Policy* involves Track 2 substances which do not meet the four criteria including being anthropogenic, bioaccumulative, persistent, and CEPA-toxic. In this case, rather than a virtual elimination approach, risk management for these substances includes

a “life-cycle management” approach that focuses on pollution prevention, pollution control, and remediation in order to prevent or minimize the release of Track 2 substances into the environment. Legal, economic and social factors are included in determining the risk management process. While pollution control or remediation strategies may be utilized, the federal government considers pollution prevention to be the most cost-effective risk management strategy (Environment Canada, 1995: 7).

An overview of the overall risk assessment and management process in the *Toxic Substances Management Policy* can be seen in figure below:



(Environment Canada, 1995: 4).

Ultimately, the *Toxic Substances Management Policy* is promoted as a precautionary approach in the identification of toxic substances and the implementation of cost-effective measures to prevent negative impacts on the environment and human health. This policy is publicized as serving as “the centrepiece for the country’s position on

managing toxic substances in discussions and negotiations with the world community" (Environment Canada, 1995: 4). The *Toxic Substances Management Policy* was released just two weeks before the House of Commons Standing Committee on Environment and Sustainable Development was scheduled to release its federally mandated review of CEPA, which focused on the effectiveness of the legislation and recommended changes to strengthen the Act in order to protect the Canadian environment and human health (House of Commons Standing Committee on Environment and Sustainable Development, 1995). The Canadian Environmental Law Association and the Canadian Institute for Environmental Law and Policy[32] (1996) critiqued the *Toxic Substances Management Policy* by pointing to concerns raised during the public consultation process which were not incorporated into the final policy. Further, they argued that the House of Commons Standing Committee on Environment and Sustainable Development was responsible for reviewing the same issues as part of their legislative review. It is suggested that there is an "inescapable conclusion that the TSMP [*Toxic Substances Management Policy*] was released to pre-empt a more full and comprehensive debate and to thwart the kinds of reforms that were to be forthcoming by the Standing Committee" (CELA and CIELAP, 1996: 101).

[32] The Canadian Environmental Law Association (CELA) was established in 1970 as a non-profit, public interest organization to use existing laws to protect the environment and to advocate for environmental law reforms. One of CELA's primary objectives is to prevent harm to human and ecosystem health through the use of precautionary measures (CELA, 2012a). The Canadian Institute for Environmental Law and Policy (CIELAP) was founded in 1970 as not-for-profit research and education organization and one of Canada's top environmental think tanks (CIELAP, n/d). CIELAP is no longer actively performing research and analysis after a decision by the Board in 2011 based on changes in funding and an overlap with CELA (CIELAP, 2011).

CEPA Parliamentary Review

Under the Liberal government, the House of Commons Standing Committee on Environment and Sustainable Development[33] conducted extensive hearings as part of its review process including nation-wide consultations with stakeholders comprised of members of the public, as well as representatives from environment, health and labour organizations, government, academia, and industry. The Standing Committee released *It's About Our Health! Towards Pollution Prevention: CEPA Revisited* in June 1995. The in-depth and detailed report contains 382 pages reviewing CEPA and provides 141 recommendations to the Government of Canada with the potential to strengthen and improve the legislation (House of Commons Standing Committee on Environment and Sustainable Development, 1995).

The Standing Committee cites Environment Canada's 1991 report, *The State of Canada's Environment* to illustrate the challenges involved with the use of chemicals in industrialized society.

> In seeking to reap the abundant benefits they offer, people may also inadvertently run the risk of doing serious harm to the environment and human health. The problem that Canada faces, as a society that is highly dependent on chemicals, is

[33] Members of the Standing Committee on Environment and Sustainable Development included: *Chair*: Charles Caccia, M.P., for Davenport; *Vice-Chairs*: Karen Kraft Sloan, M.P., for York-Simcoe and Monica Guay, M.P., for Laurentides; *Members*: Peter Adams, M.P., for Peterborough, Paul DeVillers, M.P., for Simcoe North, John Finlay, M.P., for Oxford, Paul Forseth, M.P., for New Westminster-Burnaby, Bill Gilmour, M.P., for Comox-Alberni, Clifford Lincoln, M.P., for Lachine-Lac-Saint-Louis, Pat O'Brien, M.P., for London-Middlesex, and Roger Pomerleau, M.P., for Anou-Rivière-des-Prairies; *Associate Members*: Jim Abott, M.P., for Kootenay East, Rex Crawford, M.P., for Kent, Stan Dromisky, M.P., for Thunder Bay-Atikokan, Bob Mills, M.P., for Red Deer, Len Taylor, M.P., for The Battlefords-Meadow Lake, and Andrew Telegdi, M.P., for Waterloo; and *Other Member Who Participated*: Benoît Sauvageau, M.P., for Terrebonne. The *Clerk of the Committee* was Normand Radford. *Research Staff of the Committee* included Pascale Collas, Thomas Curran, Monique Hébert, Margaret Smith, and Ruth Wherry (seconded to the Committee by Environment Canada) from the Research Branch, Library of Parliament, and François Bregha and John Moffett from Resource Futures International. *Other Staff* included Susan Waters (House of Commons Standing Committee on Environment and Sustainable Development, 1995: iv).

> how to realize the benefits of these substances while avoiding the damage they may cause or, at least, reducing the risk of such damage to acceptable levels (Environment Canada cited in House of Commons Standing Committee on Environment and Sustainable Development, 1995: 30).

This demonstrates an early recognition of the risks associated with toxic substances and understanding about the level of acceptability surrounding those environment and health risks.

The House of Commons Standing Committee on Environment and Sustainable Development (1995) specifically notes the capacity of toxic substances to persist and bioaccumulate in the environment to the point where they pose a danger to both ecosystem and human health. The Committee acknowledges the

> …mounting evidence [which] continue[s] to reinforce concerns about the effects of persistent toxic substances. Long-term exposure of fish, wildlife and humans to these substances has been linked to reproductive, metabolical, neurological and behavioural abnormalities; to immunity suppression leading to susceptibility to infections and other life-threatening problems; and to increasing levels of breast and other cancers. Available evidence also points to the long-term reproductive and intergenerational effects (International Joint Commission cited in House of Commons Standing Committee on Environment and Sustainable Development, 1995: 30).[34]

In its brief submitted to the Standing Committee, the Canadian Environmental Law Association speaks to concerns around toxic substances which have the potential to act as endocrine disrupters. The Standing Committee recognizes the increasing body of evidence around toxic substances, particularly those with persistent and bioaccumulative properties, including the potential for detrimental health outcomes such as reproductive,

[34] The International Joint Commission between Canada and the United States recognizes that each country is impacted by the other's actions related to lake and river systems located on the border with the purpose of managing and preventing pollution. The International Joint Commission publishes biennial reports on the water quality of the Great Lakes which can be found at http://www.ijc.org/en_/Biennial_Reports (International Joint Commission, 2013).

developmental and behavioural abnormalities. The report states that the "possible effects of such chemicals on the reproductive integrity of humans, particularly the suggested estrogenic properties of some pollutants, have now developed into a priority issue" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 33).

Consistent with Beck's (1992) theory of the risk society and argument that contemporary chemical threats are unlimited across both space and time as they cross territorial borders and have the potential to affect future generations, the Committee contends that pollution can no longer be viewed only as a local problem. For instance, pesticides and PCBs produced in industrial and agricultural regions of North America are evident in wildlife in Northern Canada and high levels of PCBs have been found in the breast milk of aboriginal women in northern communities (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 30-31).

The House of Commons Standing Committee on Environment and Sustainable Development expressed concern with the definition of toxic under section 11 of CEPA which determines a substance to be toxic if it enters or may enter the environment in a quantity or concentration under conditions that i) have or may have an immediate or long-term effect on the environment; ii) constitute or may constitute a danger to the environment on which life depends; or iii) constitute or may constitute a danger in Canada to human life or health. In this definition of toxic, "there must be a possibility that the substance will *enter* the environment, that living organisms will be *exposed* to the substance, and that there will be an actual or probable *effect* resulting from that exposure"

(House of Commons Standing Committee on Environment and Sustainable Development, 1995: 61). Accordingly, an *entry assessment*, *exposure assessment* and *effects assessment* must be conducted as part of the environmental and human health risk assessment processes under CEPA. The entry assessment determines whether a substance is entering or may enter the environment, and thus it requires that the major sources and releases of the substance be quantified. The exposure assessment must establish and quantify the relationship of exposure to the substance and the living organisms and human population by measuring the concentrations in air, soil, water, and sediment, and in the case of human health extrapolating those findings into probable exposures to humans. Finally, the effects assessment must determine acceptable concentrations for natural populations, communities and ecosystems exposed to the substance, and establish whether acceptable concentrations are exceeded in the environment (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 61-62). An acceptable concentration of a substance is defined in Environment Canada's risk assessment guidelines as the "maximum substance concentration that causes no immediate or long-term harmful effect to the (natural) population, community or ecosystem under consideration" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 62).

The House of Commons Standing Committee on Environment and Sustainable Development (1995: 59) found that Canadian citizens have an expectation of protective legislation and rigorous enforcement of standards around toxic substances which may contain carcinogenic and endocrine disrupting properties. A key component in CEPA's

potential to protect the environment and human health from the effects of toxic substances lies in the risk assessment process. This is the "pivotal point around which turn the functions of risk management – including scheduling, regulations, compliance, and enforcement" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 59). Unlike the assessment and management of Track 1 and Track 2 substances which were proposed (and subsequently adopted and implemented) as part of the *Toxic Substances Management Policy*, the Standing Committee recommended three tracks for the assessment and management of toxic substances. The three tracks included:

- *Track 1 substances* which would establish a presumption of sunsetting for any substance that is sunsetted or banned in a Canadian province or a member nation of the OECD, as well as for any substance that is persistent, bioaccumulative and inherently toxic;

- *Track 2 substances* which would involve a designation of toxic for any substance that is regulated in any Canadian province or in a member nation of the OECD, unless the proponent can demonstrate extraordinary reasons why the substance should not be regulated; and

- *Track 3 substances* which would involve the continued assessment of existing substances through the Priority Substances List process. The Priority Substances List program should be revised to include more classes of substances, effluents and waste streams, as well as applying a "stop-clock" provision for substances for which there is insufficient information needed to complete an assessment. The Minister of the Environment should have the authority to declare the substance toxic under CEPA even if the needed information is not available or forthcoming (Douglas et al., 1997; House of Commons Standing Committee on Environment and Sustainable Development, 1995: xxii).

The Standing Committee expressed concern with both the timing of the release of the *Toxic Substances Management Policy* and its content (Douglas et al., 1997).[35] The *Toxic Substances Management Policy* continues to use the section 11 definition of toxic, which equates toxicity with risk, and includes a risk assessment approach in which the exposure component plays a pivotal role. The risk assessment process under section 11 of CEPA considers the toxicity of a substance and the extent of exposure of a population to that substance (Health Canada, 1994). During the legislative review process, the Standing Committee received feedback suggesting that a hazard assessment process may be more appropriate than risk assessment where hazard is the "intrinsic capability of a substance to do harm, while risk is the probability of harm associated with exposure to various levels of a substance" (Health Canada, 1995: 13; House of Commons Standing Committee on Environment and Sustainable Development, 1995). A hazard assessment approach considers the intrinsic or inherent toxicity of a substance as the primary component in determining regulation and risk management strategies, rather than exposure. "The issue of how much of the substance enters the environment is not taken into account. The possibility that an inherently toxic substance *might* enter the environment is accepted as reason enough to trigger the regulatory process" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 60).

[35] The Standing Committee was critical of the *Toxic Substances Management Policy* because substances that were toxic, persistent and bioaccumulative would be allowed to be used in commerce if the proponent could demonstrate that the substance would not be released into the environment. The Standing Committee's proposal for assessing and managing toxic substances would have "cast a wider net, thereby leading to the eventual elimination of a greater number of substances of concern" (Douglas et al., 1997).

The human health risk assessment conducted under CEPA focuses on both risk and exposure, but not hazard (House of Commons Standing Committee on Environment and Sustainable Development, 1995). Health Canada (1995: 13) contends that the approach to protecting human health from toxic substances must "be aimed at controlling those substances that will have the greatest potential impact on the public's health…[which is] a function of both intrinsic toxicity and exposure."[36] Health Canada (1995: 40) does not recommend the use of hazard assessment over risk assessment because the potential for harmful effects is "wholly dependent upon the extent of exposure." It is argued that the level of risk increases with an increase in exposure (Health Canada, 1995).

In contrast, in the Canadian Institute for Environmental Law and Policy's submission to the Standing Committee, it was suggested that the definition of toxic under CEPA be revised to emphasize the intrinsic characteristics of a substance and the potential to cause harm to the environment or human health, rather than the exposure component which considers the quantity or concentration of a substance that will cause a negative effect (CIELAP, 1994: 9). Recognizing the merits associated with the hazard assessment process, the House of Commons Standing Committee on Environment and Sustainable Development (1995: xxii) recommended revising CEPA's definition of toxic to include both risk assessment and hazard assessment.

[36] Health Canada (1995: 13-14) provides an illustrative example using knives to contrast hazard- and risk-based approaches. The intrinsic property of knives being sharp demonstrates the hazard associated with the object. Rather than just considering the hazard associated with children and knives which would require that knives be removed from the home entirely, an exposure-based approach is recommended in which the knives should be placed in a locked drawer which reduces the risk by preventing exposure.

While the precautionary principle has been associated with the protection of the environment, it had not yet been traditionally or explicitly linked to preventing the health outcomes associated with exposure to toxic substances (Health Canada, 1995: 10). The House of Commons Standing Committee on Environment and Sustainable Development (1995: 54) concluded that precautionary measures should be used under circumstances where an activity or substance poses a serious threat of harm to the environment or human health, even if the outcome is uncertain. The precautionary principle was said to promote sustainable development and was supported by many of the stakeholders involved in the consultation process as part of the legislative review of CEPA. For instance, the Canadian Bar Association indicated that CEPA would benefit from the precautionary principle.

> The determination of a toxic chemical is arrived at through a classification process and the restriction of the release of that toxic chemical appears to be based on nothing short of scientific certainty. The same process is subsequently applied (substance by substance) for each and every other toxic chemical. Because this approach is proving too lengthy to attain its objectives within a reasonable time period, it does not fit with the notion of sustainable development. Instead, amendments should be made to Part II of CEPA that reflect a precautionary approach to managing toxic chemicals (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 55).

Health Canada (1995: 11) suggested that the precautionary principle is an inherent part of the human health risk assessments conducted under CEPA, but allows that it may be appropriate to explicitly highlight the precautionary principle in the Act and refer to it in the Preamble. The Standing Committee formally recommended that the precautionary principle be incorporated as a guiding principle of CEPA, included in the Preamble of the Act, and that all provisions of CEPA should be interpreted within the framework of the

precautionary principle. "CEPA should define the precautionary principle to mean that, in respect of all substances suspected of posing a threat to the environment or to human health on the basis of weight of evidence, lack of full scientific certainty shall not be sufficient reasons for postponing preventive or remedial measures" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 56).

The two Standing Committee members from the Official Opposition, the Environment and Sustainable Development critic and the Deputy critic, both members of the Bloc Québécois, wrote a dissenting opinion which was included in the submission (House of Commons Standing Committee on Environment and Sustainable Development, 1995). Despite allowing that CEPA did not succeed in its intended impact, they "disagreed profoundly with the solutions proposed by the Committee for improving the effectiveness of CEPA and of environmental issues generally" (Douglas et al., 1997). While federal environmental legislation was intended to resolve jurisdictional issues and overlap between and among the provinces, territories and the country, there were still those who favoured a secular approach and localized regulatory regimes (Girard et al., 2010). The Opposition members rejected the report in its entirety stating that it was unfairly biased against the provinces by advocating a federal, centralized approach to environmental management in Canada (Douglas et al., 1997).[37]

[37] It should be noted that the Quebec government was the strongest provincial opponent to CEPA. However, "provincial efforts to resist federal involvement in the environmental field may have resulted in a more intrusive state" (Harrison, 1996: 131). CEPA acknowledges provincial authority, but it contains strict equivalency standards with the intent of promoting national standards (Harrison, 1996).

Under Standing Order 109, the House of Commons Standing Committee on Environment and Sustainable Development requested that the federal government deliver a response to the recommendations within 150 days (Douglas et al., 1997). The official response from the Government of Canada was tabled on December 14, 1995 in a document entitled *Environmental Protection Legislation Designed for the Future – A Renewed CEPA.* It stated that the domestic and international agenda had changed dramatically since CEPA's proclamation in 1988:

> New concepts and approaches, such as sustainable development, the precautionary principle and pollution prevention, have evolved since CEPA first came into effect. Consequently, the renewed *Act* would be based on guiding principles. They would include statements on pollution prevention, the ecosystem approach, biodiversity, intergovernmental cooperation, science and the precautionary principle, economic responsibility and user/producer responsibility (Minister of Supply and Services Canada, 1995: 7).

There is agreement with the Standing Committee's interpretation of section 11 of CEPA in that the Government must consider whether the substance is entering or may enter the environment, the degree of exposure as a result, and the levels of exposure that can cause adverse effects to occur. The Government agreed that it "must consider the risk posed by substances before rendering a conclusion. Understanding the nature (including sources) and extent of the risk enables the Government to prioritize dangers to human health and the environment and to focus controls where they will have the greatest benefit" (Minister of Supply and Services Canada, 1995: 70). While the Government agreed that inherent toxicity plays a role in determining the risk associated with a substance, it resisted considering an approach that would include hazard assessment and concluded that the ultimate role of inherent toxicity is to be used in conjunction with data on

exposure in order to form the basis for assessing risk (Minister of Supply and Services Canada, 1995: 70).

Overall, the Government's response is very much focused on the *Toxic Substances Management Policy*, both in its content and as a precursor to the upcoming revisions to CEPA. The *Toxic Substances Management Policy* established the direction for all federal government departments around the assessment and management of risk associated with toxic substances (Minister of Supply and Services Canada, 1995: 71). At the time, the Government of Canada established that the key policy direction of the *Toxic Substances Management Policy* was strongly supported by industry, and would be incorporated into a revised CEPA, consistent with the Government's regulatory reform agenda (Minister of Supply and Services Canada, 1995: 5). The House of Commons Standing Committee on Environment and Sustainable Development (1996) expressed significant concerns and criticisms around the Government's response its report.[38]

[38] The House of Commons Standing Committee on Environment and Sustainable Development's (1996) response to the Government proposal to reform CEPA included an extensive list of signatories who formally endorsed the document. The organizations included Action! Environment, NFLD; Alberta Federation of Labour, AB; Allergy Foundation of Canada, SK; Amis de l'environment de Brandon, PQ; Animal Alliance, ON; APT Environment, ON; Banff Recycling Society, AB; Biomedical Waste Incineration Ban Incineration, ON; Bruce Peninsula Environment Group, ON; Canadian Auto Workers, ON; Canadian Auto Workers Lower Mainland-Environment Committee, BC; Canadian Environmental Law Association, ON; Canadian Institute for Environmental Law and Policy, ON; Canadian Labour Congress, ON; Canadian Organic Growers Inc., ON; Canadian Union of Public Employees, ON; CAW Windsor Regional Environment Council, ON; Centre for Long Term Environmental Action, NFLD; CHOICES!, MB; Citizens' Clearinghouse on Waste Management, ON; Citizens Environment Alliance of Southwestern Ontario, ON; Citizens for Renewable Energy, ON; Citizens' Network on Waste Management, ON; Clean North, ON; Clean Nova Scotia, NS; Coalition of Ontario Doctors for the Environment, ON; Common Frontiers, ON; Concerned Citizens of Ashfield and Area, ON; Concerned Citizens of Manitoba, MB; Conservation Council of New Brunswick, NB; Cosy Covers Corporation, ON; Earth Wise, ON; East Coast Environmental Law Association, NS; Ecology Awareness Group Landscape and Environment, ON; Environmental Coalition of Prince Edward Island, PEI; Environmental Component Public Service Alliance of Canada, ON; Environmental Law Centre, AB; Environmental Mining Council of British Columbia, BC; Environmental Resource Centre, AB; Friends of Lily Lake, AB; Friends of the Earth, ON; Furiously Opposed to All Dumping, ON; Georgia Strait Alliance, BC; Great Lakes United, PQ;

> Despite the Committee's recommendations, industry and pro-industry departments – like Natural Resources Canada, Industry Canada and Agriculture Canada – attempted to discredit the Standing Committee's report. Their efforts contributed to the tabling of a weak, dilute government response to the report. The government response […] does not reflect the breadth and scope of the Committee recommendations (House of Commons Standing Committee on Environment and Sustainable Development, 1996: 2).

In particular, the House of Commons Standing Committee on Environment and Sustainable Development suggested that the government's response inadequately responded to concerns around pollution prevention and toxic substances. The Standing Committee took issue with the lack of a clear commitment to phase out production and use of substances which are inherently dangerous, persistent, bioaccumulative, or disruptive to the endocrine system. For instance, substances with toxic properties such as toluene may still be declared non-toxic under CEPA (House of Commons Standing Committee on Environment and Sustainable Development, 1996: 5; CELA and CIELAP, 1996).

Green Alternatives Institute of Alberta, AB; Greenpeace, ON; Greensville Against Serious Pollution, ON; Guideposts for a Sustainable Future, ON; Healthy Sustainable Communities Association (National Capital Region), ON; Hickory Falls Rate Payers Association, ON; Housing Fairness Association, ON; Human Ecology Liaison People, BC; Incineration Counteracts the Environment, ON; Learning Disabilities Association of Canada, ON; Manitoba Federation of Labour, MB; Manitoba Future Forest Alliance, MB; National Farmers Union, SK; National Union of Public and General Employees, ON; Northwatch, ON; Nova Scotia Public Interest Research Group, NS; Ocean Voice International, ON; Ontario Federation of Labour, ON; Ontario Health Advocacy Association, ON; Ontario Health Care, ON; Ontario Public Health Association Environment Work Group, ON; Ontario Streams, ON; Ontario Toxic Waste Research Coalition, ON; Pembina Institute for Appropriate Development, AB; Pictou Harbour Environmental Protection Project, NS; Poetical Asylum, PEI; Pollution Probe, ON; Prairie Acid Rain Coalition, AB; Prince Edward Island Stranding Network, PEI; Protect Our Water and Environmental Resources, ON; Research for Unbleached, BC; Sierra Club of Canada, ON; Sierra Club of Eastern Canada, ON; Sierra Club Prairie Chapter, MB; St. Clair River International Citizens' Network, ON; Stop and Tell Our Politicians Society, AB; Stop Environmental Deregulation in Canada, York University, ON; Stop Incineration United in Yards Anywhere, ON; Time to Respect Earth's Ecosystem, MB; Toronto Environmental Alliance, ON; Town of Pickering Waste Reduction Committee, ON; Toxics Watch Society, AB; Tusket River Environmental Protection Association, NS; Voice of the Earth Society, NS; Waste Not; ON; Wastewise, ON; Western Canada Wilderness Committee, AB; Windsor and Area Coalition for Social Justice, ON; Windsor and District Labour Council Environment Committee, ON; Women's Network on Health and the Environment, ON; and the World Wildlife Fund Canada, ON.

In a detailed reaction to the Government's official response, referenced in the Standing Committee's response, the Canadian Environmental Law Association and Canadian Institute for Environmental Law and Policy (1996) expressed concerns that under the *Toxic Substances Management Policy*, the "environment" does not include the occupational environment, and the definitions of virtual elimination, persistence and bioaccumulation which are inconsistent with those set by agencies such as the International Joint Commission and the government's pollution prevention policy statement. The required criteria for substances to be classified as Track 1 are suggested to be too limited and that a combination of toxicity and persistence, or toxicity and bioaccumulation should be sufficient rather than toxicity, persistence *and* bioaccumulation. The deliberate use and management of Track 1 substances are also allowed to continue within the "no measurable release" provisions of the virtual elimination requirement of the *Toxic Substances Management Policy* (CELA and CIELAP, 1996: 100-01). In a response to the government proposal to reform CEPA, the House of Commons Standing Committee on Environment and Sustainable Development (1996: 2) contends that Canadians expected a strong federal regulatory leadership to be reflected the Government's response and expressed disappointment in the Government's proposal which fails to "implement aggressive [pollution] prevention and regulation of toxic chemicals."

The Canadian Environmental Protection Act, 1999 (CEPA 1999)

A year after submitting its response to the House of Commons Standing Committee on Environment and Sustainable Development's recommendations, the

Liberal government introduced Bill C-74 which was tabled in Parliament in December 1996, but did not receive a second reading and died when the general federal election was called in April 1997 (Douglas et al., 1997). Subsequently Bill C-32 was introduced to the House of Commons in March 1998, received a second reading in April 1998, was studied for a year by the House of Commons Standing Committee on Environment and Sustainable Development, and then received a third reading in June 1999. Bill C-32 replaced CEPA at this time and the *Canadian Environmental Protection Act, 1999*[39] was implemented (Douglas and Hébert, 1999a, 1999b). The lengthy review of CEPA resulted in a statute that was five times longer than the original Act and included new concepts such as "sustainable development" and the "precautionary principle" which had not yet been applied to the management of toxic substances (Government of Canada, 2005a; House of Commons Standing Committee on Environment and Sustainable Development, 2007: 4). The operative parts of CEPA 1999 are divided into administration; public participation; information gathering, objectives, guidelines and codes of practice; pollution prevention; controlling toxic substances; animate products of biotechnology; controlling pollution and managing wastes; environmental matters related to emergencies; government operations and federal and aboriginal land; enforcement; miscellaneous matters; and consequential amendments, repeal, transitional provision and coming into force. For the purposes of this dissertation and its focus on the regulatory

[39] Canadian Environmental Protection Act, R.S.C. 1999, c. 33; herein after described as CEPA 1999.

regime for chemicals, the most relevant sections include pollution prevention and controlling toxic substances.

CEPA 1999 is designated as an "Act respecting pollution prevention and the protection of the environment and human health in order to contribute to sustainable development" where the environment involves the components of the Earth including air, land and water; all layers of the atmosphere; all organic and inorganic matter and living organisms; and the interacting natural systems that include the former components. Sustainable development in CEPA 1999 refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The Government of Canada (2005a) promotes the revised Act as contributing to sustainable development by preventing pollution; promoting coordinated action with provinces, territories, Aboriginal governments, and federal departments in order to achieve the highest level of environmental quality for the health of Canadian citizens; managing risks from harmful substances[40]; and virtually eliminating the releases of the substances determined to be the most dangerous.

The new principles outlined in the preamble of CEPA 1999 are grounded in concepts including sustainable development, pollution prevention, an ecosystem approach, and the precautionary principle. The role of the Government of Canada is to demonstrate national leadership and fulfil international obligations in establishing

[40] A substance in CEPA was defined as any distinguishable kind of organic or inorganic matter, whether animate or inanimate. This definition has been expanded in CEPA 1999 to include "any distinguishable kind of organic or inorganic matter, whether animate or inanimate, and includes…any mixture that is a combination of substances…or any complex mixtures of different molecules that are contained in effluents, emissions or wastes that result from any work, undertaking or activity." Health Canada (2003: 24) notes that the substances "encompass…discrete chemical compounds, classes of chemicals, emissions and effluents and products of biotechnology, including microorganisms."

environmental standards, ecosystem objectives and environmental quality guidelines and codes of practice. The responsibilities of Environment Canada and Health Canada include:

- a commitment to implementing pollution prevention as a national goal and a priority for environmental protection;
- acknowledging the need to virtually eliminate the most persistent and bioaccumulative toxic substances;
- the need to control and manage pollutants and wastes if their release into the environment cannot be prevented;
- recognizing the risks associated with toxic substances in the environment and that substances cannot be contained within geographic boundaries once released; and
- removing threats to biological diversity through pollution prevention, controlling and managing the risk of adverse effects associated with the use and release of toxic substances, and the virtual elimination of persistent bioaccumulative toxic substances.

A number of the inclusions in CEPA 1999 such as the ecosystem approach, the role of pollution prevention and the precautionary principle were recommended by the House of Commons Standing Committee on Environment and Sustainable Development's (1995) review of the original Act. Pollution prevention as the cornerstone of CEPA 1999 reflected a shift in focus from the management of pollution which was one of the guiding principles of the original CEPA (Environment Canada, 2010a). This shift was consistent with the Liberal Party's 1993 platform which made toxic substances a significant focus, and emphasized that pollution would be reduced at the source (Swimmer, 1997; Toner, 2002; Juillet and Toner, 1997).

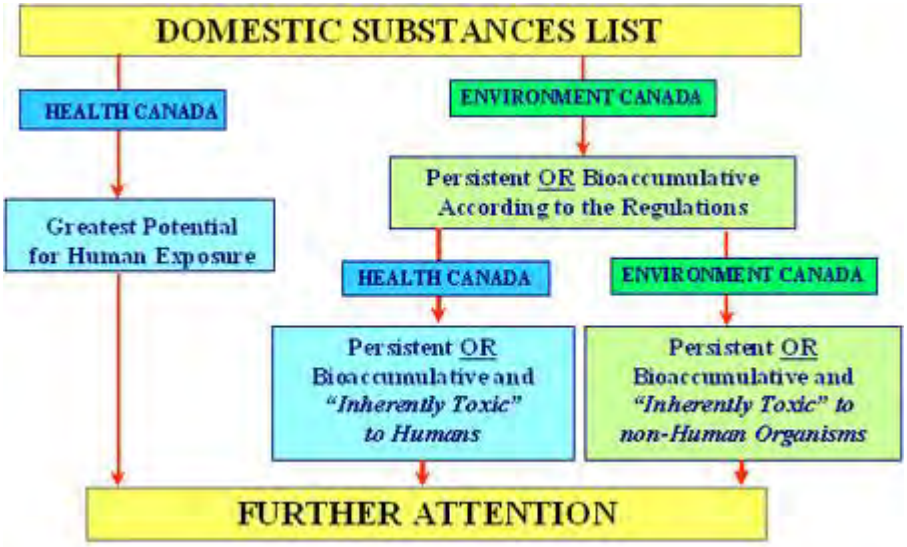
A substance is considered to be toxic under section 64 of CEPA 1999, with the exception of "inherently toxic," if it is entering or may enter the environment in a

quantity or concentration or under conditions that i) have or may have an immediate or long term harmful effect on the environment or its biological diversity; ii) constitute or may constitute a danger to the environment on which life depends; or iii) constitute or may constitute a danger in Canada to human life or health. The assessment and management of risks from toxic substances are the principal objectives of CEPA 1999, and are promoted by Environment Canada as being proactive, preventive and precautionary (Environment Canada, n/da). The risk management tools under CEPA 1999 "range from guidelines or codes of practice through to requiring the preparation and implementation of pollution prevention plans, environmental emergency plans and regulations, including economic instruments" (Government of Canada, 2005b: 2).

The revised Act continues work with the Domestic Substances List established in the original CEPA. This includes the 23,000 existing substances as outlined in section 25 of CEPA and section 66 of CEPA 1999, which were manufactured or imported into Canada in a quantity of not less than 100 kilograms in any one calendar year, or were in commerce or used for commercial manufacturing purposes in Canada between January 1, 1984 and December 31, 1986. CEPA 1999 provides a "framework for the identification/ prioritization of [e]xisting [s]ubstances for risk assessment and the control or management of those considered to pose a risk to human health and/or the environment. This framework is broad, evidence-based, open and transparent and builds upon work done in other jurisdictions" (Health Canada, 2003a: 16). Section 73(1) of CEPA 1999 required the Minister of the Environment and the Minister of Health to *categorize* the 23,000 existing substances on the Domestic Substances List which

(a) may present, to individuals in Canada, the greatest potential for exposure; or
(b) are persistent or bioaccumulative in accordance with the regulations, and inherently toxic to human beings or to nonhuman organisms, as determined by laboratory or other studies.

It should be noted that the concept of inherent toxicity is not defined in CEPA 1999. The toxic substances on the Domestic Substances List that are used in the highest quantities and that come into direct contact with the general public are considered to have the greatest potential for exposure (Health Canada, 2003a: 21). A basic overview of the categorization process can be seen below:



(Environment Canada, 2011b).

The Act included a provision requiring the categorization of existing substances to be completed within seven years of its Royal Assent. The mandate of the categorization process is to identify the substances to be considered in subsequent phases of assessment including screening assessments under section 74 and in-depth assessments for Priority Assessment under section 76 of CEPA 1999 (Health Canada, 2005c: 5). Section 74 requires the Minister of the Environment and Minister of Health to conduct

screening assessments of substances in order to determine whether a substance is toxic or capable of becoming toxic. A screening assessment is conducted if the Ministers determine that a substance on the Domestic Substances List has the greatest potential for exposure, or is persistent or bioaccumulative, and inherently toxic. Section 76 requires the Minister of the Environment and the Minister of Health to compile the Priority Substances List which includes the substances that the Ministers are satisfied should be given priority in assessing whether they are toxic or capable of becoming toxic. After the screening assessment has been conducted, the Ministers can propose one of the measures outlined in section 77(2) which may include: taking no further action in respect of the substance; adding the substance to the Priority Substances List if it is not already included; or recommending that the substance be added to the List of Toxic Substances in Schedule 1, and the implementation of virtual elimination under subsection 65(3) where applicable.[41]

Virtual elimination of toxic substances released into the environment as a result of human activity was a new addition to CEPA 1999. Under section 65(1) the virtual elimination of a toxic substance is defined as the ultimate reduction of the quantity or concentration of the substance in the release below the level of quantification specified by the Ministers in the Virtual Elimination List. The level of quantification is defined in section 65.1 as the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods. When the level of quantification for a

[41] The Ministers are required to publish their preliminary findings including a summary of the science for feedback from the public over 60 days. After considering the public comments, the Ministers must publish a final proposal (Environment Canada and Health Canada, 2006).

substance on the Virtual Elimination List has been specified, the Ministers are required to prescribe the quantity or concentration of the substance that may be released into the environment either alone or in combination with any other substance from any source or type of source, and must account for environmental and health risks, as well as any relevant social, economic or technical matters.

The List of Toxic Substances in Schedule 1 of the original CEPA was "rolled over" and incorporated into Schedule 1 of CEPA 1999. It was determined that no assessment under section 64 of CEPA 1999 would be required for the twenty-six substances on Schedule 1 as they all met the criteria for toxic (Environment Canada, 2010c). Environment Canada and Health Canada (2006: 14) explain that CEPA 1999 does not provide specific information about the type of assessment to be conducted under the main risk assessment pathways including the screening assessment, Priority Substances List, and addition to Schedule 1. Policy must be used to determine the difference between a screening assessment and a Priority Substances List assessment, the latter of which may be used under situations that require in-depth input from the public (Environment Canada and Health Canada, 2006: 14).

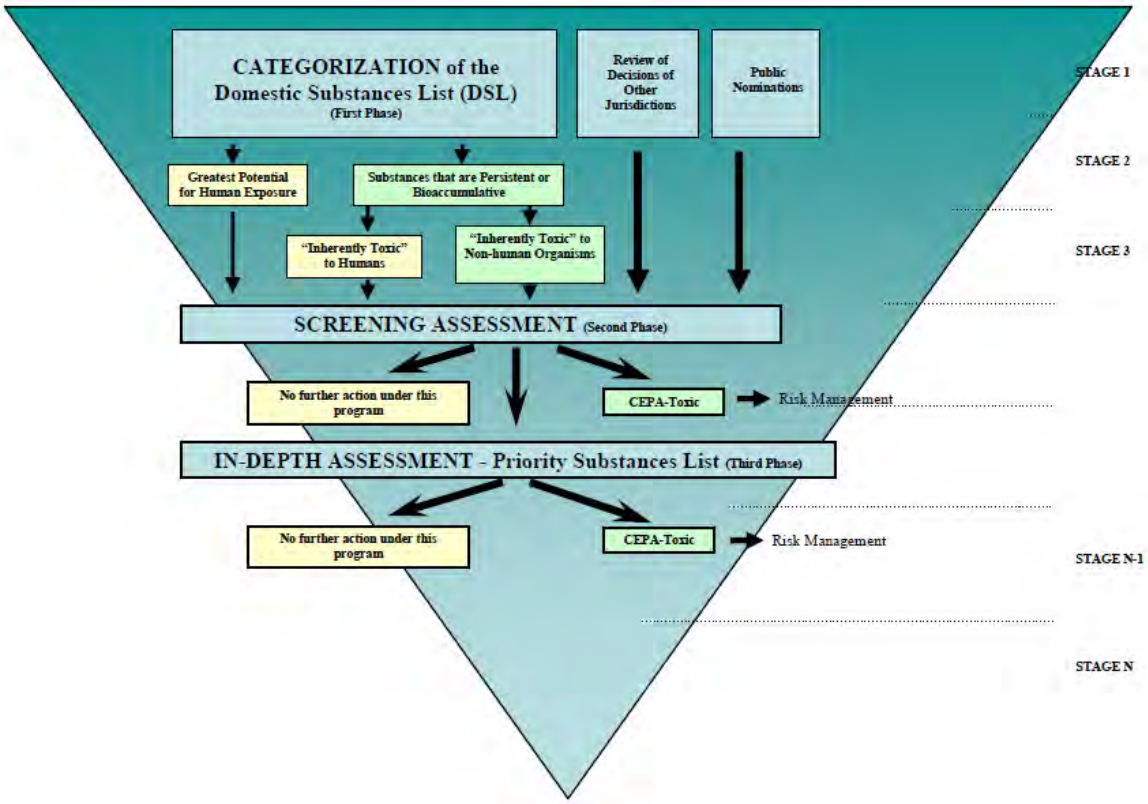
Health Canada's responsibilities as part of this process included categorizing all 23,000 substances on the Domestic Substances List in order to determine which substances are potentially harmful to human health and thus require further consideration. The substances were studied and categorized as to whether they possess the greatest potential for human exposure, and are persistent, bioaccumulative and inherently toxic to humans under section 73 of CEPA 1999 (Health Canada, 2005c; Health Canada,

2009b).[42] This process falls under section 68 of CEPA 1999 in which a Minister may collect or generate data and conduct investigations respecting any matter in relation to a toxic substance; correlate and evaluate any data collected or generated and publish results of any investigations; and provide information and make recommendations respecting any matter in relation to a toxic substance, including measures to control the presence of the substance in the environment. If a substance is declared to be CEPA-toxic, a health risk assessment involves:

- the identification of the critical adverse health effect associated with exposure to the substance;
- analysis of the dose-response relationship; and
- the determination of the extent to which the population or subset of the population are exposed to the substance; and relating the exposure to a measure of the dose-response relationship for the critical effect (Health Canada, 2004c: 10).

A more detailed diagram of the assessment process of the Domestic Substance List under CEPA 1999 which can be seen below:

[42] Under section 73 of CEPA 1999, Environment Canada is responsible for the categorization of substances on the Domestic Substances List that are persistent and/or bioaccumulative and inherently toxic to non-human organisms.



(Health Canada, 2009b: 1).

When it began in 2000, it was anticipated that approximately 4700 of the 23,000 substances assessed would meet the categorization criteria and those substances would undergo a screening assessment (Environment Canada and Health Canada, 2006). When it was completed in 2006, Canada claimed to be the "first country in the world to have examined the hazardous properties of all its 'existing substances' providing an information baseline on all of those substances" (Environment Canada and Health Canada, 2006: 16).[43]

[43] Environment Canada and Health Canada (2006: 12) do acknowledge other similar initiatives including the High Production Volume initiative by the Organisation for Economic Cooperation and Development (OECD) and the European Union's Registration, Evaluation and Authorization of Chemicals (REACH) program. The High Production Volume Chemicals Initiative was launched in 1998 with the OECD and the International Council of Chemicals Associations (IICA). This program collected screening-level data to be

The results determined that 4300 of the 23,000 substances examined were classified as priorities for further action under the newly implemented *Chemicals Management Plan* (Health Canada, 2010a). The remaining 19,000 substances did not meet the criteria for categorization (Environment Canada, 2010e). However, the House of Commons Standing Committee on Environment and Sustainable Development (2007: 12) suggested that these 19,000 substances should not be identified as "safe" based on the results of the categorization process. These substances may possess persistent, bioaccumulative or inherently toxic properties. It is also noted that persistence may be an issue of concern not only "because they break down slowly in the environment, but because there is a continuous supply of [the substance]" (House of Commons Standing Committee on Environment and Sustainable Development, 2007: 13). Five hundred chemicals were classified as the highest priorities for immediate action, 2600 were classified as medium priorities, and 1200 chemicals were classified as low priorities. Environment Canada and Health Canada must determine the priorities for the risk assessment and management of the substances that meet the categorization criteria on the

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used in hazard assessments which consider acute toxicity, repeat dose toxicity, reproductive and developmental toxicity, genetic toxicity, ecotoxicity, and the environmental fate of the chemical (IICA, 2013; OECD, 2013a). The OECD's Cooperative Chemicals Assessment Programme was established based on the High Production Volume Chemicals Programme in order to assess more chemicals in a shorter time period, address all chemicals on the market; and avoid duplication of work occurring in other member countries. The focus of the Cooperative Chemicals Assessment Programme includes the dissemination of the hazards associated with chemicals; development and application of integrated approaches to testing and assessment; avoiding duplication among member countries; and providing a forum to exchange experience (OECD, 2013b). REACH became active legislation in the European Union in 2007 and seeks to "improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances" by placing the burden of proof on industry (Europa, 2013). Manufacturers and importers of chemicals are required to manage the risks associated with the toxic substances and to provide safety information. REACH also calls for substitution when suitable alternatives can be utilized. The provisions of REACH are being phased-in over an 11 year period (Europa, 2013).

Domestic Substances List, as well as disseminate the categorization results to the public (Environment Canada and Health Canada, 2006: 16).

CEPA 1999 Parliamentary Review

CEPA 1999 requires a mandatory Parliamentary review every five years under section 343 and a review was scheduled for March 31, 2005. In preparation for the parliamentary review and under the Liberal government, Environment Canada and Health Canada (2004) published a scoping review to provide background information for a public engagement process; created a website to provide Canadian citizens with information on the CEPA 1999 review process and accept comments submitted online; and held six regional workshops across Canada in 2005 for feedback from the public about CEPA 1999. Environment Canada and Health Canada consulted with municipal governments, Aboriginal organizations, industry and business interests, and civil society, and solicited advice from provincial and territorial governments in advance of producing an *Issues Paper* on CEPA 1999 under the new Conservative federal government in 2006 (Environment Canada and Health Canada, 2006; Environment Canada, 2012).[44] The new federal government presents itself as being

[44] The Canadian Environmental Network Toxics Caucus was involved in the consultation process and submitted an agenda representing environmental non-governmental organizations across Canada. It concluded that despite efforts to control pollution under CEPA 1999, "the volume of dangerous chemicals released into Canada's environment continues to increase" (Canadian Environmental Network Toxics Caucus, 2005: 3). This report was supported and endorsed by the Allergy and Environmental Health Association of Quebec, Beyond Factory Farming Coalition, Canadian Environmental Law Association, Canadian Network for Environmental Education and Communication, Citizens Environment Alliance of Southwestern Ontario, Citizens Network on Waste Management, Coalition for Alternatives to Pesticides, Environmental Defence, Environmental Health Association of Nova Scotia, Great Lakes United, Inter-Church Uranium Committee Educational Cooperative, New Brunswick Lung Association, Ontario Toxic Waste Research Coalition, Sierra Legal Defence Fund, Sierra Youth Coalition, South Peace Environment Association, STORM Coalition, Under the Sleeping Buffalo Research, and World Wildlife Fund Canada (Canadian Environmental Network Toxics Caucus, 2005).

> committed to ensuring the environmental laws and policies promote the over-arching national goal of attaining the highest levels of environmental quality so as to enhance the well-being of Canadians, protect human health, preserve the quality of the environment and advance the country's long-term economic competitiveness (Environment Canada and Health Canada, 2006: 3).

Environment Canada and Health Canada (2006) conclude that CEPA 1999 provides a solid basis for continuing to protect the environment and human health, but concede that there are opportunities for improving the implementation of Act.

Two Parliamentary Committees were appointed in April 2006 to formally review CEPA 1999 including the House of Commons Standing Committee on Environment and Sustainable Development[45] and the House of Commons Standing Committee on Energy, the Environment and Natural Resources[46] (Environment Canada, 2012).[47] Under the

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[45] Members of the Standing Committee on Environment and Sustainable Development included: *Chair:* Bob Mills, M.P.; *Vice-Chairs:* Bernard Bigras and Hon. Geoff Regan; *Members:* Mike Allen, Nathan Cullen, Luc Harvey, Marcel Lussier, David McGuinty, Anthona Rota, Francis Scarpaleggia, Maurice Vellacott, and Mark Warawa; and *Other Members Who Participated:* Catherine Bell, Don H. Bell, Dennis Bevington, Steven Blaney, Hon. Scott Brison, Paule Brunelle, Blaine Calkins, Rodger Cuzner, Jean-Claude D'Amours, Patricia Davidson, Dean Del Mastro, Paul Dewar, Ken Epp, Mark Eyking, Hon. John Godfrey, Laurie Hawn, Mark Holland, Michael Ignatieff, Brian Jean, Hon. Marlene Jennings, Hon. Lawrence MacAulay, Luc Malo, Pat Martin, Christian Ouellet, Daniel Petit, Pierre Poilievre, Pablo Rodriguez, Denise Savoie, Mario Silva, Scott Simms, Lloyd St. Amand, Paul Steckle Hon. Gilbert Thibault, Chris Warkentin, Jeff Watson, Blair Wilson, and Borys Wrzesnewskyj. The *Clerk of the Committee* was Justin Vaive. *Research Staff of the Committee* included Tim Williams, Sam Banks and Kriten Douglas from the Library of Parliament, Parliamentary Information and Research Service (House of Commons Standing Committee on Environment and Sustainable Development, 2007: iii).

[46] Members of the Standing Senate Committee on Energy, the Environment and Natural Resources included: *Chair:* the Honorable Tommy Banks, *Deputy Chair:* the Honorable Pierre Claude Nolin, and the Honorable Willie Adams, the Honorable Bert Brown, the Honorable Ethel Cochrane, the Honorable Colin Kenny, the Honorable Elaine McCoy, the Honorable Lorna Milne, the Honorable Grant Mitchell, the Honorable Nick Sibbeston, the Honorable Mira Spivack, and the Honorable Marilyn Trenholme Counsell. *Ex-officio members of the committee* included the the Honorable Senators Hervieux-Payette P.C., (or Tardif) and LeBreton, P.C., (or Comeau), and the Honourable Senators Angus, Campbell, Carney, Chaput, Cordy, Cowan, Dawson, Fox, Fraser, Grafstein, Hubley, Lavigne, Mercer, Nolin, Nancy Ruth, Peterson, Robichaud, Segal and Tkachuk. *Research Staff of the Committee* included Kristen Douglas (principal), Lynne Myers, Sam Banks, analysts and Amelia Bellamy-Royds from the Library of Parliament, Parliamentary Information and Research Services. The *Clerk of the Committee* was Eric Jacques, Committees Directorate, and the *Administrative Assistant* was Nicole Bédard, Administrative Assistant,

legislation, the Standing Committees have up to one year to complete their review, though an extension may be granted if necessary. CEPA 1999 requires the final reports to be submitted to Parliament, and the Government of Canada has 150 days to provide a response as to whether or how the Act will be revised (s. 343(2), CEPA 1999; Environment Canada and Health Canada, 2004).

The House of Commons Standing Committee on Environment and Sustainable Development presented its report to the House of Commons in May 2007 with a seventy-five page report which included thirty-one recommendations. *The Canadian Environmental Protection Act, 1999 – Five Year Review: Closing the Gaps* focused primarily on examining the content and implementation of Part 5 of the Act, Controlling Toxic Substances. The objectives of CEPA 1999 include contributing to sustainable development through pollution prevention; promoting coordinated access across the country to achieve the highest environmental quality for the health of all Canadian citizens; and managing risks from harmful substances, while virtually eliminating releases of the most dangerous toxic substances. However, questions are raised about the

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Committees Directorate (House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008: i).

[47] The Parliamentary Review Committees received formal submissions from environmental organizations critiquing the implementation of CEPA 1999. A submission by Pollution Watch (representing the Canadian Environmental Law Association and Environmental Defence) included 34 specific recommendations to revise and reform CEPA 1999 in order to "address key gaps in federal law that enable ongoing exposure to toxic substances" (Pollution Watch, 2006: 3). The recommendations included shorter assessment periods, stronger mandatory deadlines and including the role of sensitive stages of human development and vulnerable populations in risk assessment processes (Lafrenière, n/d; Pollution Watch, 2006). Submissions by both Pollution Watch (2006) and the Ontario Public Health Association (2006) note the increasing incidence of detrimental health outcomes linked to exposure to toxic substances and the subsequent healthcare costs. It is suggested that the review of CEPA 1999 offered an opportunity to address these issues and to "close gaps in our regulatory system thus ensuring that Canadian's health and the environment are adequately protected" (Ontario Public Health Association, 2006: 3).

efficacy of CEPA 1999 and whether the objectives of the Act were being met; the report specifically notes the increasing emissions of toxic substances; and the very limited use of virtual elimination provisions to date (House of Commons Standing Committee on Environment and Sustainable Development, 2007: 6). As of 2007, the Government of Canada had not implemented many of the provisions under CEPA 1999 including:

- the authority to create regulations that control products containing toxic substances (never been used);
- the authority to create interim orders regarding potentially dangerous substances (never been used);
- the authority to request information on substances that the Minister of Health or Environment suspects are or could become toxic (limited use); and
- the authority to require virtually elimination of persistent, bioaccumulative and inherently toxic substances (occurred for only one substance which was not in commerce) (House of Commons Standing Committee on Environment and Sustainable Development, 2007: 5).

The Standing Committee considered how the Government of Canada might improve the implementation of CEPA 1999 so the objectives of the Act might be met (House of Commons Standing Committee on Environment and Sustainable Development, 2007).

The House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources extended its timeline three times during the review period, from October 31, 2007 to February 29, 2008, and ultimately submitted its final report on March 4, 2008 (Environment Canada, 2012). *The Canadian Environmental Protection Act (1999, c. 33) Rx: Strengthen and Apply Diligently* is a fifty-five page report which utilizes two comprehensive case studies, on mercury and perfluorinated compounds, in order to consider "whether, how and to what extent…[toxic substances] are currently

being managed under the Act, and how successful the management has been in protecting the health and well being of Canadians and the environment" (House of Commons Standing Committee on Energy, the Environment and Natural Resources, 2008: 6). The Senate Standing Committee provides twenty-four recommendations and suggests that the ineffectiveness of CEPA 1999 is related to a lack of will to implement and enforce the Act, as well as failure to devote the necessary resources for the implementation and enforcement (House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008: 3).

Both the House of Commons Standing Committee on Environment and Sustainability (2007) and the House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources (2008) criticize the Government of Canada for a lack of reporting on information about pollution and environmental and human health. Section 44(1)(f) of CEPA 1999 requires the Minister of the Environment to publish a periodic report on the state of the Canadian environment. Specifically, the Minister will publish, arrange for the publication of or distribute through an information clearinghouse, information respecting pollution prevention; pertinent information with respect to all aspects of environmental quality; and a periodic report on the state of the Canadian environment. The goals of these reports are to provide "timely, accurate, and accessible environmental information, integrated with socioeconomic factors, to improve decision-making and support progress towards sustainability" (House of Commons Standing Committee on Environment and Sustainability, 2007: 8). It is argued that this practice of monitoring, reporting and communicating was "virtually abandoned" since the in-depth

publications on the state of Canada's environment in 1991 and 1996 (House of Commons Standing Committee on Environment and Sustainability, 2007). While CEPA 1999 does not include specific information as to how often the reports on the state of the environment should be completed, the Standing Committee on Environment and Sustainable Development (2007) recommends the reinstatement of timely reports and the Standing Senate Committee on Energy, the Environment and Natural Resources (2008) suggests that reports should be published no less frequently than every ten years.

Both the House of Commons Standing Committee on Environment and Sustainable Development (2007) and the Standing Senate Committee on Energy, the Environment and Natural Resources (2008) note the necessity of meeting reasonable and mandated timelines. Mandatory timelines have tended be effective where they exist in CEPA 1999, such as the seven years to complete the categorization process as part of the Domestic Substances List. However, concerns were expressed around the required screening level assessments which determine if the substances are CEPA-toxic, because no timeline was specified in the legislation for them to be completed. The Standing Committee recommended that if the screening assessment determines that a substance is toxic, there should be a maximum of two years from the assessment to the implementation of a risk management plan, and five years if the screening concludes the need for a full Priority Substances List assessment (House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008: 24-27).[48]

[48] The House of Commons Standing Committee on Environment and Sustainable Development (2007: 26) provides this discussion around the importance of "reasonable timelines" based on examples where the assessment of toxic substances did not occur in a timely fashion. For instance, the listing of

The Government tabled an interim response to the House of Commons Standing Committee on Environment and Sustainable Development report in October 2007 (Parliament of Canada, 2007). The interim response was vague and non-specific in addressing the Standing Committee's recommendations; it did not specify how or if they would be addressed. The interim response indicated while CEPA 1999 is fundamentally sound and does not require significant changes, refinements to the Act would strengthen its implementation (Parliament of Canada, 2007). After the House of Commons Standing Committee on Energy, the Environment and Natural Resources submitted its report in 2008, the Government of Canada was to table a final consolidated response to both committee reports addressing the recommendations and potentially proposing various improvements to the Act (Environment Canada, 2012; Parliament of Canada, 2007). However, a final response from the government was not released. There have been no official revisions to the legislation as it is not mandatory to incorporate the Standing Committees' recommendations from the review period. The next five year review of CEPA 1999 should have been triggered on March 31, 2010 but the review was suspended (Environment Canada, 2011a). Despite comprehensive reviews and being officially scheduled for review twice, CEPA 1999 has not changed since the Act was implemented in 1999. It should be scheduled for another review as of March 31, 2015.

Chemicals Management Plan

Toner (2008) notes that when the Conservative government came into power in 2006, it had shown little commitment to prioritizing the environment in its electoral

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trichloroethylene on the Priority Substances List to the publication of its management plan took over thirteen years.

campaign or the first Speech from the Throne. However, there was a shift in public opinion in 2006-2007 with Canadian citizens prioritizing the environment as a policy issue of concern (Toner, 2008: 3). The launch of Canada's *Chemicals Management Plan* was announced by Prime Minister Stephen Harper, Minister of Health Rona Ambrose and Minister of the Environment Tony Clement in December 2006. The government promoted an approach that was "tough on toxics" as part a "comprehensive environmental agenda" (Bueckert, 2006; Campion-Smith, 2006; Conservative, 2013; Prime Minister of Canada, 2006a; Scott, 2009b; Weeks, 2006). CEPA 1999 is the primary statute under which the *Chemicals Management Plan* is implemented. The Government indicated that the *Chemicals Management Plan* was designed to assess and manage the risk of all chemical substances categorized as part of the Domestic Substances List as potentially harmful to human health or the environment by 2020. Prime Minister Harper promoted the *Chemicals Management Plan* as including

> realistic and enforceable measures that will substantially increase protection of Canadians from dangerous chemicals. In fact, it will make Canada a world leader in the testing and regulation of chemicals that are used in thousands of industrial and consumer products….Over the next four years, we will tighten regulations and accelerate risk assessment for thousands of chemicals. Our plan will require substantial investment of public funds, but in the long run it will save money by reducing expenditures on public health and the clean-up of contaminated land and water.
>
> While Canada has always been responsible when it comes to chemical management, I'm proud to say that we will become a world leader because of today's announcement. Although since 1994, new chemicals substances produced or imported into our country have been subject to rigorous assessment by federal government scientists, some 23,000 "legacy" chemicals have not undergone the assessment required of new substances. All developed countries face the same challenge, and all have committed to safely manage chemicals by 2020.

> Canada has now become the first country in the world to achieve full categorization of our legacy chemicals. We are ahead of America and Europe, and Canada's New Government is committed to keeping our nation at the forefront of health and environmental protection. Our chemicals management plan is the next step in the process (Prime Minister of Canada, 2006b).

The *Chemicals Management Plan* is managed by Environment Canada and Health Canada and incorporates all the existing federal chemical programs into one single strategic policy in order to address routes of exposure to chronic and acute hazardous substances (Treasury Board of Canada, 2012). Health Canada (2010: 35) promotes the *Chemicals Management Plan* and its

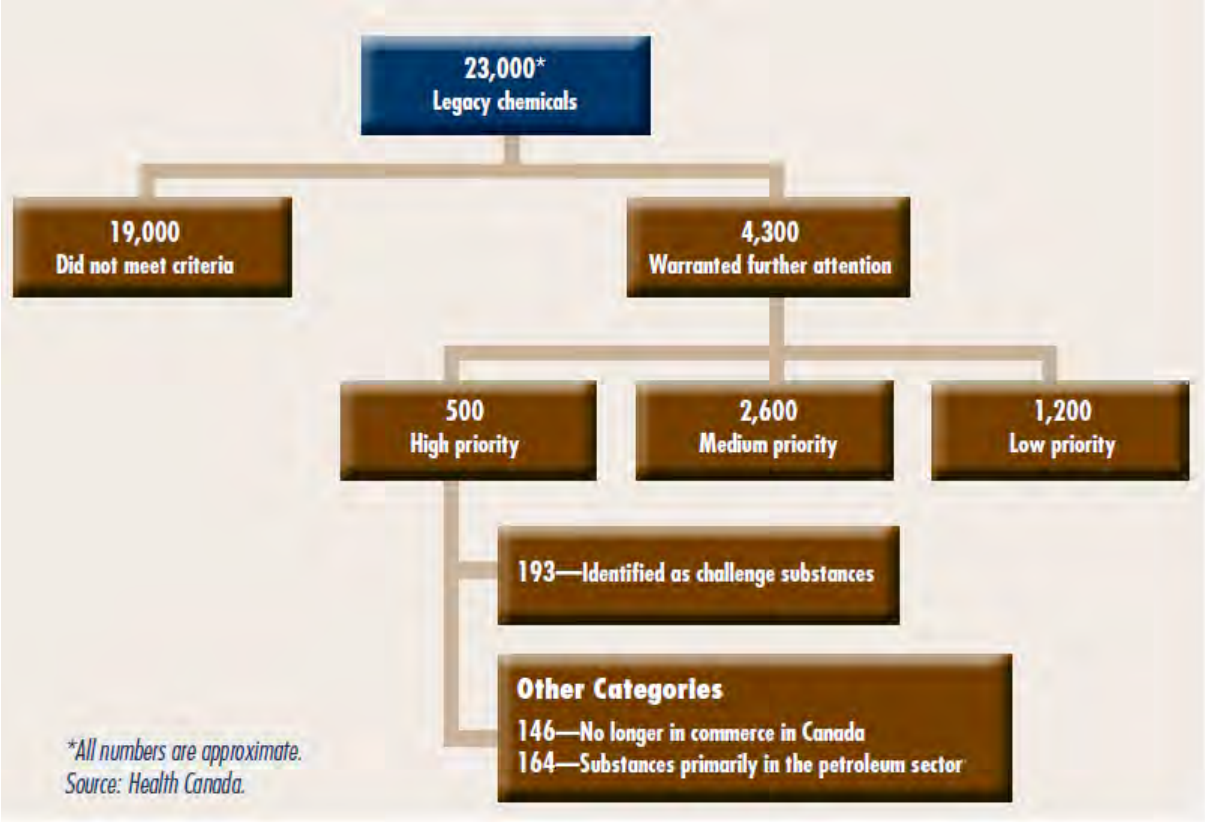
> innovative approach to regulation [which] supports the use of the best-placed and most effective Act to address the potential risks of a chemical substance…[The] government's regulatory actions should be proportional to the identified risks, as well as be the most cost effective and efficient in achieving the risk-management objective.

The *Chemicals Management Plan* is designed to protect human health and the environment by taking immediate action on chemical substances of high concern; undertaking regulatory activities to address sectors such as consumer products, food, pharmaceuticals, personal care products, and pesticides by using the most-appropriate Act; investing in research including biomonitoring to examine the health impacts associated with chemical exposures; and evaluating the success of risk management and control measures (Health Canada, 2010a: 34). The three key elements of the *Chemicals Management Plan* include a challenge to industry and stakeholders for immediate action on toxic substances of high concern; regulatory activities around food, cosmetics, drugs, and pesticides; and investment in research and monitoring about both the effects of toxic

substances on human health and the environment, and as a way to measure the success of risk management processes (Government of Canada, 2011a: 1-2).

The 500 high priority substances identified during the categorization process will be addressed through three mechanisms including the Ministerial Challenge Program (also known as "the Challenge), the Petroleum Sector Stream Approach[49] and through the Significant New Activities (SNAc) provisions. Of the chemicals that were classified as the highest priorities for immediate action, 193 substances were identified as part of the Challenge, with assessments to be completed between 2007-2010, 146 were no longer in commerce and classified under the significant new activity provisions, and 164 were substances used primarily in the petroleum sector (Health Canada, 2010a). An overview of the "Chemicals Categorization Process: A Large-Scale Priority-Setting Exercise" can be seen in the diagram below:

[49] The Petroleum Sector Stream approach includes 160 substances identified as high priorities through the categorization process. The majority of high priority petroleum substances are used or manufactured during petroleum refining or bitumen/heavy crude oil upgrading activities. Environment Canada and Health Canada are responsible for the assessment and management of risk associated with these substances (Government of Canada, 2013a).



(Health Canada, 2010a: 33)

The Challenge involves collecting data from industry under the information gathering provisions of section 71 of CEPA 1999. It includes a notice published in the *Canada Gazette* and a Challenge Questionnaire. Information required as part of the questionnaire includes details about the total quantity of a substance that was manufactured, imported, released, used, or sold for use in Canada; the concentration of the substance in a mixture, product or manufactured item; and use pattern codes and North American Industry Classification system codes that apply to the use of a substance (Government of Canada, 2009a). There is also a non-mandatory request that industry and stakeholders submit additional information that may be used as part of the risk

assessment process, and to develop best practices around risk management and product stewardship (Government of Canada, 2011b). For instance, information may be provided about the import, manufacture and use quantities; substance and product use details; releases to the environment and protocols for spill management; current and potential risk management and product stewardship actions; existing legislative and regulatory programs which control or manage the substance; and information to support the development of a regulatory impact assessment. The information is intended to assist the government in designing approaches and tools for the risk management of the Challenge substances (Government of Canada, 2009a, 2010a).

The 193 substances as part of the Challenge were divided into twelve smaller groups called "batches" to be addressed sequentially and launched within a three-year timeframe. Beginning in February 2007, a new group of 15-30 substances were released every three months for a six-month comment period from industry and stakeholder groups (Government of Canada, 2009a; 2010a). Screening risk assessments were conducted for each batch of substances by Health Canada and Environment Canada (Tilman and Rochon Ford, 2010).

The *Chemicals Management Plan* utilizes a risk management approach which includes scientific assessment and monitoring, combined with a variety of tools for the protection of human and environmental health (Health Canada, 2010a). The non-governmental organization, Environmental Defence[50], reported in 2011 that of the 193

[50] Environmental Defense is a Canadian environmental action organization whose research and campaigns focus on banning harmful chemicals, protecting green space, greening power sources, cleaning beaches, greening the economy, and detoxing Canadians (Environment Defense, 2013a).

high priority substances assessed as part of the Challenge between 2007 and 2010, twenty-five substances were determined to be toxic under CEPA 1999 and added to the Toxic Substances List, fourteen were determined to be toxic and proposed for addition to the Toxic Substances List, and six will likely be concluded as toxic in final assessments and proposed for addition to the Toxic Substances List (Environmental Defence, 2011: 14). Batches one and two each found nine substances to be toxic. However, the number of substances found to be toxic decreased in subsequent batches with three substances in batch three, four substances in batch four, two substances in batch five, one substance in batch six, and three substances in batch seven. There has been frequent use of the "future use notification" measure[51] and the proposed cosmetic ingredient hotlist[52] which are both

[51] The future use notification tool was identified early in the Challenge, but it was determined that the SNAc provisions of CEPA 1999 would fulfill this risk management measure. The future use notification tool wording was replaced with Significant New Activity provisions wording, eliminating the need to develop another regulatory initiative (Environment Canada, 2013a).

[52] The Cosmetic Ingredient Hotlist contains a list of prohibited and restricted cosmetic ingredients in Canada (Government of Canada, 2011c; Health Canada, 2011a, 2011b). The Hotlist is based in legislation including section 2 of the *Food and Drugs Act* which addresses the definitions of regulated products; section 16 of the *Food and Drugs Act* which states that no person shall sell a cosmetic product that contains a substance that may injure the health of the user; and section 24 of the *Cosmetic Regulations* which requires that the label of a cosmetic product presenting an avoidable hazard include directions for safe use. If a restricted ingredient is in a product, a "cautionary statement of direction for use associated with an ingredient mitigates the hazard of the product" (Health Canada, 2011b). Health Canada scientists use evidence-based decision making and weight of evidence in their risk assessments (CCTFA, 2007). Evidence-based decision-making is the "systematic application of the best available evidence in the evaluation of options for decision-making in clinical, management and policy settings" (Ham, 2001: 99). While evidence-based medicine focuses on the individual-clinical level, evidence-based decision-making and health policy focuses on the population-policy level (Dobrow et al, 2004: 208). The fundamental concepts of an evidence-based decision are evidence and context. It is the interaction between evidence and context in evidence-based decision making that is most critical to the development of evidence-based health policy (Dobrow et al, 2004). Health Canada may implement risk management measures including banning ingredients or restricting use through the Hotlist, requiring labelling, or requiring the product be removed from stores (CCTFA, 2007). Manufacturers may have to remove the ingredient from the formulation; reduce the concentration of the ingredient to an acceptable level; provide evidence that the product is safe for its intended use; confirm that the product is labelled as required; and confirm that the product is sold in child-resistant packaging (Health Canada, 2011b). However, the Hotlist has been criticized as it has no legal authority and cannot be enforced (David Suzuki Foundation, n/d). de Leon and

non-regulatory risk management measures. At the same time, the number of significant new activity (SNAc) provisions have steadily increased from batch one through batch seven and were applied to thirty-three substances while only three substances have been scheduled for virtual elimination (de Leon, 2010).

Under section 80 of CEPA 1999, significant new activity (SNAc) provisions apply when the Minister of the Environment or Health conclude that a substance is entering the environment in a quantity which is significantly greater than the previous release. These provisions may also apply if the substance is entering the environment in a manner that is significantly different than the previous release into the environment. The significant new activity provisions were applied to 146 substances classified as high priority under the *Chemicals Management Plan*. These substances were categorized as persistent, bioaccumulative and inherently toxic, but were not currently in commerce in Canada. If the Minister of the Environment or the Minister of Health is concerned that a significant new activity of a substance on the Domestic Substances List is being reintroduced into Canadian commerce which may result in the substance being classified

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Madray (2009) note important gaps in the Hotlist such as a lack of clarity around whether manufacturers or importers abide by the provided limits, and the Hotlist does not require exporters of cosmetic products to comply with the regulations. "This is a significant flaw, not only of the Hotlist but of the management regime for toxic chemicals in Canada. The use of CEPA toxic chemicals should not be permitted for products intended for the export market" (de Leon and Madray, 2009: 2). The Hotlist does not provide consideration for the impact on vulnerable populations who are exposed to the substances (de Leon and Madray, 2009). For a full discussion of vulnerable populations and exposure to toxic substances, refer to chapter 5. It should also be noted that personal care products which may be classified as drugs are not regulated under the *Food and Drugs Act* because they possess a therapeutic function, such as antiperspirants, face cream with a UV rating, anti-aging lotion, toothpaste, and hand sanitizers. Products which may be regulated as natural health products if they contain natural ingredients with a therapeutic function are also not regulated under the Act. Despite substances which are found to be toxic under section 64 of CEPA 1999, the Hotlist and labelling requirements in the *Cosmetic Regulations* do not apply to personal care products which are classified as drugs or natural health products (David Suzuki Foundation, n/d).

as CEPA-toxic, the Minister of the Environment may amend the Domestic Substances List under section 87(3) so that the new use of the new substance is evaluated (de Leon, 2010; Government of Canada, 2012a, 2012b). The outcomes of an assessment of a significant new activity may result in the substance being suspected of being toxic or capable of becoming toxic for the proposed activities, or not suspected of being toxic or capable of becoming toxic for the proposed activities. If the substance is suspected of being toxic or capable of becoming toxic, the Ministers may

> i) permit any person to manufacture or import the substance in relation to the Significant New Activity, subject to any conditions that the Ministers may specify;
>
> ii) prohibit any person from importing or manufacturing the substance in relation to the Significant New Activity; or
>
> iii) request any person to provide any additional information or submit the results of any testing that the Ministers consider necessary for assessing whether the substance is toxic or capable of becoming toxic, as a result of the Significant New Activity (Government of Canada, 2012b).

In a letter to the Director Generals of Environment Canada and Health Canada, de Leon et al. (2010) suggest that there has been an over-reliance on Significant New Activity provisions under the *Chemicals Management Plan* and express concern around the high priority substances that were identified for Significant New Activity Notices. "Prior to the release of the CMP [(*Chemicals Management Plan*)], the original intention was to apply SNAcs to substances considered "new" to Canada and subject to the New Substances Notification Regulation. Under the CMP, we have noticed a continuing trend toward issuing SNAcs to high hazard-low volume 'existing' substances without designating them as CEPA toxic" (de Leon et al., 2010: 7). A number of specific

concerns around the Significant New Activity provisions under the *Chemicals Management Plan* are raised including:

- The threshold for reporting use is 100kg which means that there may be uses of the substance below the reporting threshold and that does not apply to a Significant New Activity issuance;

- The Significant New Activity approach requires further assessment of toxic substances under the New Substances Program and these results are not required to apply elimination or reduction strategies as part of risk management, regardless of the original data gathered in the categorization process;

- The substances to be assessed and managed under the Significant New Activity approach of the *Chemicals Management Plan* include 146 from the high priority substances and thirty-three from batches one through seven. A more protective and precautionary approach would involve listing all these substances as toxic under CEPA 1999 and proposing to add them to CEPA's Prohibition of Specific Toxic Chemicals Regulations; and

- Despite the efforts by environmental non-governmental organizations to raise the issue of applying Significant New Activity notices under the *Chemicals Management Plan*, there has been very limited public policy debate around this issue (de Leon et al., 2010: 7-8).

The Significant New Activity approach does not fully protect human health and the environment. de Leon et al. (2010) conclude in urging the government to designate substances that meet the hazard criteria and are not in use, manufactured or imported into Canada as toxic under CEPA 1999, and add the CEPA-toxic chemicals to Schedule 1.

Other provisions under the *Chemicals Management Plan* include assessing the medium priority substances, monitoring and research including the Canadian Health Measures Survey and the Maternal Infant Research on Environmental Chemicals; mandatory ingredient labelling of cosmetics[53], regulations to address environmental risks

[53] Importantly, this labelling does not include "fragrance" or "parfum" ingredients which are protected by proprietary conditions.

from pharmaceuticals and personal care products under the *Food and Drugs Act*; rapid screening of lower risk chemicals; and accelerated re-evaluation of pesticides under the *Pest Control Products Act* (Government of Canada, 2010b; 2011a).

In October 2011, the federal government announced the second phase of the *Chemicals Management Plan* focused on consumer product safety. Minister of the Environment, Peter Kent stated that this phase "is both an investment in the health of the Canadian economy and our environment. Canadians want to have confidence in the products they use everyday, and reassurance that they are not harmful to the environment" (Health Canada, 2011d). Specifically, the Government stated that this phase will focus on continuing to improve product safety in Canada; completing assessments of 500 substances across nine categories; and investing in additional research for substances such as bisphenol A (BPA), flame retardants, and substances that affect hormone function and the environment. There are approximately 1,000 additional substances to be assessed over a five year period through other initiatives including the rapid screening of substances which pose "little or no risk" (Health Canada, 2011d).

As part of the second phase of the *Chemicals Management* Plan, the Substance Groupings Initiative involves assessment of priority substances between 2011 and 2016 in order to assess and manage the potential health and environmental risks associated with nine groups of substances including aromatic azo- and benzidine-based substances, boron-containing substances, internationally classified substances, certain organic flame retardants, cobalt-containing substances, methyldiphenyl diisocyanates and diamines, phthlates, selenium-containing substances, and substituted diphenylamines (Government

of Canada, 2012c, 2013b, 2013c; Laemy, 2012). This initiative emerged as a result of longstanding critiques, including from other jurisdictions, of the substance-by-substance approach rather than focusing on classes of substances (Denmark Ministry of the Environment Environmental Protection Agency, 2013; House of Commons Standing Committee on Environment and Sustainable Development, 1995; McClenaghan et al., 2003).

The substance groupings were chosen based on structural or functional similarities and assembled based on considerations of the ability to support informed substitution decisions, timing of international actions, stakeholder implications, assessment efficiencies, potential exposure to children and human health, and risk management efficiencies (Laemy, 2012: 6). The priorities for the assessment of the groupings initiative include potential hazard and exposure of the substances; efficiencies and effectiveness of risk assessment and risk management; transparency in the assessment and engagement with stakeholders throughout the process; and adaptability with the process regarding sub-groupings that may be revised as information becomes available (Government of Canada, 2011d).

The second phase of the *Chemicals Management Plan* also involves an inventory update for the Domestic Substances List as the original data for these substances may be out of date, some substances may no longer be in commerce, or their use and volume may have changed. There were originally 23,000 substances published on the Domestic Substances List in 1994, but there are currently 28,000 listed substances. Information from the updated Domestic Substances List will be used for risk assessment and

management activities, monitoring trends, and priority setting. Phase one of the update was launched in 2009 and included approximately 500 toxic substances. Phase two was launched in December 2012 and will involve approximately 2700 substances requiring reporting on chemicals manufactured or imported over 100kg alone or in a mixture in the 2011 calendar year, as well as polymers manufactured or imported over 1000kg alone or in a mixture in the 2011 calendar year (Government of Canada, 2013c; Télasco, 2012).

Conclusions

The proliferation of chemical contaminants used in industry, agriculture and consumer products in industrialized societies has led to increasing concern among Canadian citizens. Specific issues of concern are the health effects of exposure to environmental contaminants and particularly the long-term exposure to low-doses of contaminants, as well as the effects on developing foetuses, infants and young children (Health Canada, 2002b: 6). The measurement of the impact of environmental contaminants on human health is an important public policy challenge (Health Canada, 2002b). Public health and environmental policies have the potential to reduce environment-related diseases and contribute to significant improvements in public health.

Health Canada (2010a) has a wide range of instruments available that may be used in an attempt to achieve its public policy objectives including regulatory instruments such as legislation and regulations which are legally binding, and less formal non-regulatory instruments that encourage particular behaviours or actions such as economic incentives or disincentives and public education campaigns (Health Canada, 2010a: 7). The department works from the position that a completely risk-free environment is

neither realistic nor achievable, but rather that governments need a systematic decision-making process to determine the level of risk that is acceptable to both the environment and public health. Health Canada's approach to hazard identification, risk assessment and risk management is to develop a course of action that is evidence-based and cost effective. Risk should be reduced while also accounting for social, cultural, ethical, political, economic, and legal considerations (Health Canada, 2002b: 7). The importance of national environmental standards are emphasized as the only way to "ensure the right of all Canadians to the same minimum levels of health and environmental protection" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 15). The following chapters will investigate whether this claim is implemented in practice.

Chapter 4

Tracing Toxics: Considering Toxicity, Exposure, Precaution and Accountability

Introduction

In order to understand how the concept has evolved, this chapter examines the history of the concept of "toxicity" in Canadian legislation and the tensions between stakeholder groups during the regulatory review process. It explores how toxicity is grounded in risk assessment processes which are designed to assess the impact of toxic substances on the environment and human health. It also considers the role of toxicity in exposure assessments, threshold and non-threshold effects of exposure to toxic substances, and the requirements for virtual elimination under CEPA 1999. The chapter provides a brief overview of the case of siloxane D5, which was declared toxic under CEPA 1999 as part of the Challenge. This declaration was reversed after an objection was filed by the Silicones Environmental, Health and Safety Council of North America. The case study raises central questions about the regulation of toxic substances, risk, precaution, the contested nature of toxicity, and the influence of socioeconomic interests. This chapter also explores the precautionary principle which was included in Canadian legislation for the first time in CEPA 1999. However, the legislation is critiqued for not operationalizing the principle in the assessment of toxic substances. It provides an overview of the growing concern of the effects of endocrine disrupting chemicals, their inclusion in CEPA 1999 and whether the precautionary principle has been adequately implemented in risk management practices. Finally, it examines the debate between exposure-based and hazard-based assessments of risk and considers the efficacy of

Canadian law, policy and practice in preventing detrimental health outcomes and enacting primary prevention.

Tracing Toxicity, Risk and Exposure

In light of continued contestation around environmental health outcomes, it is interesting to reflect upon the history and context of environmental health and risk. Issues of (in)visibility of environmental contaminants and a tendency to emphasize some risks over others were recognized when the *Environmental Contaminants Act* was implemented (Page, 1978). A paper written by the Economic Council of Canada on the regulation of toxic chemicals in the environment in 1981 acknowledged the latent, long-term health effects of environmental contaminants. It emphasized that exposure to environmental contaminants can result in the development of cancer, birth defects, genetic damage, and other acute and chronic diseases (Nemetz et al., 1981). During the parliamentary review process of CEPA 1988, ninety percent of people surveyed were concerned about the effect of pollution on human health and additional surveys conducted at this time revealed that the presence of toxic chemicals in the environment was a major concern for Canadian citizens (House of Commons Standing Committee on Environment and Sustainable Development, 1995).

The Lalonde Report, which highlighted the environment as a determinant of health status, was an early indicator of environments as causal factors related to health outcomes (Lalonde, 1974). There has been an evolution in the language and terminology around toxic substances, as well as the formal definition of a “toxic substance” in Canada. Concerns were raised about the language used to describe environmental

chemicals at each stage of the parliamentary review of environmental legislation. Industry stakeholders felt that the use of "contaminants" to describe substances of concern in the *Environmental Contaminants Act* of 1975 unfairly stigmatized the industry and the substances themselves. The introduction of the term "toxic substances" in CEPA 1988 was meant to be less value-laden (House of Commons Standing Committee on Environment and Sustainable Development, 1995).

But industry representatives also expressed concerns with the use of the term "toxic substances" and the name of Schedule 1, the List of Toxic Substances under CEPA 1999. Because the Minister of the Environment and Minister of Health consider both the hazard and exposure of a substance that is defined as CEPA-toxic before placing it on Schedule 1, it was noted that a substance may be placed on the List of Toxic Substances as a result of detrimental effects at a high exposure level, but may be commonly (and safely, in their view) used under other circumstances. Industry representatives argued that "because of this, their products were being given an unfair stigma" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 45). For instance, the examples of road salt and ammonia were repeatedly raised in stakeholder consultations. Road salt[54] met two of the criteria to be defined as toxic including the potential to have an immediate or long-term harmful effect on the environment or its biological diversity, and the potential to constitute a danger to the environment on which life depends, although it was not added to Schedule 1. Ammonia was added to Schedule 1

[54] Similar to Health Canada's (1995) illustrative example using knives to contrast hazard- and risk-based approaches in chapter three, it is suggested that the public may easily confuse "toxic" and "high hazard" and may think they are "sprinkling such a substance on their french fries" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 45-46).

after a risk assessment of ammonia in the aquatic environment determined that it has the potential to have immediate or long-term effects on the environment or biological diversity. The main objection to the use of the word "toxic" by industry is that "it gives all Schedule 1 substances the same connotation of being something to be avoided at all costs" (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 45). Industry stakeholders recommended removing "toxic" entirely and replacing it with "substances to be managed," while stakeholders from environmental and health organizations suggested that the removal of the toxic substances language could diminish the importance of the impact of the regulatory decisions. While there have not been any revisions to CEPA 1999 during legislative review, there were two attempts to remove "toxic" from all or parts of the Act in Bill C-43 from the 38th Parliament, first session in 2005, and Bill C-30 of the 39th Parliament, first session in 2007 (House of Commons Standing Committee on Environment and Sustainable Development, 2007: 45-46).

> Under section 64 of CEPA 1999, a substance is considered "toxic" if
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> > it is entering or may enter the environment in a quantity or concentration or under conditions that i) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; ii) constitute or may constitute a danger to the environment on which life depends; or iii) constitute or may constitute a danger in Canada to human life or health.

Health Canada (2007c) equates the concept of risk with the definition of toxic under CEPA 1999 as it encompasses both the exposure to a substance and the hazard or inherent toxicity of a substance. Simply put, toxicity is equated with risk and this is the understanding that is used in Health Canada's decision-making framework for risk

assessment and risk management. In order to evaluate the potential impact of a toxic substance on human health, Health Canada (2013a) assesses the risk by: i) reviewing relevant decisions of other jurisdictions; ii) conducting initial screening assessments which consider the hazardous properties of the substance, routes of exposure and the potential to harm human health; and iii) conducting in-depth assessments for substances which are placed on the Priority Substances List which includes a critical and comprehensive analysis of the risks to human health (Health Canada, 2008b).[55] The risk assessments consider the use, hazard, exposure, and environmental fate of the substance, as well as the risk to human health. They consider acute exposure at the individual-level and chronic exposure at the population-level (Environment Canada, 2013b; Saner, 2010).

A risk assessment is designed to determine a range of toxicological effects by utilizing the dose-response relationship. The traditional dose-response relationship posits that the "nature, number, severity, incidence[,] and/or prevalence of specific toxicological effects *increase with increasing exposure*, as determined by the dose, duration and frequency" of the toxic substance (Health Canada, 2007c, emphasis added). Toxicological effects may be classified as "threshold" or "non-threshold." Threshold effects only occur above a certain level of exposure (Health Canada, 2007c; Saner, 2010). Health Canada (2010: 6) defines a toxicological threshold as a "dose below which no adverse effects to the exposed organism will occur." Under this model small doses of a toxic substance are expected to be tolerated by the human body because of metabolic

[55] Refer to chapter three for additional detail on human health risk assessments and these processes in CEPA 1999.

detoxification, physiological homeostasis, and cellular adaptation and repairs. Risk assessments attempt to identify the highest dose of a substance that does not result in adverse health outcomes, also known as the "No-Observed-(Adverse)-Effect-Level" (NO(A)EL) (Health Canada, 2007c: 6).[56]

Non-threshold effects, in contrast, are considered to occur at any level of exposure to a substance. During screening level assessments of existing substances under CEPA 1999, a non-threshold risk for a cancer endpoint results in the substance being found CEPA-toxic (Health Canada, 2000; Saner, 2010: 11). After this designation, the exposure component is considered in subsequent decisions, such as determining whether the substance will be added to Schedule 1 of the Act, and which risk management measures will be taken (Health Canada, 2007c: 6-7).[57]

Ultimately, determinations of toxicity are dependent upon "whether or not the potential level of exposure is below that for which the health risk is considered significant, or for which the health risk is considered negligible" (Health Canada, 2007c: 3). Risk assessments utilize "margins of exposure" in order to determine the ratio between the NOE(A)L and estimated exposure level of the substance (Barnes and Dourson, 1988; Scott and Lewis, forthcoming; USEPA, 2000). The margin of exposure

[56] If the data does not allow for the determination of a NO(A)EL, the "Lowest-Observed-Adverse-Effect-Level" (LOAEL) would be used indicating the lowest dose at which an adverse effect occurs (Health Canada, 2007c: 6).

[57] For new substances, hazard and exposure are considered concurrently. A *de minimus* ("essentially negligible") risk level is determined for new substances which do not have a threshold effect. Substances will be classified as Group 1 ("Carcinogenic to Humans") or Group 2 ("Probably Carcinogenic to Humans") where the substance will be considered toxic if its risk is not negligible. Substances will be classified as Group 3 ("Possibly Carcinogenic to Humans," "Possible Human Germ Cell Mutagen" or if the weight of evidence indicates genotoxicity in somatic cells) where the substance will be suspected of being toxic if the risk is not negligible (Health Canada, 2007c: 8).

may be used in determining both non-cancer and cancer endpoints and are based on broad, population-level estimates (Environment Canada, n/db; Government of Canada, 2013d).

Human health exposure assessments consider exposure through a variety of sources including food, air, water, dust, soil, and consumer products, and a variety of pathways including ingestion, inhalation and dermal absorption. The exposure assessments consider scenarios including direct exposure and environmental (indirect) exposure. Direct exposure to toxic substances occurs most often through inhalation and dermal contact. Direct exposure of the general public results from "direct contact with, or close proximity to, the chemical during any part of its lifecycle, whether knowingly or not" (Health Canada, 2007c: 4). Environmental (indirect) exposure occurs when there are toxic substances present in food, drinking water, domestic and recreational water, air, dust, and soil. Environmental exposure occurs as a result of substances entering the "general environment through industrial waste streams, from releases from intended industrial uses, air emissions, household wastewater and landfill sites" (Health Canada, 2007c: 5). Direct human exposure is distinguished from indirect exposure, as there is no pathway in the environment that interferes between the point of release and the point of exposure. However, it may not always be possible to make a distinction between the two exposures. The toxicological effects which may occur are evaluated as part of the exposure assessment and include organ- or system-specific effects such as cardiovascular or neurological/behavioural; reproductive and developmental; immunological; carcinogenic; or mutagenic effects (Health Canada, 2007c: 4-5).

Section 65(1) of CEPA 1999 gives a legislative basis for the virtual elimination requirement of the Toxic Substances Management Policy for Track 1 substances. Here, virtual elimination is defined as the ultimate reduction of the quantity or concentration of the substance in the release below the level of quantification specified by the Ministers in the Virtual Elimination List. Section 77(4) of CEPA 1999 states that when

> i) the substance is persistent and bioaccumulative in accordance with the regulations; ii) the presence of the substance in the environment results primarily as a result of human activity; and iii) the substance is not a naturally occurring radionuclide or a naturally occurring inorganic substance, the Ministers shall propose the implementation of virtual elimination under subsection 65(3).

Both Williams (2006) and the House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources (2008) raised concerns about substances needing to be *both* persistent and bioaccumulative in order to qualify for virtual elimination. This requirement means that substances that are CEPA-toxic and persistent, but do not bioaccumulate, are not targeted for virtual elimination under CEPA 1999. It is suggested that the definition of virtual elimination be revised to be broader in scope, similar to the one used in the International Joint Commission and the Great Lakes Water Quality Agreement (Williams, 2006; House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008).

The Standing Senate Committee (2008) conducted a case study that focused on perfluorinated compounds and on perfluorooctane sulfonate (PFOS) in particular. PFOS is a synthetic chemical that was imported from the United States to Canada to be used in numerous processes and products including water, oil, soil, and grease repellents, firefighting foams, hydraulic fluids, mining and oil surfactants, and carpet spot removers.

A State of the Science report prepared by Health Canada as part of a screening health assessment for PFOS determined that the majority of Canadian citizens have low levels of perfluorinated compounds, including PFOS, in their blood. However, the report ultimately concluded that there are adequate margins of exposure to prevent detrimental health outcomes (Health Canada, 2006; Health Canada, 2007d). Health Canada concluded that PFOS and its salts meet the criteria for persistence under CEPA 1999 and that "while the weight of scientific evidence indicates that PFOS and its salts are also bioaccumulative[,]…the relevant data for these substances do not meet the numeric criteria for bioaccumulation as defined in the CEPA 1999 *Persistence and Bioaccumulation Regulations*" (House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008: 33). Based on this result, PFOS did not qualify for virtual elimination under CEPA 1999 and environmental non-governmental organizations suggested that the criteria for bioaccumulation be expanded. Consequently, a Member of Parliament introduced the Private Member's Bill C-298 to Parliament in October 2007 to add PFOS to the Virtual Elimination list and the Bill received Royal Assent in April 2008 (House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008; Parliament of Canada, 2008b).

In the next section, I illustrate the degree to which findings of toxicity are contested in the case of siloxane D5 which was determined to be a toxic substance under CEPA 1999. The Silicones Environmental, Health, and Safety Council of North America subsequently filed an objection which reflects the deeply vested interests around issues of production and risk.

Case Study: Siloxane D5 (CEPA-toxic?)

Siloxane D5 (cyclopentasiloxane, decamethyl-) is an industrial chemical used in a variety of products and processes. It is not manufactured in Canada, but it is imported into the country as a pure substance, in mixtures with other cyclic siloxanes, as a residual in silicone polymers, and in finished consumer products. Based on information received as part of a notice published under section 71 of CEPA 1999, between 1,000,000 and 10,000,000 kilograms of siloxane D5 were imported into Canada in 2006 (Environment Canada and Health Canada, 2008a). The most common use of siloxane D5 in Canada is in blending and formulating personal care products, such as hair and skin care products, antiperspirants and deodorants. It is also used in manufacturing silicone polymers, and in textiles, paints, sealants, lubricants, plastics, non-medical ingredients in pharmaceuticals, silicone polymers, food additives, surface treatments for wounds, and medical devices (Environment Canada, 2012f; Government of Canada, 2012d). Siloxane D5 may be released into the environment as a result of industrial processes and from the use and disposal of personal care products. Thus, air, wastewater and soil are the "principal receiving environmental media for [siloxane] D5 based on its physical-chemical properties and its use patterns" (Environment Canada and Health Canada, 2008: ii).

It was determined during the categorization process of the Domestic Substances List that siloxane D5 was in commerce in Canada, and met the ecological criteria for persistence, bioaccumulation potential, and inherent toxicity to non-human organisms. This substance was identified as a high priority for screening assessment and included in the Challenge of the *Chemicals Management Plan*. Siloxane D5 was originally assessed

as part of Batch 2 under the Challenge (Environment Canada and Health Canada, 2008a). A notice announcing the release of the final screening assessment report for siloxane D5 was published in the *Canada Gazette* in January 2009 (Government of Canada, 2009b, 2012e). The screening assessment conducted by Environment Canada and Health Canada (2008a: 51) concluded that siloxane D5 has the potential to cause ecological harm and meets the criteria for being defined as "toxic" under section 64 of CEPA 1999. It was determined by the Minister of the Environment that siloxane D5 "is entering or may be entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity" (Environment Canada and Health Canada, 2008a: 51).

Siloxane D5 was not classified as a priority for in-depth assessment of the potential risks to human health during the categorization process. However, a human health assessment was conducted based on its structure and use pattern similarity to siloxane D4 (octamethylcyclotetrasiloxane) which was determined to be a high priority for assessment for risks to the environment and human health under CEPA 1999. The screening assessment of siloxane D5 considered exposure, health effects and the characterization of risk to human health. The estimates of exposure relied on the use of models and use pattern data which were not from Canadian studies. It is suggested that the extent of use of the substance in personal care products and in other products may be lower than the estimated dose and that exposure estimates from personal care products may be overestimated (Environment Canada and Health Canada, 2008a: 43-45).

The health effects of siloxanes are not covered extensively in the literature. It is noted in the health effects assessment that siloxane D5 has not been classified for carcinogenicity, genotoxicity or reproductive/developmental toxicity by an international agency. The assessment does reference reports by the Danish Environmental Protection Agency and the United States Environmental Protection Agency (Environment Canada and Health Canada, 2008a). While acute toxicity, irritant effects, sensitization and genotoxicity are not reported to be health effects of concern for siloxane D5, Lassen (2005) found that there are potential health effects related to repeated exposure to the lung and potential carcinogenic effects including uterine tumours. This is consistent with a study submitted by Dow Corning to the United States Environmental Protection Agency under the *Toxic Substances Control Act*. The study evaluated chronic toxicity and carcinogenicity of siloxane D5 on rats and concluded that the highest level of exposure resulted in a significant increase in uterine tumours (USEPA, 2009). Environment Canada and Health Canada (2008a) suggest that the high exposure levels related to these findings may be due to threshold effects.

The screening assessment identified considerable uncertainties in the risk of siloxane D5 to human health. For example, it noted that the assessment did not:

> take into consideration a full analysis of the mechanism of action of decamethylcyclopentasiloxane and it does not take into account possible differences between humans and experimental species in sensitivity to effects induced by this substance. There is uncertainty surrounding the mechanism of carcinogenicity following exposure via the inhalation route….There is uncertainty regarding the estimation of exposure and systemic dose because of the use of modelling and a lack of Canadian data (Environment Canada and Health Canada, 2008a: 50-51).

However, based on the available information and the overall findings of the screening assessment, it was determined that siloxane D5 is not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger to human life or health in Canada (Environment Canada and Health Canada, 2008a). Thus, the finding of toxicity made under the Challenge was based on meeting the criteria for ecological toxicity alone.

A proposed order to add siloxane D5 to Schedule 1, List of Toxic Substances under CEPA 1999 was published in the *Canada Gazette* in May 2009. The Government stated that the addition of siloxane D5 to Schedule 1 under section 90(1) would allow for the development of regulatory and non-regulatory measures to manage the human health and/or environmental risks (Government of Canada, 2009c). As risk management measures, the Government of Canada proposed the creation of concentration limits for siloxane D5 in order to minimize its release into municipal wastewater streams through the use of personal care products. It also proposed limiting the release of the substance into the environment from wastewater produced as part of manufacturing processes (Environment Canada, 2010f).

Within two months, in July 2009, a Notice of Objection was filed by the Silicones Environmental, Health, and Safety Council of North America which is a not-for-profit trade association representing silicone chemical producers and importers in North America (Thomas, 2009).[58] The trade association requested the establishment of a formal

[58] After a forty year history, the Silicones Environmental, Health, and Safety Council transitioned to become the Silicones Environmental, Health, and Safety Center in January 2013. The Silicones Environmental, Health, and Safety Center is a sector group of the American Chemistry Council with membership representing over ninety percent of the silicone chemical manufacturing capacity in North

Board of Review in response to the proposal to add siloxane D5 to Schedule 1. Under section 333(2) of CEPA 1999, the Minister of the Environment may establish a board of review to conduct an inquiry "into the nature and extent of danger" posed by siloxane D5. The Notice of Objection was filed by Karluss Thomas, Executive Director of the Silicones Environmental, Health, and Safety Council of North America and argued that a Board of Review

> is warranted as the Proposed Order to add…[siloxane] D5 to Schedule 1 is based on final screening assessments…that have been conducted in a manner that is not consistent with the best available science. Use of the best available science would not have resulted in the conclusion that…[siloxane] D5 "may cause adverse effects to aquatic organisms in certain Canadian environments" and "have the potential to cause ecological harm" (Thomas, 2009).

The Notice of Objection is primarily concerned with conflicting evidence around the bioaccumulative potential of siloxane D5. Further, the Silicones Environmental, Health, and Safety Council of North America contended that there would be potential socioeconomic consequences if siloxane D5 were listed on Schedule 1, including "severe global market impacts to Canadian companies importing, processing, and using, these substances." The trade association called for a Board of Review to "be convened to prevent a premature, inadequately supported Schedule 1 listing" (Thomas, 2009).

Upon receiving the Notice of Objection, the Government of Canada (2012e) considered new scientific information on siloxane D5 which became available from industry studies submitted to Environment Canada in January 2010, as well as scientific studies conducted by Environment Canada and in other jurisdictions. Based on the

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America including Bluestar Silicones, Dow Corning Corporation, Evonik Goldschmidt Corporation, Momentive Performance Materials, Shin-Etsu Silicones of America, Milliken (formerly SiVance), and Wacker Chemical Corporation (American Chemistry Council, Inc., 2013).

availability of new information, the Minister of the Environment established a Board of Review in August 2010. According to the terms of reference, the Board of Review would conduct an inquiry into the nature and extent of the danger posed by siloxane D5 and submit a final report to the Minister of the Environment before March 31, 2011 (Government of Canada, 2010c). The Chair of the Board of Review submitted a letter dated November 12, 2010 to the Minister of the Environment requesting an extension for the final report. The Board received information suggesting that new information would not be available until the end of 2010 or early 2011 and required an adequate amount of time in order to conduct a "thorough and comprehensive review of the nature and extent of the dangers posed by Siloxane D5." The Board committed to submitting its final report and recommendations by September 30, 2011. The Board of Review received a letter from the Minister of the Environment acknowledging this request on August 30, 2011. This letter required the report be translated into French and extended the final deadline for submission to October 31, 2011 (Siloxane D5 Board of Review, 2011: 76-77).

The Minister of the Environment appointed three toxicologists[59] to serve on the Board of Review. The Board consulted with each of the parties involved in the proceedings including Environment Canada; the applicant, Silicones Environmental, Health and Safety Council of North America; and the interveners, the Canadian

[59] The three members of the Board of Review included Chair, Dr. John Giesy who is the Canada Research Chair of Environmental Toxicology, Department of Veterinary Biomedical Sciences and Toxicology Centre at the University of Saskatchewan and a Distinguished Professor of Zoology Emeritus at Michigan State University; Dr. Sam Kacew who is the Associate Director of Toxicology at the McLauglin Centre for Population Health Risk Assessment and Professor in the Department of Cellular and Molecular Medicine at the University of Ottawa; and Dr. Keith Ross Solomon who is a Professor Emeritus in the Department of Environmental Science and Director of the Centre for Toxicology at the University of Guelph (Government of Canada, 2011e).

Cosmetic, Toiletry and Fragrance Association, and a coalition consisting of the Canadian Environmental Law Association, the International Institute of Concern for Public Health, Chemical Sensitivities Manitoba, and the Crooked Creek Conservancy Society of Athabasca. The Board of Review determined that it would focus its review on the nature and extent of the danger posed by siloxane D5 to the environment based on the initial screening assessment, additional information that became available, and direction from the Minister of the Environment (Government of Canada, 2010c; Siloxane D5 Board of Review, 2011).

The Board of Review investigated the nature and extent of the risk posed by siloxane D5 to the environment and whether detrimental effects may occur as a result of exposure to siloxane D5. The Board conducted a *de novo* risk assessment[60] that considered all available information surrounding the intrinsic physical and chemical properties of siloxane D5, as well as its toxicity, uses, exposures, and effects (Siloxane D5 Board of Review, 2011: 10). Specific findings of the Board of Review included:

- Siloxane D5 exceeds the regulatory threshold for persistence, but does not exceed the thresholds established in the *Persistence and Bioaccumulation Regulations*;
- While siloxane D5 can be accumulated into organisms from environmental matrices or food, it does not biomagnify through the foodchain; and
- Siloxane D5 will not accumulate to sufficient concentrations to cause detrimental effects in organisms in air, water, soils, or sediments (Siloxane D5 Board of Review, 2011: 9).

Thus, the Board of Review concluded that siloxane D5 does not pose a danger to the environment or its biological diversity (Siloxane D5 Board of Review, 2011: 9).

[60] A *de novo* risk assessment means that the Board of Review did not assess whether the conclusions of the Ministers of the Environment and Health were reasonable, but rather conducted its own assessment.

Based on the conclusions provided by the Board of Review, the federal government published a revised decision on siloxane D5 in February 2012. In reversing its decision, the Government concluded that siloxane D5 does not meet any of the criteria under section 64 of CEPA 1999 and that this substance is not entering the environment in a quantity or under conditions that constitute a danger to the environment. The Government formally annulled the original decision to add siloxane D5 to the List of Toxic Substances and all related risk management activities (Government of Canada, 2012e, 2012f).

The Board of Review for siloxane D5 was the first to be established under CEPA 1999. The reversal of the original decision by the Government of Canada, prompted by the Silicones Environmental, Health, and Safety Council of North America, raises questions about the application of the precautionary principle and may set a precedent for future regulation of toxic substances. In particular, the Board's conclusions "may make it more difficult for federal scientists to build a case for restricting problematic chemicals in future, particularly at a time when Environment Canada is already facing severe cuts to its overall budgets and still faces the task of completing assessments of approximately 1500 chemicals under Canada's Chemicals Management Plan over the next few years" (CELA, 2012b).

The Role of the Precautionary Principle

Decision-making under CEPA 1999 is said to be guided by the application of the precautionary principle. The precautionary principle is often promoted by environmental health advocates as an approach that encourages regulatory action when some evidence

of harm exists, despite uncertainty or contestation (Ley, 2009: 81). Vogel (2012: 75) suggests that it may be "the dangers that we do not yet adequately understand or know about [that] are likely to be more serious than those about which we already know." The precautionary principle is grounded in "anticipatory action in the absence of complete proof of harm, particularly where there is scientific uncertainty about causal links" and allows for decision-makers to act in a precautionary and protective manner in order to prevent harm to humans and the environment from exposure to toxic substances (Tickner, 1997). This principle guides a precautionary approach to decision-making in order to make risk assessment and management decisions around pollution prevention and the release of toxic substances into the environment (Ogilvie, 2001; Tickner, 1997).

The preamble of CEPA 1999 commits the Government of Canada to implementing the precautionary principle "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." This is consistent with the most widely used definition of the precautionary principle from the Rio Declaration on Environment and Development which was established in 1992 (Ogilvie, 2001). Principle 15 states that "[i]n order to protect the environment, the precautionary approach shall be widely applied.…Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations, 1992).

Vlek (2009) considers the Rio Declaration version of the precautionary principle used in CEPA 1999 to be weaker than the definition proposed at the Wingspread Conference in 1998 by treaty negotiators, activists, academics, and scientists from Canada, the United States and Europe. Participants in the conference

> believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment…[T]here is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary (Science and Environmental Health Network, 2013).

The Wingspread Consensus Statement promotes the implementation of the precautionary principle when "an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof" (Science and Environmental Health Network, 2013; Wilson, 2005). Unlike the definition in CEPA 1999, the Wingspread definition does not include provisions around "serious or irreversible damage" or cost-effectiveness. Many health and environmental groups promote the Wingspread definition as an alternative to the Rio Declaration definition used in CEPA 1999 because it also implies a duty to act (McClenaghan et al. 2003; Ogilvie, 2001).

The precautionary principle is also included in the administrative duties of CEPA 1999 under section 2(1) where the government must

> (a) exercise its powers in a manner that protects the environment and human health, applies the precautionary principle that, where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as reason for postponing cost-effective measures to prevent environmental degradation, and promotes and reinforces enforceable pollution prevention approaches;

> (j) protect the environment, including its biological diversity, and human health, from the risk of any adverse effects of the use and release of toxic substances, pollutants and wastes; and
>
> (k) endeavour to act expeditiously and diligently to assess whether existing substances or those new to Canada are toxic or capable of becoming toxic and assess the risk that such substances pose to the environment and human life and health.

While the precautionary principle allows for the justification of taking action, Environment Canada and Health Canada (2004: 11) note that the complexity of environment and health issues mean that most decisions cannot reflect absolute certainty and the use of the precautionary principle will vary from case-to-case depending on the degree of scientific certainty and the irreversibility or potential damage.

The House of Commons Standing Committee on Environment and Sustainable Development (2007) contends that the inclusion of the precautionary principle in the administrative principles of the Act means that the government is obliged to apply it. However, CEPA 1999 is critiqued for not operationalizing the precautionary principle in the assessment of toxic substances (Scott and Lewis, forthcoming). Environment and health advocates argue that there is a duty to act in accordance with the precautionary principle, to protect human health and the environment from exposure to substances which are CEPA-toxic and substances which are inherently toxic and have the potential to cause harm.

The House of Commons Standing Committee on Energy, the Environment and Natural Resources (2008: 4) note concerns that the legislation is sound but inadequately implemented. The Committee "believes that the lack of will to implement and enforce the

Act, and a shortage of necessary resources for that implementation and enforcement, are the weak links in the effectiveness of the CEPA [1999] environmental protection regime." There has been "little to no action taken to limit or manage a chemical before a complicated legal and political process confirms its toxicity" (CELA, 2007: 49). Dr. Kapil Khatter of PollutionWatch also pointed to the mechanisms under CEPA 1999 that had not yet been utilized.

> CEPA [1999] gives the federal government the powers to regulate any substance that it deems to endanger our health or the environment. It offers the government a range of tools to reduce pollution and to prevent harm. CEPA [1999], though, has not been effective in reducing pollution in Canada or in getting the worst chemicals off the market (House of Commons Standing Committee on Energy, the Environment and Natural Resources, 2008: 4).

The regulatory system is based on the principle that a certain level of risk is unavoidable which raises questions about the "acceptability of risk." Early risk management was based around the idea that the public could be completely protected from all risks (Health Canada, 1998). This is simply not possible within the risk society where we are exposed to substances which are invisible, do not respect territorial boundaries and have lengthy latency periods. These risks and subsequent health outcomes are often not the result of one single high-dose exposure, but rather the result of synergistic exposure to long-term cumulative doses of complex mixtures of substances. There is a lack of consensus around levels of acceptability and the risks associated with exposure to toxic substances. For example, in 1999, a Member of Parliament, the Honourable Charles Caccia asked "[w]hat comfort is it to Canadians if toxic chemicals get catalogued and assessed, but not necessarily eliminated?" (Batt, 2002: 5; Parliament of Canada, 1999).

Industry stakeholders propose that risk is acceptable in the name of socioeconomic progress. By factoring "*financial* risks and benefits into the same equation as *health* risks and benefits, risk management frames illness as an acceptable trade-off for economic prosperity and/or jobs" (Batt, 2002: 6). Among the general public, it is suggested that the degree of acceptance for risks related to health is low (Bouder, 2006). Environmental and breast cancer activists question the ethics around the acceptability of exposing populations to toxic substances which may result in detrimental health outcomes; exposing pregnant women to toxic substances which may result in their child developing health issues later in life; and exposing women to toxic substances which may result in the development of breast cancer.

The acceptable levels of risk associated with established guidelines and margins of exposure vary up to a million-fold (Health Canada, 1998: 9). Based on the notion that risk is unavoidable and to some degree, acceptable, there has been an emphasis on risk management over precaution (Scott and Lewis, forthcoming). Health Canada (1998: 2) concludes that risk management strategies provide a "high degree of health protection, based on the absence of observable health effects using epidemiological methodology." The risk management approach emphasizes control or reduction rather than elimination or substitution (CELA, 2007). As Scott (2009b: 70-71) notes:

> [i]t is increasingly clear that the central assumptions of our risk assessment models are completely ineffective at capturing the complexity that characterizes contemporary pollution harms. Advocates believe that 'precaution' demands allegiance to 'an entirely new set of assumptions', including the vulnerability of the 'environment' and 'bodies', and the serious limitations of our science with respect to the accurate prediction of the interactions between chemicals, between environments and bodies, and between chemicals and bodies. Most importantly,

> precaution assumes the availability of alternative, less harmful processes and products.

In this respect, precaution becomes particularly relevant in the case of exposure to endocrine disrupting chemicals, which are ubiquitous, display complex mechanisms and may result in detrimental health outcomes at low doses.

Endocrine Disrupting Chemicals

There has been growing concern from the public about the effects of endocrine disrupting chemicals on the environment and human health. The House of Commons Standing Committee on Environment and Sustainable Development received testimony about this issue as early as the legislative review of CEPA 1988. In their briefing to the Committee submitted in 1994, the Canadian Environmental Law Association raised concerns about the effects of endocrine disrupting chemicals.

> In recent years there has been growing concern that some chemicals – particularly persistent, bioaccumulative, chlorinated hydrocarbons – may be the cause of a variety of serious effects, including reproductive, developmental and behavioural abnormalities, in both humans and other species. The possible effects of such chemicals on the reproductive integrity of humans, particularly the suggested estrogenic properties of some pollutants, have now developed into a priority issue (House of Commons Standing Committee on Environment and Sustainable Development, 1995: 33).

Consistent with Beck's (1992) argument that toxic substances do not respect territorial boundaries, stakeholders expressed concern about pesticides and PCBs which originated in the southern industrial and agricultural regions of North America, Europe and Asia and are detected in wildlife in northern Canada and in the breast milk of northern aboriginal women (House of Commons Standing Committee on Environment and Sustainable Development, 1995).

It is suggested that the precautionary principle should be utilized in the management of endocrine disrupting chemicals (Servos et al., 2001; World Wildlife Fund Canada, 1998). Industries and sites of concern around endocrine disrupting chemicals include municipal effluents, agriculture, textile mill effluents, pulp and paper sector, mining and metal work, automotive, food canning, bars, casinos and racetracks, historically contaminated sites, identified areas of concern such as the Great Lakes, and contaminants in the Arctic including aboriginal food sources (Brophy et al., 2012; Servos et al., 2001). There is potential for risk assessment processes to "be used to identify effects produced via endocrine disrupting mechanisms, but subtle effects on growth, reproduction and development must also be considered" (Servos et al., 2001: 337). In order to adequately account for the impacts of endocrine disrupting chemicals, risk assessments need to consider sensitive life history stages, windows of susceptibility, the significance of delayed responses and effects, and the effects of mixtures and mixture interactions (Servos et al., 2001: 337).

Unlike the original Act, CEPA 1999 requires the Minister of the Environment and the Minister of Health to conduct research on hormone disrupting substances (Environment Canada, 2010e; Environment Canada and Health Canada, 2004).[61] Part 3, Section 44(4) under the Monitoring, Research and Publication requirements of CEPA 1999 involves research on the health and environmental impacts of endocrine disrupting chemicals. Specifically, the Minister of the Environment and Minister of Health must

[61] Hormone disrupting substances are defined under section 43 in CEPA 1999 as a "substance having the ability to disrupt the synthesis, secretion, transport, binding, action or elimination of natural hormones in an organism, or its progeny, that are responsible for the maintenance of homeostasis, reproduction, development or behaviour of the organism."

> conduct research or studies relating to hormone disrupting substances, methods related to their detection, methods to determine their actual or likely short-term or long-term effect on the environment and human health, and preventive, control and abatement measures to deal with those substances to protect the environment and human health.

Section 45 also requires the Minister of Health to i) conduct research and studies relating to the role of substances in illnesses or health problems; ii) collect, process, correlate and publish on a periodic basis data from any completed research or studies; and iii) distribute the available information to inform the public about the effects of substances on human health. This requirement has the potential to play an important role in preventing diseases such as breast cancer which are influenced by the role of endocrine disrupting substances. However, the ways in which the government is required to follow-through are unclear and the requirements in CEPA 1999 lack specificity with vague timelines such as a "periodic basis" that are open to interpretation. Ecojustice and the Canadian Environmental Law Association submitted a petition to the Office of the Auditor General of Canada in July 2012 seeking information about the federal research activities under Environment Canada and Health Canada on the effects of hormone disrupting substances as required by CEPA 1999. The petition inquires about how the data is collected on substances considered new under CEPA 1999; about the budget allocated to research and the involvement of Canada in international research initiatives; and how Environment Canada and Health Canada are using research results for risk assessment and risk management under CEPA 1999. Replies to the petition from Environment Canada and Health Canada are not yet available (Office of the Auditor General of Canada, 2012).

PBDE Flame Retardants and Phthalates

The House of Commons Standing Committee on Environment and Sustainable Development (2007) suggests that other federal governments have applied the precautionary principle more rigorously than Canada in cases such as polybrominated diphenyl ether (PBDE) flame retardants and phthalates in the European Union (House of Commons Standing Committee on Environment and Sustainable Development, 2007). PBDE flame retardants are lipophilic, bioaccumulative and have endocrine disrupting properties. These substances are an issue of global concern; their chemical structure is similar to PCBs and DDT and their distribution in the environment follows similar patterns as they are widespread moving beyond territorial boundaries (Rahman et al., 2001). The Restriction of the use of certain Hazardous Substances in electrical and electric equipment (RoHS) in the European Union bans new electrical and electronic equipment containing more than designated maximum allowable levels of PBDE flame retardants as of 2006 (Bromine Science and Environmental Forum, 2013; Steven Engineering Inc., 2013). This directive also requires that polybrominated diphenyl ether and polybrominated biphenyl flame retardants and heavy metals including lead, mercury, cadmium, and hexavalent chromium are substituted by safer alternatives (European Commission, 2013).

Exposure to endocrine disrupting phthalates is ubiquitous. The European Union ministers voted unanimously in 2004 to ban the use of di(2-ethylhexyl) (DEHP), di-n-butyl (DBP) and n-butyl benzyl (BBP) phthalates from use in children's toys in concentrations greater than 0.1 percent. This decision was grounded in the precautionary

principle and is viewed as protective of health and the environment (Euractiv, 2004). The European Union listed phthalates DEHP, DBP and BBP on the REACH Candidate List in October 2008, they were subsequently included on the Authorisation List in February 2011 and are scheduled to be phased-out by February 2015 (Plasticisers and Flexible PVC Information Centre, 2010). Danish Minister of the Environment announced a complete ban of DEHP, DBP, BBP, and DIBP (diisobutyl) phthalates in a wide range of consumer products and has also proposed banning the four phthalates at the EU level (Euractiv, 2012). Denmark has developed a progressive Phthalate Strategy which is grounded in the precautionary principle in its concern about the environmental health implications as a result of exposure to phthalates. It also recognizes the "cocktail effect" of the mixture of substances and proposes to address the class of substances rather than the substance-by-substance approach. "It is neither efficient nor enough to introduce legislation on phthalates one by one. With this long-term strategy, we take into account that several phthalates have the same effect on the body, and that we are often exposed to several phthalates at once" (Denmark Ministry of the Environment Environmental Protection Agency, 2013; McClenaghan et al., 2003). The current legislation around phthalates in the European Union and Denmark involves processes including

- *Classification*: Twelve phthalates have European Union-harmonized classification with eleven classified as toxic to reproduction;
- *Authorization*: Seven phthalates have been included in the European Union Candidate List of Substances of Very High Concern; and
- *Restrictions*: There are concentration limits for six phthalates in toys and childcare articles in the European Union. Four phthalates have been banned in Denmark in a wide range of products in concentrations higher than 0.1 percent, and all phthalates have been banned in Denmark in toys and childcare articles for

> children ages 0-3 years in concentrations higher than 0.05 percent (Danish Environmental Protection Agency, 2013: 7).

The aim of the Danish Phthalate Strategy is to generate new knowledge about the risks associated with these substances and will potentially result in the restriction of other phthalates (Ministry of the Environment Environmental Protection Agency, 2013). In order to adequately address endocrine disrupting substances within Canada's legislative and regulatory frameworks, a specific national risk management strategy would need to be developed (Servos et al., 2001: 337).

Applying Precaution in the Assessment and Management of Risk

The precautionary principle has not been meaningfully applied in the regulation of toxic substances through CEPA 1999 and the *Chemicals Management Plan*. If the regulatory regime were to truly utilize the precautionary principle, the focus would shift to being precautionary rather than reactionary and would not assume that humans are meant to possess a body burden of toxic substances (Lewis, 2010; Seager, 2003). "It is seen as acceptable for there to be delays in responding or refusals to act based on gaps in the research data…[The government] has rarely taken preventive measures in the face of these uncertainties and has thereby allowed existing exposures to continue" (Lewis, 2010: 25). The duty to act and to assess and manage risks associated with toxic substances does not adequately incorporate the precautionary principle which will be further explored in the following discussion about exposure and hazard.

Risk and Hazard Assessment

Concerns about the mandatory exposure requirement in the definition of CEPA-toxic were raised as early as the Parliamentary Review of CEPA 1988. The House of

Commons Standing Committee on Environment and Sustainable Development (1995) recommended changing the definition of CEPA-toxic to include both a risk assessment and a hazard assessment. A hazard assessment does not contain an exposure requirement but rather includes an assessment of the intrinsic hazard or intrinsic toxicity of the substance and its potential to cause harm. This discussion continued as part of Pollution Probe's report on standard setting for toxic substances in Canada which was released in 2001. Non-governmental and non-industry participants promoted hazard assessment as either an alternative or in addition to risk assessment under CEPA 1999 that would be able to "trigger the use of the precautionary principle, which requires actions to be taken to remove or minimize the potential risk" (Ogilvie, 2001: 57). Despite being raised as significant concerns as early as 1995, there have been no changes to the exposure requirement of CEPA-toxic or the risk assessment process as part of CEPA 1999. As a result, a toxic substance in Canada "cannot be regulated merely for having the inherent potential to cause harm" (Cooper et al., 2000: 202; Scott and Lewis, forthcoming).

The Canadian Environmental Law Association and Canadian Institute for Environmental Law and Policy (1996) cite toluene as an example of a toxic substance that possesses inherently toxic properties but was found to be not toxic under CEPA because of the exposure requirement. Toluene is an aromatic hydrocarbon which is used in cosmetics including nail polish and as a petrochemical solvent and paint thinner. This substance is linked to numerous health concerns including developmental and reproductive toxicity, neurotoxicity, and organ system toxicity (Environmental Working Group, 2013; Office of Environmental Health Hazard Assessment, n/d). "Toluene is

listed in virtually every provincial hazardous waste and occupational health and safety regulation in the country" (CELA and CIELAP, 1996: 106). However, while toluene was originally included on the Priority Substances List, it was subsequently found to be not toxic under CEPA[62] and, as such, is not subject to risk management provisions (Environment Canada and Health Canada, 1992; Health Canada, 2007e).

In California, toluene falls under the risk management provisions of the *Safe Drinking Water and Toxic Enforcement Act* of 1986, also known as Proposition 65. Proposition 65 requires the State to publish a list of toxic substances that are known to cause cancer, birth defects or other reproductive harm and which must be updated at least once a year. Industry and businesses must notify citizens about "significant amounts of chemicals in the products they purchase, in their homes or workplaces, or that are released into the environment" (Office of Environmental Health Hazard Assessment, 2013). The list is currently comprised of approximately 800 chemicals, including toluene (Office of Environmental Health Hazard Assessment, 2013; State of California, 2013a). To some extent, the onus of responsibility is placed on the individual to use the information provided though Proposition 65 to reduce exposures that may not be

[62] The Government of Canada addressed paragraph 11 under CEPA in assessing the potential impact of toluene exposure on the environment and human health. Paragraph 11(c) considers the effects on human life or health and it was concluded that the estimated total average daily intake of toluene for the Canadian population is between 50-670 times less than the tolerable daily intake derived from bioassays in animal studies and data from clinical studies (Environment Canada and Health Canada, 1992: 16-17). However, it is noted that the available epidemiological data are unable to adequately assess the carcinogenicity of toluene in humans (Environment Canada and Health Canada, 1992: 15). Based on these findings, the Ministers of Environment Canada and Health Canada concluded that "the current concentrations of toluene present in the environment do not constitute a danger in Canada to the environment or to the environment on which human life depends or to human life or health. Therefore, toluene is not considered to be 'toxic' as interpreted under section 11 of the *Canadian Environmental Protection Act*" (Environment Canada and Health Canada, 1992: v).

adequately controlled under other state or federal regulation. However, it is also noted that this law has created incentives for manufacturers to remove toxic substances that are listed as part of this initiative. For example, following their inclusion on the list, toluene was removed from many nail care products, and the carcinogens trichloroethylene and methylene chloride are no longer used in most correction fluids and reformulated paint strippers (Office of Environmental Health Hazard Assessment, 2013).

The European Union placed restrictions on toluene in 2004 so that the substance "shall not be placed on the market, or used, as a substance or in mixtures in a concentration equal or greater than 0.1% by weight where the substance or mixture is used in adhesives or spray paints intended for supply to the general public" (Armstrong and Dupont, 2012: 52). Seventy-four percent of member states (twenty countries) carried out enforcement action on toluene by 2012 (Armstrong and Dupont, 2012). The European Union has also restricted the content of toluene in nail products to twenty-five percent and included conditions of use which require that the label must contain warnings that the products be kept out of reach of children and used by adults only (Verheugen, 2009).

Traditional risk assessment and management processes fall short in the risk society (Beck, 1992). The risk assessment process determines toxicological effects utilizing threshold values and the dose-response relationship. The use of threshold values in the risk assessment process suggests that threshold effects occur only at a specific level of exposure, whereas non-threshold effects occur at any level of exposure to a substance or product. Health Canada (2007c: 6) contends that a toxicological threshold exists below which adverse effects do not occur.

> Below a certain minimum dose,…compensatory mechanisms can mitigate the adverse effects of a substance, even on a continuing basis. At higher dose levels, however, the ability of the organisms to compensate or adapt becomes overwhelmed, leading to an impairment in organ function or development of disease state (Health Canada, 2007c: 6).

However, exposure data and threshold effects, the premise of risk assessment, do not adequately account for the possibility of substances such as endocrine disrupting chemicals that have low dose effects or result in cumulative exposures. There is a significant critique from the field of epidemiology of the dose-response relationship which is utilized in risk assessment processes and is based on traditional toxicology.

The traditional dose-response relationship posits that toxicological effects increase with increased exposure and dose of a toxic substance (Health Canada, 2007c). The high dose animal testing and linear extrapolation utilized in toxicology does not allow for the potential of health effects occurring below the "safe" levels utilized in evaluating threshold values (Birnbaum, 2012; Brophy et al., 2013). Vandenberg et al. (2012) analyzed hundreds of epidemiological studies in order to demonstrate the impact of low-dose effects of endocrine disrupting chemicals on human health in comparing the role of non-monotonic responses[63] and the traditional dose- response relationship.

> Whether low doses of EDCs [(endocrine disrupting chemicals)] influence certain human disorders is no longer conjecture, because epidemiological studies show that environmental exposures to EDCs are associated with human diseases and disabilities.…[W]hen nonmonontonic dose response curves occur, the effects of low doses cannot be predicted by the effects at high doses. Thus, fundamental changes in chemical testing and safety determination are needed to protect human health (Vandenberg et al., 2012).

[63] Traditional monotonic dose response curves demonstrate the relationship between the concentration of a toxic substance and an adverse effect (i.e., "the dose makes the poison"). However, non-monotonic dose response curves demonstrate situations where the effect of a toxic substance may be greater at lower doses than at higher doses (USEPA, 2013b).

In demonstrating the continued debate and contested nature around low dose exposures to endocrine disrupting substances, the United States Environmental Protection Agency (2013a) has recently produced a *State of the Science Report* to evaluate the impact of potential non-monotonic dose response relationships to estrogen-, androgen-, and thyroid-based modes of action and the current risk assessment and management processes. This comes in response to the Vandenberg et al. (2012) article that reviewed hormones and endocrine disrupting chemicals and in particular, their low-dose effects and non-monotonic dose responses. The article "criticized the [US] government's decades old-strategy for testing the safety of many chemicals found in the environment and in consumer products" (Bienkowski, 2013b). The Environmental Protection Agency's draft report concludes that the current testing of endocrine disrupting chemicals is adequate for detecting low-dose effects of toxic substances; the "current testing strategies are unlikely to mischaracterize, as a consequence of NMDR [non-montonic dose responses], a chemical that has the potential for adverse perturbations of the estrogen, androgen or thyroid pathways" (USEPA, 2013c: 15). A trade association, the American Chemistry Council, praised these conclusions stating that this "affirms what mainstream scientists have expressed for years: the purported scientific evidence for non-monotonic low dose exposures leading to endocrine disruption and adverse effects is, at best, very weak" (Bienkowski, 2013b). However, lead author of the *Endocrine Reviews* article, Dr. Laura Vandenberg criticized the draft report and the suggestion that high dose testing cannot predict safety or a lack of risk at low doses as it "flies in the face of our knowledge of how hormones work…[Endocrine disrupting chemicals] are overtly toxic

at high doses but act like hormones, with completely different actions, at low doses" (Bienkowski, 2013b). She also suggests that the Environmental Protection Agency has used out-of-date studies on both atrazine and BPA (Bienkowski, 2013b). The draft report will be peer reviewed through the National Academies of Science and through a public comment process (USEPA, 2013d).

Endocrinologists and other environmental health researchers and advocates are raising competing paradigms to contest the reliance on toxicology and the dose-response relationship in risk assessment processes (Darbre and Fernandez, 2013; Grossman, 2012, 2013; Pesch et al., 2004; Ritter, 2011; Vandenberg et al., 2009, 2012). This debate is clearly demonstrated by the divergent positions in recently published editorials by Dietrich et al. (2013) and a subsequent response by Gore et al. (2013). Editors of toxicology and pharmacology journals prepared the Dietrich et al. (2013) editorial which demonstrates the contestation around issues of the risk assessment of endocrine disrupting chemicals, threshold values and the precautionary principle. They contend that detrimental effects associated with endocrine disrupting chemicals can be determined exclusively through toxicity studies. The authors argue that

> regulations that profoundly affect human activities, that legally impose significant fines and even detention, should not be based on irrelevant tests forced to be regarded as relevant by administrative dictates, and on arbitrary default assumptions of no thresholds. Such standards would be contrary not only to science, but to the very principles of an enlightened governance and social contract. Not only scientists but society itself would pay dearly if unscientific approaches were to undermine our everyday practice of science, and the stringency of data analysis and evaluation developed by scientific thinking over the past centuries (Dietrich et al., 2013: A1).

Gore et al. (2013) published a formal response refuting Dietrich et al. in *Endocrinology.*

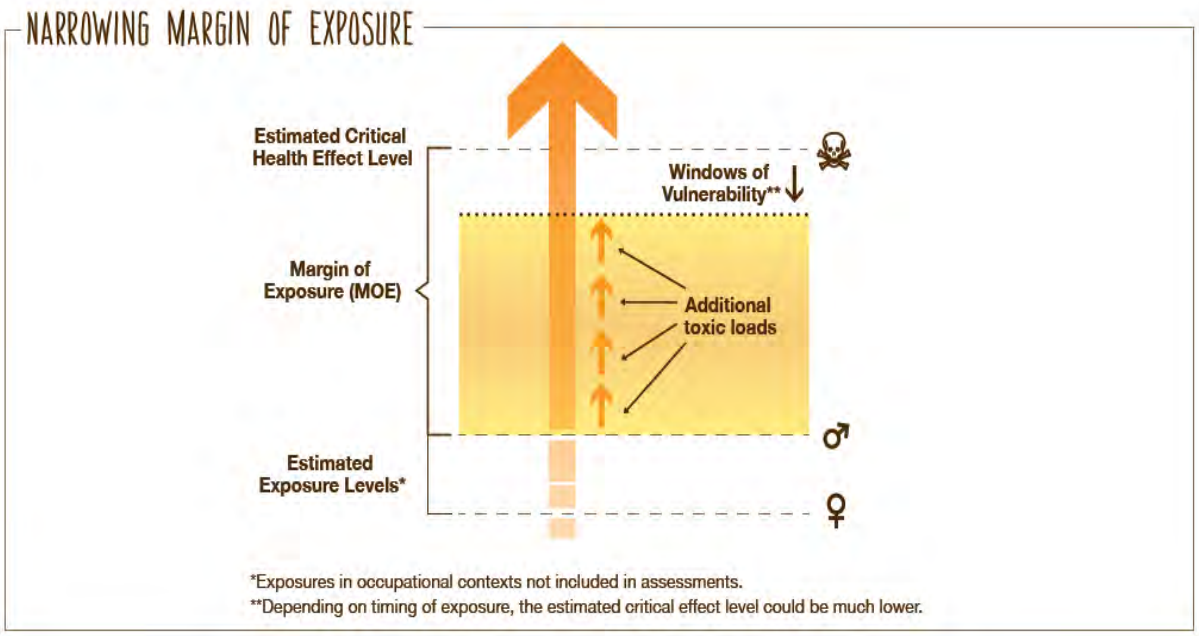
It is suggested that the latter article is "neither based on the fundamental principles of how the endocrine system works and how chemicals can interfere with its normal function, nor does it consider the consequences of that interference….[It] also ignores a growing and rigorous body of literature on both endogenous hormonal and exogenous EDC effects" (Gore et al., 2013: 3958). The authors contend that regulation of endocrine disrupting chemicals should be based on science and expertise from reproductive biology, endocrinology, medicine, genetics, behaviour, developmental biology, and toxicology (Gore et al., 2013).

The role of scientists in influencing law, policy and practice of the federal government has been diminishing in recent years in Canada. This is reflected in the 700 jobs cuts at Environment Canada in 2011 and repeated accusations of "muzzling" federal scientists from speaking publicly about peer-reviewed research results (CBC, 2011c, 2011d, 2013b; De Souza, 2013; Fitzpatrick, 2011; Gatehouse, 2013; Klinkenborg, 2013; Makuch, 2013; McLeod, 2013; Woods, 2013). However, the current regulatory regime remains highly dependent on very specific types of expertise, including the exclusive reliance on toxicology for the risk assessment processes associated with toxic substances. For instance, the Minister of the Environment appointed the representatives to the Board of Review for siloxane D5 in 2010 -- all three members are toxicologists (Government of Canada, 2011e).

The distinction between threshold and non-threshold effects is of particular concern with priority risks such environmental links to cancer (Saner, 2010). Lewis (2011: 21) notes that the margin of exposure assessment approach which is utilized in

determining whether toxic substances are "safe," involves determining the "difference between the estimated critical health effect level of the chemical (the threshold at which a chemical is considered harmful to human health or the environment), and its estimated exposure level." However, this approach does not account for the potential health effects of low dose and cumulative exposures or how sex and gender can affect the margin values. The current margins of exposure do not account for the timing of exposure, the impact of windows of susceptibility, and the role of gender in creating disproportionate exposure to toxic substances through domestic responsibilities (Lewis, 2011). Women may be more susceptible to exposures to toxic substances and subsequent health outcomes based on the timing of exposure and windows of susceptibility. These windows of susceptibility involve periods of development or hormonal activity in which women's bodies may be more susceptible including the prenatal period, childhood, puberty, menstruation, pregnancy, and menopause (Birnbaum, 2009; Brophy et al., 2012; Cooper et al., 2000; Diamanti et al., 2009; Gray, 2010; Schug et al., 2011; and Schwarzman and Janssen, 2010).

It is likely that the margins of exposure used in risk assessments are vastly over-estimated in many cases. It is proposed that the margins of exposure should be narrowed in order to adequately account for the risk associated with exposure to toxic substances and specifically with the risk in relation to women's exposure and detrimental health outcomes (Lewis, 2011; Scott and Lewis, forthcoming). An approach which narrows the margins of exposure in order to adequately account for women's risk associated with exposure to toxic substances is reflected in the diagram below:



(Lewis, 2011: 21).

de Leon, Madray and Richardson (2010: 9) also recommend that risk management should be initiated by hazard rather than exposure data. There has been little emphasis on the elimination of toxic chemicals as an overall objective of the *Chemicals Management Plan* which is contradictory to the goal of pollution prevention as the cornerstone of CEPA 1999. The current practice of risk assessment in Canada enables widespread environmental contamination and detrimental health outcomes before the risks can be assessed and managed; the process is inherently reactionary rather than precautionary (de Leon, 2010: 6; Lewis, 2011). The regulatory process is unable to be truly precautionary as long as the exposure component is required as it becomes necessary for harm to occur before preventive measures can be established despite government endorsements of the precautionary principle.

Conclusions

There is a need for coherence across and among government policies and legislation in order to protect the health of Canadian citizens (Environment Canada and Health Canada, 2004: 13). This analysis indicates that Canada's environmental legislation is not capable of being protective with the exposure requirement in the assessment of risk. The use of an exposure-based approach in risk assessment processes rather than a hazard-based approach does not account for the inherent toxicity of a toxic substance. Despite the inclusion of the precautionary principle in CEPA 1999, the implementation of CEPA 1999 and the *Chemicals Management Plan* continues to be reactionary rather than precautionary in the assessment and management of toxic substances. The regulatory regime does not adequately account for low dose, cumulative exposures of toxic substances including endocrine disrupting chemicals. These gaps do not allow for the legislation to prevent detrimental health outcomes and enact a primary prevention approach to women's health. The following chapter will explore issues of sex, gender, risk and responsibility which emerge in Canadian law, policy and practice related to toxic substances.

Chapter 5

Toxics Regulation: Sex, Gender, Risk and Responsibility

Introduction

This chapter examines the relationship between theory and practice in an examination of the regulatory regime for toxic substances. It draws upon government publications, grey literature and media coverage in order to explore questions and tensions around risk, precaution, and prevention. The chapter begins with a discussion of the role of sex- and gender-based analysis in Canadian health policy. It asks where the burden of risk in preventing detrimental health outcomes is presumed to lie. It explores the responsibilization paradigm which places the onus of responsibility for assuming risks associated with everyday exposures on the individual, and the concept of precautionary consumption which encourages individuals to avoid everyday exposures to toxic substances through decision-making practices as consumers. The chapter then asks who is at risk of exposure to toxic substances and who the policies are designed to protect. Health Canada identifies children as a specific vulnerable population of concern, but women are not considered to be at-risk or a susceptible population. It provides an overview of the regulation of bisphenol A (BPA) in Canada and a critique of the limited scope of its regulation. It explores issues of occupational health exposures to toxic substances along with the difficulties related to accountability and compensation. Finally, this chapter also considers women's health and cancer organizations' messaging and campaigns around breast cancer which are influenced by or framed in response to government policies.

The Role of Sex- and Gender-Based Analysis in Canadian Health Policy

My focus in this research is on toxic substances management under CEPA 1999 and the *Chemicals Management Plan* and the primary prevention of breast cancer. There are, of course, broader policy areas in Canada related to breast cancer prevention, including those related to sex- and gender-based analysis. This section provides a brief overview of the policy history of health and sex- and gender-based analysis in Canada in order to provide context for a call to apply a gender lens in health research, and for the applied use of sex- and gender-based analysis within the development of regulation and policy relevant to environmental health.

In reviewing the history of breast cancer, it is evident that the disease is both highly sexed and gendered. The Women's Health Bureau of Canada was established in 1993 with a mandate of "enhancing Health Canada's capacity to promote equitable health outcomes for women and men, boys and girls in Canada" (Tudiver, 2009: 21). By signing the *Beijing Declaration and Platform for Action* at the Fourth World Conference on Women in 1995, Canada demonstrated its commitment to the recognition that both biology and social context have a significant influence on women's health. This document built upon the World Health Organization's definition of health as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2003). The declaration utilized a broad definition which additionally identified women's health as involving "their emotional, social and physical well-being and [it] is determined by the social, political and economic context of their lives, as well

as biology" (Clow et al., 2009: 6). Just as sex and gender were used interchangeably during the 1990s, "women" and "gender" were used synonymously in discussions of health (Greaves, 2009). However, it is important to note that both men and women experience health effects related to gender.[64]

At the same time as the 1995 conference, the government published a federal plan entitled *Setting the Stage for the Next Century: The Federal Plan for Gender Equality* (Status of Women Canada, 1995). This report called for the implementation of gender-based analysis in federal departments and agencies including:

- the development and application of tools and methodologies to assist in the implementation of gender-based analysis;
- providing training on gender-based analysis of legislation and policies;
- the development of indicators to assess progress around gender equality;
- the collection and use of gender-disaggregated data;
- the use of gender-sensitive language across the federal government; and
- the evaluation of the effectiveness of gender-based analysis (Minister of Public Works and Government Services, 2009: 6).

The federal government also established the Women's Health Contribution Program in 1995 which was designed to address gaps in women's health research, as well as "improve the health status of women in Canada by enhancing the health system's understanding of, and responsiveness to, women's health issues" (Health Canada, 2010b). The Women's Health Contribution Program included the Atlantic Centre of Excellence

[64] There is a growing field of research on men's health which utilizes a gender lens (UBC, 2011). Greaves (2009: 17) attributes both the fields of gender and health, and men's health as positive by-products of feminist theory, activism and policy-making of the past forty years.

for Women's Health, the British Columbia Centre of Excellence for Women's Health, the Prairie Women's Health Centre of Excellence, and the Centre of Excellence for Women's Health - Consortium Université de Montréal. The Centres of Excellence[65] were established as multidisciplinary partnerships between academic researchers and community-based organizations to conduct policy-oriented research which investigates the way sex and gender interact with other determinants of health (Armstrong, 2012; Health Canada, 2003b). The Women's Health Contribution Program also funded the Canadian Women's Health Network[66], Réseau Québécois d'Action pour la Santé des

[65] The mandate of the Atlantic Centre of Excellence for Women's Health (ACEWH) includes contributing to research on women's health issues, promoting an understanding of gender as a critical variable in health outcomes, and enhancing the health system's responsiveness to the needs and concerns of women and girls. ACEWH's specific research focuses on health status and services; women's unpaid caregiving; HIV/AIDS; healthy living; obesity; sex- and gender-based analysis; gender mainstreaming; and social and economic inclusion (ACEWH, 2013). The mission of the British Columbia Centre for Excellence in Women's Health (BCCEWH) is to improve the health status of women by conducting innovative research and developing women-centred programs, practice and policies. Specific initiatives conducted by the BCCEWH include work around healthy choices in pregnancy; coalescing on women and substance use; pregnancy and smoking cessation; and developing *The Source*, a web-based resource of data sources, reports and synthesis documents related to women's health (BCCEWH, 2013).The mandate of the Prairie Women's Health Centre of Excellence (PCEWH) includes improving the health of women in Manitoba and Saskatchewan through making the health system and social systems more responsive to the health and well-being of women and girls. Program areas of the PCEWH include women and poverty; gender and health; rural, remote and Northern women's health; and Aboriginal women's health (PCEWH, 2013). Work conducted by the Centre of Excellence for Women's Health - Consortium Université de Montréal (CESAF) included caregiving, gender sensitive health indicators, experiences of immigrant and refugee women with the health care system, immigration and perinatal risk, and the health of Aboriginal women. The CESAF closed its office on August 31, 2001 (CWHN, 2012a).

[66] The Canadian Women's Health Network (CWHN) was created in 1993 as a voluntary national organization dedicated to improving the health and lives of girls and women in Canada by producing, sharing and distributing education and relevant information. In its commitment to women's health and equity, specific initiatives include establishing a visible national presence for women's health in Canada; providing user-friendly and reliable health information, resources and research; working to change inequitable health policies and practices by contributing women's voices and expertise; acting as a knowledge broker for researchers, clinicians, decision makers, media, and the public; encouraging and promoting community-based participatory research; monitoring emerging issues and trends affecting women's health; and acting as a form for debate on women's health research and policy issues (CHWN, 2012b).

Femmes[67], the National Network on Environments and Women's Health[68], specific research projects such as the Aboriginal Women's Health and Healing Research Group[69], and working groups including Women and Health Protection and the National Coordinating Group on Health Reform and Women[70] (Health Canada, 2003b, 2010b). While the individual organizations had distinct mandates, as a group they conducted research on issues which impact women's health including the role of social, economic and physical environments.

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[67] The Réseau Québécois d'Action pour la Santé des Femmes (RQASF) (Quebec Womens' Health Action Network) was founded in 1997 as a provincial, multi-disciplinary, non-profit organization. Their mission is to work closely with others in improving the physical and mental health of women, as well as their living conditions. Specific areas of interest of the RQASF include education campaigns around menopause; cognitive health and aging; homophobia and heterosexism; body image; and the medicalization of health (RQASF, 2013).

[68] The National Network on Environments and Women's Health (NNEWH) was founded in 1996 and is committed to producing policy-oriented research on the social, economic and physical environments that impact women's health. NNEWH seeks to improve the health of Canadian women through research which examines the ways in which environments impact the health status, beliefs and practices of women. NNEWH utilizes a sex-, gender- and diversity-based framework in its analysis of health research, policy development, and education materials. NNEWH benefits from expertise from academic research associates, community partners, service providers, and women's groups (NNEWH, 2013).

[69] The Aboriginal Women's Health and Healing Group represents a national network of First Nations, Métis and Inuit women researchers interested in community-based research focused on the health and healing of Aboriginal women, their families and communities. The group supports community-based health and healing research done by and with Aboriginal women, as well as developing policy recommendations (CWHN, 2012c).

[70] Women and Health Protection (WHP) is a coalition of community groups, researchers, journalists, and activists who are concerned with the safety of pharmaceutical drugs. WHP has focused on direct-to-consumer advertising, post-marketing surveillance, risk management and the precautionary principle, and the regulation of natural health products. WHP is particularly concerned with the impact of health protection legislation on Canadian women (WHP, 2010, 2012). Women and Health Care Reform (WHCR) is a multi-disciplinary, collaborative group that investigates and advises around the effects of health care reforms on women as providers, decision makers and users of health care systems. The mandate of WHCR is to coordinate research on health care reform in order to translate research into policy and practice. WHCR's areas of interest include ancillary health care work; environment; evidence about health and health care; gender and disaster management; gender and mental health of female health care workers; women and health care reform; home care; long-term care; maternity care; primary health care; principles of sex- and gender-based analysis of health care reform; private health insurance; privatization; quality of health care; and timely access to care (WHCR, 2013).

Health Canada's Women's Health's Strategy stated in 1999 that the department will "apply gender-based analysis to programs and policies in the areas of health system modernization, population health, risk management, direct services and research" (Health Canada, 1999; Health Canada, 2003b: 6). In *Exploring the Concepts of Gender and Health,* Health Canada (2003: 1) promotes the integrated use of gender-based analysis

> throughout the research, policy and program development processes [which] can improve our understanding of sex and gender as determinants of health, of their interaction with other determinants, and the effectiveness of how we design and implement sex- and gender-sensitive policies and programs.

It was during this time period that that there was a broader shift away from a focus on women's health and towards "gender and health." This shift is reflected in the federal government's adoption of the Gender-Based Analysis Policy in 2000. The intent of this policy was to attain gender equality through the use of gender-based analysis and fulfill the Government of Canada's domestic and international commitments to equality between men and women (Hankivsky, 2007a; Health Canada, 2010c). There was an attempt to mainstream gender issues, but some found these policies problematic as the focus on gender more broadly may be framed as a deliberate shift away from research and policy focused on women's health (Armstrong, 2012). The focus on gender may be framed as "less threatening to government than a woman-centred approach. Consequently, focusing on gender may be a way to avoid a focus on women and avoid funding women specific issues" (Saulnier et al., 1999: 7).

The Gender-Based Analysis Policy was replaced by the Health Portfolio Sex- and Gender-Based Analysis Policy in 2009 to develop, implement and evaluate research, programs and policies to address the different needs of men, women, boys, and girls. This

policy applies to the Health Portfolio of the Government of Canada which includes Assisted Human Reproduction Canada, Canadian Institutes of Health Research, Hazardous Materials Information Review Commission, Health Canada, Patented Medicine Prices Review Board, and the Public Health Agency of Canada (Health Canada, 2010c). The Health Portfolio is promoted as providing a

> comprehensive understanding of variations in health status, experiences of health and illness, health service use and interaction with the health system; the development of sound science and reliable evidence that addresses sex and gender health differences between men and women, boys and girls; and the implementation of rigorous and effective research, programs and policies that address sex and gender health differences between men and women, boys and girls (Health Canada, 2010c).

Advocates of sex- and gender-based analysis contend that it is essential for improving the health of Canadians in conducting health research and in the development and implementation of health programs and policies. Recognizing that "actions to reduce gender inequality will improve health for both women and men" (Clow et al., 2009: 8), the specific policy goals of the Sex- and Gender-Based Analysis Policy adopted by the Government of Canada in 2009 include:

- a comprehensive understanding of variations in health status, experiences of health and illness, health service use and interaction with the health system;
- the development of sound science and reliable evidence that addresses sex and gender health differences between men and women, boys and girls; and
- the implementation of rigorous and effective research, programs and policies that address sex and gender health differences between men and women, boys and girls (Health Canada, 2010c).

Based upon a recommendation from the House of Commons Standing Committee on the Status of Women in April 2008, the Auditor General of Canada conducted an audit

of the implementation of sex- and gender-based analysis policy by the federal government. The Auditor General of Canada conducted an audit of seven departments including the Department of Finance Canada, Health Canada, Human Resources and Skills Development Canada, Indian and Northern Affairs Canada, the Department of Justice Canada, Transport Canada, and Veterans Affairs Canada (Minister of Public Works and Government Services Canada, 2009). The audit found that "despite the government commitment to GBA [(gender based-analysis)] since 1995, there is no government-wide policy requiring that departments and agencies perform it" (Minister of Public Works and Government Services Canada, 2009: 2).

Importantly, sex- and gender-based analysis was found to be inadequately integrated into policy development. Only four of the sixty-eight initiatives integrated sex- and gender-based analysis into policy development including two at the Department of Finance Canada and two at Indian and Northern Affairs Canada. Despite a formal commitment to sex- and gender-based analysis in the Health Portfolio of the federal government, there were zero cases in Health Canada where sex- and gender-based analysis was performed and integrated into policy options development. In one case the department provided a rationale for not performing sex- and gender-based analysis, in three cases gender impacts were considered but not documented in the policy options developed, and in two cases there was no consideration of sex- and gender-based analysis (Minister of Public Works and Government Services Canada, 2009: 16). Additionally, the audit found that while Health Canada has a departmental policy and commitment in effect along with tools and methodologies readily available, training is not regularly

offered, a champion within the department has not been appointed, and sex- and gender-based analysis practices have not been evaluated (Minister of Public Works and Government Services Canada, 2009: 11).

> Sex- and gender-based analysis is argued to be:
>
> > vital to planning appropriate health programs and services, developing inclusive health policies and conducting research. It is effective because it requires policy-makers, scientists and researchers to think about who they are trying to serve and whose needs they are trying to meet (Lewis, 2011: 6).

There is also a need for an approach which incorporates intersectionality so that sex and gender are considered with other relevant factors including age, race, ethnicity, culture, geographic location, sexual orientation, and socioeconomic status (Hankivsky et al., 2010; Paterson, 2010; Tudiver, 2009). There is a call for challenging and transforming policy paradigms in the "process of engendering policy" (Hankivsky, 2005: 980; 2009: 116). Sex- and gender-based analysis should examine and critique the influence of the broader social, political and economic environments which impact health outcomes (Hankivsky, 2009).

The audit clearly demonstrates that sex-and gender-based analysis is not being adequately incorporated in health policy or legislation in Canada. Sex and gender must be accounted for in public health policy and legislation as the lack of implementation can have real implications for health outcomes among Canadian citizens (Butler-Jones, 2012). This discussion raises important questions about where the burden of risk and responsibility is presumed to lie in the prevention of disease. The Government of Canada (2011f) promotes risk as being within the control of Canadian citizens in suggesting that "we are all risk managers."

Where is the Burden of Risk Presumed to Lie?

Responsibilization Paradigm

The majority of discussions around disease prevention still focus on personal responsibility, accountability and modifiable risk factors. “The dominant view of cancer prevention has focused almost exclusively on individual lifestyle changes” (Chernomas and Donner, 2004: 3). There is a long history which focuses on the role of lifestyle and personal behaviours in health outcomes. The role of lifestyle emerged as a key area of research and aspect of health promotion in the Lalonde Report (Lalonde, 1974). The individualization of health and illness resulted in a responsibilization paradigm (Orsini, 2007: 349). This ideology places the onus of responsibility on the individual and suggests that risk factors for health are controllable if one makes the appropriate lifestyle choices. If one does not behave accordingly or if one does and still becomes ill, there are elements of blame placed on the individual. This approach to health promotion does not recognize other social determinants of health, particularly those outside of one’s control such as environmental contaminants (Orsini, 2007; Simpson, 2000).

The role of lifestyle and personal responsibility as the primary factors in the development of cancer were established in part by Doll and Peto’s foundational monograph which was published in 1981. Doll and Peto’s work set the stage for the promotion of this paradigm in the medical and public health communities in its emphasis on personal responsibility around smoking, alcohol consumption, reproductive and sexual behaviours, and diet, while simultaneously downplaying the role of environmental and occupational risks to contributing to only two percent of cancer deaths from pollution and

four percent from occupational exposures (Clapp et al., 2006; Doll and Peto, 1981). These findings are continually cited by "commentators who argue that 'cleaning up the environment' is not going to make much difference in cancer rates" (Clapp et al., 2006: 62). The Harvard Center for Cancer Prevention published a report entitled *Human Causes of Cancer* in 1996 which built upon Doll and Peto's work in its focus on modifiable risk behaviours. It suggests that "the public can become overly concerned about minimal risks while losing sight of major cancer risk factors that can be controlled or modified, in particular, tobacco use, diet, exercise, and sun exposure" (Harvard Center for Cancer Prevention, 1996: S3; Clapp et al., 2006: 63). Colditz and Hunter (2000) further develop the Harvard Center for Cancer Prevention reports in later work which continues to focus primarily on lifestyle factors regarding cancer prevention.

> For major reductions in the burden of cancer to be achieved, we need broad scale interventions that will shift the behavior of the whole population. Rather than focus on individuals defined as being at "high risk", a shift in behavior by the whole population can achieve greater reductions in cancer (Colditz and Hunter, 2000: 325-26).

While there is value in public health policy and campaigns which promote healthy lifestyles, it is highly problematic when primary prevention efforts are focused solely on modifiable behaviours and lifestyle factors. It is important to acknowledge the distinction between primary prevention in the field of environmental health and the prevention efforts focused on modifiable behaviours in traditional cancer prevention which are grounded in and directly influenced by the Doll and Peto paradigm. For instance, the Canadian Partnership Against Cancer was established in 2006 as a federally funded non-governmental organization to implement Canada's cancer control strategy. The

prevention focus of the Canadian Partnership Against Cancer operates largely under the umbrella of healthy communities and lifestyles with a significant emphasis on modifiable behavioural factors around tobacco, nutrition, physical activity, alcohol, and ultraviolet radiation (Canadian Partnership Against Cancer, 2009a, 2009b, 2013a, 2013b).

The Cancer 2020 program was developed by Cancer Care Ontario in collaboration with the Canadian Cancer Society as a long-term plan for cancer prevention and screening. Cancer 2020 is grounded in an understanding that approximately fifty percent of cancers that will be diagnosed over a twenty year period can be either prevented or detected early and aims to provide a long-term provincial plan for cancer prevention in Ontario (Cancer 2020 Steering Committee, 2003a). The program focuses on well-established risk factors as an effective avenue for cancer prevention with specific efforts focused on methods to change the risk behaviours of Ontario citizens including promoting healthy eating and physical activity, and reducing alcohol consumption and cigarette smoking (Cancer 2020 Steering Committee, 2003a, 2003b, 2006). This program does include occupational and environmental carcinogens, though some of that focus still falls under behavioural practices such as reducing tobacco smoke and demonstrating sun-protective safety practices for workers. Occupational cancer surveillance programs are recommended and in broader environmental practices, setting standards around drinking water and reducing air pollution are suggested (Cancer 2020 Steering Committee, 2006). However, while the Cancer 2020 Program acknowledges occupational and environmental carcinogens as playing a role in the development of cancer, its focus for action remains

primarily on methods to change the risk behaviours of citizens (Cancer 2020 Steering Committee, 2003b: 17).

Precautionary Consumption

The individualization of risk is consistent with both the dominant epidemiological paradigm and the responsibilization paradigm, and is reflected in the promotion of "precautionary consumption" practices. MacKendrick (2010) observed a shift in media discourse around the bioaccumulation of chemicals and the body burden over a twenty year period from 1986 to 2006. These findings reflect a move away from collective forms of prevention around the risks associated with everyday exposures to toxic substances and towards personal responsibility through behavioural practices and precautionary consumption. The practice of precautionary consumption encourages individuals to take responsibility for protecting their health and to avoid exposure to toxic substances by purchasing "green" consumer products. Precautionary consumption promotes a sense of individual empowerment and control through the act of green consumption and chemical avoidance (MacKendrick, 2010: 127).

The ideology of this practice emphasizes the precautionary principle and the agency of individual consumers as the primary mechanisms for risk management around everyday exposures to toxic substances and the chemical body burden (MacKendrick, 2010: 43). Risks are now perceived as something that can be controlled by the individual. The risk frame "redistributes the responsibility for decision-making about risk from government agencies to self-governing 'consumer-citizens'" (Scott, 2007: 37; MacKendrick, 2010). Women's health and environmental organizations are influenced by

the individualization of risk and promote practices of precautionary consumption which encourage consumer-citizens to protect themselves from risks. The Women's Healthy Environments Network launched their "Wanna Be Toxic Free" campaign in 2010 to educate the public about the risks associated with toxic substances in consumer products and how to choose safer alternatives. Information about this program is made available through the organization's website, at fundraising events and as part of Community Environment Days which take place annually in neighbourhoods in Toronto from April to September. Specific substances that individuals are encouraged to avoid as part of this campaign include:

- parabens which are endocrine disrupting chemicals and suspected carcinogens, and are widely used as preservatives in the cosmetic and pharmaceutical industries;
- phthalates which are classified as reproductive toxicants in the European Union and are commonly used as plastic softeners or solvents in perfumes and fragrances;
- triclosan which is suspected to have carcinogenic and endocrine disrupting properties and is used as an antibacterial agent in toothpaste, mouth wash, deodorants, shaving creams, and hand sanitizers;
- butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) which are suspected endocrine disrupters and carcinogens used as preservatives in moisturizers and makeup;
- sodium laureth sulfate which is a skin irritant used in shampoos and bubble baths;
- polyethylene glycol compounds (PEGs) which are potentially carcinogenic and act as foaming agents in cleansing products;
- diethylalomines (DEAs) which are used in skin lotions, shampoos and sunscreens, and have demonstrated negative health effects in mice including inhibiting brain development and spontaneous abortion;

- petrolatum which is used as an emollient in hair products, lip balms, lip sticks, and moisturizers and may be contaminated with polycyclic aromatic hydrocarbons which are carcinogenic;
- coal tar dyes which are used in some hair dyes and dandruff treatments, are potentially carcinogenic, and may be contaminated with toxic heavy metals; and
- fragrance and parfum which are used in many personal care products and the ingredients are not available to the consumer because of proprietary interests (WHEN, 2013).

Campaigns such as Wanna Be Toxic Free[71] encourage individuals to exercise precaution in order to protect themselves from everyday exposures to toxic substances and subsequent health outcomes. However, these campaigns do not include a recognition that precautionary consumption is "undeniably women's work" (Kearns, 2011; Scott and Lee, n/d). These practices create a gendered and disproportionate burden on women who often have the primary responsibility for both the sustainability of the household and the health of their family members (Lee, 2011). "This practice reinforces women's socially prescribed roles as providers for the household, adding to their 'care burden' from both a physical and emotional perspective, and contributing to the gendered divisions of labour and exploitation of women's unpaid work in the home" (Scott and Lewis, forthcoming).

The measures of precautionary consumption that are encouraged by government and women's health and environmental organizations also make a number of assumptions about the women targeted by these campaigns. They assume a particular level of language proficiency, literacy and scientific understanding, as well as the economic ability to exercise choice, and a significant time commitment in encouraging women to

[71] While the primary focus of this campaign is on precautionary consumption, the Women's Healthy Environments Network does support the assessment and management of risk by the federal government and calls for phasing out chemicals that are carcinogens, reproductive toxins or mutagens in personal care products (WHEN, 2013).

read labels with long and complicated ingredients on cleaning, cosmetics and personal care products.

Altman et al. (2008: 426) describe the underlying flaw associated with precautionary consumption as a "consumption fallacy" which suggests that individuals can protect themselves from risks by attempting to avoid exposure to toxic substances through consumerism. Precautionary consumption practices can never truly eliminate exposure to toxic substances which are ubiquitous. For instance, Scott and Lee found that less toxic alternative products may not be available and that toxic substances such as phthalates and flame retardants are very difficult to avoid despite precautionary attempts to do so by individuals (Kearns, 2011; Scott and Lee, n/d). These substances are "so pervasive in consumer products, are rarely clearly labelled, and alternative products can be difficult or expensive to obtain, consumers are unlikely to be able to avoid exposures" (Scott and Lee, n/d).

Precautionary consumption is also unable to account for everyday exposures to toxic substances through other mechanisms including the air, soil and water, and which environmental justice research demonstrates are often unequally distributed (Brown et al., 2012b; Hoover et al., 2012; Scott and Lee, n/d). The body burden experienced by Canadian citizens may be framed as "evidence of the failure of…risk assessments to prevent universal exposure to bioaccumulative chemicals" (MacKendrick, 2010: 128). The body burden is portrayed as a "blameless phenomenon" and as a "social problem by portraying it as a personal or individual-level concern, rather than societal or collective concern" (MacKendrick, 2010: 140; 2011: 43). The emphasis on behaviour at the level of

the individual does not encourage political and collective action that may be targeted at long-term and more broadly focused solutions including regulatory reform (Kearns, 2011; Scott and Lee, n/d). This discussion of where the burden of risk is presumed to lie demonstrates that the public health of the Canadian population can never be truly protected if responsibility remains at an individual level rather than recognizing the role of government and industry in health outcomes as a result of exposure to toxic substances.

Who is at Risk and Who are the Policies Designed to Protect?

Children as a Vulnerable Population

An important question which emerges when researching environmental health legislation and public health policy asks *who* is at risk. The only "vulnerable population" specifically designated by Health Canada[72] are children. This is reflected in the *National Strategic Framework on Children's Environmental Health* (Health Canada, 2010c). Vulnerable populations are considered to be at-risk to environmental exposures due to "physical differences, behaviours, location and/or control over their environment" (Health Canada, 2011e). The rationale behind the focus on children as a vulnerable population of concern is framed as a result of environmental hazards disproportionately impacting children. Age-specific windows of susceptibility which impact infants and children include pre-conception, the embryonic, fetal and neonatal period during which maternal ingestion, inhalation, and dermal contact play a role, as well as the first three years of life, preschool and primary school-age, and adolescence when inhalation,

[72] Health Canada (2011e) does acknowledge Aboriginal peoples and senior citizens as vulnerable populations, but children are the only population specifically addressed through a strategic framework.

ingestion and dermal contact occurs through the child's body (Health Canada, 2007f). Cooper et al. (2011: 130) note that cancer latency periods can span 20 to 40 years and that industrial activities result in multiple exposures to known or suspected carcinogens and endocrine disrupting chemicals. Windows of susceptibility during the prenatal exposures and early stages of development can impact cancer development and other developmental and reproductive health issues later in life.

> …[C]hildren are extremely sensitive to exogenous sex steroids and endocrine disruptors with no apparent lower threshold below which hormonal effects in children and potentially severe effects in adult life, are not seen. Thus,…[it is] caution[ed] that unnecessary exposure of fetuses and children to such substances, even at very low levels, should be avoided (Cooper et al., 2011: 130).

However, focusing solely on early periods of susceptibility does not account for four critical windows of susceptibility women experience later in life including i) before menstruation, ii) menstruation to first full pregnancy, iii) first full pregnancy to menopause, and iv) after menopause (Brophy et al., 2012; Schwarzman and Janssen, 2010).[73]

The scope of the *National Strategic Framework on Children's Environmental Health* includes chemical, biological and physical hazards related to children's exposure through air, water, soil, dust, food, consumer products, and any other features of the physical environment through pre-conception, prenatal and childhood exposures. The framework focuses on the environment as a determinant of health while also recognizing that other

[73] The language around critical windows of vulnerability is currently undergoing a shift. I observed this when attending the Environmental Health 2013 Conference: Science and Policy to Protect Future Generations in Boston, Massachusetts in March 2013. Key note speakers and presenters at this conference have shifted from describing the key periods of development in human bodies as "vulnerable" and are now using "windows of susceptibility."

determinants of health such as genetics, socioeconomic status and culture may influence the susceptibility of children to environmental exposures and subsequent health outcomes (Health Canada, 2010d: 9). Health Canada (2010d: 7) points to specific concerns around children's environmental health including:

- children's physiology and critical windows of vulnerability during developmental stages which may affect the absorption, metabolism and elimination of toxic substances;
- the development of the immune system which may be suppressed by exposure to persistent toxic substances;
- early exposure pathways including trans-placental transfer and consumption of breast milk;
- increased exposures related to size and weight of children compared to adults, and as a result of childhood behaviours such as close-to-ground exposures;
- children's lack of awareness and control over their own environmental risks including second-hand smoke exposure, parental occupational exposures, radiation, and microbiological hazards; and
- lack of knowledge about how to reduce environmental risks for children by parents, caregivers and health professionals.

As the primary source of authority for the assessment and management of risk associated with toxic substances, CEPA 1999 is identified as the foundation for policy direction related to toxic substance exposure (Health Canada, 2008c). Environment Canada and Health Canada (2004: 11) promote human health risk assessment and management as including research related to the exposure of the most affected population groups to toxic substances. While CEPA 1999 does not include specific reference to children's health, it is a "vital component of those activities related to the identification and assessment of existing substances that may pose a risk to the health and well-being of

children and Canadians of all ages" (Health Canada, 2008a: 6). The specific goals of the *National Strategic Framework on Children's Environmental Health* include risk assessment in order to increase the understanding of the existing and emerging environmental health impacts on children associated with environmental contaminants; risk management in order to prevent and reduce exposure of children to environmental hazards; as well as increasing communication and capacity building related to environmental health issues and children in Canada (Health Canada, 2010d: 13-4).

Consistent with the inclusion of socioeconomic status in CEPA 1999, the strategic framework provides a compelling argument which proposes the protection of children's environmental health as a cost-saving measure for adulthood. In accounting for health promotion, prevention and protection, Health Canada (2010d: 10) argues that "it is easier and less expensive to prevent or minimize environmental exposures which may lead to adverse outcomes, rather than to identify treatment strategies after children have been exposed or adversely affected." While the focus on children's health is predicted to reduce health care costs in adulthood, it does not consider important windows of susceptibility later in life that can also impact health outcomes.

The Regulation of Bisphenol A (BPA)

A recent example of a national effort focused on protecting the health of infants and children is the removal of the endocrine disruptor BPA from baby bottles. BPA is a high-production-volume industrial chemical that is widely used in the production of polycarbonate plastics including food and drink packaging and in epoxy resin linings of food and drink containers, as well as other applications such as additives in polyvinyl

chloride plastics, medical devices, automotive parts, electronics devices, compact discs, cell phones, sporting equipment, glasses, and receipts (Breast Cancer UK, 2013; Food and Agriculture Organization of the United Nations and World Health Organization, 2010; Health Canada, 2012b). The production of BPA has increased by 500% over the past thirty years reaching more than three billion kilograms per year. It is estimated to be worth approximately $500,000 per hour to the global economy (Breast Cancer UK, 2013: 11). Exposure to BPA is ubiquitous and the chemical can be detected and measured in humans in blood, urine, amniotic fluid, follicular fluid, placental tissue, and umbilical cord blood (Soto and Sonnenschein, 2010; Vandenberg et al., 2007). Nudelman et al. (2009: 87) note that studies funded by the chemical industry contend that BPA is harmless, whereas non-industry research suggests that it is a powerful hormone disrupter with the potential to result in detrimental health outcomes. Research is raising concerns about the health implications of broader exposures to BPA, particularly the estrogenic and endocrine disrupting properties as a result of low-dose, cumulative exposures (CAPE et al., 2010). Specific health concerns associated with BPA include the development of breast, prostate and testicular cancers, reproductive and developmental disorders, fertility disorders, neurodevelopmental and behavioural impacts including attention deficit hyperactivity disorder and impaired learning, and obesity (Breast Cancer Fund, 2013a; CAPE et al., 2010; Diamanti-Kandarakis et al., 2009; Ikezuki et al., 2002; Vandenberg et al., 2009, 2012; vom Saal et al., 2012).

BPA was identified as a high priority during the categorization of the Domestic Substances List. Environment Canada and Health Canada conducted a screening

assessment in 2008 which concluded that BPA meets the criteria under paragraph 64(a) and (c) of CEPA 1999. It found that BPA is

> entering or may be entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term effect on the environment or its biological diversity….[and] in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health (Environment Canada and Health Canada, 2008b: 76).

In 2009, the Government of Canada announced its intention establish regulations to "prohibit the advertisement, sale and importation of polycarbonate plastic baby bottles that contain BPA, to reduce newborn and infant exposure to this substance" (Health Canada, 2009c). The federal government concluded that exposure levels for newborns and infants up to 18 months are below those that could cause health effects, but intends to further limit exposure due to uncertainty raised in other studies about the potential effects of low levels of BPA. The proposed regulations are part of the *Chemicals Management Plan*[74] (Health Canada, 2009c).

Health Canada hosted an international meeting about BPA in November 2010 with the Food and Agriculture Organization and the World Health Organization. The controversy associated with BPA within the scientific community was acknowledged and the meeting was organized

> in light of uncertainties about the possibility of adverse human health effects at low doses of BPA, especially on reproduction, the nervous system and behavioural development, and considering the relatively higher exposure of very young children compared with adults (Food and Agriculture Organization of the United Nations and World Health Organization, 2010: vi).

[74] BPA was part of Batch 2 of the Challenge under the *Chemicals Management Plan*, along with siloxane D5 (Government of Canada, 2012e; Health Canada, 2008d).

The meeting considered acute and repeated dose toxicity, carcinogenicity, reproductive and developmental toxicity, and hazard characterization associated with exposure to BPA. It was suggested that establishing a "safe" level of exposure for BPA was complicated by a lack of data and experimental animal studies that are suitable for risk assessment. Recommendations included generating new information and studies in order to better understand the risks to human health posed by exposure to BPA (Food and Agriculture Organization of the United Nations and World Health Organization, 2010: 30, xi).

BPA concentrations were measured in Canadian citizens for the first time at a national level as part of the Canadian Health Measures Survey in 2007-2009. Statistics Canada partnered with Health Canada and the Public Health Agency of Canada to collect health and wellness data, as well as biological specimens in the most comprehensive health measures survey conducted in Canada. The Canadian Health Measures Survey is the cornerstone of the national biomonitoring component of the *Chemicals Management Plan* and is meant to be used as a tool in evaluating the success of risk management measures (Health Canada, 2010a, 2010e, 2010f). Biomonitoring involves the "direct measurements of environmental chemicals, their metabolites or reaction products in people" and are most often measured in blood or urine, as well as other tissues and fluids such as hair, nails and breast milk (Haines, 2010; Health Canada, 2007g). While CEPA 1999 requires the Minister of Health to conduct research and studies on the role of toxic substances and health outcomes, there is no specific mandate for biomonitoring (Environment Canada and Health Canada, 2004: 27). There has been limited

biomonitoring data on Canadians. The Canadian Health Measures Survey was launched in 2007 to collect and provide data on levels of environmental chemicals that "represent the overall Canadian population" (Health Canada, 2007g). The body burden associated with exposure to toxic substances that is revealed through biomonitoring processes can be viewed as representing the personalization of pollution (Altman et al., 2008).

The first cycle of the Canadian Health Measures Survey was conducted in 2007-2009 and collected blood and urine samples from approximately 5600 Canadians aged six to seventy-nine in fifteen sites across the country (Health Canada, 2010e). The second cycle of the Canadian Health Measures Survey was conducted in 2009-2011 and included blood and urine samples from approximately 6400 Canadian citizens aged three to seventy-nine from eighteen sites[75,76] (Health Canada, 2013b). This was the first study to include biomonitoring data for children aged three to five years (Haines, 2013; Health Canada, 2013b). Chemical groups[77] that were measured in the first cycle include polybrominated flame retardants, polychlorinated biphenyls and organochlorines; metals

[75] The cycle one data collection sites included Moncton, NB; Quebec City, Montreal, Montérégie and South Mauricie, QC; Clarington, North York, Don Valley, St. Catherine's-Niagara, Kitchener-Waterloo, and Northumberland Country, ON; Edmonton and Red Deer, AB; and Vancouver, Williams Lake and Quesnel, BC (Health Canada, 2010e). The cycle two data collection sites included Saint John's, NL; Colchester and Pictou Counties, NS; Laval, South Montérégie, Gaspésie, and North Shore Montreal, QC; Central and East Ottawa, South Brantford, Southwest Toronto, East Toronto, Kingston, and Oakville, ON; Edmonton and Calgary, AB; Winnipeg, MB; and Richmond, Central and East Kootenay, and Coquitlam, BC (Health Canada, 2013b).

[76] Cycle three data collection is currently underway (January 2012-December 2013) and planning is in progress for cycle four (2014-2015) and cycle 5 (2016-2017) (Haines, 2013; Health Canada, 2013c).

[77] The chemicals tested in the biomonitoring aspect of the Canadian Health Measures Survey are selected for reasons including known or suspected health effects; level of public concern; evidence of exposure in the Canadian population; new or existing requirements in public health policy; ability to detect or measure the toxic substance in humans; similarity to substances measured in national and international programs for comparison; and the costs associated with performing the analysis. The second cycle of the survey includes fifty-five percent new chemicals and forty-five percent of the same chemicals as the first cycle (Health Canada, 2013c).

and trace elements, environmental phenols, pesticides, nicotine metabolites, perfluoroalkyl substances, phthalate metabolites, and chlorophenols were measured in both cycles one and two; and cycle two also tested triclocarban with the environmental phenols, as well as benzene metabolites and polycyclic aromatic hydrocarbons (Health Canada, 2013d).

BPA was measured in both cycles of the Canadian Health Measures Survey under the "environmental phenols" group of chemicals. Ninety-one percent of Canadians aged six to seventy-nine were found to have detectable concentrations of BPA in their urine in the first cycle of the Canadian Health Measures Survey from 2007-2009 (Bushnik et al., 2010; Statistics Canada, 2011). The results of the second cycle were released in April 2013 and determined that BPA was detected in ninety-five percent of Canadian citizens (Health Canada, 2013c).

The results of the Canadian Health Measures Survey data are promoted as being used to establish national baseline levels to track trends over time and as a reference point for international comparison (Haines, 2013; Health Canada, 2012b). Health Canada's special medical advisor, Dr. Robert Cushman stated that the "latest collection of national biomonitoring data will build on the [previous] information collected…for future monitoring and research. It will improve our understanding of human chemical exposure and help with the development of policies to protect the health of Canadians" (CBC, 2013c). Additional potential uses of the data also include providing information for priority-setting and action to protect Canadian's health from exposure to environmental chemicals; assessing the effectiveness of health and environmental risk management

strategies related to exposures and health risks associated with environmental chemicals; supporting future research on the potential links between exposure to environmental chemicals and specific health outcomes; and contributing to international monitoring programs such as the Stockholm Convention on Persistent Organic Pollutants (Health Canada, 2013c: 3).

Health Canada (2013d) acknowledges limitations associated with the use of biomonitoring as part of the Canadian Health Measures Survey. Biomonitoring measures the amount of a specific chemical in the body, but the measurement determines exposure from any or all routes including ingestion, inhalation or dermal contact, as well as any or all sources including air, water, soil, food, and consumer products. As a result, biomonitoring cannot determine the source or route of exposure and the chemical may be the result of a single source or multiple sources of exposure. Biomonitoring in and of itself cannot determine what health effects may occur as a result of the exposure. Relevant factors in considering whether a detrimental health outcome may occur include the amount of the chemical a person was exposed to, the duration and timing of exposure, and the toxicity of the chemical. It is also important to take into account levels of susceptibility in populations at-risk such as pregnant women, developing fetuses, children, the elderly, or people with compromised immune systems. Finally, the absence of a chemical in biomonitoring results does not mean that a person has not been exposed as existing technology may not be capable of detecting small amounts, and it is also possible that the chemical may have been eliminated, or metabolized, before the measurement occurs (Health Canada, 2010f: 4, 2013d).

The target population of the Canadian Health Measures Survey involves people living at home and residing in the ten provinces and three territories aged six to seventy-nine in cycle one and aged three to seventy-nine in cycle two. It is important to note that "people living on reserves or in other Aboriginal settlements in the provinces, residents of institutions, full-time members of the Canadian forces, persons living in certain remote areas, and persons living with a low population density were excluded" (Health Canada, 2010e: 3; Health Canada, 2013c: 4). While Health Canada (2010e) promotes the survey data as intended to be a nationally representative sample of the Canadian population, its limiters also exclude people who may be at higher risk for exposure to environmental chemicals. For instance, Sarnia and the Aamjiwnaang First Nation in southwestern Ontario are bordered by forty percent of Canada's chemical industry. The area known as "Chemical Valley" is one of the most polluted hotspots in the country (MacDonald and Rang, 2007). Residents of the Aamjiwnaang First Nation are exposed to chronic pollution including endocrine disrupting chemicals and as a result have experienced a significantly skewed sex ratio in the number of male live births compared to female (Mackenzie et al., 2005).[78] Residents have also experienced increased incidences of cancer, reproductive and developmental disorders (MacDonald and Rang, 2007).

[78] The disproportionate exposure to endocrine disrupting chemicals in this community and the resulting skewed sex ratio has resulted in an effect which is both gendered and gendering. The pollution itself may be "actively 'producing' sex, and to the extent that it is related, gender" (Scott, 2012a: 61, 2013). For additional discussion around exposure to toxic substances, the skewed sex ratio, and other health outcomes in Aamjiwnaang, refer to Dhillon and Young (2010), Jackson (2010), Luginaah et al. (2010), MacDonald and Rang (2007), Scott (2008, 2012a), and Wiebe (2010). For a sample of the media coverage associated with this case, refer to Colihan (2008) and Mittelstaedt (2008a, 2008b).

Environmental Defence has conducted biomonitoring research on Canadian citizens including participants from the Aamjiwnaang First Nation.[79] Biomonitoring tests were conducted on eleven individuals and five families across the country. Laboratory results detected forty-six of the sixty-eight toxic substances tested for in the body burdens of participants including five polybrominated diphenyl ethers (PBDEs), thirteen polychlorinated biphenyls (PCBs), five perfluorinated chemicals (PFCs), nine organochlorine pesticides, four organophosphate insecticide metabolites, five polycyclic aromatic hydrocarbons (PAHs), and five heavy metals. The results of the study detected thirty-eight carcinogens, twenty-three hormone disruptors, twelve respiratory toxins, thirty-eight reproductive and developmental toxins, and nineteen neurotoxins in participants (Environmental Defence, 2006: 1). However, the body burden of toxic substances in members of the family from Aamjiwnaang was among the highest in the study. The grandfather had the highest concentration of PFOS, PCBs and organochlorine pesticides, and the father had the highest total number of chemicals detected (Environmental Defence, 2006: 26). Basu et al. (2013) conducted a biomonitoring study of forty-three mother-child pairs living in Aamjiwnaang. This study found that mothers and their children are exposed to numerous environmental pollutants including metals, PAHs, PFCs, brominated flame retardants (BFRs), PCBs, and organochlorine pesticides (Basu et al., 2013). Residents of Aamjiwnaang are exposed to a "chemical cocktail" of toxic substances and the results of this study found that for some substances, the "trends

[79] For more detailed results of the biomonitoring research, refer to Environmental Defence (2005, 2006, 2007).

revealed higher exposures on the reserve than among the general population" (Dobson, 2013). The increased exposures included cadmium, mercury, DDT, organochlorine pesticides, hexachlorohexane, and some PFCs and PCBs (Basu et al., 2013). Excluding populations such as the Aamjiwnaang First Nation from the Canadian Health Measures Survey does not adequately account for potentially highly exposed and at-risk populations, nor the "manifestation of the pervasive, diffuse, and body-altering pollution that the residents report" (Scott, 2008: 297).

The federal Minister of Health, Leona Aglukkaq said in October 2010 that "[o]ur science indicated that Bisphenol A may be harmful to both human health and the environment and we were the first country to take bold action in the interest of Canadians" (Reuters, 2010). Minister Aglukkaq announced that BPA would be declared toxic making Canada the first jurisdiction to do so (Mittelstaedt, 2010). In light of BPA being added to Canada's list of toxic substances, Minister of the Environment Jim Prentice stated that "[w]e are continuing our leadership on this issue and Canadians can rest assured that we are working hard to monitor and manage bisphenol A" (CBC, 2010a). Yet despite BPA being declared toxic under CEPA 1999, this action does not require mandatory regulatory action and risk management strategies. The risk management associated with this assessment was limited to considering the highest potential for exposure and the potential vulnerability of newborns and infants by prohibiting the advertisement, sale and importation of polycarbonate plastic baby bottles that contain BPA (Health Canada, 2010b). The limited regulatory action that has occurred

focuses solely on infants and baby bottles but does not include any of the other numerous consumer products that still contain BPA.

A major route of exposure to BPA is through diet and the epoxy resins lining the insides of canned foods and beverages, as well as the metal lids of glass containers (Mittelstaedt, 2008c). In considering exposures to BPA beyond that in polycarbonate baby bottles, Health Canada's Food Directorate concluded that the current dietary exposure through food packaging is not expected to pose a health risk to the general population, including newborns and infants (Health Canada, 2008d; 2010e). However, it is important to note that fetuses and infants are exposed to BPA as breast milk passes on the exposures of nursing mothers and pregnant women (Kuruto-Niwa et al., 2007; Mendonca et al., 2012; Scott, 2012b; Ye et al., 2006).

In the most recent *Snapshot of Environmental Health in Canada*, Health Canada (2012b) acknowledges laboratory studies which suggest that low levels of exposure to BPA during windows of susceptibility in animals can affect neural development and behaviour. Health Canada does not reference any other studies which suggest wide-ranging health outcomes in humans as a result of exposure to BPA, though it does "support the need for additional research in these areas, and scientists continue to evaluate new scientific evidence as it emerges" (Health Canada, 2012b: 15). Health Canada (2012c) conducted additional surveys since the initial 2008 risk assessment around BPA in food packaging to measure concentrations in canned drink products, bottled water products, canned food products, soft drink and beer products, and total diet samples. Based on a weight-of-evidence approach, the Food Directorate again concluded

that dietary exposure to BPA through food packaging does not pose a health risk to the general population, including newborns and young children (CBC, 2013c; Health Canada, 2012c: 4; Mittelstaedt, 2010).

The Canadian Cancer Society (2013b) and the David Suzuki Foundation (2013) encourage Canadians to reduce their exposure to BPA. The Canadian Cancer Society suggests that it may be possible to reduce, but not eliminate exposure to BPA because it is so widely used. The organization recommends individuals take steps to avoid exposure to the substance if they are concerned about potential health effects (Canadian Cancer Society, 2013b). The David Suzuki Foundation (2013) also encourages individual citizens to reduce their exposure to BPA in light of the regulatory actions being limited to polycarbonate baby bottles. While the David Suzuki Foundation does call for a more precautionary regulatory framework to protect health and the environment, both organizations are promoting individualized strategies in the form of precautionary consumption. These campaigns place the focus at the level of individual citizens and do not acknowledge the limitations of a precautionary consumption approach.[80]

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[80] The precautionary consumption practices recommended by the Canadian Cancer Society (2013c) include avoiding children's toys, bottles and dishes made with polycarbonate plastic; using food and drink containers made of stainless steel, glass or non-polycarbonate plastic; choosing fresh or frozen foods not stored in cans; and talking to dentists about the materials being used and the options available if having dental work. The David Suzuki Foundation (2013) recommends using glass, stainless steel or porcelain containers instead of plastic dishes, containers and kitchen appliances; choosing plastics #2, #4 and #5 instead of #3 and #7 which often contain bisphenol A; using parchment paper, glass jars, beeswax cotton wraps or recycled aluminum foil instead of plastic wrap; not using plastic containers in the freezer, microwave or dishwasher as BPA and phthalates leach at a higher rate in hot or cold temperatures; using glass or stainless steel kettles instead of plastic kettles; avoiding canned food and drinks; breastfeeding or using powdered baby formula as more BPA leaches into liquid than powdered formulas; avoiding thermal paper receipts which contain BPA; using wood and cloth toys for children instead of plastic toys; and speaking to dentists about options as dental sealants and composites can contain BPA.

Critique of the Limited Scope of Bisphenol A regulation

Despite the regulatory action around BPA and baby bottles, the scope of action remains limited and does not go far enough. Consistent with the dominant epidemiological paradigm, the onus of responsibility is still placed primarily on the public and at the level of the individual. For instance, Health Canada (2010d: 7) maintains that "[t]he environmental burden of disease, with its associated socioeconomic costs, can be reduced by both ensuring healthier environments and providing people with the information they need to protect themselves [and their children] from harmful exposures." As Theo Colborn argues in her letter to the President of the United States about endocrine disrupting chemicals, there is no safe level for many chemicals to which fetuses and children are exposed when they penetrate the body and the womb (Colborn, 2012; The Endocrine Disruption Exchange, 2013).[81] A newly published report in May 2013 by the Royal College of Obstetricians and Gynaecologists is designed to provide guidelines informing women who are pregnant or breastfeeding about the "sources and routes of chemical exposure in order for them to take positive action in regard to minimizing harm to their unborn child" (Royal College of Obstetricians and Gynaecologists, 2013a). The report recommends a "safety first approach" which assumes there is risk in exposure to toxic substances but places the onus of responsibility on the mother to reduce consumption of foods in cans and plastic containers, minimize the use of personal care products and cosmetics, avoid paint fumes and pesticides, and reduce the

[81] Dr. Theo Colborn is one of the authors of the highly influential *Our Stolen Future* which was published in 1996 and explored the environmental and health effects associated with hormone disrupters and "hormone mimics" (Colborn, Dumanoski and Myers, 1996).

purchase of household furniture, fabrics, non-stick frying pans and cars while pregnant or nursing (Khatter, 2013; Royal College of Obstetricians and Gynaecologists, 2013a, 2013b).[82]

Placing responsibility for protecting children's health at the level of the individual creates a burden on the parents and particularly on mothers. "[M]others, more than other actors, are considered primarily responsible for controlling children's exposure to chemicals, and this responsibility represents a new way mothers are held accountable for their children's well-being" (MacKendrick, 2011: 42). The precautionary consumption behaviour with which women are encouraged to engage reinforces "individualized approaches to managing new forms of risk and simultaneously reinforce[s] mothering as a singular, but total responsibility for children's well-being" (MacKendrick, 2011: 42). This critique demonstrates that limiting the focus of health promotion to behavioural factors does not account for broader determinants of health including social, structural and environmental factors (Brown, 2007; Nash, 2006)

In restricting the scope of regulation to infants, the federal government is effectively dismissing exposures for other populations at risk. Thirteen of Canada's

[82] The American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women and the American Society for Reproductive Medicine Practice Committee published a Committee Opinion on exposure to toxic environmental agents in October 2013. The statement acknowledges reducing exposure to toxic substances at the level of the individual. However, it goes further than the position of the Royal College of Obstetricians and Gynaecologists by calling for primary prevention. It notes that individuals can "do little about exposure to toxic environmental agents, such as from air and water pollution, and exposure perpetuated by poverty. The incorporation of the authoritative voice of health care professionals in policy arenas is critical to translating emerging scientific findings into prevention-oriented action on a large scale" (American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women and the American Society for Reproductive Medicine Practice Committee, 2013: 3). At this time, the Society of Obstetricians and Gynaecologists of Canada has not published a position regarding exposure to toxic substances (Society of Obstetricians and Gynaecologists of Canada, 2013).

health and environmental organizations[83] released a joint statement calling for the federal government to eliminate key sources of exposure after Canada's designation of BPA as toxic under CEPA 1999. Providing context for the statement and demonstrating the real life implications for the Canadian population, Kathleen Cooper, Senior Researcher with the Canadian Environmental Law Association said that "[r]obust scientific evidence links low-dose BPA exposure with increased risks for breast, prostate and testicular cancers, altered reproductive function, altered metabolism of sugars and fats linked to obesity and diabetes, and adverse effects on the developing brain" (Canadian Partnership for Children's Health and the Environment (CPCHE), 2010). The joint statement makes recommendations which call for: an elimination of all food- and beverage-related uses of BPA; legislative reforms to improve the testing and regulation of toxic substances which are known endocrine disrupting chemicals; and clear labelling of products which contain endocrine disrupting chemicals (CPCHE, 2010).

In light of the recent findings that ninety-five percent of Canadians have BPA in their urine, Environmental Defence[84] launched a letter writing campaign asking

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[83] The thirteen signatories of *Focus on Bisphenol A - Statement of Health and Environmental Organizations on Endocrine Disrupting Chemicals* are the Canadian Association of Physicians for the Environment, Canadian Child Care Federation, Canadian Environmental Law Association, Canadian Partnership for Children's Health and Environment, Environmental Health Clinic – Women's College Hospital, Environmental Health Institute of Canada, Health Nexus, Learning Disabilities Association of Canada, Ontario College of Family Physicians, Ontario Public Health Association, Pollution Probe, South Riverdale Community Health Centre, The Lung Association – Ontario, and Toronto Public Health (CAPE et al., 2010).

[84] Environmental Defence first raised concerns about the potential health effects of BPA in 2007 as part of efforts to remove the substance from baby bottles (Environmental Defence, 2013b). Environmental Defense's most recent research and call to federal regulatory action surrounds a report released in June 2013 entitled *Pre-Polluted: A report on toxic substances in the umbilical cord blood of Canadian newborns.* The organization tested the umbilical cord blood of three newborn babies and the results determined that each of the children was born with between 55 and 121 toxic substances resulting in a toxic

Canadians to contact the Minister of the Environment and the Minister of Health. The text of the letter recognizes the success of the regulations around polycarbonate baby bottles, but calls on the federal government to take action around the continued exposure to children and adults to BPA.

> International organizations, expert panels and more than 150 peer-reviewed studies have associated bisphenol A with a variety of health problems – obesity, attention deficit hyperactivity disorder, breast cancer and a wide range of developmental problems – often at low levels of exposure (Environmental Defence, 2013d).

This campaign calls on the federal government to demonstrate leadership and develop and implement regulatory action that will be protective of both children and adults and eliminate BPA from all food and beverage containers, as well as other sources of exposure such as cash register receipts (Environmental Defence, 2013e).

Issues of Occupational Health Exposures, Accountability and Compensation

There has also been no move to address the occupational health exposures for workers who are exposed to BPA in their workplaces, such as the food canning industry. The occupational risks for breast cancer have traditionally been a neglected area of research (DeMatteo et al., 2012). A Canadian case-control study recently published by Brophy et al. (2012) found an increased risk of breast cancer among women working in

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body burden at birth. Of the 137 chemicals detected, 132 are reported to be carcinogenic, 110 are considered to be toxic to the brain and nervous system, and 133 result in developmental and reproductive problems. This study has a small sample size but is consistent with other umbilical cord studies conducted in the United States. Demonstrating the extreme persistence of some chemicals, 96 PCBs were found among the three samples. PCBs cross international boundaries, are bioaccumulative and carcinogenic and toxic to the immune, reproductive and neurological systems; they have also been banned in Canada since 1977. Organochlorine pesticides including DDT which are highly toxic and persistent were also found in the cord blood, despite being banned by the federal government in 1985 and banned from agricultural use by the Stockholm Convention in 2004. While the chemicals found in these children were in low doses, there is still significant cause for concern around windows of susceptibility, as well as additive, cumulative and synergistic effects of chemicals (Environmental Defense, 2013c). For more information, refer to CTV (2013), Environmental Defence, (2013b, 2013c), MacDonald, (2013), and Ubelacker, (2013).

occupations including farming, automotive, food canning, metal working, and bars, casinos and racetracks. Women who worked for ten years in occupations classified as "highly exposed" to cancer-causing substances and endocrine disrupting chemicals were found to have a higher risk for developing breast cancer. Specific findings included:

- *Farming:* A 36 percent increased breast cancer risk was found in the farming sector. Research has established that several pesticides act as mammary carcinogens and many are endocrine disrupting chemicals. Employment in farming and exposure to pesticides often begins earlier in women's lives than other occupations and may play a role in the development of breast cancer during subsequent windows of susceptibility.

- *Automotive:* A statistically significant more than two-fold increased breast cancer risk was found in the automotive plastics industry sector. The increase rose to an almost 5-fold excess among women who were pre-menopausal. Many plastics have been found to release estrogenic and carcinogenic chemicals and cumulative exposures to mixtures of these chemicals are a particularly significant concern.

- *Food Canning:* A statistically significant 2-fold breast cancer risk was found in the food canning sector. The increase rose to more than 5-fold among women who were pre-menopausal. Exposures to chemicals in the food canning industry may include pesticide residues and emissions from the polymer linings of cans including BPA.

- *Metalworking:* A statistically significant 73 percent increased breast cancer risk was found in the metalworking sector. Women working in tooling, foundries and metal parts manufacturing are exposed to a variety of potentially hazardous metals and chemicals. The cumulative exposures to mixtures of toxic substances are of concern.

- *Bars, Casinos and Racetracks:* A 2-fold increased breast cancer risk approaching statistical significance was found in bars, casinos and racetracks. The elevated risk of developing breast cancer may be linked to second-hand smoke exposure and night work which has been found to disrupt the endocrine system (Sweeney, 2012b).

This research has a number of important implications which are detailed by Brophy et al. (2013). This work challenges the paradigm promoted by Doll and Peto by demonstrating

the importance of occupational and environmental factors in the development of cancer. The predominant focus on lifestyle and behavioural factors in cancer research and public health policy has resulted in gaps including the prevention of exposure to toxic substances and the resulting detrimental health outcomes such as the development of breast cancer in environmental and occupational settings.

Seriously considering the role of endocrine disrupting chemicals in the development of breast cancer undermines the established orthodoxy in traditional toxicology where the "dose makes the poison." These chemicals can have effects at low doses. The majority of exposure standards for occupational, environmental and consumer health and safety are still based on the toxicology model which is insufficient in accounting for endocrine disrupting chemicals and low-dose cumulative exposures. Brophy et al. (2013) suggest that "[i]f there are no 'thresholds' for certain substances at which no effects are observed, no 'safe' limit can be established."

Finally, these research findings present clear challenges to the workers' compensation system (Brophy et al., 2013). Definitively assessing and managing occupational diseases is a complex and highly problematic process which is influenced by social, cultural and political issues, as well as scientific and medical knowledge and theories (Watterson, 1999). The difficulties in establishing a direct and causal link between a particular substance and a specific health outcome are complicated by a variety of factors. For example, lengthy latency periods are often required in order to establish a statistically significant correlation between an exposure to a toxic substance and an increased incidence of disease in a particular population. The contested nature of

environmental health outcomes may mean that it is not possible to establish a connection conclusively and to the satisfaction of the entire scientific community (Markowitz and Rosner, 2002: 6).

Health outcomes as a result of environmental and occupational exposures have traditionally been framed as contested and are surrounded by questions of uncertainty and accountability. The risks that arise as a result of new and continually evolving technologies are unique to the risk society and there are difficulties with compensation and accountability where the risks are not limitable, either spatially or temporally; may not be accountable according to the prevailing rules of causality, guilt and liability; and may not be compensable nor insurable (Beck, 1995: 2; 1996: 31). Issues of accountability are wrought with difficulties, "far from being caused by individuals who…[can] be held accountable, these risks…[are] caused by the system of high technology itself" (Richter et al., 2006: 7).

In examining examples of accountability and compensation, Richter et al. (2006: 6) note that the traditional compensation system is most often unable to adequately account for those affected by environmental health issues such as those impacted by the Chernobyl nuclear disaster. This is especially evident in cases where the illness is contested, both in its existence and in cases where there are issues around determining causality. For instance, health care workers in Nova Scotia claimed to be suffering from heavy metal poisoning as a result of exposure to toxic dust during renovations at the New Waterford Consolidated Hospital in 2001-2002. These claims have not been universally accepted and their illnesses and the events in this community constitute an environmental

health controversy with opposing viewpoints carried out in both public and private realms.[85] The health care workers at the New Waterford Consolidated Hospital encountered resistance in three specific ways including belief in the existence of the illness; conflict in a diagnosis; and conflict regarding an appropriate treatment (Sweeney, 2006a). Affected employees filed a workers' compensation claim which was supported by local MLA Frank Corbett who stated that "there is no excuse left for the [Workers' Compensation Board] to further delay the compensation owed to eligible workers who became sick while they were employed [at the New Waterford Consolidated Hospital]" (Corbett, 2004; Sweeney, 2006a). The Workers' Compensation Board rejected the claim from thirty-six employees reasoning that they could not find a link between the employees' illnesses and the Hospital (CBC, 2005). The approval of the Workers Compensation Board claim not only would have assisted workers financially, but would have formally legitimized their claims. An oral surgeon who was affected by this case filed a statement of claim at the Supreme Court against the Cape Breton District Health Authority contending that occupational health and safety rules were violated and resulted in hospital workers being exposed to excessive levels of toxic dust (Richer, 2004; Sweeney, 2006a). The lawsuit concluded in 2009 when the Supreme Court judge found

[85] Those affected in this case engaged in Brown's (1992: 267-9) stages of popular epidemiology which are based on his research surrounding communities affected by toxic waste "where lay persons gather and direct and marshall the knowledge and resources of experts in order to understand the epidemiology of disease, treat existing and prevent future disease, and remove the responsible contaminants." A case study of the events surrounding the environmental health controversy at the New Waterford Consolidated Hospital amends the stages of popular epidemiology to include biographical disruption in an examination of the experiences of health care workers who become ill with environment-related illnesses, when they encounter resistance from their peers and the health care system to which they belong (Sweeney, 2006a).

in favour of the Cape Breton District Health Authority. In a 113-page decision, Justice MacLellan found that

> [t]he plaintiff here has suffered a great deal. His life has been torn apart by his illness. He is a good man and a skilled dental surgeon. The court finds no joy in denying his claim. However, the legal system requires that a plaintiff prove his claim based on certain legal principles, including proof of causation (Camus, 2009).

The plaintiff has since filed an appeal which suggests that the Supreme Court failed to address the original claim that the Cape Breton District Health Authority breached its leasing contract by exposing employees to hazardous substances including heavy metals and toxic gases (CBC, 2010b). It also suggests that the Supreme Court erred by placing the burden of proof on the plaintiff to "prove hazardous materials were present in the hospital while the renovations were going on, when the Occupational Health and Safety Act requires the health authority to determine what hazardous materials were present before starting the renovations" (Hayes, 2010). The controversy around issues of accountability and compensation in this case involves the affected health care workers, the Hospital Administration, health care system, and the Workers' Compensation Board, and has yet to be resolved. This case demonstrates the intrinsic link between risk, environmental health controversies and contested illnesses, where the affected health care workers have continued to suffer physically, financially and emotionally.

In cases concerning occupational exposures and breast cancer, the existence of the disease itself is not contested but its causation and issues of accountability are continually surrounded by scrutiny and debate. Many of the endocrine disrupting chemicals and mammary carcinogens of concern in the development of breast cancer have come into

widespread use over the past thirty years and women in Canada are exposed to these toxic substances on a regular basis.

> Based on the mounting evidence, this widespread introduction of toxic chemicals into various work environments, and particularly new pesticides into agriculture and plastics into automotive manufacturing, will likely result in escalating numbers of claims for work place compensation for women who have developed breast cancer from these new technologies (Brophy et al., 2013).

To date there have been no workers' compensation claims upheld in Canada in cases of toxic exposures linked to breast cancer (Keith, 2013). Manitoba became the first jurisdiction in Canada to "enact a firefighter's disease presumption" when it added breast cancer to its list of compensable diseases for firefighters in 2011 (Government of Manitoba, 2010). Ten primary-site cancers were listed in the original legislation in 2002 including brain, bladder, kidney, lung, ureter, colorectal, esophageal, and testicular cancers, non-Hodgkin's lymphoma, and leukemia. The amendments proposed in 2010 apply to volunteer, part-time and full-time firefighters and included four additional cancers including multiple myeloma, primary site prostate, skin, and breast cancer (Government of Manitoba, 2010). The risk of a female firefighter developing breast cancer is three to five times higher than the general population as a result of exposure to more than 200 known carcinogens connected to breast cancer at every fire (CBC, 2010c; Kusch, 2010).[86] Thus far, other provinces and territories do not have this category for

[86] Janette Neves Rivera is a California firefighter who was diagnosed with breast cancer that is believed to be linked to her exposure to toxic substances as a result of her occupation (Fire Engineering, 2013). Rivera maximized her sick time and applied to San Francisco's catastrophic illness program which enables employees to donate their sick time to each other, but the city's Department of Public Health denied her claim, stating that her current condition was not considered to be "life threatening" (KTVU, 2012). Rivera recently filed a petition along with the Center for Environmental Health to the Chairman of the Consumer Product Safety Commission which is currently considering a federal flammability standard that would restrict the use of flame retardants in furniture and other products across the United States. The federal standard being considered will undermine a new California standard (TB 117-2013) which would require

firefighters or any other specific occupational group. A workers' compensation claim was initially granted to health care workers who experienced a breast cancer cluster in a hospital laboratory in British Columbia and claimed they were exposed to carcinogens. However, this claim was appealed by the employer who argued that there was insufficient evidence to demonstrate that the claimants' cases of breast cancer were caused by occupational factors. The claim was overturned by the provincial Supreme Court, though the case has been left open if new evidence becomes available in the future (BC Justice, 2013; Keith, 2013).

Meek and Armstrong (2007: 593) note that the definition of environment in CEPA 1999 is broad enough to encompass the occupational environment. However, the federal regulatory regime that is designed to protect human health including CEPA 1999 and the *Chemicals Management Plan* does not encompass occupational health which instead falls under provincial and territorial legislation in the form of Occupational Health and Safety Acts. The research conducted by Brophy et al. (2012) linking increased incidence rates of breast cancer to occupational exposures of toxic substances raises important questions about the adequacy of existing chemical testing protocols in workplaces under provincial occupational health and safety standards. The Association of Workers' Compensation Boards of Canada recently listed breast cancer as an emerging issue citing the Brophy et al. (2012) study and its findings that the risk of breast cancer is

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companies to make products with improved fire safety and without hazardous flame retardants. The petition calls on the Consumer Product Safety Commission to join California and research other fire safety approaches that would provide greater fire safety without the use of toxic chemicals that are hazardous to human health and the environment (Fire Engineering, 2013; Rivera, Janette Neves and the Center for Environmental Health, 2013; State of California, 2013b, 2013c).

higher in workers in automotive plastic manufacturing and food canning industries (Association of Workers' Compensation Boards of Canada, 2013; Keith, 2013). The growing body of epidemiological and laboratory research has the potential to impact the workers' compensation system and frame breast cancer as a compensable occupational disease (Brophy et al., 2013).

Neither the federal regulatory or provincial occupational health and safety regimes adequately protect women and prevent detrimental health outcomes including the development of breast cancer as a result of exposure to toxic substances. The Government of Canada contends that "[n]ational consistency secures the same level of environmental and human health protection for all Canadians" (Environment Canada and Health Canada, 2006: 18). However, the federal regulatory regime does not account for women as a susceptible population who are at risk as a result of everyday exposures to toxic substances. Health Canada's focus on infants and children as the only vulnerable population at risk from exposure to environmental contaminants does not account for either a lifecourse approach to health or windows of susceptibility that occur through a woman's life. The risk assessment and management frameworks do not adequately account for the effects of low-dose, cumulative and synergistic effects of exposure to complex mixtures of toxic substances. These frameworks do not currently account for the emerging understandings of the long-term health effects of endocrine disrupting chemicals, despite the "abundant scientific evidence of the harmful effects by EDCs [which] has accumulated to support a swift change in public health and environmental policies aimed at protecting the public in general, and, in particular, the developing fetus

and women of reproductive age" (Soto and Sonnenschein, 2010: 7).

Women's Health and Cancer Organizations' Response

The majority of health and environmental organizations operate within the framework and discourse established by the government and public health sector. The more mainstream cancer and women's health organizations have traditionally and primarily promoted the lifestyle and behavioural risk factors in the development of cancer with the individualization of risk and responsibilization paradigm. It is also suggested that this approach has been promoted by mainstream organizations because of partnerships with and funding from pharmaceutical organizations. Batt (2010: 69) demonstrates that "[s]urveys based on annual reports, websites, and interviews confirm the prevalence of pharmaceutical company donors as well as concerns about disclosure, not only in Canada but in the U.S., Europe, Australia, and New Zealand." Health-related organizations receive tens to hundreds of thousands of dollars annually from pharmaceutical companies for conferences, publications, websites, and advocacy training (Batt, 2010: 69).[87] However, there is emerging evidence that points to a shift in mainstream women's health and cancer organizations which acknowledges the environment as a determinant of health and exposure to toxic substances as hazardous to women's health.

[87] Indeed, the Canadian Breast Cancer Foundation lists GlaxoSmithKline and the Roche Group as "Pink Ribbon Partners" of its Ontario branch with donations greater than $50,000 (CBCF, 2013). The Canadian Breast Cancer Network lists GlaxoSmithKline, the Roche Group, Novartis, and Amgen as sponsors (CBCN, 2013a).

The Canadian Cancer Society is perhaps the most well-known cancer organization in the country with a Nationwide Strategic Plan for 2010-2015 which aims to "deter, defeat and defy cancers" through the reduction of cancer incidence and cancer mortality rates for Canadians (Canadian Cancer Society, 2013d). The Canadian Cancer Society has traditionally focused its public education campaigns on lifestyle and behavioural risk factors. The Canadian Cancer Society published the "Seven Steps to Health" which were widely utilized in public educational campaigns of various cancer organizations including the Canadian Breast Cancer Foundation, Halifax Breast Cancer Screening Clinic, Cancer Care Nova Scotia, and the Canadian Cancer Society itself. For instance, the Seven Steps to Health appear prominently in public education pamphlets including "Breast Self-Examination: How to Check Your Breasts" (1997); "Facts on Breast Cancer" (2000); "Cancer Facts for Women" (2000); "Breast Health: What You Can Do" (2002); and "Breast Self-Examination: What You Can Do" (2002) (Sweeney, 2006b). The Seven Steps to Health are framed around the knowledge that "some cancers can be prevented," and the suggestion that members of the general public should take responsibility for their health and use these steps to reduce their risk of developing breast cancer:

> 1) Be a non-smoker and avoid second hand-smoke;
>
> 2) Eat 5 to 10 servings of vegetables and fruit a day. Choose high fibre, lower fat foods. If you drink alcohol, limit your intake to 1 or 2 drinks a day;
>
> 3) Be physically active on a regular basis: this will also help you maintain a healthy body weight;
>
> 4) Protect yourself and your family from the sun. Reduce sun exposure between 11a.m. and 4 p.m. Check your skin regularly and report any changes to your doctor;

> 5) Follow cancer screening guidelines. For women, discuss mammography, Pap tests and breast exams with a health professional. Both men and women should also discuss screening for colon and rectal cancers.
>
> 6) Visit your doctor or dentist if you notice a change in your normal state of health; and
>
> 7) Follow health and safety instructions both at home and work when using, storing and disposing of hazardous materials (Sweeney, 2006b: 82).

The influence of the Doll and Peto paradigm, the individualization of risk, and promotion of responsibilization is evident in the emphasis on lifestyle and behavioural factors in the public education literature. Breast cancer is primarily framed as a problem of behavioural practices as women are encouraged to live a healthy lifestyle which includes not smoking, limiting alcohol consumption, eating healthy, exercising, and engaging in cancer screening practices (Steingraber, 2000).

Step seven of the Canadian Cancer Society's approach is the only one to acknowledge an environmental role in the development of cancer. The language used in step seven has evolved over time. A public education pamphlet published in 1997 suggests that "[a]t home and work, follow health and safety instructions when using hazardous materials." There was a minor revision in 2000 to read "[f]ollow health and safety instructions at home and at work when using, storing and disposing of hazardous materials" (Sweeney, 2006b: 84). An article published in *This Magazine* questioned the Chief Executive Officer of the Canadian Cancer Society about why this step offers advice on handling hazardous materials and does not urge citizens to avoid known carcinogens altogether. The question in itself reflects the lifestyle and behavioural component in framing the responsibility for avoiding exposure to carcinogens as a problem to be

addressed at the individual level. The Chief Executive Officer replied that "[i]t's sort of wussy," and that all public education materials using the Seven Steps to Health should be updated within the year (Murphy, 2002: 32). The interview was published in March 2002, and two of the pamphlets that were revised and printed in July 2002 contained a re-wording of step seven: "[f]ollow health and safety instructions both at home and at work when using, storing and disposing of hazardous materials." This was nearly identical to the text from seven years prior and the Canadian Cancer Society's website reflected the same information in 2003 (Sweeney, 2006b: 84-85). Chernomas and Donner (2004) note that in 2004 the Canadian Cancer Society endorsed the precautionary principle as an effective tool for preventing cancer. However, the authors critique the organization's approach as "inconsistent in acknowledging the importance of primary prevention" in relation to the precautionary principle as the public education literature on breast cancer does not contain reference to possible environmental risk factors (Chernomas and Donner, 2004: 17).

More recently, the Canadian Cancer Society (2008, 2013b) suggests that the current scientific evidence has not been able to confirm or eliminate a causal link to environmental contaminants in the development of cancer and list environmental exposures under unknown risk factors, but does allow that "people who are continually exposed to cancer-causing substances at high levels or over long periods of time may have a higher risk of developing cancers" (Canadian Cancer Society, 2008: 3). *The Environment, Cancer and You* is an underwhelming publication as it still places a significant amount of responsibility on the individual and only fully confirms asbestos

and radon as cancer-causing, while other substances such as flame retardants, phthalates and electromagnetic fields are classified as a concern (Canadian Cancer Society, 2008). The organization maintains that more research is needed in order to clearly understand how toxic or environmental substances may be linked to cancer, but suggest that substances that are known to cause cancer should be replaced with safer alternatives and if that is not possible, then exposure to the substance should be reduced as much as possible (Canadian Cancer Society, 2013e). The Canadian Cancer Society relies on classification material from international sources including the International Agency for Research on Cancer, the United States National Toxicology Program; and the United States Environmental Protection Agency (Canadian Cancer Society, 2013e).[88]

The Canadian Cancer Society announced in November 2012 that it will be funding three new prevention-focused projects. Director of Research, Dr. Mary Argent-Katwala stated that

> [t]hese new prevention grants are a unique opportunity for the Society to use the findings to inform our advocacy and policy agenda. For example, the results…could be used for educational campaigns, advocacy activities to urge governments to enact prevention regulations, and to set priorities for our prevention activities (Canadian Cancer Society, 2012b).

[88] The International Agency for Research on Cancer (IARC) is an intergovernmental agency and part of the World Health Organization. It uses four classes in its conclusions around carcinogenicity including Group 1 (carcinogenic to humans); Group 2A (probably carcinogenic to humans); Group 2B (possibly carcinogenic to humans); Group 3 (not classifiable as to its carcinogenicity to humans); and Group 4 (probably not carcinogenic to humans) (Canadian Cancer Society, 2013f; IARC, 2013). The National Toxicology Program (NTP) is part of the United States Department of Health and Human Services. The defining criteria it uses for determining carcinogenicity includes known to be a human carcinogen; and reasonably anticipated to be a human carcinogen (Canadian Cancer Society, 2013f; NTP, 2011). The United States Environmental Protection Agency (USEPA) classifies toxic substances in five categories including carcinogenic to humans; likely to be carcinogenic to humans; suggestive of carcinogenicity but not sufficient to assess human carcinogenic potential; data are inadequate for an assessment of human carcinogenic potential; and not likely to be carcinogenic to humans (Canadian Cancer Society, 2013f; USEPA, 1999; 2012).

The first study will quantify the number of new cancer cases and deaths in Canada that can be attributed to workplace factors and determine its economic impact. This multi-disciplinary research will receive $1 million over four years to examine the human and economic impact of workplace exposure to forty-four known or suspected carcinogens based on the guidelines from the International Agency for Research on Cancer, and toxic substances links to twenty-seven types of cancer. The substances that will be considered include industrial chemicals benzene, formaldehyde and 1.3-butadiene; metals such as chromium, nickel and arsenic; and other factors including exposure to sunlight, asbestos, paint, diesel fumes, and shift work. The research will also estimate direct costs such as medical care, indirect costs such as lost work time, and quality of life costs related to occupationally-related cancers; estimate the human and economic burden of occupational cancer by province, industry, sector, and gender (sex); and utilize the estimates in order to determine potential benefits of cancer prevention such as toxics use reduction (Canadian Cancer Society, 2012b).

The second prevention-focused research project funded by the Canadian Cancer Society involves $928,000 over four years to study how public health agencies can collaborate to reduce cancer rates in Northern British Columbia which has higher rates of smoking, obesity and cancer-related deaths than the rest of the province. The third project involves $970,000 over four years to create a smoking cessation intervention program for youth in Quebec involving general practitioners and nurses, follow-up counselling, and peer support in order to target youth who smoke and prevent cancer incidence related to smoking-related illnesses such as lung cancer (Canadian Cancer Society, 2012b). While

the first study has a broader focus on occupational exposure to toxic substances, the two remaining studies continue to focus primarily on lifestyle and behavioural factors in their focus on smoking cessation.

The Canadian Breast Cancer Foundation (2012d) acknowledges the potential of toxic substances in increasing the risk of developing breast cancer and points to key areas of concern such as the health effects of endocrine disrupting chemicals, low-level cumulative exposures and mixtures of toxic substances, and critical periods of development and susceptibility including infancy, puberty and pregnancy. Research on indoor air and household exposures to toxic substances suggests that low-level exposures may result in triggers for the development of breast cancer including disruptions in the hormonal system, early puberty and altered mammary gland development. The Canadian Breast Cancer Foundation endorses the use of the precautionary principle as a way to "apply evolving breast cancer prevention evidence in our daily lives. By following the precautionary principle in your life, when scientific evidence is inconclusive you put your health first and err on the side of caution" (CBCF, 2012d).

The Canadian Breast Cancer Foundation encourages people to limit their daily exposure to toxic substances at home and in the workplace (CBCF, 2012d, 2012e). Specifically, the organization suggests that people can reduce their exposure to toxic substances in food, plastics, personal care and cleaning products, and products for children in order to reduce chemical exposures in the home. In order to reduce exposures through food, people are encouraged to wash fruits and vegetables to remove traces of pesticides; buy local, pesticide-free or organic food; and minimize exposure to BPA by

avoiding canned foods and using glass containers instead of plastic to prevent leaching. Avoiding plastics that contain polyvinyl chloride, polystyrene and polycarbonate is also suggested. In order to reduce or limit exposure, the organization recommends using fewer cosmetics and personal care products or ones with less ingredients. They also encourage consumers to read the label for ingredients and avoid products that contain fragrance or parfum or toxic substances such as phthalates, parabens, alkylphenols, and placental extracts. To reduce exposures through the use of household products, consumers are encouraged to use non-toxic household products, avoid products containing bleach, and use pesticide-free and non-toxic products on yards and gardens and in particular avoid products which contain 2,4-D or malathion. Finally, the organization suggests limiting children's exposure to toxic substances by using glass food containers instead of plastic and buying toys that do not contain phthalates (CBCF, 2012f). These recommendations all fall under practices of precautionary consumption and seem to target a highly educated and affluent demographic with recommendations to purchase organic food and read labels for cosmetics, personal care products, and cleaning products.

The Canadian Breast Cancer Foundation also acknowledges concerns around workplace exposures to toxic substances and the risk of developing breast cancer. Occupations with increased breast cancer risks include agriculture and manufacturing of textiles, paper, microelectronics, metals, food canning, and automotive plastics as a result of exposure to toxic chemicals; health care where workers are exposed to ionizing radiation; work with heavy traffic such as border service agents where there are high levels of exposure to diesel exhaust; and long-term night-shift workers whose exposure to

artificial light can reduce melatonin levels which can play a role in suppressing the growth of breast tumours (CBCF, 2012f). The Canadian Breast Cancer Foundation cites the Brophy et al. (2012) work as a "landmark study" in occupational breast cancer research which found that women who were exposed to carcinogens and endocrine disrupting chemicals over a ten year period had a forty-two percent increased average risk and women working in the food canning and automotive plastics had a five times higher risk of developing breast cancer before menopause. The precautionary steps recommended for workers exposed to toxic substances include knowing workplace health and safety rights; learning about how to best protect yourself from risks such as how to properly use protective equipment or clothing; as well as raising concerns with supervisors, Occupational Health and Safety Committees, the local ministry of labour office, or the Canadian Centre for Occupational Health and Safety. In addition to the precautionary measures recommended for individual workers, the Canadian Breast Cancer Foundation argues that there is a need for regulators and employers to take precautionary action in order to protect workers and reduce the risk of negative health outcomes (CBCF, 2012g).

The Breast Cancer Society of Canada (2013c) has also moved towards acknowledging the environment as playing a role in "healthy living" and in the development of breast cancer. The Breast Cancer Society of Canada acknowledges both environmental and occupational exposures as issues of concern, although their recommendations for "living green" fall into precautionary consumption behaviours and are vague at best. The organization suggests that the cost of making extreme

modifications to our homes or changing careers in order to live a completely green lifestyle without exposures to toxic substances is not feasible, while still placing responsibility on the individual by recommending that "there are many things that can be done in your daily life and if you integrate these changes gradually in the areas where you are most vulnerable, you'll be living green before you know it" (BCSC, 2013c). The Breast Cancer Society of Canada acknowledges that Canadian citizens come into contact with chemicals that have been linked to breast cancer including polychlorinated biphenyls, dioxin, pesticides, phthalates, BPA, polyvinyl chloride, fire retardants, and ingredients in cosmetics. However, there is no background or context provided as part of this discussion, rather they provide a link to the Environmental Working Group's Cosmetics Database where people can "verify how safe your brands are," and a link to an alphabetized list of carcinogens compiled by Health Canada. Farm workers are the only occupation included as increasing the risk of developing breast cancer and the recommendations are to follow warnings and handling procedures in material safety data sheets for chemicals and to work with employers to ensure the workplace has good air quality and that chemicals are properly handled (BCSC, 2013c). This information lacks any level of detail and specificity while placing the onus of responsibility for behavioral change on the individual rather than any acknowledgement or call for regulatory reform around environmental and occupational exposures.

The Canadian Breast Cancer Network finds that some organizations categorize environmental risk factors with a very broad understanding of environment to encompass all determinants that are not genetic or hereditary including lifestyle and behavioral

factors such as smoking. This framework is grounded in the responsibilization paradigm and the individualization of risk which are promoted in public health policy. At the other end of the spectrum are organizations who attempt to shift the discourse and approach to health outcomes by defining environmental risk factors as limited primarily to industrial chemical pollutants. The Canadian Breast Cancer Network itself recognizes the wide variation between the definitions as well as the political implications involved in categorical decisions. As such, the organization chooses to work with a middle ground by recognizing the impact of the environment on health outcomes and by providing a general selection of resources in its educational materials "relating to environmental concerns with the hope that a cleaner, healthier, conscientious environment is conducive to all facets of health, not least of all breast health" (CBCN, 2013b). The Canadian Breast Cancer Network acknowledges that toxic chemicals and radiation play a role in the risk a woman has of developing breast cancer and suggests that our exposure to chemicals and radiation is something that can be controlled through personal, corporate and political action. They do not provide any detailed information or suggestions as to what the corporate or political action may involve, but suggest precautionary consumption practices in "get[ting] to know the chemicals that have been linked to breast cancer and tak[ing] action to reduce your risk" (CBCN, 2013b).

While the Canadian Breast Cancer Network does acknowledge environmental risks, they categorize occupational hazards as a "lifestyle risk." The occupational information provided includes automotive combustion with an article published in 2000 specific to male breast cancer incidence as a result of exposure to gasoline and vehicular

combustion product; and chemical exposure in female firefighters providing links to an American study from Cornell University and the International Agency for Research on Cancer Monographs with "recent evaluations of occupational carcinogens" which provides a broken link to the Canadian Cancer Society website (CBCN, 2010). There is no substantive discussion for concerns around automotive combustion or chemical exposure, though there is slightly more information provided about hazards associated with working night shifts and the role of melatonin in tumour development and a higher incidence of breast cancer among women who work night shifts (CBCN, 2010). Recognizing the risks associated with occupational exposures and developing breast cancer is of great importance. However, categorizing occupational exposures as a lifestyle risk is problematic in a number of ways. First, framing occupational exposures and health outcomes in this manner clearly implies that individuals can control these exposures and subsequent health outcomes through behavioural practices when in the majority of cases this is beyond the capacity of the individual. It is also important to consider the social determinants of health such as socioeconomic status when discussing occupational exposures. There is often apprehension about being labelled a "troublemaker" for raising concerns around occupational health issues. In addition to this stigma, workers face the very real threat and fear of workplace closure and subsequent job loss in cases with environmental, contested or occupational exposures and health outcomes. This is similar to threats around mine closures when respiratory illnesses were linked to miners who were exposed to contaminated air (Rosner and Markowitz, 1987). The threat of job loss is particularly relevant in rural communities where there are few

major employers (Sweeney, 2006a). Brophy et al. (2012) also point to a class and gender bias around the issue of occupational exposures and that breast cancer is a neglected issue. Finally, framing occupational exposures as a lifestyle risk effectively dismisses the role of the employer and the government in regulating exposures and protecting workers' health.

Despite the Canadian Cancer Society, Canadian Breast Cancer Foundation, Canadian Breast Cancer Society, and the Canadian Breast Cancer Network making some move towards acknowledging the environment and toxic substances as influencing women's health and cancer outcomes, their primary focus remains on lifestyle and behavioural factors which places the onus of responsibility for preventing breast cancer on the individual and which is consistent with the mainstream organizations in the United States. Separate from these mainstream organizations, there are those which are more progressive in taking action through educational campaigns and lobbying government, and which can be classified as part of the culture of cancer prevention and environmental risk. The Breast Cancer Fund and Breast Cancer Action are two organizations that emerged as part of this culture of action in the San Francisco Bay Area, and Breast Cancer Action Montreal represents a similar organization in Canada as part of the broader environmental breast cancer movement. All of these organizations have similar mandates in their commitment to advancing and protecting women's health through public education and advocacy campaigns and a refusal to accept funding from organizations and corporations that conflict with their mandate such as pharmaceutical

companies, chemical manufacturers, oil companies, tobacco companies, and health treatment facilities.

The Breast Cancer Fund works towards translating scientific evidence which links environmental exposures to the development of breast cancer into public education and advocacy campaigns around reducing breast cancer risk and protecting women's health (Breast Cancer Fund, 2013b). The organization points to the emerging body of scientific evidence which indicates that exposures to toxic substances such as chemicals and radiation are contributing to the increased breast cancer incidence rates in industrialized countries. The Breast Cancer Fund's *State of the Evidence: The Connection Between Breast Cancer and the Environment* is now in its sixth edition. This widely cited report examines the links between exposure to environmental chemicals and radiation and the development of breast cancer within a broad context that recognizes the social determinants of health and susceptible populations who may be at higher risk of developing the disease. The organization argues for the importance of the timing and duration of exposures to toxic substances, low-dose exposures at environmentally significant levels, patterns and mixtures of exposures, and the complexity of interactions between environmental and other risk factors for breast cancer (Gray et al., 2009; Gray, 2010). The organization points to the role of windows of susceptibility when "mammary cells are more susceptible to the carcinogenic effects of hormones, chemicals and radiation including early stages of development, from the prenatal period through puberty, adolescence and on until the first full-term pregnancy" (Nudelman et al., 2009: 80).

The broad categories of concerns addressed by the Breast Cancer Fund include hormones in personal care products; endocrine disrupting chemicals; hormones in food; non-endocrine disrupting industrial chemicals; light-at-night and melatonin; and radiation. Specifically, there is a focus on air and water contaminants; chemicals used in cosmetic and personal care products; chemical ingredients in household cleaning products; chemicals in plastics; exposures in health care settings; and pesticides. The chemicals are considered in terms of the source of exposure and whether they are carcinogenic, a mammary carcinogen, or an endocrine disrupting compound (Gray et al., 2009; Gray, 2010; Nudelman et al., 2009; Nudelman and Engel, 2010). The everyday exposures associated with these toxic substances are widespread and cannot be controlled through measures of precautionary consumption. The Breast Cancer Fund advocates for increased research and regulatory change in order to "decrease human exposures to toxic substances implicated in the high rates of breast cancer, thereby decreasing the incidence of this disease" (Nudelman et al., 2009: 97).

Advocacy organization Breast Cancer Action operates with three priority areas including i) advocating for more effective and less toxic breast cancer treatments; ii) decreasing involuntary environmental exposures that increase the risk of developing breast cancer; and iii) creating awareness that social injustices, including political, economic and racial inequities lead to disparities in breast cancer outcomes (BCA, 2013a). Breast Cancer Action promotes the use of the precautionary principle in its commitment to advancing women's health. "While many breast cancer organizations offer advice on how individuals can reduce their voluntary exposures to carcinogens, the

policy changes needed to eliminate these exposures for everyone require a broader social justice approach" (BCA, 2013b).

Breast Cancer Action launched the "Think Before You Pink" campaign in 2002 which calls for increased levels of transparency and accountability by companies who participate in breast cancer fundraising, and encourages people to ask critical questions about pink ribbon products and promotions (BCA, 2013c). The "What the Cluck?" campaign in 2010 noted the health hypocrisy of "Buckets for the Cure" which was a partnership between KFC and Susan G. Komen for the Cure, one of the largest and most well-funded breast cancer organizations. "Raise a Stink" also targeted Susan G. Komen for the Cure in 2011 to demand the recall of Promise Me perfume and that the highest precautionary standards be adopted to protect women's health. The specific concerns with Promise Me Perfume centre around the chemicals it contains that i) are categorized as toxic and hazardous; ii) have not been adequately evaluated for human safety; and iii) have demonstrated negative health effects. Ingredients in the perfume include galaxolide which is a synthetic musk that acts as a hormone disruptor detected in blood and breast milk, and toluene which is a neurotoxin with a variety of negative health effects and is banned by the International Fragrance Association. This campaign resulted in a victory for Breast Cancer Action with Susan G. Komen for the Cure ending their partnership to produce Promise Me perfume as of May 2012 (BCA, 2011b, 2011c). The 2012 Think Before You Pink campaign was entitled "It's An Epidemic, Stupid" and argued that "after three decades of 'awareness' campaigns and billions of dollars raised, breast cancer remains a public health crisis of epidemic proportions." This campaign called for a

mandate for government action and for meaningful prevention efforts (BCA, 2012). The most recent Think Before You Pink campaign is entitled "Toxic Time is Up!" and was launched in October 2013. It calls for an end to pinkwashing and asks that chemical substances be proven to be safe before they are placed on the market and subsequently, into women's bodies (BCA, 2013d). Breast Cancer Action is calling for a systemic change in advocating for the legislation, regulation, research, and education which would reduce and ultimately eliminate involuntary everyday exposures to toxic substances (BCA, 2013c).

Breast Cancer Action Montreal is a non-profit activist and advocacy organization which works to i) educate the public about environmental toxicants and widespread exposures linked to breast cancer, the precautionary principle, the benefits and risks associated with various treatments for breast cancer, and current cancer research, treatment and services; ii) advocate for policies that would decrease the amount of toxic substances in the environment and allocate increased funding for research on environmental causes of breast cancer; iii) provide support for efforts to improve services, health care and health policies, as well as for individuals to have a strong voice in decisions about their diagnosis and treatment; and iv) network to create a resource-sharing community of women around the issue of breast cancer, and encourage other breast cancer organizations to join the fight for prevention of the disease, as well as for improvements in diagnosis and treatment (BCAM, 2013a).

Breast Cancer Action Montreal has a similar critique about the use of the pink ribbon and launched a campaign called "Little Pink Lies" which counters the mythology

around Breast Cancer Awareness Month (Cohen, 2012[89]). The little pink lies included in this educational campaign include:

- "*We're close to finding a cure*." This message is repeated at fundraising events and printed in media coverage around Breast Cancer Awareness Month. However, the treatment options including surgery, radiation and chemotherapy have not changed in the past forty years, and a cure or cures have not been found despite the significant amount of funding for research in this area. With the mainstream organizational, corporate and media attention focused on the "cure," there has been far less focus on prevention and less than five percent of research funding goes to prevention;

- *"Rates of breast cancer are decreasing.*" While mortality rates among women diagnosed in Canada and the United States are decreasing, this is attributed to detection measures and the reduced use of hormone replacement therapy. The incidence of breast cancer is increasing in developing countries which may be linked with the proliferation of toxic substances in the environment and is not reflected in pink ribbon campaigns;

- "*Pink ribbons mean companies care.*" There is a general perception that purchasing pink ribbons products contributes to the "cause" and that the company's practice is grounded in philanthropy. However, there is very little transparency about what amount of money will be contributed, if there is a cap on donations, or what organization the money will be donated to and what work will be done with the donation. Breast Cancer Action Montreal points to the pinkwashing associated with companies who "support breast cancer" with pink ribbon products while simultaneously manufacturing products which contain ingredients that may be linked to the disease such as automobile manufacturers whose vehicles emit PAHs, cosmetic companies whose products contain carcinogens or endocrine disrupting chemicals, food producers whose cans are lined with BPA, and multinational pharmaceutical companies who produce and sell carcinogenic pesticides as well as medications that are used in cancer treatment;

- "*Government regulations prohibit the use of known or suspected carcinogens in consumer products.*" The *Consumer Product Safety Act* which was introduced in 2011 was designed to protect the public by "addressing or preventing dangers to human health or safety posed by consumer products in Canada." However,

[89] This research project received ethics approval from York University's Office of Research Ethics. Participation was completely voluntary and participants received information describing the goals of the study and signed an informed consent form.

despite meeting the Act's definition of a "danger to human health," it does not include carcinogens. Breast Cancer Action Montreal created a petition calling for regulatory changes asking Health Canada to prohibit the use of any chemicals that are inherently carcinogenic or mutagenic, as well as those that have been identified as reproductive toxicants in products sold in Canada; mandate that manufacturers of consumer products supply full and complete safety data tests for all chemical ingredients used in their products; and require that producers submit complete environmental and health data to Health Canada on each chemical used as most chemicals lack comprehensive testing information; and

- "*We lack evidence that environmental factors affect breast cancer.*" Breast Cancer Action Montreal points to the substantial and growing body of evidence on how chemicals, radiation and other environmental factors contribute to the development of the disease. Over the past sixty years there have been at least 100,000 new chemicals introduced into the environment and breast cancer incidence in Canada rose from one in forty women to one in nine. Recognizing that only five to ten percent of breast cancers are as a result of genetic and family history, the organization points to important findings in considering the everyday environmental exposures women experience including: synthetic chemicals mimicking the action of estrogen; a woman's risk of breast cancer increasing with her lifetime exposure to estrogen; and that estrogen-like chemicals including BPA, PVCs and phthalates are found in consumer goods and personal care products. Women are consistently exposed to a "chemical soup" which can have cumulative and synergistic effects, as well as effects as a result of low-dose, long-term and chronic exposures (BCAM, 2013b).

Breast Cancer Action Montreal is particularly interested in the involuntary risk factors which are inherent in everyday exposures to environmental toxicants and grounds its work in the precautionary principle (Cohen, 2012). In addition to the Little Pink Lies campaign, Breast Cancer Action Montreal has a campaign for safe cosmetics which calls on Health Canada to prohibit the use of chemicals in cosmetics sold in Canada that are inherently carcinogenic, mutagenic or act as a reproductive toxin. The campaign also seeks to mandate that cosmetic companies supply complete safety data tests for all chemical ingredients in their products, and demands that producers supply full environmental and health data on all chemicals used in their products to Health Canada

(BCAM, 2013c, 2013d). FemmeToxic is a related initiative and educational campaign which focuses on young women and toxic substances found in cosmetic and personal care products that are detrimental to human health and may increase the risk of breast cancer.

> The average woman uses 12 cosmetic and personal care products every day, exposing her to 126 unique chemicals. Canada's weak cosmetic regulations, and the influence of the powerful $5.4 billion Canadian cosmetic industry, allow compounds such as carcinogens, mutagens and reproductive toxins, for example, to be used in our cosmetic products. It has reached a point where the financial costs of reformulating outweigh and undermine the impacts and concerns these chemicals have on our health. Marketing schemes have been successful in skewing a woman's perspective on true beauty. The small dose, long-term exposure from these cosmetics toxins accumulate and add to the body burden of women who have already been overloaded with other environmental contaminants that pollute our bodies (FemmeToxic, 2013).

The FemmeToxic campaign engages with youth aged twelve to twenty-five and advocates for stronger regulations from Health Canada including labelling and the substitution and removal of toxic substances in cosmetics and personal care products (BCAM, 2013e; FemmeToxic, 2013).

The final campaign from Breast Cancer Action Montreal is framed around the loopholes in the federal regulatory system for consumer products. "Becoming a Chemical Detective" provides education and resources with practical solutions and safer alternatives in order to help reduce exposure to toxic substances and provides low-cost and affordable solutions, recognizing potential socioeconomic barriers. The campaign is focused on new and potential parents in its emphasis on the risks associated with exposure to toxic substances and susceptibility during pregnancy, infancy, early childhood and adolescence (BCAM, 2013f). Breast Cancer Action Montreal

demonstrates that the focus of breast cancer research must "move beyond its current emphasis on treatment to also embrace a serious search for the causes of the disease and its prevention" (BCAM, 2013g).

As a response to the critiques around Breast Cancer Awareness Month and the pink ribbon campaigns, the Canadian Women's Health Network launched a postcard campaign in 2012 focused on breast cancer prevention. The Canadian Women's Health Network utilized messaging in this educational campaign which included:

- *Think Before You Pink*: Drawing on Breast Cancer Action's campaign, the Canadian Women's Health Network notes the history behind Charlotte Haley's peach ribbon and the lack of funding for primary prevention;

- *Prevent the Root Causes:* This postcard calls for the prevention of the root causes of breast cancer, lung cancer and cardiovascular disease and their impacts on women's health and mortality;

- *An Ounce of Prevention:* Questioning the predominant focus on research for a cure for breast cancer, this postcard notes organizations who are working on prevention including Breast Cancer Action Montreal, the Women's Healthy Environments Network, the Breast Cancer Fund, Breast Cancer Action, and the Alliance for Cancer Prevention;

- *Breast Cancer is Preventable:* This postcard notes that breast cancer is preventable and points to the toxic substances and environmental exposures to the disease, calling for both personal and political action; and

- *Link Our Environments with Prevention*: This postcard speaks to occupational exposures and calls for the need to link both home and work environments with breast cancer prevention efforts (Canadian Women's Health Network, 2012d).

The Canadian Women's Health Network is attempting to shift the dominant discourse on breast cancer and acknowledge the role of the environment, risk and prevention in women's health outcomes (CWHN, 2012d). While the burden of responsibility most often falls onto the individual through precautionary consumption practices, it is

ultimately legislation and public health policy that can play a role in truly protecting women's health and exposure to toxic substances (Cohen, 2012).

The longstanding organizations that operated with funding from Health Canada as part of the Women's Health Contribution Program produced research with a commitment to sex- and gender-based analysis and advancing women's health and well-being. This program was "critical to funding innovative social policy research, building community partnerships and providing important mentorship opportunities in women's health" (CWHN, 2012e). The Women's Health Contribution Program lost its funding as part of the 2012 federal budget. It was anticipated that Health Canada needed to cut more than $200 million from its budget and would save $2.85 million per year in eliminating the Women's Health Contribution Program (Rabson, 2012; Smith, 2012). The budget cuts resulted in four research centres and two communications networks losing their federal funding as of March 31, 2013, including the Atlantic Centre of Excellence for Women's Health, the British Columbia Centre of Excellence for Women's Health, the Canadian Women's Health Network, the Prairie Women's Health Centre of Excellence, the National Network on Environments and Women's Health, and the Réseau Québécois d'Action pour la Santé des Femmes. Steven Outhouse, communications director for the Minister of Health said that Health Canada was prioritizing front-line services (Rabson, 2012). However, Anne Rochon Ford, Executive Director of the Canadian Women's Health Network stated that the biggest loss associated with these cuts will be "how the

groups went beyond clinical research to focus on how particular government policies and regulations affect the health of women" (Smith, 2012).[90]

The Atlantic and Prairie Centres of Excellence for Women's Health have already closed as a result of the budget cuts, while the remaining centres and organizations such as the Canadian Women's Health Network and the National Network on Environments and Women's Health are searching for other sources of funding in the hope of remaining open and continuing to conduct research (CWHN, 2013). Chi Nguyen, Chair of the Board of the Canadian Women's Health Network criticized the funding cuts and remarked that

> [t]he effect of this decision by Health Canada is yet another sign that the federal government is pulling away from its responsibility to gender equality. The work funded through the WHCP [(Women's Health Contribution Program)] has been critical to ensuring that Canadian women have had access to the best evidence and policy advice on women's health issues, through research that recognized social

[90] The Canadian Federation of University Women compiled a list of women's organizations and programs whose funding has been cut or eliminated by the federal government since the Conservative government was elected in 2006. These organizations and programs include Aboriginal Healing Foundation (cuts affected several healing centres that focused on providing support to abused women, such as the Native Women's Shelter of Montreal), Action travail des femmes, Alberta Network of Immigrant Women, Association féminine d'éducation et d'action sociale, Atlantic Centre of Excellence for Women's Health, British Columbia Centre of Excellence for Women's Health, Canadian Child Care Federation, Canadian Research Institute for the Advancement of Women, Canadian Women's Health Network, Centre de documentation sur l'éducation des adultes et la condition féminine, Child Care Advocacy Association of Canada, Childcare Resource and Research Unit, SpeciaLink the National Centre for Child Care Inclusion, Conseil d'intervention pour l'accès des femmes au travail, Elspeth Heyworth Centre for Women Toronto, Feminists for Just and Equitable Public Policy, First Nations Child and Family Caring Society, International Planned Parenthood Federation, Kelowna Women's Resource Centre, Marie Stopes International (a maternal health agency that has received only a promise of "conditional" funding if it avoids any and all connection with abortion), MATCH International, National Association of Women and the Law, National Network on Environments and Women's Health, Native Women's Association of Canada, New Brunswick Coalition for Pay Equity (lost funding for advocacy and research), Older Women's Network, Ontario Association of Interval and Transition Houses, Ontario Coalition for Better Child Care, Pauktuutit, Intuit Women of Canada, Prairie Women's Health Centre of Excellence, Réseau action femmes, Réseau des tables régionales de groupes de femmes du Québec, Le Réseau québécois d'action pour la santé des femmes, Riverdale Immigrant Women's Centre, Toronto, Sisters in Spirit, South Asian Women's Centre, Tri-Country Women's Centre Society, Womanspace Resource Centre, Women and Health Protection, Women for Community Economic Development in Southwest Nova Scotia, Women's Innovative Justice Initiative – Nova Scotia, and Workplace Equity/Employment Equity Program (Canadian Federation of University Women, 2012).

> and environmental determinants of health are key (Institute for Feminist Legal Studies, 2012).

These funding cuts have resulted in losing organizations that conduct important research, policy and advocacy work on women's health with a critical feminist lens (Armstrong et al., 2012). Dayna Scott, Director of the National Network on Environments and Women's Health reflected upon the funding cuts and that organizations will no longer be able to apply their expertise and offer important critiques to policy issues. "It is difficult to reconcile it with a genuine need or desire to protect health in the long-term and to take preventive strategies that move towards health promotion for Canadians" (Scott, 2012c).

Federal funding cuts also seriously impacted the Canadian Environmental Network which is one of the country's oldest and largest environmental groups. It was established in 1977 and represents over 640 diverse environmental organizations with support for networking, communication and coordination services (Canadian Environmental Network, 2013). The Canadian Environmental Network provided opportunities for representatives from environmental non-governmental organizations to "participate in federal government meetings, conferences, workshops and consultations on environmental policy issues through a transparent, bilingual and democratic delegate selection process" (Canadian Environmental Network, 2013). The federal government eliminated the $547,000 in core funding to the Canadian Environmental Network in 2011 (Canadian Environmental Network, 2011; CTV, 2011).

The level of engagement as part of the Canadian Environmental Network falls under the public participation requirements of CEPA 1999 and with the funding cuts, there is no longer an organizational process to coordinate feedback from non-

governmental organizations (Lewis, 2011). The federal government cited responsible spending and sound management of tax dollars as the basis for their decision and suggested that Environment Canada will be moving towards web-based public consultation (Environmental Hansard, 2011). However, there was no explanation provided about the possible limitations of this process including barriers around socioeconomic status and geographic location, access to computers, and levels of computer literacy. Megan Leslie, MP for Halifax criticized this decision stating that

> The cancellation of this funding is forcing the closure of one of the most critical environment networks Canada has. Environment Canada has senselessly ended a 34 year partnership with a respected organisation. The government has told [the network]…that this decision is part of a cost-efficiency plan, but given the important role this organization plays, cancelling their funding will likely have expensive, long-term consequences. This decision just doesn't make sense financially, and it will endanger the health and sustainability of our environment (Leslie, 2011).

Conclusions

This chapter continued to examine the relationship between theory and practice in its examination of Canada's regulatory regime for toxic substances. In doing so, the gaps which exist in Canadian law, policy and practice are revealed. It demonstrates the ways in which women are not adequately protected from detrimental health outcomes as a result of exposure to toxic substances, in part because the regime places the onus of responsibility on individual citizens, and in part because it does not recognize women as a susceptible population who are at risk as a result of exposure to toxic substances. The final chapter will synthesize the findings of the dissertation and provide recommendations based on the research findings including policy implications related to environmental health, breast cancer and disease prevention.

Chapter 6

Conclusions –

A Paradigm Shift: From A Reactionary to a Preventative Approach to Health Policy

Through my examination of the history of Canada's regulatory regime, it becomes clear that this research is steeped in politicized debates as it engages with issues central to women's health, risk and the environment. Davies and Sadler (1997: 19) found that "[p]ublic policy to achieve 'health for all' has yet to be translated into institutionalized processes that systematically address health issues at the policy, program and plan levels for decision-making." Despite substantive regulatory changes since 1997, including a revised *Canadian Environmental Protection Act* and the *Chemicals Management Plan*, these findings remain consistent sixteen years later with Canadian efforts for pollution prevention and precaution surrounding environmental health falling short. The significance of my research findings lies between the promise of precaution grounded in the regulatory regime and promoted by the federal government, and in exposing the gaps which exist in practice. These gaps result in an uneven protection which places women at risk for developing breast cancer. Women are not considered to be a susceptible population at risk as a result of exposure to toxic substances, and the influence of sex- and gender-related determinants of health are not adequately considered. At the same time, there is a gendered burden which places the onus of responsibility for preventing disease on individual women. My findings clearly demonstrate that despite being framed by the precautionary principle, Canadian law, policy and practice is not truly precautionary and does not enact a primary prevention approach.

Only a truly precautionary approach can be effective in protecting women's health. This approach would require shifting debates around causation upstream to focus on everyday exposures to toxic substances, while concurrently shifting the focus away from individual-level factors (Brown et al., 2006: 529). This concluding chapter will explore how primary prevention might be best reflected in Canadian health policy and its potential for positive health outcomes. By engaging with issues of risk, environmental justice, and viewing breast cancer as a multi-faceted social movement, the overarching theoretical framework and interdisciplinary approach allowed for an analysis which involved issues of gender, risk and precaution. The overarching goal of my research was not only to determine what legislation and policies exist within Canada's regulatory regime for toxic substances, but to examine how the issues are communicated and understood, where the burden of risk is presumed to lie, who the policies are designed to protect, and if the policies capture the need for prevention and action related to protecting women's health.

A paradigm shift is required in how the issues around breast cancer are communicated and understood, and where the burden of responsibility and risk is presumed to lie. The responsibilization paradigm and the trend towards individualization of risk clearly place the onus of responsibility in determining health outcomes on the individual. The dominant epidemiological paradigm is utilized by the biomedical community and the mainstream breast cancer movement to promote individual-level approaches to prevention, detection and treatment. This approach is promoted by government departments and mainstream cancer organizations and focuses solely on

modifiable risk factors such as tobacco and alcohol use, a lack of physical activity, and a healthy diet. The clear messaging in health promotion and public education campaigns is that breast cancer is preventable if individuals engage and participate in a "healthy lifestyle." However, it is not made clear that the modifiable risk factors account for only a fraction of breast cancer incidence. The focus on lifestyle and behavioural risk factors excludes the possibility of other approaches and dismisses the importance of other social, structural, political, economic, and environmental factors that influence the disease.

The promotion of precautionary consumption practices acknowledges the potential role of toxic substances in health outcomes. However, risk is still framed as something that can be controlled by individual citizens through acts of green consumption in order to avoid everyday exposures to toxic substances. This practice is also highly problematic in placing the onus of responsibility at the level of the individual and in dismissing other social determinants of health including socioeconomic status and education, as well as creating a gendered and disproportionate burden on women. In both the dominant epidemiological paradigm and practices of precautionary consumption, individual citizens are encouraged to act and are framed as the "risk managers" that the federal government promotes (Government of Canada, 2011f).

Women would benefit from a repoliticization of breast cancer in order to shift away from the fundamental emphasis on lifestyle and behavioural risk factors, as well as from the widespread and consumption-based pink ribbon campaigns which are designed to raise a very specific type of "awareness." Pink ribbon campaigns have resulted in the commercialization of breast cancer which presents the disease through a very restricted

and narrow lens. The efforts to raise awareness about breast cancer present a particular framing of the disease and do not encourage a more critical examination around the messaging of the campaigns, a lack of transparency in donated funds, and instances of pinkwashing. These pink ribbon campaigns divert attention from the realities of the disease, environmental links to breast cancer, and calls for primary prevention.

Environmental law, policy and practice are designed to protect and be representative of the entire Canadian population, but they are inadequate in protecting populations at risk including those who are highly exposed through occupational settings and in geographic areas that are highly polluted. Children's health emerged as a particular area of concern in the late 1990s, but this has not been reflected in the legislation as CEPA 1999 does not specifically address any populations of concern. Health Canada (2010c) does consider children as a vulnerable population in the *National Strategic Framework on Children's Environmental Health.* However, this method is contradictory as it does not include a lifecourse approach which allows for understanding the causal links between determinants of health throughout a person's life and health outcomes. It also does not account for windows of susceptibility that occur across the lifespan where the timing of exposure to toxic substances and stage of biological development can impact the development of diseases such as breast cancer.

Lalonde (1974: 18) noted with great foresight that "all the foregoing environmental conditions create risks which are a far greater threat to health than any present inadequacy of the health care system." *A New Perspective on the Health of Canadians* would benefit from a revised second edition with updated information on

environmental contaminants as determinants of health, the impact of sex and gender on health outcomes, and the role of primary prevention. Despite a provision in section 44(1)(f) of CEPA 1999 that requires the publication of reports on the state of the Canadian environment, this practice appears to have ceased since publications in 1991 and 1996. Both Standing Committees raised concerns about this during the CEPA 1999 legislative review and it would be advantageous to reinstate the practice of monitoring, reporting and disseminating the results about the state of the Canadian environment (House of Commons Standing Committee on Environment and Sustainable Development, 2007; House of Commons Standing Senate Committee on Energy, the Environment and Natural Resources, 2008). This process is a requirement for the Minister of the Environment, but it would be beneficial for Environment Canada to collaborate with Health Canada in order to address the current state of the Canadian environment, as well as the impacts of toxic substances on the environment and on human health.

Despite CEPA 1999 and the *Chemicals Management Plan* emphasizing the precautionary principle and the prevention of pollution, it is clear that the risk assessment and risk management processes are reactionary rather than precautionary. Firstly, the mandatory exposure requirement in determining the toxicity of a substance does not recognize inherent toxicity, and a toxic substance cannot be regulated for having the potential to cause harm. This process allows for harm to occur before a risk can be appropriately managed whereas a hazard assessment instead of or along with a risk assessment would offer room to evaluate the inherent toxicity and hazard of the substance, and its potential to cause harm in and of itself. Secondly, the risk assessment

and risk management process continues to be based on threshold values and the traditional dose-response relationship which suggest that threshold effects occur only at a specific level of exposure and that there is a toxicological threshold below which adverse effects do not occur. The basis of this aspect of risk assessment is problematic because it does not adequately account for the timing of exposure, windows of susceptibility, or the effects of low dose, cumulative and synergistic exposures to toxic substances including endocrine disrupting chemicals which have impacts below the traditional dose-response curve and threshold values. It also does not consider how sex and gender may impact the margins of exposure and how women may be a susceptible population.

Despite a formal commitment by the federal government, the Auditor General's report clearly demonstrates that sex- and gender-based analysis is not adequately integrated into policy development (Minister of Public Works and Government Services Canada, 2009). The role of sex and gender in influencing health outcomes is not reflected in Canadian law, policy and practice, and women are not considered to be a susceptible population of concern under CEPA 1999 or the *Chemicals Management Plan*. Public health policy and the regulatory regime for toxic chemicals lack the application of sex- and gender-based analysis which implies a gendered preference in their implementation and in the ability to protect women from health outcomes, such as breast cancer which is influenced by exposure to mammary carcinogens and endocrine disrupting chemicals. The budget cuts which formally eliminated federal funding for the Canadian Environmental Network and the Women's Health Contribution Program demonstrate a

continued devaluing of public engagement around environmental issues and of a commitment to women's health research and policy.

My dissertation concludes that Canadian law, policy and practice are not truly precautionary and do not capture the need for prevention and action related to women's health. Unless these gaps are adequately addressed in the federal regulatory regime, women will continue to be placed at risk. The importance of primary prevention in breast cancer cannot be overstated, and the current regulatory regime does not enact primary prevention. There is a need to bring the environment into public health discourse in a meaningful way which recognizes and fully understands the risks associated with exposure to toxic substances. An approach to health which embodies primary prevention must include sex- and gender-based analysis, as well as shifting the burden of risk and responsibility away from individual women. As Seager (2003: 957) suggests

> [i]t has taken (and still takes) relentless pressure from environmental justice and women's health advocates to shift paradigms—to put human health issues on the mainstream environmental movement agenda and to put environmental issues on the health map. Even now, virtually all assertions of causality between health disruptions and environmental assaults are fiercely contested, all the more so when women are the primary proponents of linkage.

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Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses

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For decades, studies of endocrine-disrupting chemicals (EDCs) have challenged traditional concepts in toxicology, in particular the dogma of "the dose makes the poison," because EDCs can have effects at low doses that are not predicted by effects at higher doses. Here, we review two major concepts in EDC studies: low dose and nonmonotonicity. Low-dose effects were defined by the National Toxicology Program as those that occur in the range of human exposures or effects observed at doses below those used for traditional toxicological studies. We review the mechanistic data for low-dose effects and use a weight-of-evidence approach to analyze five examples from the EDC literature. Additionally, we explore nonmonotonic dose-response curves, defined as a nonlinear relationship between dose and effect where the slope of the curve changes sign somewhere within the range of doses examined. We provide a detailed discussion of the mechanisms responsible for generating these phenomena, plus hundreds of examples from the cell culture, animal, and epidemiology literature. We illustrate that nonmonotonic responses and low-dose effects are remarkably common in studies of natural hormones and EDCs. Whether low doses of EDCs influence certain human disorders is no longer conjecture, because epidemiological studies show that environmental exposures to EDCs are associated with human diseases and disabilities. We conclude that when nonmonotonic dose-response curves occur, the effects of low doses cannot be predicted by the effects observed at high doses. Thus, fundamental changes in chemical testing and safety determination are needed to protect human health. (***Endocrine Reviews*** **33: 378–455, 2012)**

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ISSN Print 0163-769X ISSN Online 1945-7189
Printed in U.S.A.
Copyright © 2012 by The Endocrine Society
doi: 10.1210/er.2011-1050 Received October 27, 2011. Accepted February 7, 2012.
First Published Online March 14, 2012

Abbreviations: A4, Androstenedione; AhR, aryl hydrocarbon receptor; BPA, bisphenol A; CDC, Centers for Disease Control and Prevention; DDE, dichlorodiphenyldichloroethylene; DDT, dichlorodiphenyltrichloroethane; DES, diethylstilbestrol; EDC, endocrine-disrupting chemical; EPA, Environmental Protection Agency; ER, estrogen receptor; FDA, Food and Drug Administration; GLP, good laboratory practices; LOAEL, lowest observed adverse effect level; mER, membrane-associated ER; NHANES, National Health and Nutrition Examination Survey; NIS, sodium/iodide symporter; NMDRC, nonmonotonic dose-response curve; NOEL, no observed effect level; NOAEL, no observed adverse effect level; NTP, National Toxicology Program; PIN, prostatic intraepithelial neoplasias; POP, persistent organic pollutants; ppb, parts per billion; SERM, selective ER modulator; TCDD, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin; WoE, weight of evidence.

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I. Introduction

This review focuses on two major issues in the study of endocrine-disrupting chemicals (EDCs): low-dose exposures and nonmonotonic dose-response curves (NMDRCs). These concepts are interrelated, and NMDRCs are especially problematic for assessing potential impacts of exposure when nonmonotonicity is evident at levels of exposure below those that are typically used in toxicological assessments. For clarity of presentation, however, we will first examine each of the concepts separately.

A. Background: low-dose exposure

It is well established in the endocrine literature that natural hormones act at extremely low serum concentrations, typically in the picomolar to nanomolar range. Many studies published in the peer-reviewed literature document that EDCs can act in the nanomolar to micromolar range, and some show activity at picomolar levels.

1. What is meant by low dose?

In 2001, at the request of the U.S. Environmental Protection Agency (EPA), the National Toxicology Program (NTP) assembled a group of scientists to perform a review of the low-dose EDC literature (1). At that time, the NTP panel defined low-dose effects as any biological changes 1) occurring in the range of typical human exposures or 2) occurring at doses lower than those typically used in standard testing protocols, *i.e.* doses below those tested in traditional toxicology assessments (2). Other definitions of low dose include 3) a dose below the lowest dose at which a biological change (or damage) for a specific chemical has been measured in the past, *i.e.* any dose below the lowest observed effect level or lowest observed adverse effect level (LOAEL) (3), or 4) a dose administered to an animal that produces blood concentrations of that chemical in the range of what has been measured in the general human population (*i.e.* not exposed occupationally, and often referred to as an environmentally relevant dose because it creates an internal dose relevant to concentrations of the chemical measured in humans) (4, 5). This last definition takes into account differences in chemical metabolism and pharmacokinetics (*i.e.* absorption, distribution, and excretion of the chemical) across species and reduces the importance of route of exposure by directly comparing similar blood or other tissue concentrations across model systems and experimental paradigms. Although these different definitions may seem quite similar, using just a single well-studied chemical like bisphenol A (BPA) shows how these definitions produce different cutoffs for exposure concentrations that are considered low dose (Table 1). For many chemicals, including EDCs, a large number of studies meet the criteria for low-dose studies regardless of whether the cutoff point for a low dose was based on the range of typical human exposures, doses used in traditional toxicology, or doses that use an internal measure of body burden.

Whether low doses of EDCs influence disease is a question that now extends beyond the laboratory bench, because epidemiological studies show that environmental exposures to these chemicals are associated with disorders in humans as well (see for examples Refs. 6–16). Although disease associations have historically been observed in individuals exposed to large concentrations of EDCs after

TABLE 1. Low-dose definitions and cutoff doses: BPA and DEHP as examples

Chemical	Estimated range of human exposures	Doses below the NOAEL	Doses below the LOAEL	Administered doses (to animals) that produce blood levels in typical humans
BPA	0.4–5 μg/kg · d (679)	No NOAEL was ever established in toxicological studies (38)	<50 mg/kg · d (38)	~400 μg/kg · d to rodents and nonhuman primates (4, 253)
DEHP	0.5–25 μg/kg · d (680)	<5.8 mg/kg · d (681, 682)	<29 mg/kg · d (681, 682)	Unknown

Estimates of human exposure are made from consumer product consumption data but do not take into account that there are unknown sources of these chemicals.
DEHP, Bis(2-ethylhexyl) phthalate.

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industrial accidents (17–19) or via occupational applications (20–22), recent epidemiological studies reveal links between environmentally relevant low concentrations and disease prevalence. With the extensive biomonitoring studies performed by the U.S. Centers for Disease Control and Prevention (CDC) (23, 24) and similar environmental surveys performed in Europe (25) and elsewhere (www.statcan.gc.ca/concepts/hs-es/measures-mesures-eng.htm), knowledge about environmental exposures to EDCs and their associations with human health disorders has increased substantially.

Low-dose effects have received considerable attention from the scientific and regulatory communities, especially when examined for single well-studied chemicals like BPA (4, 27–32). The low-dose literature as a whole, however, has not been carefully examined for more than a decade. Furthermore, this body of literature has been disregarded or considered insignificant by many (33, 34). Since the NTP's review of the low-dose literature in 2001 (2), a very large body of data has been published including 1) additional striking examples of low-dose effects from exposures to well-characterized EDCs as well as other chemicals, 2) an understanding of the mechanisms responsible for these low-dose effects, 3) exploration of nonmonotonicity in *in vivo* and *in vitro* systems, and 4) epidemiological support for both low-dose effects and NMDRCs.

2. Is the term low dose a misnomer?

Endogenous hormones are active at extremely low doses, within and below the picomolar range for endogenous estrogens and estrogenic drugs, whereas environmental estrogen mimics are typically active in the nanomolar to micromolar range (for examples, see Refs. 35–38), although some show effects at even lower concentrations (39–41). Importantly, the definitions above do not take into account the potency or efficacy of the chemical in question, a topic that will be discussed in greater detail below. Instead, low dose provides an operational definition, in which doses that are in the range of human exposure, or doses below those traditionally tested in toxicological studies, are considered low. To be clear, none of these definitions suggest that a single concentration can be set as a low dose cutoff for all chemicals. Using the above definitions, for some chemicals, low doses could potentially be in the nanogram per kilogram range, but for most chemicals, doses in the traditional micro- and milligram per kilogram range could be considered low doses because traditional approaches to testing chemicals typically did not examine doses below the milligram per kilogram dose range.

B. Background: NMDRCs

We have defined low-dose studies according to the definitions established by the NTP panel of experts (2). However, because the types of endpoints that are typically examined at high doses in toxicological studies are often different from the types of endpoints examined in low-dose studies, one cannot assume that an effect reported in the low-dose range is necessarily different from what would be observed at higher doses. For example, low doses of a chemical could affect expression of a hormone receptor in the hypothalamus, an endpoint not examined in high-dose toxicology testing, and high doses could similarly affect this same endpoint (but are likely to be unreported because high doses are rarely tested for these types of endpoints). Thus, the presence of low-dose effects makes no assumptions about what has been observed at higher concentrations. (As discussed elsewhere, for the majority of chemicals in commerce, there are no data on health effects and thus no established high- or low-dose range.) Therefore, low-dose effects could be observed at the lower end of a monotonic or linear dose-response curve.

In contrast, the definition of a NMDRC is based upon the mathematical definition of nonmonotonicity: that the slope of the dose-response curve changes sign from positive to negative or vice versa at some point along the range of doses examined (42). Often NMDRCs have a U- or inverted U-shape (43); these NMDRCs are thus also often referred to as biphasic dose-response curves because responses show ascending and descending phases in relation to dose. Complex, multiphasic curves have also been observed (41, 44, 45). NMDRCs need not span from true low doses to high (pharmacologically relevant) doses, although experiments with such a broad dose range have been performed for several EDCs; the observation of nonmonotonicity makes no assumptions about the range of doses tested. Examples of NMDRCs from *in vitro* cell culture and *in vivo* animal experiments, as well as epidemiological examples, are presented in detail later in this review (see *Sections III.C.1–3*). Additional examples of NMDRCs are available in studies examining the effects of vitamins and other essential elements on various endpoints (see for example (46); these will not be examined in detail in this review due to space constraints.

NMDRCs present an important challenge to traditional approaches in regulatory toxicology, which assume that the dose-response curve is monotonic. For all monotonic responses, the observed effects may be linear or nonlinear, but the slope does not change sign. This assumption justifies using high-dose testing as the standard for assessing chemical safety. When it is violated, high-dose testing regimes cannot be used to assess the safety of low doses.

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It should be noted that both low dose and nonmonotonicity are distinguished from the concept of hormesis, which is defined as a specific type of response whereby "the various points along [the dose response] curve can be interpreted as beneficial or detrimental, depending on the biological or ecological context in which they occur" (47). Estimations of beneficial or adverse effects cannot be ascertained from the direction of the slope of a dose-response curve (48–50). In their 2001 Low Dose Peer Review, the NTP expert panel declined to consider whether any effect was adverse because "in many cases, the long-term health consequences of altered endocrine function during development have not been fully characterized" (2). There are still debates over how to define adverse effects (51–53), so for the purposes of this review, we consider any biological change to be an effect. Importantly, most epidemiological studies are by definition examining low doses (unless they are focusing on occupationally exposed individuals), and these studies typically focus on endpoints that are accepted to be adverse for human health, although some important exceptions exist (54–56).

Finally, it is worth noting that any biological effect, whether it is observed to follow linear relationships with administered dose or not, provides conclusive evidence that an EDC has biological activity. Thus, other biological effects are likely to be present but may remain undetected or unexamined. Many EDCs, including those used as pesticides, were designed to have biological effects (for example, insecticides designed to mimic molting hormone). Thus, the question of whether these chemicals have biological effects is answered unequivocally in their design; the question is what other effects are induced by these biologically active agents, not whether they exist.

C. Low-dose studies: a decade after the NTP panel's assessment

In 2000, the EPA requested that the NTP assemble a panel of experts to evaluate the scientific evidence for low-dose effects and dose-response relationships in the field of endocrine disruption. The EPA proposed that an independent and open peer review of the available evidence would allow for a sound foundation on which the EPA could "determine what aspects, if any, of its standard guidelines for reproductive and developmental toxicity testing [would] need to be modified to detect and characterize low-dose effects" (2). The NTP panel verified that low-dose effects were observed for a multitude of endpoints for specific EDCs including diethylstilbestrol (DES), genistein, methoxychlor, and nonylphenol. The panel identified uncertainties around low-dose effects after exposure to BPA; although BPA had low-dose effects on some endpoints in some laboratories, others were not found to be consistent, leading the panel to conclude that it was "not persuaded that a low-dose effect of BPA has been conclusively established as a general or reproducible finding" (2).

Since the NTP's review of low-dose endocrine disruptor studies, only a few published analyses have reexamined the low-dose hypothesis from a broad perspective. In 2002, R. J. Witorsch (57) analyzed low doses of xenoestrogens and their relevance to human health, considering the different physiologies associated with pregnancy in the mouse and human. He proposed that low doses of endocrine disruptors would not likely affect humans because, although low-dose effects had been observed in rodents, the hormonal milieu, organs controlling hormonal release, and blood levels of estrogen achieved are quite different in humans. There are, of course, differences in hormones and hormone targets between rodents and humans (58), but the view that these differences negate all knowledge gained from animal studies is not supported by evolutionary theory (59–61). This human-centered stance argues against the use of animals for any regulatory testing (62) and runs counter to the similarities in effects of EDCs on humans and animals; rodents proved to be highly predictive of the effects of DES on humans (63, 64). In a striking example, studies from mice and rats predicted that gestational exposure to DES would increase mammary cancer incidence decades before women exposed *in utero* reached the age where this increase in risk was actually observed (65–67).

In 2007, M. A. Kamrin (68) examined the low-dose literature, focusing on BPA as a test case. He suggested that three criteria were required to support the low-dose hypothesis. First is reproducibility, which he defined as "the same results are seen from the same causes each time a study is conducted." Furthermore, he proposed that the dose response for the effects must be the same from study to study. Second is consistency, which he defined as the results all fitting into a pattern, whereby the results collected from multiple species and under variable conditions all show the same effect. And third is proper conduct of studies, which he defined as including the appropriate controls and performance under suitable experimental conditions as well as the inclusion of multiple doses such that a dose-response curve can be obtained.

Although we and others (69–72) agree with the use of these criteria (reproducibility, consistency, and proper experimental design), there are significant weaknesses in the logic Kamrin employed to define these factors. First, suggesting that reproducibility is equivalent to the same results obtained each time a study is conducted is unrealistic and not a true representation of what is required of replication. As has been discussed in other fields, "there is no

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end to the ways in which any two experiments can be counted as the same — or different . . . All experiments are the same in respect of their being experiments; they are all different by virtue of being done at different places, at different times, by different people, with different strains of rat, training regime, and so on" (73).

Furthermore, according to the Bradford-Hill criteria, a set of requirements accepted in the field of epidemiology to provide adequate evidence of a causal relationship between two factors, a single negative result (or even several studies showing negative results) cannot negate other studies that show adverse effects (74). Essentially, all scientists know that it is very easy for an experiment to find no significant effects due to a myriad of reasons; it is more difficult to actually find effects, particularly when using highly sophisticated techniques (69).

Second, the concept of consistency as a pattern that can be derived from all results is one we will use below, using a weight-of-evidence (WoE) approach and several specific examples. However, Kamrin's proposed idea that every study must show the same effect has the same weaknesses as discussed for the proposed definition of reproducibility and does not acknowledge the obvious differences in many species and strains. It also suggests that the identification of a single insensitive strain could negate any number of positive studies conducted with appropriate animal models (75).

And finally, Kamrin suggested that only studies with appropriate controls should be used for analyses, a criterion we agree should be followed. However, his own scrutiny of the low-dose animal literature fails to do so (68). He also suggested that studies use multiple doses so that a dose-response curve can be obtained. Although studies using a single dose can be informative, we agree that dose-response relationships provide important information to researchers and risk assessors alike. However, this requirement is not helpful if there is an insistence on observing a linear response; as we discuss in depth in this review, there are hundreds of examples of nonmonotonic and other nonlinear relationships between dose and endpoint. These should not be ignored.

In 2004, Hayes (76) reviewed the available literature concerning the effects of atrazine on amphibian development, with a specific focus on the effect of ecologically relevant doses of this EDC on malformations of the gonads and other sexually dimorphic structures; in the case of aquatic exposures, it can be difficult to determine what a cutoff for a low dose would be; thus, Hayes focused on studies examining the effects of atrazine at levels that had been measured in the environment. He reviewed the results produced by several labs, in which it was independently demonstrated that low concentrations of atrazine produced gonadal abnormalities including hermaphroditism, males with extra testes, discontinuous gonads, and other defects. Hayes' work also clearly addressed the so-called irreproducibility of these findings by analyzing the studies that were unable to find effects of the pesticide; he noted that the negative studies had multiple experimental flaws, including contamination of the controls with atrazine, overcrowding (and therefore underdosing) of experimental animals, and other problems with animal husbandry that led to mortality rates above 80%.

In 2006, vom Saal and Welshons (77) examined the low-dose BPA literature, identifying more than 100 studies published as of July 2005 that reported significant effects of BPA below the established LOAEL, of which 40 studies reported adverse effects below the 50 μg/kg · d safe dose set by the EPA and U.S. Food and Drug Administration (FDA); all of these studies would be considered low dose according to the NTP's definition (2). The authors proposed that these examples should be used as evidence to support the low-dose hypothesis. Furthermore, this publication detailed the similarities among the studies that were unable to detect any effects of low doses of BPA and established a set of criteria required to accept negative studies. We have adapted the criteria detailed by Hayes (76) and vom Saal and Welshons (77) to produce a set of requirements for low-dose studies; these criteria are described in some detail below.

D. Why examine low-dose studies now?

The developmental origins of health and disease hypothesis originated from studies showing that fetal DES exposure could cause severe malformations and cancers of the reproductive tract, and other studies demonstrating that fetal malnutrition could lead to adult diseases including metabolic syndrome, diabetes, and increased stroke incidence (78–81). Since that time, the developmental origins of health and disease hypothesis has been extended to address whether diseases that are increasing in prevalence in human populations could be caused by developmental exposures to EDCs (67, 82–85). Evidence from the animal literature has been tremendously informative about the effects of EDC exposures early in development and has driven new hypotheses to be tested in epidemiology studies (86). Studies including several discussed in this review provide supportive evidence that the fetal and neonatal periods are specifically sensitive to chemicals that alter endocrine signaling and that EDCs could be contributing to a range of diseases.

Strong, reliable, and reproducible evidence documents the presence of low concentrations of EDCs and other chemicals in human tissues and fluids, as well as in environmental samples (28, 87–89). These studies indicate

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that samples collected from humans and the environment typically contain hundreds of contaminants, usually in the parts-per-billion (ppb) range (90, 91). The obvious question with potentially large public health implications is whether these concentrations are so low as to be irrelevant to human health. The fact that epidemiological analyses (reviewed in *Section III.C.3*) repeatedly find associations between the measured concentrations in human samples and disease endpoints suggests it is inappropriate to assume the exposures are too low to matter. That is especially the case given the empirical data (reviewed in *Section II.A*) from animal and cell culture experiments showing effects can be caused by concentrations comparable (and sometimes below) what is measured in humans and also the detection of NMDRCs in some of those same experiments.

In the human biomonitoring field, large databases such as the CDC's National Health and Nutrition Examination Survey (NHANES) have allowed researchers to make comparisons between groups of individuals with various exposure criteria; some of these studies will be addressed in detail in subsequent sections of this review. Although by definition these databases examine low-dose exposures, their use has been the subject of significant debate. Because of the large number of chemicals that have been measured (>300 in the most recent NHANES by the CDC) and the large number of health outcomes and other disease-related data collected from the individuals that donated biological samples, it has been argued that the number of possible associations that could be made would lead to a significant number of false positives (92); thus, associations could be found simply because of extensive data dredging. This has led some to suggest that these studies as a whole should be rejected (93, 94).

In response to these criticisms, epidemiologist Jan Vandenbroucke (95) notes, "researchers do not mindlessly grind out one analysis after another"; the examination of these databases for associations between chemical exposures and health effects does not entail the statistical comparison between all possible factors, calculated as some 8800 comparisons in the CDC's NHANES database (92). Instead, epidemiologists typically focus on a select number of comparisons that address relationships between chemicals and diseases identified *a priori* (96, 97), often because of mechanistic data obtained in laboratory animals or *in vitro* work with human and animal cells and tissues. Repeated findings of links between EDC exposures and diseases in epidemiological analyses of biomonitoring data based on *a priori* hypotheses suggests these relationships should not be rejected as a statistical artifact and, instead, should be the basis for significant concern that low-dose effects can be detected in the general population (85, 98).

E. Mechanisms for low-dose effects

The endocrine system is particularly tuned to respond to very low concentrations of hormone, which allows an enormous number of hormonally active molecules to coexist in circulation (38). As a ligand-receptor system, hormones act by binding to receptors in the cell membrane, cytosol, or the nucleus. The classical effects of nuclear hormone receptors influence gene expression directly, although rapid nongenomic actions at membrane-associated receptors are now well documented and accepted. Membrane receptors are linked to different proteins in the cell, and binding to these receptors typically changes cellular responses in a rapid fashion (99), although the consequence of a rapid signaling event could be the activation of a nuclear transcription factor, leading to responses that take longer to detect. Peptide hormones can also influence gene expression directly (see Refs. 100 and 101 for examples).

There are several means by which the endocrine system displays specificity of responses to natural hormones. Many hormone receptors are expressed specifically in a single or a few cell types (for example, receptors for TSH are localized to the thyroid), whereas some (like thyroid hormone receptors) are found throughout the body (102). For receptors that are found in multiple cell types, different effects are produced in part due to the presence of different coregulators that influence behaviors of the target genes (103–105). And finally, some hormones have multiple receptors [for example estrogen receptor (ER)α and ERβ], which are expressed in different quantities in different cell types and organs and can produce variable effects on gene expression or cellular phenomena (cell proliferation *vs.* apoptosis) (102, 106).

The typical physiological levels of the endogenous hormones are extremely low, in the range of 10–900 pg/ml for estradiol, 300–10,000 pg/ml for testosterone, and 8–27 pg/ml for T_4 (see Table 2). Importantly, steroid hormones in the blood are distributed into three phases: free, representing the unconjugated, unbound form; bioavailable, representing hormones bound to low-affinity carrier proteins such as albumin; and inactive, representing the form that is bound to high-affinity binding proteins such as SHBG or α-fetoprotein (38) (Fig. 1A). When the circulating levels in blood are corrected for the low fraction of the hormones that are not bound to serum binding proteins, the free concentrations that actually bring about effects in cells are even lower, for example 0.1–9 pg/ml for estradiol. Concentrations of active hormones will vary based on the age and physiological status of the individual (*i.e.* plasma testosterone levels are less than 1 ng/ml in male children but increase to approximately 5–7 ng/ml in adulthood; during menses, estradiol levels are typically less than 100

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TABLE 2. Ranges of endogenous hormones in humans (from Ref. 108)

Hormone	Free concentration (females)	Total concentration (females)	Free concentration (males)	Total concentration (males)
Cortisol	20–300 ng/ml		20–300 ng/ml	
Estradiol	0.5–9 pg/ml (adult female)	<20 pg/ml (prepubertal) 20–800 pg/ml (premenopausal) <30 pg/ml (postmenopausal)		10–60 pg/ml (adult)
Progesterone		0.2–0.55 ng/ml (prepubertal) 0.02–0.80 ng/ml (follicular phase) 0.90–4 ng/ml (luteal phase) <0.5 ng/ml (postmenopausal)		0.1–0.4 ng/ml (prepubertal) 0.2–2 ng/ml (adult)
Insulin		0–250 pmol/liter		0–250 pmol/liter
GH		2–6 ng/ml		2–6 ng/ml
Prolactin		0–15 ng/ml		0–10 ng/ml
Testosterone	9–150 pg/ml (adult)		0.3–250 ng/ml	
Thyroid hormone	8–30 pg/ml (10–35 pM)		8–30 pg/ml (10–35 pM)	
TSH	0.5–5 μU/ml		0.5–5 μU/ml	

pg/ml, but just before ovulation, they spike to 800 pg/ml; *etc.*) (107, 108). Of course, it should be noted that active concentrations of natural hormones vary somewhat from species to species and can even vary between strains of the same species (109).

There are several reasons why endogenous hormones are able to act at such low circulating concentrations: 1) the receptors specific for the hormone have such high affinity that they can bind sufficient molecules of the hormone to trigger a response, 2) there is a nonlinear relationship between hormone concentration and the number of bound receptors, and 3) there is also a nonlinear relationship between the number of bound receptors and the strongest observable biological effect. Welshons and colleagues (38) describe how hormone concentration influences receptor occupancy: "receptor occupancy is never determined to be linear in relation to hormone concentration . . . At concentrations above the K_d [the dissociation constant for receptor-ligand binding kinetics], saturation of the response occurs first, and then at higher concentrations, saturation of receptors is observed." What this means is that at low doses of hormone, a 10-fold increase in hormone concentration can have a 9-fold increase in receptor occupancy, whereas at high doses of hormone, a 10-fold increase in hormone concentration produces a less than 1.1-fold increase in receptor occupancy (38) (Fig. 1B). Thus, even moderate changes in hormone concentration in the low-dose range can produce substantial changes in receptor occupancy and therefore generate significant changes in biological effects. Welshons *et al.* (38) also note that a near-maximum biological response can be observed without a high rate of receptor occupancy, a situation that was previously termed the spare receptor hypothesis (110, 111); that is, the response mechanism saturates before all of the receptors are saturated. The presence of spare receptors is the basis for saying that these receptor systems are tuned to detect low concentrations that lead to occupancy of 0.1–10% of total receptors. Within this range of low receptor occupancy, there is high proportionality between changes in the free hormone concentration and changes in receptor occupancy, and a change in receptor occupancy by a ligand for the receptor is required to initiate changes in receptor-mediated responses (38).

There are additional reasons why natural hormones are active at low doses: 4) hormones have a strong affinity for their receptors (relative to affinity for other receptors) because many hormones are secreted from a single gland or site in the body but must have effects throughout the body in multiple tissues and 5) blood concentrations of hormones are normally pulsatile in nature, with the release of one hormone often controlled by the pulsatile release of another hormone (112, 113), and both the frequency and the amplitude of pulses modulate the biological response; hormones are also influenced by circadian rhythms, with dramatic differences in hormone secretion depending on the time of day (114, 115).

For many years, the mechanisms by which some environmental chemicals acted at low doses were not well understood. In 1995, the National Research Council appointed the Committee on Hormonally Active Agents in the Environment to address public concerns about the potential for adverse effects of EDCs on human health (116). At the time, work on understanding the mechanisms by which EDCs exert their effects was in its infancy, and in the executive summary, the committee stated, "Lack of knowledge about a mechanism does not mean that a reported effect is unconfirmed or unimportant, nor does demonstration of a mechanism document that the resulting effects are unique to that mechanism or are pervasive

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Figure 1.

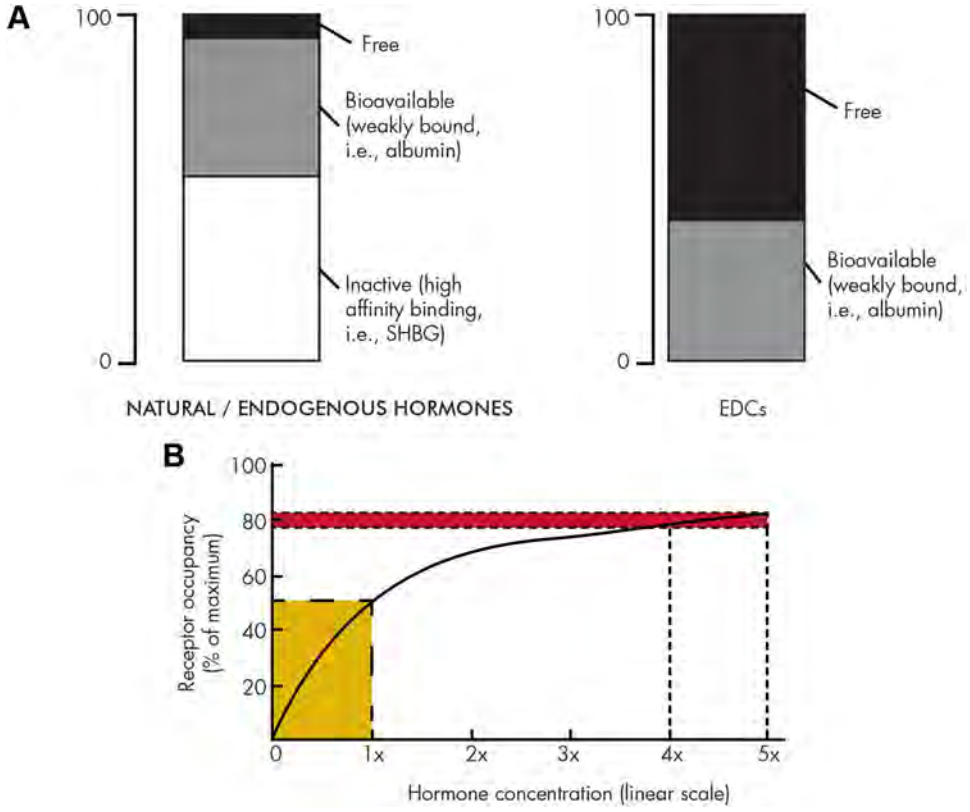

Figure 1. Characteristics and activities of natural hormones. A, This schematic depicts a typical relationship of three phases of circulating hormones: free (the active form of the hormone), bioavailable (bound weakly to proteins such as albumin), and inactive (bound with high affinity to proteins such as SHBG). These three phases act as a buffering system, allowing hormone to be accessible in the blood, but preventing large doses of physiologically active hormone from circulating. With EDCs, there may be little or no portion maintained in the inactive phase. Thus, the entirety or majority of a circulating EDC can be physiologically active; the natural buffering system is not present, and even a low concentration of an EDC can disrupt the natural balance of endogenous hormones in circulation. B, Schematic example of the relationship between receptor occupancy and hormone concentration. In this theoretical example, at low concentrations, an increase in hormone concentration of x (from 0 to 1x) causes an increase in receptor occupancy of approximately 50% (from 0 to 50%, see *yellow box*.) Yet the same increase in hormone concentration at higher doses (from 4x to 5x) causes an increase in receptor occupancy of only approximately 4% (from 78 to 82%, see *red box*).

in natural systems." Since that time, a tremendous amount of work has been dedicated to understanding the molecular mechanisms of action of EDCs, and in particular the mechanisms responsible for low-dose effects.

1. General mechanisms for EDC action

As discussed above, the endocrine system evolved to function when unbound physiologically active ligands (hormones) are present at extremely low doses (117). Because of shared receptor-mediated mechanisms, EDCs that mimic natural hormones have been proposed to follow the same rules and therefore have biological effects at low doses (38, 118). Similarly, EDCs that influence in any way the production, metabolism, uptake, or release of hormones also have effects at low doses, because even small changes in hormone concentration can have biologically important consequences (38, 119).

The estrogen-response mechanisms have been extensively studied with regard to the effects of endogenous estrogens and estrogenic drugs. In classical, genomic estrogen action, when endogenous estrogens bind to ER, those receptors bind to estrogen response element sequences or to a number of other response element sites adjacent to the genes directly responsive to estrogens; this binding influences transcription of estrogen-sensitive genes (120). Xenoestrogens produce the same reactions; these chemicals bind to ERs, which then initiate a cascade of molecular effects that ultimately modify gene expression. Therefore, for the actions of estrogenic EDCs, molecular mechanisms and targets are already known in some detail. Similar mechanisms are induced by the binding of androgens to the androgen receptor, or thyroid hormone agonists to the thyroid hormone receptor, among others.

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Additionally, there are EDCs that act as antagonists of these hormone systems, binding to a receptor, but not activating the receptor's typical response, and preventing the binding or activity of the endogenous ligand. Finally, many EDCs bind to the receptor and trigger a response that is not necessarily the same as that triggered by the endogenous estrogens; these are termed selective ER modulators (SERMs). Ultimately, all of these actions occur at the level of the receptor.

Many studies have been dedicated to the understanding of which EDCs bind to which nuclear hormone receptors and how the binding affinities compare to the natural steroid. Thus, many of these chemicals have been classified as weak hormones. Yet studies have shown that, for example, the so-called weak estrogens like BPA can be equally potent as endogenous hormones in some systems, causing biological effects at picomolar levels (30, 38, 41, 121). Both endogenous estrogens and EDCs can bind to ER associated with the cell membrane [membrane-associated ER (mER)α and mERβ] that are identical to the nuclear ER (122–124), and a transmembrane ER called G-protein coupled receptor 30 that is structurally dissimilar to the nuclear ER and encoded by a distinct gene (125, 126). In many cells, 5–10% of total ERα and ERβ are localized to the plasma membrane (124); these membrane-associated receptors are capable of nongenomic steroid action in various cell types (30, 121, 127); thus, rapid and potent effects are well documented for many EDCs including BPA, DES, endosulfan, dichlorodiphenyldichloroethylene (DDE), dieldrin, and nonylphenol, among others (41, 128–130).

Finally, EDCs have other effects that are not dependent on binding to either classical or membrane-bound steroid hormone receptors. EDCs can influence the metabolism of natural hormones, thus producing differences in the amount of hormone that is available for binding either because more (or less) hormone is produced than in a typical system or because the hormone is degraded faster (or slower) than is normal. Other EDCs influence transport of hormone, which can also change the amount of hormone that is available for receptor binding. And EDCs can also have effects that are independent from known endocrine actions. One example is the effect of endogenous hormones and EDCs on ion channel activity. BPA, dichlorodiphenyltrichloroethane (DDT), DES, nonylphenol, and octylphenol have all been shown to disrupt Ca^{2+} channel activity and/or Ca^{2+} signaling in some cell types (131–134). This example illustrates how both natural hormones and EDCs can have hormonal activity via binding to nuclear hormone receptors but may also have unexpected effects via receptor-mediated actions outside of the classical endocrine system.

2. Mechanisms of EDC-induced low-dose actions

The various mechanisms by which EDCs act *in vitro* and *in vivo* provide evidence to explain how these chemicals induce effects that range from altered cellular function, to abnormal organ development, to atypical behaviors. Just as natural hormones display nonlinear relationships between hormone concentration and the number of bound receptors, as well as between the number of bound receptors and the maximal observable biological effect, EDCs obey these rules of binding kinetics (38). Thus, in a way, EDCs exploit the highly sensitive endocrine system and produce significant effects at relatively low doses.

To gain insight into the effects of natural hormones and EDCs on gene expression profiles, it is possible to calculate doses that produce the same effect on proliferation of cultured cells, *i.e.* the quantitative cellular response doses, and determine the effect of those doses on transcriptomal signature profiles. When this is done for estradiol and EDCs with estrogenic properties, the affected estrogen-sensitive genes are clearly different (135). However, an interesting pattern emerges: comparing profiles among only the phytoestrogens shows striking similarities in the genes up- and down-regulated by these compounds; profile comparisons between only the plastic-based estrogens also show similarities within this group. Yet even more remarkable is what occurs when the doses are selected not based on cell proliferation assays but instead on the ability of estradiol and estrogen-mimics to induce a single estrogen-sensitive marker gene. When doses were standardized based on marker gene expression, the transcriptomal signature profiles were very similar between estradiol and estrogen mimics (135). Taken together, these results suggest that the outcomes of these experiments are contextual to the normalization parameter and that marker gene expression and cell proliferation are not superimposable. This indicates that the biological level at which the effects of chemicals are examined (*i.e.* gene expression, cellular, tissue, organ, or organismal) can greatly impact whether low-dose effects are observed and how these effects are interpreted.

There are several other mechanisms by which low-dose activities have been proposed. One such possibility is that low doses of EDCs can influence the response of individuals or organs/systems within the body to natural hormones; thus, the exposed individual has an increased sensitivity to small changes in endogenous steroids, similar to the effects of intrauterine position (see Ref. 136 and *Section I.F*). In fact, several studies have shown that exposure to EDCs such as BPA during perinatal development can influence the response of the mammary gland to estrogen (137, 138) and the prostate to an estrogen-testosterone

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mixture similar to the concentrations produced in aging men (139–142). There is also evidence that EDCs work additively or even synergistically with other chemicals and natural hormones in the body (143–145). Thus, it is plausible that some of the low-dose effects of an EDC are actually effects of that exogenous chemical plus the effects of endogenous hormone.

Finally, it should be noted that during early development, the rodent fetus is largely, but not completely (146), protected from estrogen via the binding activity of α-fetoprotein, a plasma protein produced in high levels by the fetal liver (147). Some estrogen-like EDCs, however, bind very weakly to α-fetoprotein, and therefore, it is likely that this protein does not provide protection to the fetus during these sensitive developmental periods (36, 148). Furthermore, because EDCs may not bind to α-fetoprotein or other high-affinity proteins in the blood (148–150) and can have a higher binding affinity to proteins like albumin (compared with natural estrogens) (36, 149), the balanced buffer system in place for endogenous hormones may be disturbed (Fig. 1A). Thus, whereas only a portion of endogenous hormones are bioavailable, the entirety of a circulating EDC could be physiologically active.

The effects of hormones and EDCs are dependent on dose, and importantly, low (physiological) doses can be more effective at altering some endpoints compared with high (toxicological) doses. There are many well-characterized mechanisms for these dose-specific effects including signaling via single *vs.* multiple steroid receptors due to nonselectivity at higher doses (30), receptor down-regulation at high doses *vs.* up-regulation at low doses (151, 152), differences in the receptors present in various tissues (153, 154), cytotoxicity at high doses (155), and tissue-specific components of the endocrine-relevant transcriptional apparatus (104, 105). Some of these factors will be addressed in *Section III.B* in the section dedicated to NMDRCs.

F. Intrauterine position and human twins: examples of natural low-dose effects

Hormones have drastically different effects at different periods of development. In a now classical *Endocrinology* paper, Phoenix and colleagues (156) showed that hormone exposures during early development, and in particular fetal development, had organizational effects on the individual, whereby the developing organs were permanently reorganized by exposure to steroids. Permanent, nonreversible masculinization of the developing body plan by androgen exposure *in utero* is an example. These organizational effects are in contrast to the effects of the same hormones, at similar or even higher doses, on adults. The effects of steroids on individuals after puberty have been termed activational, because the effects on target organs are typically transient; withdrawal of the hormone returns the phenotype of the individual to the preexposed state (157), although this is not always the case (158).

One of the most striking examples of the ability of low doses of hormones to influence a large repertoire of phenotypes is provided by the study of intrauterine positioning effects in rodents and other animals. The rodent uterus in particular, where each fetus is fixed in position along a bicornate uterus with respect to its neighbors, is an excellent model to study how hormones released from neighboring fetuses (159) can influence the development of endocrine-sensitive endpoints (31). Importantly, differences in hormonal exposures by intrauterine position are relatively small (see Fig. 2) (160). Thus, even a small magnitude in differences of hormonal exposures is sufficient to generate effects on behavior, physiology, and development.

The earliest studies of intrauterine position compared behavioral characteristics of females relative to their position in the uterus (161–164); male behavior was also affected by intrauterine position (161, 165–167). Subsequent studies of intrauterine position showed that position in the uterus influenced physiological endpoints (157, 160–162, 168–174) as well as morphological endpoints in female rodents (160, 161, 163, 164, 175–177). Male physiology and morphological endpoints were similarly affected by intrauterine position (165, 167, 177–179).

The endocrine milieu of the uterine environment has been implicated in these effects because differences in hormonal exposure have been observed based on intrauterine position (Fig. 2). The production of testosterone in male mice starting at approximately d 12 of gestation allows for passive transfer of this hormone to neighboring fetuses (159, 160, 180). Thus, fetuses positioned between two male neighbors have slightly higher testosterone exposures compared with fetuses positioned between one male and one female or two female neighbors (168, 181–183). These data indicate that very small differences in hormone exposures during fetal development are capable of influencing a variety of endpoints, many of which become apparent only during or after puberty. Furthermore, small differences in hormone exposures may be compounded by other genetic variations such as those normally seen in human populations.

Intrauterine effects have been observed in animals with both large litters and singleton or twin births including ferrets, pigs, hamsters, voles, sheep, cows, and goats (136, 184, 185). But perhaps the most compelling evidence for intrauterine effects comes from human twin studies. Many

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Figure 2.

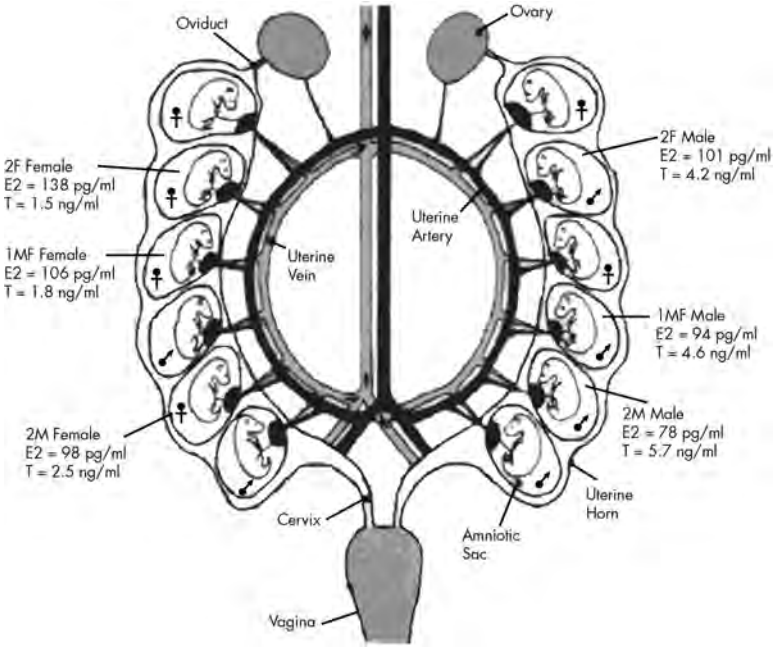

Figure 2. Intrauterine position produces offspring with variable circulating hormone levels. Fetuses are fixed in position in the bicornate rodent uterus, thus delivery via cesarean section has allowed for study of the influence of intrauterine position on behaviors, physiology, and organ morphology. Illustrated here are the differences in estradiol (E2) and testosterone (T) concentrations measured in male and female fetuses positioned between two male neighbors (2M), two female neighbors (2F), or neighbors of each sex (1MF). Direction of blood flow in the uterine artery (dark vessel) and vein (light vessel) is indicated by an *arrow* (159).

studies have found that the sex of the fetuses impacts the phenotype of one or more of the twins, with significant evidence suggesting that male twins strongly influence a female co-twin; endpoints including sensation seeking (186), ear superiority (187, 188), brain and cerebellum volume (189), masculine/feminine behaviors and aggression levels (190–192), handedness (193, 194), reproductive fitness (192, 195), finger length ratios (196), risk for developing eating disorders (197), and birth weight (198) were all affected in females with a male twin. From these studies, many authors have concluded that testosterone from male fetuses influences developmental parameters in female twins; typically, male same-sex twins do not display altered phenotypes for these endpoints. Yet importantly, limited studies indicate that female twins can influence their uterine pairs, with some behaviors affected in male co-twins (191); breast cancer incidence in women and testicular cancer in men have also been shown to be influenced by having a female co-twin (83, 199, 200).

Although the mechanisms for these intrauterine effects are not completely understood, very small differences in hormone exposures have been implicated, making the effects of twin gestations a natural example of low-dose phenomena. In the human fetus, the adrenals produce androgens that are converted to estrogen by the enzyme aromatase, specifically in the placenta. In a human study designed to compare hormone levels in the amniotic fluid, maternal serum, and umbilical cord blood of singleton male and female fetuses, significant differences were observed in the concentrations of testosterone, androstenedione (A4), and estradiol (201). Specifically, amniotic fluid concentrations of testosterone and A4 were approximately twice as high in male fetuses, whereas estradiol concentrations were slightly, but significantly, higher in female fetuses. Yet, interestingly, there were no differences for any of the hormones in maternal serum, similar to findings in mice that litters with a high proportion of males or females did not impact testosterone, estradiol, or progesterone serum levels in mothers (180). In umbilical cord serum, concentrations of A4 and estradiol were higher in males compared with females (201), although it must be noted that these samples were collected at parturition, long after the fetal period of sexual differentiation of the reproductive organs.

Several studies have specifically compared steroid hormone levels in maternal and umbilical cord blood samples collected from same-sex and opposite-sex twins. Male twins, whether their co-twin was a male or a female, had higher blood concentrations of progesterone and testosterone compared with female twins (202). Furthermore, for both sexes, dizygotic twins had higher levels of these hormones, as well as estradiol, compared with monozygotic twins. Fetal sex had no effect on maternal concentrations of testosterone, progesterone, or estrogen, suggesting that any differences observed in fetal samples are due to contributions from the fetuses' own endocrine systems and the placental tissue (203). Yet an additional study conducted in women carrying multiple fetuses (more than three) indicates that both estradiol and progesterone concentrations in maternal plasma increase with the number of fetuses, and when fetal reduction occurs, these hormone levels remain elevated (204).

It has been proposed that low-dose effects seen in different intrauterine positions in litter-bearing animals could be an evolutionary adaptation, whereby the genotypes of the fetuses are relatively similar but a range of phenotypes can be produced via differential hormone exposures (136, 168). For example, female mice positioned between two females are more docile and thus have better

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reproductive success when resources are plentiful, but females positioned between two males are more aggressive and therefore are more successful breeders under stressful conditions (161, 171, 175). In this way, a mother produces offspring with variable responses to environmental conditions, increasing the chances that her own genetic material will continue to be passed on. Yet although there is evidence to suggest that a variable intrauterine environment is essential for normal development (171), intrauterine positional effects appear to have little effect on offspring phenotypes in inbred rodent strains (168, 205). This result may be related to the link between genetic diversity and hormone sensitivity (206, 207), suggesting that outbred strains are the most appropriate for studying endocrine endpoints and are also most similar to the effects of low doses of hormones on human fetuses.

Finally, it has been proposed that similar mechanisms are used by the developing fetus in response to natural hormones via intrauterine position and EDCs with hormonal activity (136). To this end, several studies have examined the effects of both exposure to an EDC and intrauterine position or have considered the effect of intrauterine position on the response of animals to these chemicals (174, 176, 181, 208, 209). For example, one study found that intrauterine position affected the morphology of the fetal mammary gland, yet position-specific differences were obliterated by BPA exposure (176). Additional studies suggest that prostate morphology is disrupted by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) exposure in males positioned between two females, but this chemical does not affect prostate morphology in males positioned between two males (181). Finally, male rodents positioned between two males have higher glucose intolerance than males positioned between two females, yet when these males are given a diet high in phytoestrogens, glucose tolerance is dramatically improved in the males positioned between two males, whereas their siblings positioned between two females do not benefit (209). What is clear from these studies is that low doses of natural hormones are capable of altering organ morphology, physiology, and reproductive development, similar to the effects of EDCs.

It has been suggested that the endocrine system allows for homeostatic control and that the aim of the endocrine system is to "maintain normal functions and development in the face of a constantly changing environment" (210). Yet studies from intrauterine position, together with studies of EDCs (see *Sections II.C–F*), clearly indicate that the fetal endocrine system cannot maintain a so-called homeostasis and is instead permanently affected by exposures to low doses of hormones.

II. Demonstrating Low-Dose Effects Using a WoE Approach

A. Use of a WoE approach in low-dose EDC studies

In 2001, the NTP acknowledged that there was evidence to support low-dose effects of DES, genistein, methoxychlor, and nonylphenol (2). Specifically, the NTP expert panel found that there was sufficient evidence for low-dose effects of DES on prostate size; genistein on brain sexual dimorphisms, male mammary gland development, and immune responses; methoxychlor on the immune system; and nonylphenol on brain sexual dimorphisms, thymus weight, estrous cyclicity, and immune responses. Using the NTP's definitions of low dose (*i.e.* effects occurring in the range of typical human exposures or occurring at doses lower than those typically used in standard testing protocols), we propose that most if not all EDCs are likely to have low-dose effects. Yet an important caveat of that statement is that low-dose effects are expected for particular endpoints depending on the endocrine activity of the EDC, and not for any/all endocrine-related endpoints. For example, if a chemical blocks the synthesis of a hormone, blood levels of the hormone are expected to decline, and the downstream effects should then be predicted from what is known about the health effects of low hormone levels. In contrast, if a chemical binds a hormone receptor, the effects are expected to be very complex and to be both tissue specific and dose specific. Finally, most EDCs interact with multiple hormone pathways, or even multiple hormone receptors, making the expected effects even more complex and context specific (211–213).

Table 3 summarizes a limited selection of chemicals that have evidence for low-dose effects, with a focus on *in vivo* animal studies. As seen by the results presented in this table, low-dose effects have been observed in chemicals from a number of classes with a wide range of uses including natural and synthetic hormones, insecticides, fungicides, herbicides, plastics, UV protection, and other industrial processes. Furthermore, low-dose effects have been observed in chemicals that target a number of endocrine endpoints including many that act as estrogens and antiandrogens as well as others that affect the metabolism, secretion, or synthesis of a number of hormones. It is also clear from this table that the cutoff for low-dose effects is not only chemical specific but also can be effect dependent. And finally, although this table is by no means comprehensive for all EDCs or even the low-dose effects of any particular chemical, the affected endpoints cover a large range of endocrine targets.

Several EDCs have been well studied, and the number of publications focusing on low-dose effects on a particular developmental endpoint is high; however, other

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TABLE 3. EDCs with reported low-dose effects in animals (or humans, where stated)

Chemical	Use	EDC action	Low-dose cutoff	Affected endpoint	Refs.
Aroclor 1221 (PCB mixture)	Coolants, lubricants, paints, plastics	Mimics estrogens, antiestrogenic activity, *etc.*	0.1–1 mg/kg (produces human blood levels)	Brain sexual dimorphisms	683, 684
Atrazine	Herbicide	Increases aromatase expression	200 μg/liter (334, 335)	Male sexual differentiation/development	See this review
BPA	Plastics, thermal papers, epoxy resins	Binds ER, mER, ERRγ, PPARγ, may weakly bind TH receptor and AR	400 μg/kg · d (produces human blood concentrations)	Prostate, mammary gland, brain development and behavior, reproduction, immune system, metabolism	See this review
Chlordane	Insecticide	Binds ER	100 ng/g (produces human blood levels)	Sexually dimorphic behavior	685
Chlorothalonil	Fungicide, wood protectant	Aromatase inhibitor	164 μg/liter (environmental concentrations, EPA)	Corticosterone levels (amphibians)	686
Chlorpyrifos	Insecticide	Antiandrogenic	1 mg/kg · d (EPA)	Acetylcholine receptor binding (brain)	687
DDT	Insecticide	Binds ER	0.05 mg/kg (EPA)	Neurobehavior	688
DES	Synthetic hormone	Binds ER	0.3–1.3 mg/kg · d (dose typically administered to pregnant women)	Prostate weight	689
Dioxin (TCDD)	Industrial byproduct	Binds AhR	1 μg/kg · d (397)	Spermatogenesis, immune function and oxidative stress, tooth and bone development, female reproduction, mammary gland, behavior	See this review
Genistein	Phytoestrogen	Binds ER	50 mg/kg (EPA)	Brain sexual dimorphisms	690
Heptachlor	Insecticide	Induces testosterone hydroxylases	0.15 mg/kg · d (EPA)	Immune responses	691
Hexachlorobenzene	Fungicide	Modulates binding of ligand to TRE, weakly binds AhR	0.08 mg/kg · d (EPA)	Anxiety and aggressive behaviors	692
Maneb	Fungicide	Inhibits TSH release, may bind PPARγ	5 mg/kg · d (EU Commission)	Testosterone release	693
Methoxychlor	Insecticide	Binds ER	5 mg/kg · d (WHO)	Immune system	694, 695
4-Methylbenzylidine camphor	UV screen	Weakly estrogenic	10 mg/kg · d (Europa)	Sexual behavior	696
Methyl paraben	Preservative	Estrogenic	1000 mg/kg · d (EFSA)	Uterine tissue organization	697
Nicotine	Natural alkaloid in tobacco	Binds acetylcholine receptors, stimulates epinephrine	Human use of nicotine substitutes	Incidence of cryptorchidism (humans)	698
Nonylphenol	Detergents	Weakly estrogenic	15 mg/kg · d (EPA)	Testosterone metabolism	699
Octylphenol	Rubber bonding, surfactant	Weakly binds ER, RXR, PRGR	10 mg/kg · d (700)	Testes endpoints	701
Parathion	Insecticide		0.2 mg/kg · d (WHO)	Cognitive and emotional behaviors	702
PBDE-99	Flame retardant	Alters TH synthesis	0.3 mg/kg · d (EPA)	TH levels in blood	703
PCB180	Industrial lubricant, coolant	Impairs glutamate pathways, mimics estrogen	Examined normal human populations	Diabetes (humans)	704
PCB mixtures	Coolants, lubricants, paints, plastics	Binds AhR, mimic estrogens, antiestrogenic activity, etc.	Each at environmentally relevant levels	TH levels	705
Perchlorate	Fuel, fireworks	Blocks iodide uptake, alters TH	0.4 mg/kg · d (436)	TSH levels (humans)	See this review
Sodium fluoride	Water additive (to prevent dental caries), cleaning agent	Inhibits insulin secretion, PTH, TH	4 mg/liter water (EPA standard)	Bone mass and strength	706
Tributyltin oxide	Pesticide, wood preservation	Binds PPARγ	0.19 mg/kg · d (EPA)	Obesity	707
Triclosan	Antibacterial agent	Antithyroid effects, androgenic and estrogenic activity	12 mg/kg · d (Europe SCCP)	Altered uterine responses to ethinyl estradiol	708
Vinclozolin	Fungicide	Antiandrogenic	1.2 mg/kg · d (EPA)	Male fertility	709

EDC action indicates that for some chemicals, an effect is observed (*i.e.* estrogenic, androgenic), but for many EDCs, complete details of receptor binding are unavailable or incomplete. Low-dose cutoff means the lowest dose tested in traditional toxicology studies, or doses in the range of human exposure, depending on the data available. Affected endpoint means at least one example of an endpoint that shows significant effects below the low-dose cutoff dose. This list is not comprehensive, and the lack of an endpoint on this table does not suggest that low doses do or do not affect any other endpoints. AR, Androgen receptor; EFSA, European Food Safety Authority; ERR, estrogen related receptor; PCB, polychlorinated biphenyl; PPARγ, peroxisome proliferator-activated receptor-γ; PRGR, progesterone receptor; RXR, retinoid X receptor; SCCP, Scientific Committee on Consumer Products; TH, thyroid hormone; TRE, thyroid response element; WHO, World Health Organization.

chemicals are less well studied with fewer studies pointing to definitive low-dose effects on a given endpoint. In fact, there are a significant number of EDCs for which high-dose toxicology testing has been performed and the no observed adverse effect level (NOAEL) has been derived, but no animal studies in the low-dose range have been conducted, and several hundred additional EDCs where no significant high- or low-dose testing has been performed (see Table 4 for examples). Balancing the large amount of data collected from some well-studied chemicals like BPA and atrazine with the relative paucity of data about other chemicals is a difficult task.

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TABLE 4. Select examples of EDCs whose potential low-dose effects on animals remain to be studied

Chemical	Use	EDC action	Low-dose cutoff
Antiseptics and preservatives			
Butyl paraben	Preservative (cosmetics)	Estrogenic, antiandrogenic	2 mg/kg · d (EPA)
Propyl paraben	Antimicrobial preservative found in pharmaceuticals, foods, cosmetics, and shampoos	Estrogenic activity	LOAEL 10 mg/kg · d, NOEL 6.5 mg/kg · d (Europa)
Cosmetics and personal care products			
2,4-Dihydroxybenzophenone	UV absorber in polymers, sunscreen agent	Estrogenic activity	Not identified
3-Benzylidene camphor	UV blocker used in personal care products	Estrogenic activity	0.07 mg/kg · d (710)
4,4′-Dihydroxybenzophenone	UV light stabilizer used in plastics, cosmetics, adhesives, and optical fiber	Estrogenic activity	Not identified
Benzophenone-2	Used in personal care products such as aftershave and fragrances	Estrogenic activity, changes in T_4, T_3, and TSH levels, alterations in cholesterol profile	NOEL 10–333 mg/kg · d (711)
Benzophenone-3	UV filter	Estrogenic, PPARγ activator	200 mg/kg · d (Europa)
Multiple use (other)			
Melamine	Flame-retardant additive and rust remover; used to make laminate, textile, and paper resins; metabolite of cyromazine	Affects voltage-gated K^+ and Na^+ channels and Ca^{2+} concentrations in hippocampal neurons	63.0 mg/kg · d (FDA)
Resorcinol	Used in the manufacturing of cosmetics, dyes, flame retardants, hair dye formulations, pharmaceuticals, skin creams, and tires	Alters T_4 and TSH levels	80.00 mg/kg · d (Europa)
Pesticides			
Aldrin[a]	Insecticide	Estrogenic activity	0.025 mg/kg · d (Health Canada)
Alachlor	Herbicide	Decreases serum T_4, binds PR, weakly binds ER	1 mg/kg · d (EPA)
Amitrole	Herbicide	Decreases thyroid hormone	0.12 mg/kg · d (FAO)
Bitertanol	Fungicide	Alters aromatase	30 mg/kg · d (EPA)
Carbendazim	Fungicide	Affects FSH, LH, and testosterone levels; alters spermatogenesis and Sertoli cell morphology	8 mg/kg · d (712)
Diazinon	Insecticide	Alters glucocorticoids	0.065 mg/kg · d (CDC)
Endrin[a]	Insecticide	Stimulates glucocorticoid receptor	0.025 mg/kg · d (CDC)
Fenoxycarb	Insecticide	Alters acetylcholinesterase	260 mg/kg · d (CDC)
Mirex[a]	Insecticide	Decreases testosterone levels	0.075 mg/kg · d (CDC)
Zineb	Fungicide	Alters T_4 and dopamine levels	LOAEL 25 mg/kg · d (EPA)
Ziram	Fungicide	Alters norepinephrine levels	1.6 mg/kg · d (EPA)
Resins			
Bisphenol F	Used in polycarbonates	Alters T_4, T_3, and adiponectin levels, has estrogenic activity	LOAEL 20 mg/kg · d (713)
Styrene	Precursor to polystyrene	Alters dopamine	200 mg/kg · d (EPA)

PPARγ, peroxisome proliferator-activated receptor-γ; PR, progesterone receptor.

[a] These chemicals were identified in the 1990s as part of the dirty dozen, 12 chemicals that were acknowledged to be the worst chemical offenders because of their persistence in the environment, their ability to accumulate through the food chain, and concerns about adverse effects of exposures to wildlife and humans. These chemicals were banned by the Stockholm convention and slated for virtual elimination. Yet there is still very little known about the low-dose effects of these chemicals, likely in the range of past and current human and/or wildlife exposures.

WoE approaches have been used in a large number of fields to determine whether the strength of many publications viewed as a whole can provide stronger conclusions than any single study examined alone. Although the term 'weight of evidence' is used in public policy and the scientific literature, there is surprisingly little consensus about what this term means or how to characterize the concept (214). Historically, risk assessors have used qualitative ap-

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proaches (*i.e.* professional judgment to rank the value of different cases) and quantitative approaches (*i.e.* scoring methods to produce statistical and mathematical determinations of chemical safety), but it has been argued that these methods lack transparency and may produce findings that are unrepeatable from one risk assessor to another (215, 216). Whatever the method used, when EDCs are being assessed, it is important to use the principles of endocrinology to establish the criteria for a WoE approach. We do this in *Section II.B*, identifying three key criteria for determining whether a study reporting no effect should be incorporated into a WoE approach. It also should be noted that in epidemiology, the term 'weight of evidence' is typically not used, but the concept is actuated by meta-analysis, formally and quantitatively combining data across studies, including a plot of individual and pooled study findings and also a measure of heterogeneity of findings between studies.

For some well-studied chemicals, there are large numbers of studies showing both significant effects, and additional studies showing no effects, from low-dose exposures. In these cases, extensive work is needed to deal with discordant data collected from various sources; studies showing no effect of low-dose exposures must be balanced in some way with those studies that do show effects. As stated by Basketter and colleagues (217), "it is unwise to make a definitive assessment from any single piece of information as no individual assay or other assessment . . . is 100% accurate on every occasion . . . This means that from time to time, one piece of conflicting data has to be set aside." WoE approaches in EDC research have typically dealt with datasets that have some conflicting studies, and these conflicts are even more difficult to sort out when studies have attempted to directly replicate published findings of adverse effects (see for example Refs. 218–221).

Most previously published WoE analyses have examined chemicals broadly (asking questions such as, "Does BPA produce consistent adverse effects on any endpoint?") (see Ref. 222). This can lead to problems including those encountered by the NTP expert panel, which found that there was some evidence for low-dose effects of BPA on certain endpoints but mixed findings for other endpoints. For example, the panel noted that some studies found low-dose effects of BPA on the prostate, but other studies could not replicate these findings. In *Section II.B*, we address criteria that are needed to accept those studies that are unable to detect low-dose effects of chemicals; these criteria were not used by the NTP in 2001, but they are essential to address controversies of this sort and perform WoE analyses using the best available data. In the sections that follow, we employed a WoE approach to examine the evidence for low-dose effects of single chemicals on selected endpoints or tissues, also paying attention to when in development the EDCs in question were administered.

B. Refuting low-dose studies: criteria required for acceptance of studies that find no effect

Over the past decade, a variety of factors have been identified as features that influence the acceptance of low-dose studies (69, 71, 76, 77, 90, 205, 223, 224). In fact, the NTP low-dose panel itself suggested that factors such as strain differences, diet, caging and housing conditions, and seasonal variation can affect the ability to detect low-dose effects in controlled studies (2). In particular, three factors have been identified; when studies are unable to detect low-dose effects, these factors must be considered before coming to the conclusion that no such effects exist.

1. Negative controls confirm that the experimental system is free from contamination

Although all scientific experiments should include negative (untreated) controls, this treatment category is particularly important for EDC research. When a study fails to detect low-dose effects, the observed response in control animals should be compared with historical untreated controls; if the controls deviate significantly from typical controls in other studies, it may indicate that these animals were, in fact, treated or contaminated in some way or that the endpoint was not appropriately assessed (77, 205, 225). For example, if an experiment was designed to measure the effect of a chemical on uterine weight, and the control uteri have weights that are significantly higher than is normally observed in the same species and strain, these animals may have been inadvertently exposed to an estrogen source, or the uteri may not have been dissected properly by the experimenters. In either case, the study should be examined carefully and likely cannot be used to assess low-dose effects; of course, untreated controls should be monitored constantly because genetic drift and changes in diet and housing conditions can also influence these data, thus explaining changes from historical controls. Importantly, several types of contamination have been identified in studies of EDCs including the leaching of chemicals from caging or other environmental sources (226, 227), the use of pesticide-contaminated control sites for wildlife studies and contaminated controls in laboratory studies (76), and even the use of food that interferes with the effects of EDCs (224, 228). It is also important to note that experiments must consider the solvent used in the administration of their test chemical, and thus good negative controls should test for effects of the solvent itself. Using solvent negative controls helps prevent false posi-

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tives as well as the possibility that the vehicle could mask the effects of the chemical being studied.

2. Positive controls indicate that the experimental system is capable of responding to low doses of a chemical acting on the same pathway

Many studies do not include a positive control, either because of the size and cost of the experiment when including an additional treatment or because an appropriate positive control has not been identified for the endpoint being examined. If the experiment detects an effect of the chemical in question, the exclusion of a positive control does not necessarily affect the interpretation of the results; instead, it can be appropriately concluded that the test chemical is significantly different from unexposed (but similarly handled/treated) negative controls. However, if the study fails to detect low-dose effects of a test chemical, no convincing conclusion can be made; in this case, a positive control is required to demonstrate that the experimental system was capable of detecting such effects (71, 75, 77, 205).

Several issues must be considered when addressing whether the positive control confirms the sensitivity of the assay. First, an appropriate chemical must be selected, and it must be administered via the appropriate route, *i.e.* if the test chemical is administered orally, a positive control that is orally active, such as ethinyl estradiol, should be used; if the test chemical is administered sc, a positive control that is active via this route, such as 17β-estradiol, is most appropriate. The use of 17β-estradiol in studies that use oral exposures is particularly inappropriate (see Ref. 229) for example) because this hormone, like most natural steroids, has very low oral activity (77). Second, the positive control chemical must be examined, and effective, at appropriately low doses. Thus, if the test chemical is 100 times less potent than the positive control, a dose of the positive control 100 times lower than the test compound must produce effects (69, 71, 205). For example, studies that report effects of ethinyl estradiol only at doses that are hundreds of times higher than the dose that is effective in contraceptives (230) are not capable of detecting low-dose effects of test chemicals. Without appropriate and concurrent positive and negative controls, studies that fail to detect low-dose effects of test chemicals should be rejected.

3. Species and animal strains that are responsive to EDCs must be used

The NTP expert panel specifically noted that "because of clear species and strain differences in sensitivity, animal-model selection should be based on responsiveness to endocrine-active agents of concern (*i.e.* responsive to positive controls), not on convenience and familiarity" (2). An analysis of the BPA literature clearly showed that many of the studies that failed to detect effects of low doses used the Charles River Sprague-Dawley rat (75); this strain was specifically bred to have large litters (231), and many generations of inbreeding have rendered the animal relatively insensitive to estrogens (205). The NTP expert panel noted the lack of effects of BPA on Sprague-Dawley rats and concluded that there were clear differences in strain sensitivity to this chemical (2). Importantly, this may not be true for Sprague-Dawley rats that originate from other vendors, indicating that animal origin can also influence EDC testing.

Many studies in mice (138, 206, 207, 232–234) and rats (232, 235–239) have described differences displayed between two (or more) animal strains to a natural hormone or EDC. Often these differences can be traced to whether a strain is inbred or outbred. Genetically diverse strains are generally found to be more sensitive to estrogens (206). Importantly, well-controlled studies demonstrate that strain differences in response to estrogen treatment may be organ dependent or may even differ between levels of tissue organization within the same organ. For example, the Sprague-Dawley rat is more sensitive to ethinyl estradiol than other strains when measured by uterine wet weight. However, when other endpoints were measured, *i.e.* height of cells in the uterine epithelium, the Sprague-Dawley rat was indistinguishable from the DA/Han rat; instead, the Wistar rat had the most heightened response (237). Additionally, there are data to indicate that strain differences for one estrogen may not be applicable for all estrogenic chemicals. In comparing the responses of DA/Han, Sprague-Dawley, and Wistar rats to other xenoestrogens, additional differences were observed including a greater increase in uterine wet weight of DA/Han and Sprague-Dawley rats but not Wistar rats after exposure to 200 mg/kg BPA; increased uterine epithelium thickness was observed in Wistar and Sprague-Dawley rats but not DA/Han rats after exposure to 200 mg/kg octylphenol (237). Attempts have been made, at times successfully, to map the differences in strain response to genetic loci (240). However, it appears that strains with differences in response that manifest in some organs do not have divergent responses in other organs, a phenomenon that is not explained by genetic differences alone. For these reasons, the NTP's recommendation that scientists use animals that are proven responsive to EDCs (2) must be observed.

4. Additional factors?

Additional factors have also been identified as influential in the ability (or inability) to detect low-dose effects in

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EDC studies. Although these factors must be considered when interpreting studies and using a WoE approach, some issues that were previously identified as essential factors in the design of studies (*i.e.* route of administration) have more recently been disputed (241).

The first factor is the use of good laboratory practices (GLP) in the collection of data. When assessing the EDC literature for risk assessment purposes, the FDA and European Food Safety Authority (EFSA) have given special prominence to studies that complied with GLP guidelines, essentially giving scientific priority to industry-funded studies because that group typically conducts GLP guideline studies (33, 242). Because GLP guidelines are designed only to control data collection, standards for animal care, equipment, and facility maintenance, and they do not ensure that studies were designed properly with the appropriate controls, it has been argued that the use of GLP methods is not appropriate or required for EDC studies (69).

GLP studies are typically large, with dozens of animals studied for each endpoint and at each time point. Thus, it has been concluded that these studies are better simply because they are larger. Yet small studies designed with the use of power analysis, statistical tools that allow researchers to determine *a priori* the number of animals needed to determine significant differences based on effect size, are equally capable of detecting effects while reducing the number of animals used (69). GLP studies also typically (but not necessarily) rely upon standardized assays, which are not generally considered contemporary tools and are often shown to be incapable of detecting adverse effects on endpoints that employ modern tools from molecular genetics and related disciplines. Furthermore, some fields of EDC research have no GLP studies (243). Finally, there is no published evaluation of whether studies performed under GLP are more capable of providing accurate results. The priority given to GLP studies therefore does not appear to have been justified based on any comparative analysis. Thus, as long as studies include appropriate measures of quality assurance, they need not be performed under GLP standards to provide reliable and valuable information, and many GLP studies are inadequate to assess important and relevant endpoints. Instead, the most valuable studies consider the factors presented above, along with appropriate dose selections and choice of endpoint.

The second factor worth considering is the source of funding for studies. In several fields, significant controversy has been produced based on the results obtained from independent scientists compared with results obtained from scientists affiliated with the chemical industry (75, 76). Funding source *per se* should not dictate the outcome of a research study, but that does not mean that researchers are not subject to underlying biases. In our own WoE analyses, presented in *Sections II.C–G*, we do not discount studies merely because they were conducted with industry funds, nor do we lend higher weight to studies conducted in independent or government laboratories; if a study, regardless of funding, finds no effect of a chemical, it is given weight only if the three criteria described in *Sections II.B.1–3* (successful and appropriate negative and positive controls and appropriate choice of animal model) were met.

To perform a WoE evaluation, we identified some basic information about the chemical in question, the dose that would be considered a low-dose cutoff, and the studies in support of and against low-dose effects. We then considered whether the majority of studies found effects of low doses of a chemical on a single endpoint in question. If studies did not find low-dose effects, we considered whether they adhered to the criteria discussed above for proper design of an EDC low-dose study. In particular, we considered whether appropriate animal strains as well as positive and negative controls were used. With regard to animal strain, as discussed briefly in *Section II.B.3*, there is variability between animal strains that can significantly influence the ability to detect effects of EDCs; using insensitive strains to produce negative data cannot refute positive data in a sensitive strain. In several cases, it was easy to conclude that there was a strong case for low-dose effects because there were no studies finding no effects at low doses or because all of the negative studies were inappropriately designed. For other chemicals, a significant number of studies found effects on the endpoint being considered, but other (adequately designed) studies refuted those findings. Under those circumstances, we determined whether the findings of harmful effects came from multiple laboratories; when they did, we cautiously concluded that there was evidence for low-dose effects. Below (*Sections II.C–G*), we present five examples where a significant number of studies were available examining low-dose effects of an EDC on a single particular endpoint.

C. BPA and the prostate: contested effects at low doses?

As discussed briefly above, BPA is one of the best-studied EDCs, with more than 200 published animal studies, many of which focused on low doses (29, 31). The effects of this chemical on wildlife species have also been described in detail (28). BPA is found in a myriad of consumer products, and it leaches from these items under normal conditions of use (4). It has also been regularly detected in air, water, and dust samples. The majority of individuals in industrialized countries have BPA metabolites in their urine, and trends indicate increasing expo-

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sures in developing nations like China (87, 244). Although it was long suspected that most human exposures originate from BPA contamination of food and beverages, a study comparing the excretion of BPA metabolites with the length of time spent fasting suggests that there are also likely to be significant exposures from sources other than food and beverages (245). BPA has recently been shown to be used in large quantities in thermal and recycled papers and can enter the skin easily via dermal absorption (246–248). Thus, despite the large amount of information available on BPA sources, our understanding of how these sources contribute to total human exposures remains poor; these studies also point to significant gaps in current knowledge about BPA metabolism in humans (243).

BPA binds to the nuclear and membrane ER, and thus most of the effects of this chemical have been attributed to its estrogenic activity (27). However, there is evidence that it can activate a number of additional pathways, including thyroid hormone receptor, androgen receptor, as well as peroxisome proliferator-activated receptor-γ signaling pathways (249–252). The cutoff for a low dose has been set at several different concentrations depending on which studies and definitions are used (see Table 1). The EPA calculated a reference dose for BPA of 50 μg/kg · d based on a LOAEL of 50 mg/kg · d (38). More recent pharmacokinetic scaling experiments have estimated that exposures to approximately 400 μg/kg · d produce blood concentrations of unconjugated BPA in the range of human blood concentrations (4). Thus, for the two WoE analyses of the BPA literature we conducted, doses of 400 μg/kg · d or lower were considered low dose; pharmacokinetic studies from nonhuman primates support the appropriateness of this dose for approximating human exposure levels (253). Furthermore, because this dose is below the toxicological LOAEL, it is a conservative cutoff for low-dose studies (see Refs. 3 and 38 and Table 1).

One of the most well studied and hotly debated examples of a low-dose effect comes from the BPA literature; regulatory agencies and scientists have addressed several times whether low doses of BPA during fetal and perinatal development affect the rodent prostate (118, 205, 254, 255). In 1997, the first study on BPA and the prostate determined that fetal exposure to low doses (2 and 20 μg/kg · d administered orally to pregnant mice) increased the weight of the adult prostate compared with unexposed male offspring (256). Since that time, several additional studies have verified that prostate weight is affected by fetal exposure to similar low doses (257–259). Studies have also shown that low doses of BPA affect androgen receptor binding activity in the prostate (257), tissue organization, and cytokeratin expression in the gland (260–262) as well as the volume of the prostate and the number and size of dorsolateral prostate ducts (208). Several recent studies have also examined whether low doses of BPA (10 μg/kg · d) influence the incidence of adult-onset prostatic intraepithelial neoplasia (PIN) lesions. Perinatal BPA exposure, whether administered orally or sc to pups, increases the incidence of PIN lesions in response to a mixture of testosterone and estradiol in adulthood (139, 141, 263); this hormonal cocktail was designed to mimic the endocrine changes associated with aging in men that also typically accompany the onset of prostate cancer. In addition to the effects of BPA on PIN lesions, these low doses also produced permanent alterations in the epigenome of exposed males, with prostates displaying completely unmethylated sequences in genes that are hypermethylated in unexposed controls (140, 263). In examining these studies, although the same effects of BPA on the prostate were not observed in all studies, there is an obvious trend demonstrating that low doses of BPA during early development significantly affect several aspects of prostate development.

Since the initial report showing effects of low doses on the prostate, approximately nine studies, including several designed specifically to replicate the original positive study, have shown no effects of low doses on the prostate (264–272); every one of these studies examined the prostate weight, and Ichihara *et al.* (264) also examined the effects of BPA on PIN lesions (without hormonal treatment) and the response of the prostate to a chemical carcinogen. Three of these studies failed to include a positive control of any kind (264, 268, 270); three studies used DES as a positive control but found no effect from exposure to this potent xenoestrogen (265–267) (*i.e.* the positive control failed); another study used 17β-estradiol as a positive control, inappropriately administered orally, and found no effects of this hormone on the prostate (271); and two studies used an estrogenic positive control (ethinyl estradiol) and found effects from its exposure, but only at inappropriately high doses (269, 272). These two studies clearly showed that the positive control dose was too high, because rather than increase the weight of the prostate (as seen after low doses of estrogens in other studies), the positive control decreased the weight of the adult prostate (269, 272).

Although this topic was once considered controversial, using a WoE approach, it is clear that there is strong evidence in support of low-dose effects of BPA on the development of the prostate. The evidence clearly shows that several endpoints, including prostate weight, were affected in similar ways in multiple studies from several different labs at doses below 400 μg/kg · d; most effects were seen at doses below 50 μg/kg · d. Furthermore, PIN lesions were reported after neonatal exposure to 10 μg/kg · d with

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hormonal treatment in adulthood. No appropriately conducted studies contest this evidence. Therefore, the WoE analysis demonstrates that low doses of BPA significantly alter development of the rodent prostate. The NTP's review of the BPA literature in 2008 indicated that this agency agrees that there is now significant evidence that low-dose BPA adversely affects development of the prostate (273).

D. BPA and the mammary gland: undisputed evidence for low-dose effects

The mammary gland is a conspicuous choice to examine the effects of estrogenic compounds because this organ depends on estrogen for proper development at several critical periods in life (274). The fetal gland expresses ER in the mesenchymal compartment, and just before birth, the epithelium becomes ER positive as well (275). At puberty, estrogen is responsible for ductal elongation and overall development of the gland, allowing the epithelium to fill the stromal compartment in preparation for pregnancy and lactation. Although BPA is an example of a chemical that has been classified as a weak estrogen because it binds with a much lower affinity to ERα compared with 17β-estradiol, even weak estrogens are known to affect the development of the mammary gland during early development (276).

In the first study to examine the effects of BPA on the mammary gland, prepubertal rats were exposed to relatively high doses (100 μg/kg · d or 54 mg/kg · d) for 11 d. After even this short exposure, mammary gland architecture was affected in both dose groups, with increased numbers of epithelial structures and, in particular, structures that suggest advanced development (277). BPA exposure also altered proliferation rates of mammary epithelium and cell cycle kinetics, with an increased number of cells in S-phase and a decreased number of cells in G1. Although relatively high doses of BPA were examined, this initial study indicated that the prepubertal and pubertal gland could be sensitive to BPA.

Many additional studies have examined another critical period, the fetal and neonatal periods, which are sensitive to environmental estrogens (78, 276, 278). Mice exposed prenatally to low doses of BPA via maternal treatment (0.25 μg/kg · d) displayed altered development of both the stromal and epithelial compartments at embryonic d 18, suggesting that exposures affect tissue organization during the period of exposure (176). In addition, similar low doses produced alterations in tissue organization observed in puberty and throughout adulthood, long after exposures ended, and even induced pregnancy-like phenotypes in virgin females (137, 279–282). Female mice exposed to BPA *in utero* displayed heightened responses to estradiol at puberty, with altered morphology of their glands compared with animals exposed to vehicle *in utero* (138). Another study demonstrated that perinatal BPA exposure altered the mammary gland's response to progesterone (283). Remarkably, all of these effects were observed after maternal exposures to low doses (0.025–250 μg/kg), suggesting that the gland is extremely sensitive to xenoestrogen exposures. These studies are in contrast to one that examined the effects of higher doses (0.5 and 10 mg/kg · d) when BPA was administered for 4 d to the dam, which reported advanced development of BPA-exposed glands before puberty but no effects in adulthood (284).

Adult exposure to BPA is only now being examined in the mouse mammary gland model. A recent study examined the effects of BPA on mice with mutations in the *BRCA1* gene. This study reported that 4 wks of exposure to a low dose of BPA altered the tissue organization of the mammary gland in ways that are similar to the effects observed after perinatal exposure (285). This study focused on altered development of the gland during exposure; additional studies are needed to determine whether these effects are permanent or whether normal mammary morphology could be achieved by cessation of BPA exposure.

Another obvious endpoint is the effect of BPA exposure on mammary cancer incidence. Several studies indicate that exposure to BPA *in utero* produces preneoplastic (281, 286, 287) and neoplastic lesions (286) in the gland in the absence of any other treatment. Additionally, other studies show that females exposed to BPA during the perinatal period are more sensitive to mammary carcinogens, decreasing tumor latency and increasing tumor incidence (287–290). These studies are also supported by subsequent studies examining gene and protein expression, which show that low-dose BPA specifically up-regulates expression of genes related to immune function, cell proliferation, cytoskeletal function, and estrogen signaling and down-regulates apoptotic genes (282, 288, 289, 291).

Postnatal BPA exposures also influence mammary cancer incidence; animals exposed lactationally to BPA from postnatal d 2 until weaning displayed decreased tumor latency and increased tumor multiplicity after treatment with DMBA [7,12-dimethylbenz(a)anthracene], a carcinogen (292). This study suggested that BPA exposure led to increased cell proliferation and decreased apoptosis in the gland and shifted the period where the gland is most susceptible to mammary carcinogens, a result that has important implications for human breast cancer. Finally, an additional study examined the effects of adult BPA exposure on mammary cancer; this study demonstrated that low doses of BPA accelerate the appearance of mammary tumors in a tumor-prone mouse strain (293). Interestingly,

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high doses did not have this effect; thus, this study is also an excellent example of a NMDRC.

Two studies of BPA and the mammary gland seem to contradict this body of literature, but both examined extremely high doses. In the first study, Nikaido *et al.* (294) exposed female mice to 10 mg/kg BPA from postnatal d 15–18. Mammary glands from these animals were examined at 4, 8, and 24 wk of age, and no differences were observed in the exposed animals relative to controls. Although the lack of effects reported in this study could be due to the high dose employed, they could also be related to the relatively short exposure period during the preweaning phase. In the second study, Yin and colleagues (295) examined the effects of BPA during the first few days after birth (0.1 or 10 mg BPA, equivalent to approximately 10 and 1000 mg/kg) on the incidence of mammary tumors after exposure to a mammary carcinogen at puberty. Similar to the study described above, this one also examined the effects of BPA after a relatively short period of exposure (only three injections administered between postnatal d 2 and 6). Although the study showed that BPA affected tissue organization, there was no change in the incidence of tumors in BPA-exposed females. Because both of these studies examined both high doses and relatively short periods of exposure, it is difficult to compare them directly to the studies finding effects of BPA on the mammary gland after longer exposures to lower doses; at the very least, they cannot refute studies suggesting that BPA alters development of this gland.

In summary, the WoE clearly shows that low-dose BPA exposure affects development of the mammary gland, mammary histogenesis, gene and protein expression in the gland, and the development of mammary cancers. In fact, this example of low-dose effects produced remarkably similar effects across more than a dozen studies conducted in several different labs. These results are also consistent with the effects of low-dose BPA exposure on mammary epithelial cells in culture (reviewed in Ref. 30). Although epidemiology studies examining the influence of BPA on breast cancer rates have proven to be inconclusive at best (296), to replicate the animal studies discussed above, epidemiologists must collect information about prenatal and neonatal exposures and relate them to adult breast cancer incidence. These types of studies would take decades to conduct (67) and should take into consideration the effects of other estrogens, because their effects can be additive or even synergistic (143, 144, 297).

Although our analyses of BPA have focused on its effects on the mammary gland and prostate (see *Sections II.C–D*), it is worth noting that several other endpoints have strong data to support the hypothesis that BPA has low-dose effects. In a recent review using similar WoE approaches, Hunt and colleagues (298) focused on those studies that examined the effects of BPA on the oocyte, specifically scrutinizing studies that reported effects, or no effects, on meiotic aneuploidy and other alterations in the intracellular organization and chromosome abnormalities. Similar to what has been observed with the prostate and mammary gland, the effects observed in the oocyte are variable from study to study, but overall consistent, and suggest that BPA exposure produces defects in these cells.

A large number of studies have also focused on the effects of BPA on the brain and behavior, with the most significant effects on sexually dimorphic regions of the brain and behaviors (299–307). Other affected behaviors include social behaviors, learning and anxiety, and maternal-neonate interactions (reviewed in Refs. 29 and 308). The NTP expert panel statement concluded that there were significant trends in these behavioral data and wrote that there was some concern that BPA could have similar effects in humans (273). Low-dose effects have also been reported for BPA in the female reproductive tract (309, 310), immune system (311, 312), maintenance of body weight and metabolism (313, 314), fertility (315–317), and the male reproductive tract (259, 318) (see Refs. 29 and 319 for comprehensive reviews).

E. Another controversial low-dose example: atrazine and amphibian sexual development

Atrazine is an herbicide that is applied in large volumes to crops, and there is concern that agricultural runoff of this chemical can affect nontarget animal species, especially amphibians that live and reproduce in small ponds and streams where significant amounts of atrazine have been regularly measured (320–322). It is the most commonly detected pesticide in ground and drinking water. Atrazine induces aromatase expression in cells and animals after exposure (323); this ultimately causes an increase in the conversion of testosterone to estrogen (324, 325). This effect has been reported in all vertebrate classes examined: fish, amphibians, reptiles, birds, and mammals, including human cell lines (see Ref. 326 for review). Another well-documented effect of atrazine is that it decreases androgen synthesis and activity, again, in every vertebrate class examined (326). In addition, endocrine-disrupting effects of atrazine occur through a number of other mechanisms, including antiestrogenic activity (327), altered prolactin release (328), and increased glucocorticoid release from the adrenal glands (329, 330), among others (327).

Because of atrazine's indirect effect on estrogen levels, one relevant endpoint that has been given attention is the effect of this chemical on gonad differentiation in various amphibian species. The early gonad is bipotential, and in

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mammals, the expression of genes on the Y-chromosome is needed to masculinize the undifferentiated gonad; when this does not occur, the gonad develops into ovarian tissue. In *Xenopus laevis* frogs (and some other animals like birds), the opposite is true: females are heterogametic (*i.e.* ZW-chromosomes) and males have two of the same chromosomes (*i.e.* ZZ). In *X. laevis*, the W-chromosome is the dominant one, containing a gene, DM-W, which induces aromatase expression (331). Thus, having a W-chromosome is needed to produce estrogen; without the conversion of testosterone to estrogen, the frog develops as a male (332). Changes in sex ratio and gonadal morphology are therefore good indicators that an estrogen, or a chemical that up-regulates aromatase and indirectly increases estrogen levels, is present (76).

Determining a low-dose cutoff for atrazine is not a simple task. Although the safe limit of 3 μg/liter in drinking water was set by the EPA, actual levels in the environment often exceed this concentration (333), and levels in ponds and streams can reach 100 μg/liter (322) or more. In traditional toxicology studies examining several amphibian species, the LOAEL was set at 1.1 mg/liter, and the no observed effect level (NOEL) was 200 μg/liter (334, 335). Thus, using the definitions of low dose established by the NTP (2), we consider any treatment at or below 200 μg/liter to be a low dose.

In 2002, one of the first published studies to connect atrazine exposures to altered gonadal morphology examined *X. laevis* frogs exposed to 0.01–200 μg/liter throughout larval development (336). All doses from 0.1–200 μg/liter produced gonadal malformations including the presence of multiple gonads and hermaphroditism. Several other reports showed similar effects of low doses on gonadal phenotypes including studies that report the production of hermaphrodites and intersex frogs, males with ovotestes, and males with testicular oocytes (337–343). Additional studies showed that low-dose atrazine exposure (0.1–200 μg/liter in the water) during sexual differentiation caused testicular dysgenesis, testicular resorption, and testicular aplasia in male frogs (343, 344), and others indicated effects on sex ratios (339, 342, 345, 346). Importantly, these effects were not all observed at the same atrazine concentration, and the studies were conducted in several different species, with some reporting effects at low doses but no effects at higher doses (341) and others reporting effects in some but not all species (339). Examining these studies as a whole, there is clearly a pattern of effects that are reproducible from study to study, and they collectively support the hypothesis that atrazine disrupts sex hormone concentrations.

To date, five peer-reviewed studies have reported no effects of atrazine on sex ratios, gonadal morphology, the incidence of testicular abnormalities or testicular oocytes, gonad size, or the incidence of intersex phenotypes (347–351). Little can be ascertained from these negative studies, however, because four did not include any positive control, suggesting that the frogs used in those studies may have been incapable of responding to atrazine or any other hormonal treatment (347–350). Additionally, one of those studies reported testicular oocytes in the control frogs, suggesting either that the negative control population was contaminated with atrazine (or another EDC or hormone), or that an inappropriate strain of *X. laevis* was selected for the experiments (347). Only one study remains that did not find any effects of atrazine; this study used an appropriate positive control (17β-estradiol) and found effects of that hormone on sex ratios and the incidence of intersex gonads (351). An EPA expert panel noted, however, that this study used a strain of *X. laevis* that was obtained from a new, unexamined population of frogs from Chile and suggested that this strain may be insensitive to environmental chemicals. Furthermore, the panel called for additional analysis of the data in this study, including the statistical approaches; they suggested that an independent laboratory should evaluate the histopathological results; and they requested that atrazine metabolites be measured (352). The panel also proposed that these experiments should be repeated with an established *X. laevis* strain. Taking together the results of those studies that found effects of atrazine on sexual differentiation, and this one negative study, the WoE for the case of low-dose atrazine on sexual differentiation is clearly in support of adverse effects of this chemical.

Just as epidemiological studies have found links between EDCs and human diseases, ecological field studies have examined whether exposure to atrazine in natural environments affects the development of wild amphibians (343, 353–358). These studies have many of the same constraints as those observed in epidemiology: a paucity of data on early life exposures (including exposure levels of controls), limitations on the total number of EDCs that can be measured in environmental and biological samples, and a lack of causative relationships that can be established between exposures and effects. For these reasons, studies that found relationships between atrazine exposure (or concentrations in environmental samples) and effects on one or more aspect of sexual differentiation (343, 353–355) are considered weak, but significant, evidence for low-dose effects. The presence of several studies suggesting a relationship between low-dose exposure to atrazine in the wild and altered sexual differentiation indicates a plausible causal relationship. Because the ecological and laboratory data show similar effects of atrazine on go-

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nadal development, this strengthens the conclusions of our WoE that low doses of atrazine cause harm to amphibians.

Feminization of males after atrazine exposure is not restricted to amphibians; exposure of zebrafish to low doses increased the ratio of female to male fish and increased expression of aromatase (359). Close to a dozen additional studies also report that environmentally relevant doses of atrazine can up-regulate aromatase, decrease testosterone, and/or increase estrogen levels in a large number of species (reviewed in Ref. 119), suggesting that low-dose effects of atrazine may be more widespread than their effects on the gonads of amphibians. Other studies indicate that low-dose atrazine affects the immune system and stress responses of salamanders (360–362), survivorship patterns of several frog species (363), and thyroid hormone and plasma ion concentrations in salmon (364).

An important factor to consider when examining the effects of atrazine on different animal models is the difficulty in identifying an appropriate low, environmentally relevant dose for all species. Aquatic animals can be housed in water containing levels of atrazine found in wild habitats, yet no toxicokinetic studies are available to determine what administered dose produces the levels of atrazine metabolites, typically in the parts-per-million or ppb range (365, 366), measured in human samples. There are also no blood or urine measurements in exposed rodents to compare with human levels; thus, extrapolations across species are estimates at best.

Keeping this qualification in mind, exposures in the range of 25–100 mg/kg · d during development have been shown to alter mammary gland development (367, 368), estrous cyclicity (369), serum and intratesticular testosterone concentrations (370), timing of puberty in males and prostate weight (371), and immune function (372) in rodents. Lower doses of atrazine metabolites (0.09–8.73 mg/kg · d) altered development of the mammary gland (373), male pubertal timing and prostate development (374). Identifying the range of doses administered to animals that produce the levels of atrazine and its metabolites measured in human blood and urine is an essential research need to pursue low-dose studies in rodents and other mammals.

F. Dioxin and spermatogenesis: low-dose effects from the most potent endocrine disruptor?

Dioxin, or TCDD, is formed as a byproduct of industrial processes as well as during waste incineration. Because TCDD is extremely toxic to some animals, with 1 μg/kg capable of killing 50% of guinea pigs, it has been labeled the most toxic chemical on earth (375). But interestingly, other animals are less sensitive to lethal effects of TCDD, with an LD_{50} of approximately 1000 μg/kg in hamsters, and studies also suggest that humans are not a hypersensitive species for lethality (376). Additionally, there are differences in the half-life of TCDD in different animals; in rodents, the half-life is 2–4 wks, but in humans, the half-life is approximately 10 yrs, and additional factors influence TCDD pharmacokinetics including the exposure level and the amount of body fat present (377–379). In cell cultures, doses as low as 10^{-11} M are toxic, with decreased viability observed even in cells maintained in nonproliferative states (380).

TCDD binds to the aryl hydrocarbon receptor (AhR), and differences in the affinity for the receptor may be responsible for differences in sensitivity between species (381). The K_d (dissociation constant for receptor-ligand binding kinetics) in human samples typically ranges from 3–15 nM, but in samples from rodents, the K_d is less than 1 nM (382). Importantly, there are also nongenomic pathways affected by TCDD that are mediated by AhR that are typically altered within minutes of TCDD exposure and therefore without changes in transcription (383). Yet many studies suggest that important differences exist between species regarding binding affinity of TCDD for AhR and the toxicity of this chemical, but that other adverse effects, including those related to the endocrine-disrupting activities of TCDD, occur at similar doses (or body burdens) across animal species (384, 385). Thus, it is plausible that AhR affinity alone can predict some, but not all, effects of TCDD and related chemicals.

The mechanisms responsible for many of the endocrine-disrupting activities of TCDD are currently not well understood. Knocking out AhR disrupts morphogenesis of several organ systems even in the absence of a ligand like TCDD, suggesting that this receptor plays important roles in early development (386). AhR is translocated to the nucleus after loss of cell-cell contacts and is often localized to the nucleus in embryonic cells, suggesting that it could have ligand-independent effects on development and/or that endogenous ligands could be present during early development (387). When TCDD is present, AhR translocates to the nucleus and dimerizes with ARNT, the aromatic hydrocarbon receptor nuclear translocator (388). Although the (currently unidentified) physiological activators of AhR are likely to induce rapid on/off signaling via AhR, TCDD and related compounds appear to maintain activation of AhR, and the presence of TCDD prevents the normal action of the AhR signaling pathway in the maintenance of homeostasis (389). This induces changes in the expression of genes and promotes the production of toxic metabolites. These effects may be responsible for some of the endocrine-related endpoints affected by TCDD exposure. Additionally, recent studies have shown complex and intricate interactions between the

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AhR and ER signaling pathways (390), suggesting that dioxin may also have indirect effects on some ER-mediated endpoints via AhR signaling.

Teratogenic effects of TCDD have been well documented after high-dose (391, 392) and low-dose exposures (393). These studies show that almost every organ and system in the body is affected by this chemical. High doses that did not produce lethality caused severe weight loss, intestinal hemorrhaging, alopecia, chloracne, edemas, and severe liver damage. Sadly, there are now several examples in humans of accidental exposures after the industrial release of TCDD where a number of individuals have been exposed to large doses (389, 394) as well as a few documented intentional poisonings (395). The tolerated daily intake level was set at 1–4 pg/kg · d, although the doses consumed by nursing infants are likely to exceed these levels by a factor of 10 (375). Adult exposures usually result from the consumption of contaminated foods, and because TCDD is lipophilic, it is concentrated in the fat component of breast milk and therefore passed in large quantities from a nursing mother to her infant.

Using classical toxicology methods, the effects of single TCDD doses were examined in adult male rats, specifically focusing on the effects of this chemical on the number of spermatids per testis and the integrity of the testicular germinal epithelium (396). In one of the earliest studies, Chahoud and colleagues (397) determined a LOAEL of 3 μg/kg · d and set the NOAEL at 1 μg/kg · d for effects on the testes. Because there are significant differences in the toxicity of TCDD between animal models, and different endpoints have different identified NOAELs, we have selected the 1 μg/kg · d identified by Chahoud *et al.* as the cutoff for low-dose studies of this compound. This cutoff is based on the NTP's definition of low dose as occurring at doses lower than those tested in traditional toxicology assessments (2). However, it is important to acknowledge that body burdens that mimic those observed in human populations are likely the best indicators of low doses for TCDD (384), and thus we recommend that future studies determine body burdens after administration of TCDD for the specific strain, origin, and species of animal being tested to ensure that truly low doses, relevant to human populations, are being tested.

Several recent epidemiological studies have indicated that relatively high exposures to TCDD during early life (due to industrial release of high amounts of the chemical) can permanently affect semen quality and sperm count in men (398). Yet epidemiology studies also clearly show that the timing of TCDD exposure can vastly influence the effect of this chemical on spermatogenesis; exposures during perinatal life significantly reduced sperm parameters, but exposures during puberty increased sperm counts; exposures in adulthood had no effect on sperm parameters (399). Thus, it is also important for animal studies to focus on exposures during critical periods for development of the male reproductive tract and spermatogenesis in particular.

We are aware of 18 studies that have examined the effects of low doses ($\leq$1 μg/kg · d) of TCDD during perinatal development on male fertility endpoints in adulthood. The endpoints assessed vary, including epididymal sperm counts, ejaculated sperm number, daily sperm production, sperm transit rate, and percent abnormal sperm, and the sensitivity of these endpoints appears to impact the ability to detect low-dose effects in different studies (400, 401) (Table 5). In total, 16 rodent studies examined the effect of low-dose TCDD on epididymal sperm count; 12 showed significant effects on this endpoint (402–413), whereas the other four did not (414–417). Of the five studies that examined ejaculated sperm counts, four studies (404, 405, 408), including one examining rhesus monkeys (418), showed effects of low-dose TCDD, *i.e.* a significant decrease in sperm counts; one study found no effect (417). Daily sperm production was a less-sensitive endpoint, with four studies showing significant decreases after prenatal exposure to low doses (402, 403, 407, 409) and four studies showing no effects (406, 412, 413, 416); sperm transit rate was examined in only two studies, although both showed significant decreases in sperm tranfer rates (403, 410); and finally, three studies determined that low-dose TCDD produced abnormalities in sperm appearance or motility (414, 415, 419), but one study was not able to replicate these findings (417).

When examining the TCDD literature as a whole, the WoE strongly suggests that prenatal exposure to low doses of TCDD affects sperm-related endpoints in adulthood (Table 5). In all, only two studies were unable to detect any effect of TCDD on the sperm endpoints assessed, although both studies found effects of TCDD on other endpoints including the weight of the adult prostate (416) and the timing of puberty (417). No study on TCDD used a positive control, likely due to a paucity of information on the mechanisms of dioxin action, but this raises obvious questions about the ability of these experimental systems to detect effects on spermatogenesis. Finally, some of the inability to detect effects of TCDD could be due to the use of insensitive strains, because 1000-fold differences in sensitivity have been reported for different rodent strains (420).

Even though we have focused the majority of our attention on the effects of low-dose TCDD exposure on spermatogenesis, it should be noted that low doses of this chemical affect a multitude of endpoints in animals, altering immune function (421, 422), indicators of oxidative

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TABLE 5. Summary of low-dose animal studies examining the effects of TCDD on spermatogenesis endpoints

Study	Administered dose (time of administration)	Animal	Epididymal sperm count	Ejaculated sperm no.	Daily sperm production	Sperm transit rate	% abnormal sperm
Mably *et al.* (409)	0.064–1 μg/kg (gestational d 15)	Rat	Decreased	NA	Decreased	NA	NA
Bjerke and Peterson (402)	1 μg/kg (gestational d 15)	Rat	Decreased	NA	Decreased	NA	NA
Gray *et al.* (404)	1 μg/kg (gestational d 8)	Rat	Not significant	Decreased	NA	NA	NA
	1 μg/kg (gestational d 15)	Rat	Decreased	Decreased	NA	NA	NA
	1 μg/kg (gestational d 11)	Hamster	Decreased	Decreased	NA	NA	NA
Sommer *et al.* (408)	1 μg/kg (gestational d 15)	Rat	Decreased	Decreased	Decreased	Not significant	Not significant
Wilker *et al.* (410)	0.5, 1 or 2 μg/kg (gestational d 15)	Rat	Decreased	NA	Unaffected	Increased	NA
Gray *et al.* (405)	0.05–1 μg/kg (gestational d 15)	Rat	Decreased	Decreased	Decreased	NA	NA
Faqi *et al.* (403)	0.025–0.3 μg/kg (before mating, then 0.005–0.06 μg/kg weekly [to dams])	Rat	Decreased	NA	Decreased	Increased	Increased
Loeffler and Peterson (412)	0.25 μg/kg (gestational d 15)	Rat	Decreased	NA	Unaffected	NA	NA
Ohsako *et al.* (416)	0.0125–0.8 μg/kg (gestational d 15)	Rat	Not significant	NA	Unaffected	NA	NA
Ohsako *et al.* (406)	1 μg/kg (gestational d 15)	Rat	Decreased	NA	Unaffected	NA	NA
	1 μg/kg (gestational d 18)	Rat	Unaffected	NA	Unaffected	NA	NA
	1 μg/kg (postnatal d 2 [to pups])	Rat	Unaffected	NA	Unaffected	NA	NA
Simanainen *et al.* (407)	0.03–1 μg/kg (gestational d 15)	Rat	Decreased	NA	Decreased	NA	NA
Yonemoto *et al.* (417)	0.0125–0.8 μg/kg (gestational d 15)	Rat	Unaffected	Unaffected	NA	NA	Unaffected
Yamano *et al.* (714)	0.3 or 1 μg/kg (postnatal d 1 and then every week [to dams])	Rat	Not significant	NA	NA	NA	NA
Ikeda *et al.* (715)	0.4 μg/kg (before mating, then 0.08 μg/kg weekly [to dams])	Rat	Unaffected	NA	NA	NA	NA
Bell *et al.* (414)	0.05–1 μg/kg (gestational d 15)	Rat	Increased (at certain ages)	NA	NA	NA	Increased
Bell *et al.* (415)	0.0024–0.046 μg/kg (d 12 weeks before pregnancy through parturition)	Rat	Unaffected	NA	NA	NA	Increased
Arima *et al.* (418)	0.03 or 0.3 μg/kg (gestational d 20, then 5% of dose monthly [to dams])	Rhesus monkey	Decreased	Not significant	NA	NA	Not significant
Yamano *et al.* (419)	0.3 or 1 μg/kg (weekly to dams then pups [all postnatal])	Rat	NA	NA	NA	NA	Increased
Jin *et al.* (411)	1 μg/kg · d (postnatal days 1–4 [to dams])	Mouse	Decreased	NA	NA	NA	NA
Rebourcet *et al.* (413)	0.01–0.2 μg/kg (gestational d 15)	Rat	Decreased (at some ages)	NA	Not significant	NA	NA

Not significant indicates trend for effect but did not reach statistical significance. Unaffected means assessed, but no differences were observed relative to controls. Here, low doses were considered any at or below 1 μg/kg · d (see text for discussion of how this cutoff was established for rodent studies). NA, Not assessed.

stress (423–425), bone and tooth development (426, 427), female reproduction and timing of puberty (428–430), mammary gland development and suceptibility to cancers (431), behaviors (432, 433), and others. In several cases, lower doses were more effective at altering these endpoints than higher ones (423, 424, 426, 433). Epidemiology studies of nonoccupationally exposed individuals also indicate that serum TCDD levels may be linked to diseases in humans as well (434). Mean serum TCDD levels have decreased by a factor of 7 over a 25-yr period (1972–97) in several industrial nations (435), but results from both animal and epidemiological studies suggest that even the low levels detected now could have adverse effects on health-related endpoints.

G. Perchlorate and thyroid: low-dose effects in humans?

A significant challenge with observing low-dose effects of EDCs in the human population is that human chemical exposures are multivariate along the vectors of time, space, and sensitivities. In addition, chemicals can exert effects on several systems simultaneously. Therefore, associations in human studies between exposures and disease are difficult to reconcile with experimental studies in animal model systems. For this reason, the literature describing the potential impacts of perchlorate contamination on the human population is potentially clarifying because to the best of our knowledge, perchlorate exerts only a single effect, and the pharmacology of perchlorate exposures has been studied in human volunteers (436). This

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literature offers a unique perspective into the issue of low-dose effects, perhaps providing important hypotheses to explain mechanistically why high-dose, short-term experiments can fail to predict the outcome of low-dose, lifetime exposures.

In the 2001–2002 NHANES dataset, perchlorate was detected in the urine of each of the 2820 samples tested (437). This widespread exposure means that the human population is being continuously exposed because perchlorate has a half-life in the human body of about 8 h (438). Human exposures to perchlorate are likely attributed to both contaminated drinking water and food (439); in fact, a recent analysis concludes that the majority of human exposure to perchlorate comes from food (440).

The predominant theory proposed to explain the source of perchlorate contamination in the United States is that it has been employed for many decades as the principal oxidant in explosives and solid rocket fuels (441). Perchlorate is chemically stable when wet and persists for long periods in geological systems and in ground water. Because of disposal practices during the 1960s through 1990s, perchlorate became a common contaminant of ground water in the United States (441, 442). Perchlorate is also formed under certain kinds of natural conditions (443), although the relative contributions to human exposure of these different sources is not completely understood. As a result of perchlorate contamination of natural waters, the food supply has become contaminated through irrigation in part because both aquatic and terrestrial plants can concentrate perchlorate more than 100-fold over water levels (444).

This exposure profile in the human population is important because high doses of perchlorate are known to reduce functioning of the thyroid gland, and poor thyroid function is an important cause of developmental deficits and adult disease (445). The primary question is: at what dose does perchlorate inhibit thyroid function sufficiently to cause disease? The current literature, reviewed below, supports the view that background exposure may affect thyroid function in adult women. These exposure levels, however, are considerably lower than predicted by early toxicology experiments in humans.

Perchlorate reduces thyroid function by inhibiting iodide uptake by the sodium/iodide symporter (NIS) (446), which is the only known effect of perchlorate on human physiology (438). NIS is responsible for transporting iodide into the thyroid gland, which is required for the production of thyroid hormone (447). However, NIS is also expressed in the gut (448, 449), in lactating breast (448, 450, 451), and in placenta (452), presumably all as a delivery mechanism for iodide to the developing and adult thyroid gland. Because the NIS transports perchlorate (450), the pathway by which humans take up and concentrate perchlorate is the same as the pathway by which humans take up and concentrate iodide. Interestingly, NIS expression in the human fetal thyroid gland is the rate-limiting step in production of thyroid hormone (453). Moreover, NIS transport of perchlorate explains why high levels of perchlorate are found in human amniotic fluid (454, 455) and breast milk (456–459).

This effect of perchlorate on thyroid function is important because thyroid hormone is essential for normal brain development, body growth as well as for adult physiology (445, 460). Moreover, it has become clear that even small deficits in circulating thyroid hormone in pregnant women (461, 462) or neonates (463) have permanent adverse outcomes. In fact, recent work indicates that very subtle thyroid hormone insufficiency in pregnant women is associated with cognitive deficits in their children (461). Because of the importance of thyroid hormone in development and adult physiology, and because perchlorate is a potent inhibitor of iodide uptake and thyroid hormone synthesis, identifying the dose at which these events occur is critical.

Perchlorate was used medically to reduce circulating levels of thyroid hormone in patients with an overactive thyroid gland in the 1950s and 1960s (reviewed in Ref. 446); therefore, it was reasonable to examine the dose-response characteristics of perchlorate on the human thyroid gland. Because perchlorate inhibits iodide uptake, several studies were performed to evaluate the effect of perchlorate exposure on iodide uptake inhibition in human volunteers (438, 464–466). In one study, 0.5 or 3 mg/d (approximately 0.007 and 0.04 mg/kg · d) perchlorate was administered to healthy volunteers (n = 9 females and 5 males, age 25–65 yr), and no effects were observed (466). Of course, it is important to note that the 2 wk of administration tested in this study is not sufficient to see any effect on serum concentrations of T_4 or TSH; the healthy thyroid can store several months' worth of thyroid hormone in the gland (467). Another small study also found no effects of administering 3 mg/d (approximately 0.04 mg/kg · d) on any thyroid endpoint assessed (n = 8 adult males) (464).

In contrast, two studies examining adult volunteers administered perchlorate found effects of this chemical on at least one endpoint. The first found that radioactive iodide uptake was affected by 2 wk of exposure to 10 mg/d (0.13 mg/kg · d), but other measures of thyroid function were not altered (n = 10 males) (465). The second examined adults (n = 37) given doses ranging from 0.007–0.5 mg/kg · d; all but the lowest dose altered radioactive iodide uptake, and only the highest dose altered TSH levels (438). These studies were interpreted to suggest that adults would have to consume 2 liters of drinking water daily that

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was contaminated with at least 200 ppb (200 μg/liter) perchlorate to reach a level in which iodide uptake would begin to be inhibited. Yet, these administered doses are high and relatively acute, so the derivation of a safe dose from these studies, applied to vulnerable populations such as those with low iodide intake, has been strongly disputed (471).

Studies of occupational exposures have also been used to examine the effects of exposure to relatively high levels of perchlorate. In the first such study, more than 130 employees were separated into eight groups based on exposure estimates from airborne perchlorate in the workplace (472). The authors found that individuals with longer daily exposures to perchlorate, due to longer work shifts, had significant decreases in TSH levels compared with individuals with shorter exposures. But this study was hampered because actual exposure levels were not measured via urine or blood samples. A second study examined 37 employees exposed to perchlorate and 21 control employees from an azide factory; actual exposure measures were not conducted, but estimates were calculated based on exposures to perchlorate dust and air samples (473). This study found no effects of perchlorate exposures on any thyroid endpoint, although the sample size examined was small. In the final occupational exposure study, serum perchlorate levels were measured and compared with several measures of thyroid function in workers (n = 29) who had spent several years as employees in a perchlorate production plant (474). In this study, the most complete because of the biomonitoring aspect of the exposure measures, higher perchlorate levels were associated with lower radioactive iodide uptake, higher urinary iodide excretion, and higher thyroid hormone concentrations.

Although iodide uptake was often inhibited in these studies, serum thyroid hormones were typically not altered, perhaps because of sufficient stored hormone. Based on these observations, the National Academy Committee to Assess the Health Implications of Perchlorate Ingestion (467) estimated that perchlorate would have to inhibit thyroid iodide uptake by about 75% for several months to cause a reduction in serum thyroid hormones. Moreover, the drinking water concentration of perchlorate required for this kind of inhibition was estimated to be over 1,000 ppb (438). Therefore, the National Academy of Sciences committee recommended a reference dose of 0.0007 mg/kg · d (467), based on the dose at which perchlorate could inhibit iodide uptake, and the EPA used this value to set a provisional drinking water standard of 15 ppb.

Considering these data and general knowledge about the thyroid system, it was unexpected that Blount *et al.* (475) would identify a positive association between urinary iodide and serum TSH in adult women in the NHANES 2001–2002 dataset. Yet several features of this dataset were consistent with a causal action of perchlorate on thyroid function. First, in the general population of adult women, urinary perchlorate was positively associated with serum TSH. In the population of adult women who also had low urinary iodide, however, urinary perchlorate was more strongly associated with serum TSH and was negatively associated with serum T_4. The strength of this association was such that the authors calculated that women at the 50th percentile of perchlorate exposure experienced a 1 μg/dl T_4 reduction (reference range = 5–12 μg/dl). Should this magnitude of reduction in serum T_4 occur in a neonate, measurable cognitive deficits would also be present (476). Finally, Steinmaus *et al.* (477), using the same NHANES dataset, showed that women with low urinary iodide who smoke had an even stronger association between urinary perchlorate and measures of thyroid function. Tobacco smoke delivers thiocyanates, which also inhibit NIS-mediated iodide uptake (446).

The NHANES dataset suggests that perchlorate exposures of 0.2–0.4 μg/kg · d (440) are associated with depressed thyroid function, even when urinary iodide is not reduced. This is a considerably lower dose than the 7 μg/kg · d dose required to suppress iodide uptake in the Greer *et al.* (438) study or the 500 μg/kg · d the NAS estimated would be required for several months to actually cause a decline in serum T_4. Therefore, it is reasonable to question whether these associations represent a causative relationship between perchlorate and thyroid function.

A number of epidemiological studies have been published to test for a relationship between perchlorate exposure and thyroid function. Early work used neonatal screening data for T_4 as a measure of thyroid function, and the city of birth (Las Vegas, NV, compared with Reno, NV) as a proxy measure of exposure (478, 479). The reported findings were negative, but we now know that all Americans are exposed to perchlorate, so there was considerable misclassification of exposure, and no relationship should have been observed. Several additional studies using similar flawed designs also found no relationship between proxy measures of perchlorate exposures and clinical outcomes (480–484).

A recent study of the neonatal screening data from 1998 in California identified a strong association between neonatal TSH and whether or not the mother resided in a contaminated area (485). This study included over 497,000 TSH measurements and 800 perchlorate measurements. In addition, they used as a cutoff a variety of TSH levels (as opposed to the 99.9th percentile used for the diagnosis of congenital hypothy-

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roidism), indicating that perchlorate exposure is not associated with congenital hypothyroidism. Two additional studies have shown similar relationships between perchlorate and TSH levels, particularly in families with a history of thyroid disease (486, 487).

Several studies in pregnant women have failed to identify a relationship between perchlorate exposure and measures of thyroid function (488–490). Although these are important studies that need to be carefully scrutinized, they do not replicate or refute the NHANES dataset. It thus remains important to conduct additional studies exploring the relationship between background exposure to perchlorate and thyroid function in adults, pregnant women, neonates, and infants. This effort will be challenging because of the different characteristics of thyroid function and hormone action at different life stages (460). In addition, it will be important to obtain individual measurements of exposures to perchlorate and other NIS inhibitors (thiocyanate and nitrate), and iodide itself as well as individual measures of thyroid function (free and total T_4 and TSH).

If background levels of perchlorate affect thyroid function in any segment of the population, it will be challenging to explain how the high-dose, short-term experiments of Greer *et al.* (438) completely underestimated the sensitivity of the human thyroid gland to perchlorate exposure. One possibility is that physiological systems respond to short durations of robust stress with compensatory mechanisms that reset during periods of long-term stress.

When these data are examined together, several important issues are raised. First, this example illustrates the difficulties inherent in studying human populations; epidemiology yields associations, not cause-effect relationships, in many cases using surrogate markers for perchlorate, and is not able to distinguish short- *vs.* long-term exposure duration. Second, our WoE analysis suggests that there is weak evidence for low-dose effects of perchlorate; further research is needed. The relationship between low-dose perchlorate exposures and thyroid endpoints would be strengthened by the addition of studies that measure biological concentrations of perchlorate and compare them with thyroid endpoints in neonates and other vulnerable populations. Third, the published studies that reported low-dose effects of perchlorate typically examined very specific populations, with several focusing on women with low iodine intake. This observation suggests that some groups may be more vulnerable to low doses of perchlorate than others (491).

H. Low-dose summary

These examples, and the examples of low-dose effects in less well-studied chemicals (Table 3), provide evidence that low-dose effects are common in EDC research and may be the default expectation for all chemicals with endocrine activity. Many known EDCs have not been examined for low-dose effects, but we predict that these chemicals will have effects at low doses if studied appropriately. Although studies unable to detect effects at low doses have received attention, including some studies designed to replicate others that reported low-dose effects, the majority of these studies contain at least one major design flaw. Thus, a WoE approach clearly indicates that low-dose effects are present across a wide span of chemical classes and activities.

III. Nonmonotonicity in EDC Studies

A concept related to low dose is that of nonmonotonicity. As noted in *Section I.B*, in a monotonic response, the observed effects may be linear or nonlinear, but the slope does not change sign (Fig. 3, A and B). In contrast, a dose-response curve is nonmonotonic when the slope of the curve changes sign somewhere within the range of doses examined (Fig. 3C). NMDRCs are often U-shaped (with maximal responses of the measured endpoint observed at low and high doses) or inverted U-shaped (with maximal responses observed at intermediate doses) (Fig. 3C, *top panels*). Some cases are more complicated, with multiple points along the curve at which the slope of the curve reverses sign (Fig. 3C, *bottom left*). Nonmonotonicity is not synomymous with low dose, because there are low-dose effects that follow monotonic dose-response curves. Thus, it is not required that a study include doses that span from the true low-dose range to the high toxicological range to detect nonmonotonicity. The consequence of NMDRCs for toxicity testing is that a safe dose determined from high doses does not guarantee safety at lower, untested doses that may be closer to current human exposures.

Examples of NMDRCs from the cell culture, animal, and epidemiological literature will be discussed in detail in *Section III.C*. Importantly, our review of the literature finds that NMDRCs are common in the endocrine and EDC literature. In fact, it is plausible that, considering the mechanisms discussed below, NMDRCs are not the exception but should be expected and perhaps even common.

A. Why is nonmonotonicity important?

NMDRCs in toxicology and in the regulatory process for EDCs are considered controversial. In addition to discussions of whether NMDRCs exist, there is also discussion of whether those that do exist have relevance to

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Figure 3.

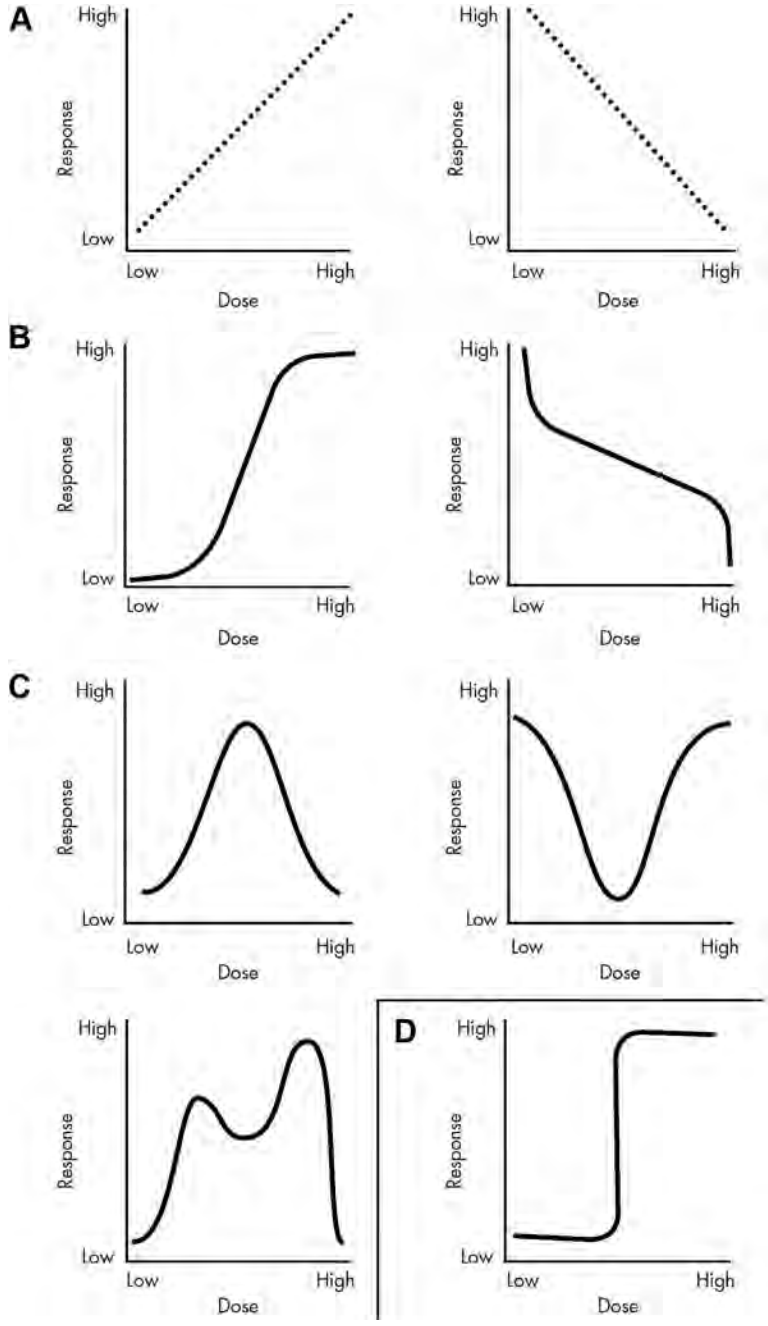

Figure 3. Examples of dose-response curves. A, Linear responses, whether there are positive or inverse associations between dose and effect, allow for extrapolations from one dose to another. Therefore, knowing the effects of a high dose permits accurate predictions of the effects at low doses. B, Examples of monotonic, nonlinear responses. In these examples, the slope of the curve never changes sign, but it does change in value. Thus, knowing what happens at very high or very low doses is not helpful to predict the effect of exposures at moderate doses. These types of responses often have a linear component within them, and predictions can be made within the linear range, as with other linear responses. C, Displayed are three different types of NMDRCs including an inverted U-shaped curve, a U-shaped curve, and a multiphasic curve. All of these are considered NMDRCs because the slope of the curve changes sign one or more times. It is clear from these curves that knowing the effect of a dose, or multiple doses, does not allow for assumptions to be made about the effects of other doses. D, A binary response is shown, where one range of doses has no effect, and then a threshold is met, and all higher doses have the same effect.

toxicological determination of putative safe exposures. In the standard practice of regulatory toxicology, the calculated safe dose, also called a reference dose, is rarely tested. In a system that is responding nonmonotonically, it is not appropriate to use a high-dose test to predict low-dose effects. Unfortunately, all regulatory testing for the effects of chemical exposures assume that this is possible. All current exposure standards employed by government agencies around the world, including the FDA and EPA, have been developed using an assumption of monotonicity (492, 493). The low-dose range, which presumably is what the general public normally experiences, is rarely, if ever, tested directly.

The standard procedure for regulatory testing typically involves a series of tests to establish the lowest dose at which an effect is observable (the LOAEL), then a dose beneath that at which no effect is observable (the NOAEL). Then a series of calculations are used to acknowledge uncertainty in the data, species differences, age differences, *etc.*, and those calculations, beginning with the LOAEL or the NOAEL, produce a reference dose that is presumed to be a safe exposure for humans (Fig. 4). Typically, the reference dose is 3- to 1000-fold lower than the NOAEL. That reference dose then becomes the allowable exposure and is deemed safe, even when it is never examined directly. For chemicals with monotonic linear dose-response curves (Fig. 3A), this may be appropriate. But for chemicals that display nonmonotonic patterns, it is likely to lead to false negatives, *i.e.* concluding that exposure to the reference dose is safe when in fact it is not.

As described above, there are other nonlinear dose-response curves that are monotonic (Fig. 3B). These curves may also present problems for extrapolating from high doses to low doses because there is no linear relationship that can be used to predict the effects of low doses. Equally troubling for regulatory purposes are responses that have a binary response rather than a classical dose-response curve (Fig. 3D). In these types of responses, one range of doses has no effect on an endpoint, and then a threshold is met, and all higher doses have the same effect. An example is seen in the atrazine literature, where doses below 1 ppb had no effect on the size of the male larynx but doses

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at or above 1 ppb produced a significant decrease in size of approximately 10–15% (336). Even doses of 200 ppb, the toxicological NOEL, produce the same effect. Thus, this all-or-none effect is observed because atrazine does not shrink the larynx; instead, it removes the stimulatory agent (*i.e.* androgens). In the absence of some threshold dose of androgen, the larynx simply remains at the unstimulated (female) size. The EPA's assessment of this study and others was that the lack of a dose-dependent response negates the importance of this effect (352). The lack of a dose response for a threshold effect like larynx size does not mean that the effects are not dose dependent; thus, understanding these types of effects and their implications for risk assessments is essential for determining the safe levels of chemicals.

It is important to mention here that the appropriateness of determining NOAEL concentrations, and therefore calculating reference doses, from exposures to endogenous hormones or EDCs has been challenged by several studies (Fig. 4A) (494–496). These studies show that hormonally active agents may still induce significant biological effects even at extremely low concentrations and that presently available analytical methods or technologies might be unable to detect relatively small magnitudes of effects. Previous discussions of this topic have shown that as the dose gets lower (and approaches zero) and the effect size decreases, the number of animals needed to achieve the power to detect a significant effect would have to increase substantially (497). Even more importantly, the assumption of a threshold does not take into account situations where an endogenous hormone is already above the dose that causes detectable effects and that an exogenous chemical (whether an agonist or antagonist) will modulate the effect of the endogenous hormone at any dose above zero (Fig. 4B). There can thus be no threshold or safe dose for an exogenous chemical in this situation. Forced identification of NOAEL or threshold doses based on the assumption that dose-response curves are always monotonic without considering the background activity of endogenous hormones and the limitations of analytical techniques supports the misconception that hormonally active agents do not have any significant biological effects at low doses. Thus, the concept that a toxic agent has a safe dose that can be readily estimated from the NOAEL derived from testing high, acutely toxic doses is overly simplistic and contradicted by data when applied to EDC (5, 497, 498).

B. Mechanisms for NMDRCs

Previously, the lack of mechanisms to explain the appearance of NMDRCs was used as a rationale for ignoring these phenomena (492, 493). This is no longer acceptable because there are several mechanisms that have been identified and studied that demonstrate how hormones and EDCs produce nonmonotonic responses in cells, tissues, and animals. These mechanisms include cytotoxicity, cell- and tissue-specific receptors and cofactors, receptor selectivity, receptor down-regulation and desensitization, receptor competition, and endocrine negative feedback loops. These mechanisms are well understood, and by providing detailed biological insights at the molecular level into the etiology of NMDRCs, they strongly negate the presumption that has been central to regulatory toxicology that dose-response curves are by default monotonic.

1. Cytotoxicity

The simplest mechanism for NMDRCs derives from the observation that hormones can be acutely toxic at high doses yet alter biological endpoints at low, physiologically relevant doses. Experiments working at concentrations that are cytotoxic are incapable of detecting responses that are mediated by ligand-binding interactions. For example, the MCF7 breast cancer cell line proliferates in response to estradiol in the low-dose range (10^{-12} to 10^{-11} M) and in the pharmacological and toxicological range (10^{-11} to 10^{-6} M), but toxic responses are observed at higher doses (38). Thus, when total cell number is graphed, it displays an inverted U-shaped response to estrogen. But cells that do not contain ER, and therefore cannot be affected by the hormonal action of estradiol, also display cytotoxic responses when treated with high doses of hormone. These results clearly indicate that the effects of estradiol at high doses are toxic via non-ER-mediated mechanisms.

2. Cell- and tissue-specific receptors and cofactors

Some NMDRCs are generated by the combination of two or more monotonic responses that overlap, affecting a common endpoint in opposite ways via different pathways. For example, *in vitro* cultured prostate cell lines demonstrate a nonmonotonic response to increasing doses of androgen where low doses increase cell number and higher doses decrease cell number, thus producing an inverted U-shaped curve (499, 500). Although the parental cell expressed an inverted U-shaped dose-response curve, after a long period of inhibition, the effects on cell number could be segregated by selecting two populations of cells: one that proliferated in the absence of androgens and other cells that proliferated in the presence of high androgen levels (501). Thus, the observed inverted U-shaped response is due to actions via two independent pathways that can be separated from each other in an experimental setting (502). Similarly, estrogens have been shown to induce cell proliferation and inhibit apoptosis in several cell populations, but inhibit proliferation and induce apopto-

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Figure 4.

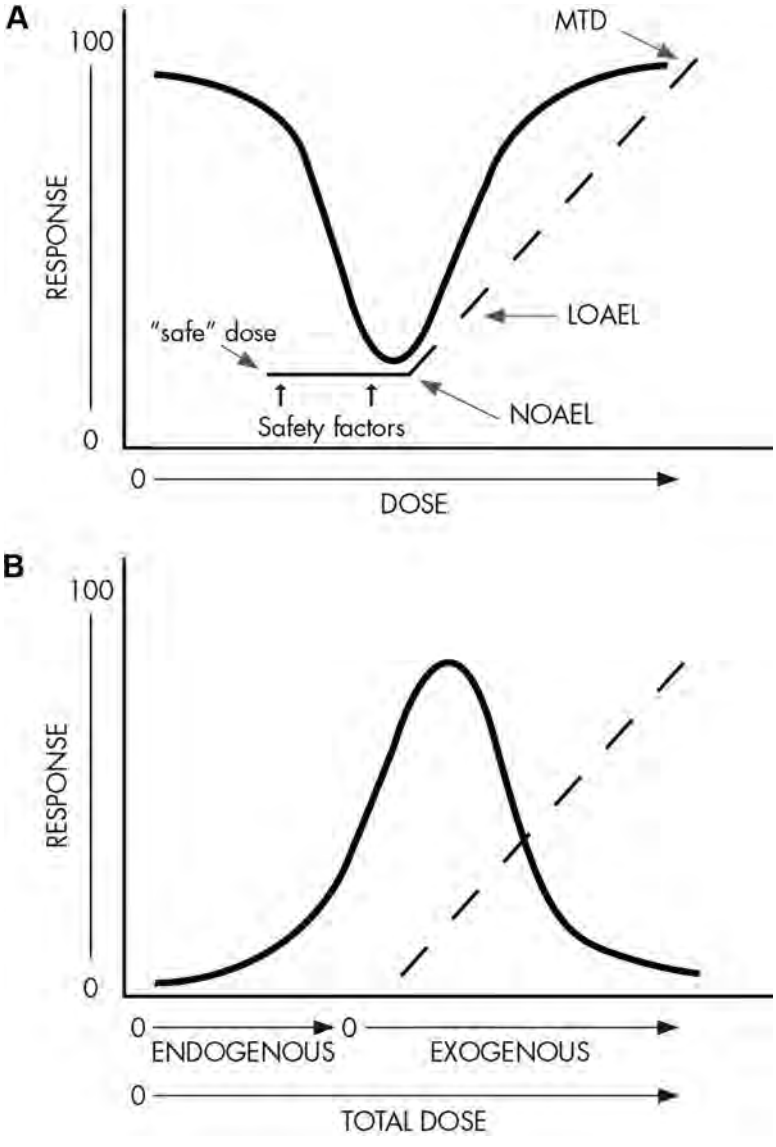

Figure 4. NOAEL, LOAEL, and calculation of a safe reference dose. A, In traditional toxicology testing, high doses are tested to obtain the maximum tolerated dose (MTD), the LOAEL, and the NOAEL. Several safety factors are then applied to derive the reference dose, *i.e.* the dose at which exposures are presumed safe. This reference dose is rarely tested directly. Yet when chemicals or hormones produce NMDRCs, adverse effects may be observed at or below the reference dose. Here, the doses that would be tested are shown by a *dotted line*, and the calculated safe dose is indicated by a *thick solid line*. The actual response, an inverted U-shaped NMDRC, is shown by a *thin solid line*. B, Experimental data indicate that EDCs and hormones do not have NOAELs or threshold doses, and therefore no dose can ever be considered safe. This is because an exogenous hormone (or EDC) could have a linear response in the tested range (*dotted line*), but because endogenous hormones are present (*thin solid line*), the effects of the exogenous hormone are always observed in the context of a hormone-containing system.

sis in others (503, 504), with the combined effect being an inverted U-shaped curve for cell number (505).

Why does one single cell type have different responses to different doses of the same hormone? The case of the prostate cell line described above is reminiscent of the results described from the transcriptome of MCF7 cells, whereby a discrete global response like cell proliferation manifests at significantly lower estrogen doses than the induction of a single marker gene (135). That a response like cell proliferation requires a significantly lower dose of hormone than the dose needed to induce a given target gene is counterintuitive but factual; it may be interpreted as consistent with the notion that metazoan cells, like cells in unicellular organisms, are intrinsically poised to divide (503, 506, 507) and that quiescence is an induced state (508, 509). The biochemical details underlying these different responses are largely unknown; however, recent studies showed that steroid receptors control only a portion of their target genes directly via promoter binding. The majority of the changes are indirect, through chromatin rearrangements (510, 511).

Why do different cell types (*in vitro* and *in vivo*) have different responses to the same hormone? One answer is that they may express different receptors, and these receptors have different responses to the same hormone. For example, some tissues express only one of the two major ER (ERα and ERβ), and actions via these receptors are important not just for responsiveness to hormone but also for cellular differentiation and cross talk between tissue compartments (512). Yet other tissues express both ERα and ERβ, and the effects of signaling via these two receptors often oppose each other; *i.e.* estrogen action via ERα induces proliferation in the uterus, but ERβ induces apoptosis (154). Complicating the situation further, different responses to a hormone can also be obtained due to the presence of different cofactors in different cell and tissue types (513, 514); these coregulators influence which genes are transcriptionally activated or repressed in response to the presence of hormone. They can also influence ligand selectivity of the receptor and DNA-binding capacity, having tremendous impact on the ability of a hormone to have effects in different cell types (105, 515, 516).

Although much of these activities occur on a biochemical level, *i.e.* at the receptor, there is also evidence that nonmonotonicity can originate at the level of tissue organization. The mammary gland has been used as a model to study inter- and intracompartmental effects of hormone treatment: within the ductal epithelium, estro-

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gen has distinct effects during puberty, both inducing proliferation, which causes growth of the ductal tree, and inducing apoptosis, which is required for lumen formation (517, 518); in cell culture, the presence of stromal cells can also enhance the effects of estrogen on epithelial cells (519, 520), suggesting that stromal-epithelial compartmental interactions can mediate the effects of estrogen.

3. Receptor selectivity

NMDRCs can occur because of differences in receptor affinity, and thus the selectivity of the response, at low *vs.* high doses. For example, at low doses, BPA almost exclusively binds to the ER (including mER), but at high doses it can also bind weakly to other hormone receptors, like androgen receptor and thyroid hormone receptor (249, 521). This type of receptor nonselectivity is quite common for EDCs, and it has been proposed that binding to different receptors may be an explanation for the diverse patterns of disease observed after EDC exposures (522). In fact, several of the chemicals shown to have low-dose effects are known to act via multiple receptors and pathways (Table 3). Thus, the effects seen at high doses can be due to action via the binding of multiple receptors, compared with the effects of low doses, which may be caused by action via only a single receptor or receptor family.

4. Receptor down-regulation and desensitization

When hormones bind to nuclear receptors, the ultimate outcome is a change in the transcription of target genes. When the receptor is bound by ligand, an increase in response is observed; as discussed previously in this review, the relationship between hormone concentration and the number of bound receptors, as well as the relationship between the number of bound receptors and the biological effect, is nonlinear (38). After the nuclear receptor is bound by hormone and transcription of target genes has occurred (either due to binding of the receptor at a DNA response element or the relief of a repressive event on the DNA), the reaction eventually must cease; *i.e.* the bound receptor must eventually be inactivated in some way. Thus, nuclear hormone receptors are ubiquitinated and degraded, usually via the proteasome (523). Importantly, the role of the hormone in receptor degradation differs depending on the hormone; binding of estrogen, progesterone, and glucocorticoid mediates the degradation of their receptors (524–526), whereas the presence of hormone may actually stabilize some receptors and prevent degradation (527), and other receptors are degraded without ligand (528). As hormone levels rise, the number of receptors being inactivated and degraded also rises, and eventually the number of receptors being produced cannot maintain the pace of this degradation pathway (523). Furthermore, the internalization and degradation of receptors can also influence receptor production, leading to an even stronger down-regulation of receptor (529). In the animal, the role of receptor down-regulation is actually quite complex, because signaling from one hormone receptor can influence protein levels of another receptor; *i.e.* ER signaling can promote degradation of the glucocorticoid receptor by increasing the expression of enzymes in the proteasome pathway that degrade it (530).

There is also the issue of receptor desensitization, a process whereby a decrease in response to a hormone is not due to a decrease in the number of available receptors but instead due to the biochemical inactivation of a receptor (531). Desensitization typically occurs when repeated or continuous exposure to ligand occurs. Normally seen with membrane-bound G protein-coupled receptors, the activation of a receptor due to ligand binding is quickly followed by the uncoupling of the activated receptor from its G proteins due to phosphorylation of these binding partners (532). Receptor desensitization has been observed for a range of hormones including glucagon, FSH, human chorionic gonadotropin, and prostaglandins (533). Importantly, desensitization and down-regulation can occur in the same cells for the same receptor (534), and therefore, both can play a role in the production of NMDRCs.

5. Receptor competition

Mathematical modeling studies suggest that the mixture of endogenous hormones and EDCs establishes a natural environment to foster NMDRCs. Using mathematical models, Kohn and Melnick (42) proposed that when EDC exposures occur in the presence of endogenous hormone and unoccupied hormone receptors, some unoccupied receptors become bound with the EDC, leading to an increase in biological response (*i.e.* increased expression of a responsive gene, increased weight of an organ, *etc.*). At low concentrations, both the endogenous hormone and the EDC bind to receptors and activate this response, but at high doses, the EDC can outcompete the natural ligand. The model predicts that inverted U-shaped curves would occur regardless of the binding affinity of the EDC for the receptor and would be abolished only if the concentration of natural hormone were raised such that all receptors were bound.

6. Endocrine negative feedback loops

In several cases, the control of hormone synthesis is regulated by a series of positive- and negative feedback loops. Several hormones are known to control or influence their own secretion using these feedback systems. In one example, levels of insulin are known to regulate glucose uptake by cells. Blood glucose levels stimulate insulin pro-

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duction, and as insulin removes glucose from circulation, insulin levels decline. Thus, NMDRCs can occur as the free/available ligand and receptor concentrations are influenced by one another. In another example, thyroid hormone secretion is stimulated by TSH, and thyroid hormone suppresses TSH; thus, feedback between these two hormones allows thyroid hormone to be maintained in a narrow dose range.

Several studies indicate that these negative feedback loops could produce NMDRCs when the duration of hormone administration is changed (535). For example, short exposures of estrogen induce proliferation in the uterus and pituitary, but longer hormone regimens inhibit cell proliferation (236, 536). Thus, the outcome is one where exposure to a single hormone concentration stimulates an endpoint until negative feedback loops are induced and stimulation ends (537).

7. Other downstream mechanisms

Removing the variability that can come from examining different cell types, or even single cell types in the context of a tissue, studies of cultured cells indicate that different gene profiles are affected by low doses of hormone compared with higher doses. In a study of the genes affected by low *vs.* higher doses of estrogen, researchers found that there were a small number of genes in MCF7 breast cancer cells with very high sensitivity to low doses of estradiol (10 pM) compared with the total number of genes that were affected by higher (30 or 100 pM) exposures (538). But the surprising finding was the pattern of estradiol-induced *vs.* estradiol-suppressed gene expression at high and low doses; when 10 pM was administered, the number of estradiol-suppressible genes was approximately three times higher than the number of estradiol-inducible genes. However, the overall profile of the number of estradiol-suppressible genes was approximately half the total number of estradiol-inducible genes. This observation suggests that low doses of estrogen selectively target a small subset of the total number of estrogen-sensitive genes and that the genes affected by low doses are most likely to be suppressed by that treatment. The mechanisms describing how low doses of estrogen differently affect the expression of genes compared with higher doses have yet to be elucidated, but low doses of estradiol inhibit expression of apoptotic genes (539), indicating that which genes are affected by hormone exposure is relevant to understand how low doses influence cellular activities.

C. Examples of nonmonotonicity

1. Examples of NMDRCs from cell culture

A tremendous amount of theoretical and mathematical modeling has been conducted to understand the production of nonlinear and nonmonotonic responses (42, 540). These studies and others suggest that the total number of theoretical response curves is infinite. Yet this does not mean that the occurrence of NMDRCs is speculative; these types of responses are reported for a wide variety of chemicals. Cell culture experiments alone provide hundreds of examples of nonmonotonic responses (see Table 6 for examples). In the natural hormone category, many different hormones produce NMDRCs; this is clearly not a phenomenon that is solely attributable to estrogen and androgen, the hormones that have been afforded the most attention in the dose-response literature. Instead, NMDRCs are observed after cells are treated with a range of hormones, suggesting that this is a fundamental and general feature of hormones.

Chemicals from a large number of categories with variable effects on the endocrine system also produce NMDRCs in cultured cells. These chemicals range from components of plastics to pesticides to industrial chemicals and even heavy metals. The mechanisms for nonmonotonicity discussed in *Section III.B* are likely explanations for the NMDRCs reported in a range of cell types after exposure to hormones and EDCs. Table 6 provides only a small number of examples from the literature, and it should be noted that because these are studies of cells in culture, most of these studies typically examined only a few types of outcomes: cell number (which could capture the effects of a chemical on cell proliferation, apoptosis, or both), stimulation or release of another hormone, and regulation of target protein function, often examined by measuring the phosphorylation status of a target.

2. Examples of NMDRCs in animal studies

Some scientists suggest that nonmonotonicity is an artifact of cell culture, however, a large number of NMDRCs have been observed in animals after administration of natural hormones and EDCs, refuting the hypothesis that this is a cell-based phenomenon only. Similar to what has been observed in cultured cells, the NMDRCs observed in animals also span a large range of chemicals, model organisms, and affected endpoints (Table 7). These results underscore the biological importance of the mechanisms of nonmonotonicity that have been largely worked out *in vitro*.

Although NMDRCs attributable to estrogen treatment are well documented, the induction of NMDRCs is again observed to be a general feature of hormone treatment; a wide range of hormones produce these types of responses in exposed animals. Importantly, a number of pharmaceutical compounds with hormone-mimicking or endocrine-disrupting activities also produce NMDRCs. Finally, as expected from the results of cell culture

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TABLE 6. Examples of NMDRCs in cell culture experiments

Chemicals by chemical class	Nonmonotonic effect	Cell type	Refs.
Natural hormones			
17β-Estradiol	Cell number	MCF7 breast cancer cells	135, 716
	Dopamine uptake	Fetal hypothalamic cells (primary)	717
	pERK levels, prolactin release	GH3/B6/F10 pituitary cells	41, 718, 719
	β-Hexosaminidase release	HMC-1 mast cells	720
	Cell number	Vascular smooth muscle cells	721
	Production of L-PGDS, a sleep-promoting substance	U251 glioma cells	722
5α-Dihydrotestosterone	Cell number	LNCaP-FGC prostate cancer cells	499
	Cell number, kinase activity	Vascular smooth muscle cells	721
5α-Androstenedione	Cell number	LNCaP-FGC prostate cancer cells	499
Corticosterone	Mitochrondrial oxidation, calcium flux	Cortical neurons (primary)	723
Insulin	Markers of apoptosis (in absence of glucose)	Pancreatic β-cells (primary)	724
Progesterone	Cell number	LNCaP-FGC prostate cancer cells	499
Prolactin	Testosterone release	Adult rat testicular cells (primary)	725
hCG	Testosterone release	Adult rat testicular cells (primary)	725
T_3	Rate of protein phosphorylation	Cerebral cortex cells (primary, synaptosomes)	726
	LPL mRNA expression	White adipocytes (rat primary)	727
GH	*IGF-I* expression	Hepatocytes (primary cultures from silver sea bream)	728
Pharmaceutical hormones			
DES	Cell number	MCF7 breast cancer cells	716
	Prolactin release	GH3/B6/F10 pituitary cells	41
Ethinyl estradiol	CXCL12 secretion	MCF7 breast cancer cells, T47D breast cancer cells	729
R1881 (synthetic androgen)	Cell number	LNCaP-FGC cells	499
Trenbolone	Induction of micronuclei	RTL-W1 fish liver cells	730
Plastics			
BPA	Cell number	MCF7 breast cancer cells	135, 716
	Dopamine efflux	PC12 rat tumor cells	40
	pERK levels, intracellular Ca^{2+} changes, prolactin release	GH3/B6/F10 pituitary cells	41, 718
	Cell number	LNCaP prostate cancer cells	731
DEHP	Number of colonies	*Escherichia coli* and *B. subtilis* bacteria	732
Di-*n*-octyl phthalate	Number of colonies	*E. coli* and *B. subtilis* bacteria	732
Detergents, surfactants			
Octylphenol	Cell number	MCF7 breast cancer cells	716
	Dopamine uptake	Fetal hypothalamic cells (primary)	717
	pERK levels	GH3/B6/F10 pituitary cells	718
	hCG-stimulated testosterone levels	Leydig cells (primary)	733
Propylphenol	pERK levels	GH3/B6/F10 pituitary cells	718
Nonylphenol	pERK levels, prolactin release	GH3/B6/F10 pituitary cells	41, 718
	β-Hexosaminidase release	HMC-1 mast cells	720
	Cell number	MCF7 breast cancer cells	135
PAH			
Phenanthrene	All-trans retinoic acid activity	P19 embryonic carcinoma cells	734, 735
Benz(a)acridine	All-trans retinoic acid activity	P19 embryonic carcinoma cells	734
Naphthalene	hCG-stimulated testosterone	Pieces of goldfish testes	736
B-naphthoflavone	hCG-stimulated testosterone	Pieces of goldfish testes	736
Retene	hCG-stimulated testosterone	Pieces of goldfish testes	736
Heavy metals			
Lead	Estrogen, testosterone, and cortisol levels	Postvitellogenic follicles (isolated from catfish)	737
Cadmium	Expression of angiogenesis genes	Human endometrial endothelial cells	738

(*Continued*)

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TABLE 6. Continued

Chemicals by chemical class	Nonmonotonic effect	Cell type	Refs.
Phytoestrogens and natural antioxidants			
Genistein	Cell number	Caco-2BBe colon adenocarcinoma cells	739
	CXCL12 secretion, cell number	T47D breast cancer cells	729
	Cell number, cell invasion, MMP-9 activity	PC3 prostate cancer cells	740
	pJNK levels, Ca^{2+} flux	GH3/B6/F10 pituitary cells	719
Coumesterol	Prolactin release, pERK levels	GH3/B6/F10 pituitary cells	719
Daidezin	Prolactin release, pERK levels	GH3/B6/F10 pituitary cells	719
	Cell number	MCF7 breast cancer cells	135
	Cell number	LoVo colon cancer cells	741
Resveratrol	Expression of angiogenesis genes	Human umbilical vein endothelial cells	742
Trans-resveratrol	pERK levels, Ca^{2+} flux	GH3/B6/F10 pituitary cells	719
Artelastochromene	Cell number	MCF7 breast cancer cells	743
Carpelastofuran	Cell number	MCF7 breast cancer cells	743
Biochanin A	Induction of estrogen-sensitive genes in the presence of testosterone	MCF7 breast cancer cells	744
Licoflavone C	Induction of estrogen-sensitive genes	Yeast bioassay	745
Quercetin	Aromatase activity	H295R adrenocortical carcinoma cells	746
	Cell number	SCC-25 oral squamous carcinoma cells	747
Dioxin			
TCDD	Cell number, gene expression	M13SV1 breast cells	748
PCB			
PCB-74	Cell viability, GnRH peptide levels	GT1-7 hypothalamic cells	749
PCB-118	Cell viability, GnRH peptide levels	GT1-7 hypothalamic cells	749
Aroclor 1242 (PCB mixture)	β-Hexosaminidase release	HMC-1 mast cells	720
POP mixture	Apoptosis of cumulus cells	Oocyte-cumulus complexes (primary, isolated from pigs)	750
Herbicides			
Glyphosphate-based herbicide (Round-Up)	Cell death, aromatase activity, ERβ activity	HepG2 liver cells	751
Atrazine	Cell number	IEC-6 intestinal cells	752
Insecticides			
Endosulfan	Cell number	IEC-6 intestinal cells	752
	β-Hexosaminidase release	HMC-1 mast cells	720
	ATPase activity of P-glycoprotein	CHO cell extracts	753
Diazinon	Cell number	IEC-6 intestinal cells	752
Dieldrin	β-Hexosaminidase release	HMC-1 mast cells	720
DDT	Cell number	MCF7 breast cancer cells	144
DDE	β-Hexosaminidase release	HMC-1 mast cells	720
	Prolactin release	GH3/B6/F10 pituitary cells	41
3-Methylsulfonyl-DDE	Cortisol and aldosterone release, expression of steroidogenic genes	H295R adrenocortical carcinoma cells	754
Fungicides			
Hexachlorobenzene	Transcriptional activity in the presence of DHT	PC3 prostate cancer cells	755
Prochloraz	Aldosterone, progesterone, and corticosterone levels; expression of steroidogenic genes	H295R adrenocortical cells	756
Ketoconazole	Aldosterone secretion	H295R adrenocortical cells	757
Fungicide mixtures	Aldosterone secretion	H295R adrenocortical cells	757
PBDE			
PBDE-49	Activation of ryanodine receptor 1	HEK293 cell (membranes)	758
PBDE-99	Expression of *GAP43*	Cerebral cortex cells (primary)	759

Due to space concerns, we have not elaborated on the shape of the curve (U, inverted U, or other nonmonotonic shape) or the magnitude of observed effects in this table. CXCL12, Chemokine (C-X-C motif) ligand 12; DEHP, bis(2-ethylhexyl) phthalate; DHT, dihydrotestosterone; hCG, human chorionic gonadotropin; MMP, matrix metalloproteinase; PAH, polyaromatic hydrocarbons; PBDE, polybrominated diphenyl ethers; PCB, polychlorinated biphenyl; pERK, phospho-ERK; PGDS, prostaglandin-D synthase; pJNK, phospho-c-Jun N-terminal kinase.

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TABLE 7. Examples of NMDRCs in animal studies

Chemicals by chemical class	Nonmonotonic effect	Organ/sex/animal	Refs.
Natural hormones			
17β-Estradiol	Morphological parameters	Mammary gland/female/mice	138, 541
	Accumulation of cAMP	Pineal/female/rats	760
	Prostate weight	male/mice	689
	Uterine weight	female/mice	761
	Antidepressant effects, measured by immobility assay	Behavior/male/mice	762
	Nocturnal activity, gene expression in preoptic area	Brain and behavior/female/mice	763
Corticosterone	Spatial memory errors	Behavior/male/rats	764
	Cholinergic fiber loss in cortex after treatment with neurodegenerative drugs	Brain/male/rats	765
	Mitochondrial metabolism	Muscle/male/rats: strain differences	766
	Contextual fear conditioning	Behavior/male/rats	767
	Locomotor activity	Behavior/male/captive Adelie penguins	768
Glucocorticoid	Na^+/K^+-ATPase activity	Brain/tilapia (fish)	769
Testosterone	Na^+/K^+-ATPase activity	Brain/tilapia (fish)	769
	Gonadotropin subunit gene expression	Pituitary/sexually immature goldfish	770
11β-Hydroxyandrosterone	Gonadotropin subunit gene expression	Pituitary/sexually immature goldfish	770
T_4	Bone growth	Tibia/male/rats with induced hypothyroidism	771
Leptin	Insulin production (in the presence of glucose)	Pancreas/male/rats	560
Oxytocin	Infarct size, plasma LDH levels, creatine kinase activity after ischemia/ reperfusion injury	Brain and blood/male/rats	772
	Memory retention	Behavior/male/mice	773
Melatonin	Brain infarction and surviving neuron number after injury	Brain/female/rats	774
Dopamine	Memory	Brain/both/rhesus monkey	775
	Neuronal firing rate	Brain/male/rhesus monkey	776
Pharmaceutical			
DES	Sex ratio, neonatal body weight, other neonatal development	Mice	777
	Adult prostate weight	Male/mice	689
	Uterine weight	Female/mice	761
	Expression of PDGF receptor	Testes/male/rats	778
	Morphological parameters	Mammary gland/male and female/ mice	779
Estradiol benzoate	Dorsal prostate weight, body weight	Male/rats	780
	Sexual behaviors, testes morphology	Male/zebra finches (birds)	781
Ethinyl estradiol	GnRH neurons	Brain/zebrafish	782
Tamoxifen	Uterine weight	Female/mice	761
Fluoxetine (antidepressant)	Embryo number	*Potamopyrgus antipodarum* (snails)	783
Fadrozole (aromatase inhibitor)	Aromatase activity	Ovary/female/fathead minnows	784
Plastics			
BPA	Fertility	Reproductive axis /female/mice	316
	Reproductive behaviors	Behavior/male/rats	785
	Protein expression	Hepatopancreas/male/*Porcellio scaber* (isopod)	786
	Timing of vaginal opening, tissue organization of uterus	Reproductive axis/female/mice	577
	Expression of receptors in embryos	Brain and gonad/both/ mice	787
DEHP	Aromatase activity	Hypothalamus/male/rats	788
	Cholesterol levels	Serum/male/rats	569
	Timing of puberty	Reproductive axis /male/rats	789
	Body weight at birth, vaginal opening, and first estrous	Female/rats	790
	Seminal vesicle weight, epididymal weight, testicular expression of steroidogenesis genes	Male/rats	791
	Responses to allergens, chemokine expression	Skin/male/mice	792

(*Continued*)

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TABLE 7. Continued

Chemicals by chemical class	Nonmonotonic effect	Organ/sex/animal	Refs.
Detergents, surfactants			
Nonylphenol ethoxylate	Fecundity	*Biomphalaria tenagophila* (snails)	793
Octylphenol	Embryo production	*P. antipodarum* (snails)	794
	Spawning mass and egg numbers	*Marisa cornuarietis* (snails)	795
Semicarbazide	Timing of preputial separation, serum DHT	Male/rats	796
Antimicrobial			
Triclocarban	Fecundity	*P. antipodarum* (snails)	797
PCB			
Mixture of PCB	Corticosterone levels	Male/kestrels (birds)	798
Environmental PCB mixture	Corticosterone levels	Female/tree swallows (birds)	799
UV filters			
Octyl methoxycinnamate	Activity, memory	Behavior/both/rats	800
Aromatic hydrocarbons			
B-naphthoflavone	Testosterone	Plasma/male/goldfish	736
Toluene	Locomotor activity	Behavior/male/rats	801
Dioxins			
TCDD	Cell-mediated immunity	Immune system/male/ rats	802
	Proliferation after treatment with chemical carcinogen	Liver/female/rats	803
Heavy metals			
Cadmium	Expression of metallothionein, *pS2/TFF1*	Intestine and kidney/ female/rats	804
	Activity of antioxidant enzymes	Earthworms	805
	Size parameters, metamorphic parameters	*Xenopus laevis*	806
Lead	Growth, gene expression	*Vicia faba* seedlings (plant)	807
	Retinal neurogenesis	Eye and brain/female/rats	808
Selenium	DNA damage, apoptotic index	Prostate/male/dogs	809
	Hatching failure	Eggs/red-winged blackbirds (wild population)	810
Phytoestrogens			
Genistein	Aggressive, defensive behaviors	Behavior/male/mice	811
	Retention of cancellous bone after ovariectomy	Tibia bones/female/rat	812
	Expression of *OPN*, activation of Akt	Prostate/male/mice	740
Resveratrol	Angiogenesis	Chorioallantoic membrane/chicken embryos	742
	Ulcer index after chemical treatment, expression of gastroprotective genes	Stomach/male/mice	813
Phytochemicals			
Phlorizin	Memory retention	Behavior/male/mice	814
Herbicides			
Atrazine	Time to metamorphosis	Thyroid axis/*Rhinella arenarum* (South American toad)	815
	Survivorship patterns	Four species of frogs	363
	Growth parameters	*Bufo americanus*	816
Pendimethalin	Expression of *AR*, *IGF-I*	Uterus/female/mice	817
Commercial mixture with mecoprop, 2,4-dichlorophenoxyacetic acid and dicamba	Number of implantation sites, number of live births	Female/mice	818
Simazine	Estrous cyclicity	Reproductive axis/female/rat	819
Insecticides			
Permethrin	Dopamine transport	Brain/male/mice	820
Heptachlor	Dopamine transport	Brain/male/mice	820
DDT	Number of pups, sex ratios, neonatal body weight, male anogenital distance	Mice	777
Methoxychlor	Number of pups, anogenital distance (males and females), neurobehaviors (males and females)	Mice	777
Chlorpyrifos	Body weight	Male/rats	821
	Antioxidant enzyme activity	*Oxya chinensis* (locusts)	822
Malathion	Antioxidant enzyme activity	*O. chinensis* (locusts)	822

(*Continued*)

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TABLE 7. Continued

Chemicals by chemical class	Nonmonotonic effect	Organ/sex/animal	Refs.
Fungicides			
Carbendazim	Liver enzymes, hematology parameters	Blood and liver/male/rats	823
Chlorothalonil	Survival, immune response, corticosterone levels	Several amphibian species	686
Vinclozolin	Protein expression	Testes/male/*P. scaber* (isopod)	786

Due to space concerns, we have not elaborated on the shape of the curve (U, inverted U, or other nonmonotonic shape) or the magnitude of observed effects in this table. DEHP, Bis(2-ethylhexyl) phthalate; DHT, dihydrotestosterone; LDH, lactate dehydrogenase; PCB, polychlorinated biphenyl; PDGF, platelet-derived growth factor.

experiments, chemicals with many different modes of action generate NMDRCs in treated animals.

Perhaps most striking is the range of endpoints affected, from higher-order events such as the number of viable offspring (which could be due to alterations in the reproductive tissues themselves or the reproductive axis), to behavioral effects, to altered organ weights, and to lower-order events such as gene expression. The mechanisms responsible for these nonmonotonic phenomena may be similar to those studied in cell culture systems, although additional mechanisms are likely to be operating *in vivo* such as alterations in tissue organization (541) and the interactions of various players in the positive and negative feedback loops of the endocrine system.

3. Examples of NMDRCs in the epidemiology literature

Perhaps not surprisingly, natural hormones produce NMDRCs in human populations as well (Table 8). Although the methods needed to detect NMDRCs in humans are specific to the field of epidemiology, these results sup-

TABLE 8. NMDRCs for natural hormones identified in the epidemiology literature

Hormone	Affected endpoint	NMDRC	Study subjects	Refs.
Testosterone (free)	Incidence of coronary events	Incidence of 25% at extremes of exposure, 16% at moderate exposure	Rancho Bernardo Study participants, women aged 40+ (n = 639)	824
	Depression	Hypo- and hypergonadal had higher depression scores than those with intermediate free testosterone	Androx Vienna Municipality Study participants, manual workers, men aged 43–67 (n = 689)	825
PTH	Mortality	~50% excess risk for individuals with low or high iPTH	Hemodialysis patients (n = 3946)	826
	Risk of vertebral or hip fractures	~33% higher for low or high iPTH compared to normal levels	Elderly dialysis patients (n = 9007)	827
TSH	Incidence of Alzheimer's disease	About double the incidence in lowest and highest tertile in women (no effects observed in men)	Framingham Study participants (elderly) (n = 1864, 59% women)	828
Leptin	Mortality	Mortality ~10% higher for lowest and highest leptin levels	Framingham Heart Study participants (elderly) (n = 818, 62% women)	563
Insulin	Coronary artery calcification	Higher for low and high insulin area under the curve measures.	Nondiabetic patients with suspected coronary heart disease, cross-sectional (n = 582)	829
	Mortality (noncardiovascular only)	Relative risk ~1.5 for highest and lowest fasting insulin levels	Helsinki Policemen Study participants, men aged 34–64 (n = 970)	830
Cortisol	BMI, waist circumference	Low cortisol secretion per hour for individuals with highest and lowest BMI, waist circumference	Whitehall II participants, adults, cross-sectional (n = 2915 men; n = 1041 women)	831
	Major depression (by diagnostic interview)	Slight increases at extremes of cortisol	Longitudinal Aging Study Amsterdam participants, aged 65+, cross-sectional (n = 1185)	832

BMI, Body mass index; iPTH, intact PTH; PTH, parathyroid hormone.

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port the idea that NMDRCs are a fundamental feature of hormones. Importantly, it should be noted that most of the individuals surveyed in studies examining the effects of natural hormones have a disease status or are elderly. This of course does not mean that natural hormones induce NMDRCs in only these select populations but may instead be a reflection of the types of individuals available for these studies (for example, there are very few clinical events in younger people).

NMDRCs observed in the epidemiology literature from human populations exposed to EDCs are now starting to receive attention (Table 9). Here, most reports of NMDRCs come from studies of healthy individuals exposed to persistent organic pollutants POPs, chemicals that do not easily degrade and consequently bioaccumulate in human and animal tissues (542). These POPs do encompass a range of chemical classes including components of plastics, pesticides, and industrial pollutants. A large number of these studies have focused on endpoints that are relevant to metabolic disease, and together, these studies show that there is a recurring pattern of NMDRCs related to POPs and disease. Of course, not every study of POPs shows NMDRCs, and this is probably due to the distribution of EDCs in the populations examined.

In addition to the studies that show strong evidence for NMDRCs in human populations, there is also a subset of studies that provide suggestive evidence for nonmonotonic relationships between EDCs and human health endpoints (Table 9). In fact, the authors of many of these papers clearly identify U- or inverted U-shaped dose-response curves. However, when authors do not perform the appropriate statistical tests to verify the presence of a NMDRC, there is some ambiguity in their conclusions. The usual cross-sectional *vs.* prospective design dichotomy in epidemiology also is a factor that can influence the strength of a NMDRC, or prevent the detection of one at all. This disjunction in design is often incongruous with EDC exposure studies because we often know very little about clearance rates of the chemical, interactions with adiposity, and changes to these factors with age and gender. Yet regardless of any possible weaknesses in these studies, they provide supportive evidence that NMDRCs are observed in human populations.

Because these reports of NMDRCs in human populations are relatively new, few mechanisms have been proposed for these phenomena. Why would risk curves be nonmonotonic over the dose distribution observed in human populations? Why would individuals with the highest exposures have less severe health outcomes compared with individuals with more moderate exposures? One plausible explanation is that the same mechanisms for NMDRCs in animals and cell cultures operate in human populations: chronic exposures to high doses can activate negative feedback loops, activate receptors that promote changes in different pathways that diverge on the same endpoint with opposing effects, or produce some measure of toxicity. Accidental exposures of very large doses may not behave the same as background doses for a variety of reasons, including the toxicity of high doses; these large doses tend to occur over a short time (and therefore more faithfully replicate what is observed in animal studies after controlled administration).

Another explanation is that epidemiology studies, unlike controlled animal studies, examine truly complex mixtures of EDCs and other environmental chemicals. Some chemical exposures are likely to be correlated due to their sources and their dynamics in air, water, soil, and living organisms that are subsequently eaten. Therefore, intake of these chemicals may produce unpredicted, likely nonlinear outcomes whether the two chemicals act via similar or different pathways.

The design of observational epidemiological studies is fundamentally different from studies of cells or animals, in that the EDC exposure distributions are given, rather than set by the investigator. In particular, as shown in Fig. 5, different epidemiological populations will have different ranges of exposure, with the schematic example showing increasing risk in a population with the lowest exposures (labeled group A), an inverted U-shaped risk in a moderate dose population (labeled group B), and an inverse risk in a population with the highest exposures (labeled group C). An additional example is provided (labeled group D) in which an industrial spill shows high risk, but the comparison with the entire unaffected population with a wide variety of risk levels due to differential background exposure could lead to a high- or a low-risk reference group and a wide variety of possible findings.

It is reasonable to suggest that even though epidemiological studies are an assessment of exposures at a single time point, many of these pollutants are persistent, and therefore a single measure of their concentration in blood may be a suitable surrogate for long-term exposures. The movement of people from relatively low- to higher-exposure groups over time depend on refreshed exposures, clearance rates, and individual differences in ability to handle exposures (*i.e.* due to genetic susceptibilities, amount of adipose tissue where POPs can be stored, *etc.*).

Figure 5 therefore further illustrates that observational epidemiological studies yield the composite effect of varying mixtures of EDCs at various exposure levels for various durations, combining acute and chronic effects. These studies are important, however, in that they are the only way to study EDC effects in the long term in intact humans, as opposed to studying signaling pathways, cells,

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TABLE 9. NMDRCs for EDCs identified in the epidemiology literature

Chemicals by chemical class	Affected endpoint	NMDRC	Study subjects	Refs.
Insecticides				
Trans-nonachlor	Diabetes incidence	Highest risk in groups with intermediate exposures (quartile 2)	CARDIA participants, case-control study (n = 90 cases and n = 90 controls)	833
	Telomere length in peripheral leukocytes	Increased length in intermediate exposures (quintile 4)	Adults aged 40+ (Korea, n = 84)	591
p,p′-DDE	BMI, triglyceride levels, HDL cholesterol	Highest risk in groups with intermediate exposures (quartile 3)	CARDIA participants (n = 90 controls from nested case control study)	590
	Risk of rapid infant weight gain	For infants born to women of normal weight prepregnancy, risk is highest with intermediate exposures.	Infants from Childhood and the Environment project, Spain (n = 374 from normal prepregnancy weight mothers; n = 144 from overweight mothers)	834
	Telomere length in peripheral leukocytes	Increased length with intermediate exposures (quintile 4)	Adults aged 40+ (Korea, n = 84)	591
Oxychlordane	Bone mineral density of arm bones	With low exposures, fat mass had inverse associations with bone mineral density; with high exposures, fat mass had positive associations with bone mineral density.	NHANES 1999–2004 participants, aged 50+ (n = 679 women, n = 612 men)	835
Plastics				
Mono-methyl phthalate (MMP)	Atherosclerotic plaques	Increased risk in intermediate exposure groups (quintiles 2–4)	Adults aged 70, living in Sweden (n = 1016)	836
Perfluorinated compounds				
PFOA	Arthritis (self-reported)	Increased risk in intermediate exposure groups (quartile 2)	NHANES participants, aged 20+ (both sexes, n = 1006)	837
Fire retardants				
PBB-153	Blood triglyceride levels	Increased risk in intermediate exposure groups (quartile 2)	NHANES participants, aged 12+ (n = 637)	604
PBDE-153	Prevalence of diabetes,	Prevalence of diabetes highest in intermediate groups (quartiles 2–3 relative to individuals with undetectable levels)	NHANES participants, aged 12+ (n = 1367)	604
	Prevalence of metabolic syndrome, levels of blood triglycerides	Prevalence of metabolic syndrome highest in intermediate exposure groups (quartile 2 relative to individuals with undetectable levels); blood triglycerides highest in low exposure groups (quartile 1 relative to individuals with undetectable levels)	NHANES participants, aged 12+ (n = 637)	604
PCB				
PCB-74	Triglyceride levels	Lowest levels are observed in intermediate groups (quartile 2)	CARDIA participants (n = 90 controls from nested case-control study)	590
PCB-126	Bone mineral density in right arm	With low exposures, fat mass had inverse associations with bone mineral density; with high exposures, fat mass had positive associations with bone mineral density	NHANES participants, aged <50 (n = 710 women, n = 768 men)	835
PCB-138	Bone mineral density in right arm	With low exposures, fat mass had inverse associations with bone mineral density; with high exposures, fat mass had positive associations with bone mineral density	NHANES participants, women aged 50+ (n = 679 women, n = 612 men)	835
PCB-153	Telomere length in peripheral leukocytes	Increased length with intermediate exposure groups (quintile 4)	Adults aged 40+ (Korea, n = 84)	591
PCB-170	Diabetes incidence	Highest risk in groups with intermediate exposures (quartile 2)	CARDIA participants, case-control study (n = 90 cases and n = 90 controls)	833
	Endometriosis	Decreased risk in groups with intermediate exposures (quartile 3)	Participants from the Women at Risk of Endometriosis (WREN) study, 18–49 yr old, case-control study (n = 251 cases; n = 538 controls)	838
PCB-172	DNA hypomethylation (by Alu assay)	Highest levels of hypomethylation in groups with lowest and highest exposures	Adults aged 40+ (Korea, n = 86)	839
PCB-180[a]	BMI	Highest BMI with intermediate exposures (quartile 2)	CARDIA participants (n = 90 controls from nested case control study)	590
PCB-187[a]	HDL cholesterol levels	Lowest levels with intermediate exposures (quartile 2)	CARDIA participants (n = 90 controls from nested case control study)	590
PCB 196–203	Diabetes incidence	Highest risk in groups with intermediate exposures (quartile 2)	CARDIA participants, case-control study (n = 90 cases and n = 90 controls)	833
PCB-196	Endometriosis	Decreased risk in groups with intermediate exposures (quartile 3)	Participants from the Women at Risk of Endometriosis (WREN) study, 18–49 yr old, case-control study (n = 251 cases; n = 538 controls)	838

(*Continued*)

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TABLE 9. Continued

Chemicals by chemical class	Affected endpoint	NMDRC	Study subjects	Refs.
PCB-199[a]	Triglyceride levels	Highest risk in groups with intermediate exposures (quartiles 2–3)	CARDIA participants (n = 90 controls from nested case control study)	590
PCB-201	Endometriosis	Decreased risk in groups with intermediate exposures (quartiles 2–3)	Participants from the Women at Risk of Endometriosis (WREN) study, 18–49 yr old, case-control study (n = 251 cases, n = 538 controls)	838
Heavy metals				
Selenium	Fasting glucose levels (by modeled exposure)	Intermediate exposures have highest fasting glucose levels	NHANES 2003- 2004 participants, aged 40+ (n = 917)	840
	Glycosylated hemoglobin (by modeled exposure)	Intermediate exposures have highest % glycosylated hemoglobin	NHANES 2003- 2004 participants, aged 40+ (n = 917)	840
	Diabetes incidence (by modeled exposure)	Intermediate exposures have highest risk for diabetes	NHANES 2003- 2004 participants, aged 40+ (n = 917)	840
	Blood triglyceride levels	Intermediate exposures have highest triglyceride levels	NHANES participants, aged 40+ (n = 1159)	841
Arsenic	Cytokines in umbilical cord blood	Lower inflammatory markers at intermediate exposures (quartile 2)	Pregnant women in Bangladesh (n = 130)	842
Manganese	Mental development scores in infants and toddlers	Intermediate exposures had highest mental development scores at 12 months of age; association lost in older toddlers	12-month-old infants, Mexico (n = 301)	843
	Sperm count, motility and morphology	Intermediate doses had lowest sperm counts and motility; intermediate doses also had the worst sperm morphologies	Men aged 18–55 (infertility clinic patients, n = 200)	844
Mixtures				
31 POP	Diabetes incidence	Highest incidence in intermediate groups (sextiles 2–3)	CARDIA participants, case-control study (n = 90 cases and n = 90 controls)	833
16 POP	Diabetes incidence	Highest incidence in intermediate groups (sextiles 2–3)	CARDIA participants, case-control study (n = 90 cases and n = 90 controls)	833
Non-dioxin-like PCB (mix)	Metabolic syndrome	Highest incidence in intermediate groups (quartile 3)	NHANES 1999–2002 participants, aged 20+ (n = 721)	845
Dioxin-like PCB (mix)	Triacylglycerol levels by quartile of exposure	Highest levels in intermediate groups (quartile 3)	NHANES 1999–2002 participants, aged 20+ (n = 721)	845
Additional supportive evidence for NMDRC in the epidemiology literature				
Insecticides				
Heptachlor epoxide	Prevalence of newly diagnosed hypertension	Highest risk in intermediate groups (quartile 2); other endpoints do not have NMDRC	NHANES participants, women aged 40+, cross-sectional (n = 51 cases, n = 278 total)	26
β-Hexachloro-cyclohexane	Triacylglycerol levels by quartile of exposure	Highest risk in intermediate group (quartile 2)	NHANES participants, aged 20+ (n = 896 men, 175 with metabolic syndrome)	845
Plastics				
Mono-*N*-butyl phthalate (MBP)	BMI, age-specific effects	Effects seen only in elderly participants (age 60–80); risk is lowest in quartile 3	NHANES male participants (n = 365; age 60–80)	470
Mono-benzyl phthalate (MBzP)	BMI, age-specific effects	Effects seen only in young participants (age 6–11); risk is highest in quartiles 2–3	NHANES participants (both sexes, n = 329 males; n = 327 females)	470
Flame retardants				
PFOA	Thyroid disease (self-reported)	Lowest risk in intermediate groups (quartile 3)	NHANES 1999–2000, 2003–2006 participants, males aged 20+ (n = 3974)	837
Dioxin and related compounds				
TCDD	Age at natural menopause	Highest for intermediate exposure group (quintile 4)	Highly exposed women; Seveso Women's Health Study participants (n = 616)	468
HCDD	Bone mineral density in right arm by quintile of fat mass	With low exposures, fat mass had inverse associations with bone mineral density; with high exposures, fat mass had positive associations with bone mineral density	NHANES participants, women aged 50+ (n = 679 women, n = 612 men)	835
Heavy metals				
Selenium	Prevalence of peripheral artery disease	Disease prevalence decreased in intermediate doses, then increased gradually with higher doses	NHANES participants, aged 40+ (n = 2062)	469

BMI, Body mass index; HCDD, hexachloro-dibenzo-p-dioxin; HDL, high-density lipoprotein; PCB, polychlorinated biphenyls; PFOA, perfluorooctanoic acid; PBB, polybrominated biphenyl; PBDE, polybrominated diphenyl ethers; POP, persistent organic pollutants.

[a] In many cases, multiple chemicals in the same class had similar effects. A few chemicals were selected to illustrate the observed effect. This list is not comprehensive.

organs, or animal models over limited periods of time. Causal inference is not done directly from the epidemiological study results; instead, it is done via combining information from the epidemiological observations with findings from the detailed studies of pathways and animals.

We have suggested that NMDRCs are a fundamental and general feature of hormone action in cells and animals.

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Figure 5.

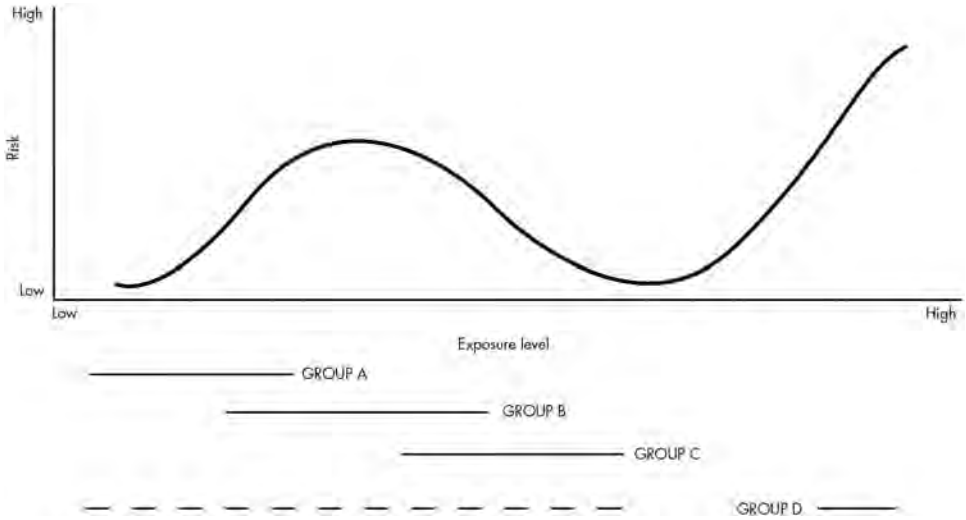

Figure 5. Example of a NMDRC in humans and the sampling populations that could be examined in epidemiology studies. This schematic illustrates a theoretical NMDRC in a human population. If a study were to sample only group A, the conclusion would be that with increasing exposures, risk increases monotonically. Sampling group B would allow researchers to conclude that there is a nonmonotonic relationship between exposure level and risk. If a study included only group C, the conclusion would be that with increasing exposures, there is decreased risk of disease. Group D represents a population that was highly exposed, *i.e.* due to an industrial accident. This group has the highest risk, and there is a monotonic relationship between exposures and risk, although risk is high for all individuals. In the group D situation, there is generally a background population with which high-dose exposure is compared (*dotted line*); relative risk for group D would depend on whether that background population resembles group A, B, or C. From this example, it is clear that the population sampled could strongly influence the shape of the dose-response curve produced as well as the conclusions reached by the study.

It is therefore worth asking whether NMDRCs are expected in the epidemiology literature. The endpoints assessed in epidemiology studies are typically integrated effects, rather than short-term effects; therefore, the various cell- or organ-specific effects may cancel each other, particularly if they are NMDRCs (because they are unlikely to all have nonmonotonicity at the same dose and direction). Thus, NMDRCs are likely to be rarer in the epidemiology literature compared with studies examining the effects of a wide range of doses of an EDC on animals and cultured cells. Yet it is also important to ask what can be concluded if a NMDRC is detected in one epidemiology study but not in others examining the same chemical and outcome. There are several factors that must be considered. The first is that differences in the populations examined between the two studies could explain why a monotonic relationship is observed in one group and a nonmonotonic relationship in another (see Fig. 5). The second is that one or more studies may not be statistically designed to detect NMDRCs. Finally, it is plausible that the NMDRC is an artifact due to residual confounding or some other factor that was not considered in the experimental design. As more becomes known about the mechanisms operating in cells, tissues, and organs to generate NMDRCs, our ability to apply this information to epidemiology studies will increase as well.

4. Tamoxifen flare, a NMDRC observed in cells, animals, and human patients

Although there is controversy in toxicology and risk assessment for endocrine disruptors, NMDRCs are recognized and used in current human clinical practice, although under a different specific term, flare. Flare is often reported in the therapy of hormone-dependent cancers such as breast and prostate cancer. Clinically, failure to recognize the NMDRC that is termed a flare would be considered malpractice in human medicine.

Tamoxifen flare was described and named as a transient worsening of the symptoms of advanced breast cancer, particularly metastases to bone associated with increased pain, seen shortly after the initiation of therapy in some patients (543). If the therapy could be continued, the patients showing tamoxifen flare demonstrated a very high likelihood of subsequent response to tamoxifen, including arrest of tumor growth and progression of symptoms for some time.

The subsequent mechanism of the flare was described in basic lab studies in athymic mouse models of human hormone-dependent breast cancer xenografts (544) and in tissue culture of hormone-dependent human breast cancer cells (545–547). In these models, it was observed that although high, therapeutic concentrations of tamoxifen inhibited estrogen-stimulated proliferation of breast cancer cells, lower concentrations of tamoxifen actually stimulated breast can-

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Figure 6.

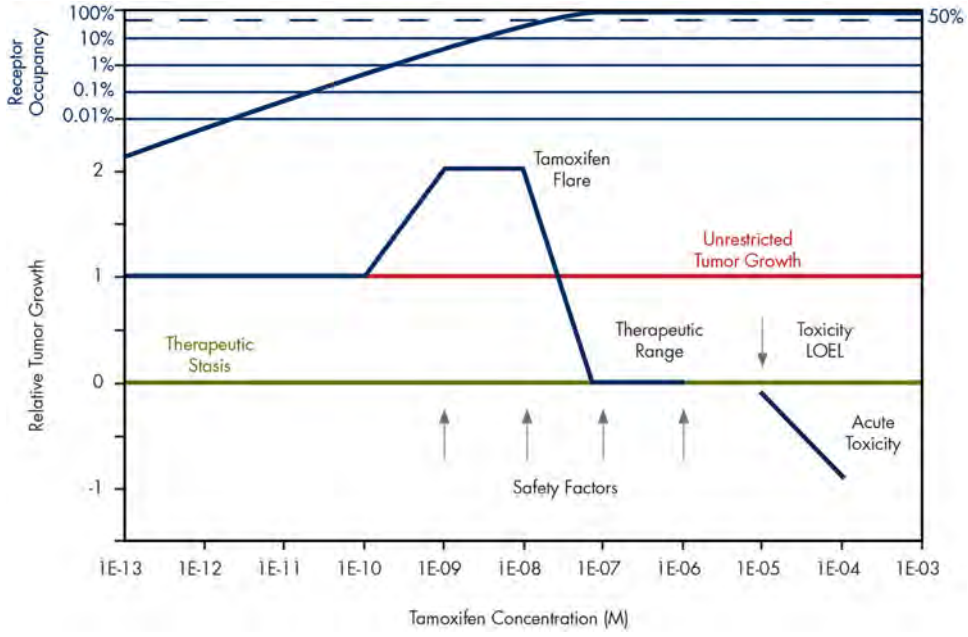

Figure 6. Dose-response ranges for tamoxifen in breast cancer therapy. This figure demonstrates the NMDRC, also called flare, in tamoxifen treatments. As the circulating dose of tamoxifen increases when treatment starts, patients initially experience flare, *i.e.* growth of the tumor (546), followed by a decrease in tumor size as the circulating levels of tamoxifen rise into the therapeutic range (676, 677). High doses of tamoxifen are acutely toxic (546). Starting from the highest concentrations, where acute toxicity is observed, and going to lower concentrations on the X-axis, the acute toxicity diminishes towards zero growth, *i.e.* therapeutic stasis (*green* baseline). This occurs at approximately 1E-05 m, the lowest observed effect level (LOEL) for toxicity. The vertical arrows show the results of applying three or four 10-fold safety factors to the LOEL for the high-dose toxicity of tamoxifen, and would calculate a safe or reference dose for tamoxifen in the region of flare, the least safe region of exposure in actual practice. Above the diagram of dose response ranges is estimated ER occupancy by tamoxifen. This was calculated from the affinity constant of tamoxifen for ERs determined in human breast cancer cells (Ki = 29.1 nM; Ref 678); flare appears to correspond to low receptor occupancy (*blue axis*), therapeutic range with mid and upper-range receptor occupancy, and acute toxicity well above 99% receptor occupancy. (678).

cer cell growth as long as the cells were estrogen dependent (548). Tamoxifen was also shown to disrupt tissue organization of the mammary gland, with specific effects on the stroma that may contribute to the observed effects on proliferation of epithelial cells (549, 550).

Tamoxifen therapy is administered as 10 mg twice per day (20 mg/d; approx 0.3 mg/kg body weight per day), but the target circulating levels are in the near submicromolar range (0.2–0.6 μM); these levels are reached slowly, after approximately 2 wks of therapy (551). In the initial period, where tamoxifen flare is observed, the circulating concentrations are ascending through lower concentrations, in the range below therapeutic suppression of growth, where breast cancer cell proliferation is actually stimulated by the drug, both in tissue culture, in animal xenograft studies, and in human patients (reviewed in Ref. 548). The recognition of this dual dose-response range for tamoxifen (low-dose, low-concentration estrogenic growth-stimulatory and higher-dose, higher-concentration estrogenic growth-inhibitory responses) led to the definition of the term selective estrogen response modulator, or SERM, activity (552–554). This SERM activity has since been observed for many or even most estrogenic EDCs, including BPA (3, 555–557).

These observations defined three separate dose-response ranges for the SERM tamoxifen in human clinical use. The lowest dose-response range, the range of flare, stimulated breast cancer growth and symptoms in some patients with hormone-dependent cancer. The next higher dose-response range is the therapeutic range where tamoxifen inhibits estrogen-dependent tumor growth. The highest dose range causes acute toxicity by the SERM (see Fig. 6).

Tamoxifen provides an excellent example for how high-dose testing cannot be used to predict the effects of low doses. For tamoxifen (as for other drugs), the range of acute human toxicity for tamoxifen was determined in phase I clinical trials. Phase I trials also defined an initial therapeutic range, the second dose-response range, as a dose below which acute toxicity was not observed. The therapeutic dose range was tested and further defined in phase II and later clinical trials to determine efficacy (see for example Ref. 558). Standard toxicological testing from

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Figure 7.

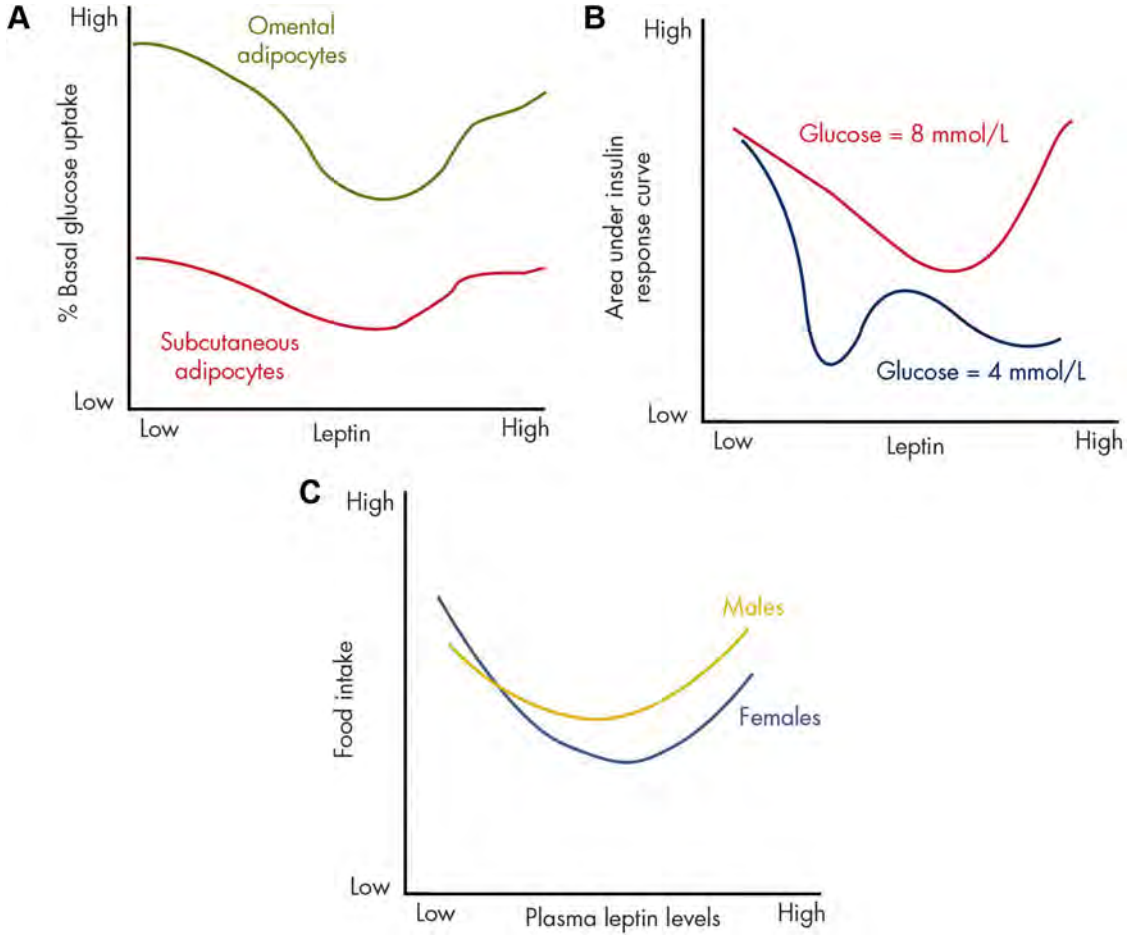

Figure 7. Leptin as an example of a NMDRC. Several studies report NMDRCs in response to leptin treatments. A, NMDRCs are observed in cultured primary adipocytes after leptin exposure. This graph illustrates the relationship between administered leptin dose and glucose uptake in two types of adipocytes, those isolated from omental tissue (*green*) and others from sc fat (*purple*) (schematic was made from data in Ref. 559). These data are on a log-linear plot. B, *Ex vivo* rat pancreas was treated with leptin and various doses of glucose, and the insulin response curves were examined. Area under the curve is a measure of the ability of the pancreas to bring glucose levels under control. Different dose-response curves were observed depending on the amount of glucose administered: a U-shaped curve when 8 mmol/liter was included (*pink*) or a multiphasic curve with 4 mmol/liter (*blue*) (schematic made from data in Ref. 560). These data are on a linear-linear plot. C, U-shaped NMDRCs were also observed when food intake was compared with leptin levels in the blood of rats administered the hormone. This response was similar in males (*orange*) and females (*cyan*) (schematic made from data in Ref. 562). These data are on a linear-linear plot.

high doses to define a LOAEL or NOAEL are equivalent to the phase I clinical testing, and in risk assessment, a safe dose or reference dose is calculated from these tests. However, the lowest dose range, with the highly adverse effects termed flare, was not detected in the phase I trials and was determined only for tamoxifen in breast cancer therapy at the therapeutic doses (543). The implication for risk assessment is that NMDRCs for EDCs, particularly those already identified as SERMs, would likely not be detected by standard toxicological testing at high doses. That is, the consequence of high-dose testing is the calculation of a defined but otherwise untested safe dose that is well within the range equivalent to flare, *i.e.* a manifestly unsafe dose of the EDC (Fig. 6).

5. Similarities in endpoints across cell culture, animal, and epidemiology studies: evidence for common mechanisms?

There are common trends in some findings of NMDRCs in cell, animal, and human studies and therefore evidence for related mechanisms for NMDRCs at various levels of biological complexity. Tamoxifen flare, discussed in *Section III.C.4*, is an informative example. Another illustrative example is that of the effect of the hormone leptin (Fig. 7). In cultured primary adipocytes, NMDRCs are observed after leptin exposure; moderate doses of leptin significantly reduce insulin-mediated glucose intake, whereas low and high doses maintain higher glucose intake in response to insulin (559). The rat pancreas shows a similar response to leptin; the amount of

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secreted insulin has an inverted U-shaped response to leptin (560, 561). Even more striking is the relationship between leptin and food intake. Rats administered moderate doses of leptin consume less food compared to rats dosed with low or high levels of leptin (562); mechanistically, this lower food intake could be due to higher circulating glucose levels in these animals due to ineffective insulin action. And finally, in a human study, leptin levels were found to correlate with body mass index but have a U-shaped relationship with mortality (563). These results suggest that hormones can produce similar responses at several levels of biological complexity (cell, organ, animal, and population).

A large number of epidemiology studies with NMDRCs have found relationships between EDC exposures like POPs and metabolic diseases including obesity and diabetes (Table 9) (see also Ref. 564 for a review), and the mechanisms for these relationships have begun to be explored. Human and animal cells treated with EDCs in culture display NMDRCs that are relevant to these diseases: BPA has nonmonotonic effects on the expression of adipocyte proteins in preadipocytes and the release of adiponectin from mature adipocytes (565–567). Similarly, in female rodents, low doses but not high doses of BPA increased adipose tissue weight and serum leptin concentrations (568), and intermediate doses of phthalates decrease serum cholesterol levels (569). Thus, although understanding the mechanisms operating at the cellular level of organization has not yet led to definitive knowledge of the mechanisms producing NMDRCs in human populations, there appear to be strong similarities in cells, animals, and humans that support a call for continued work focusing on metabolic disease endpoints at each level of biological organization.

D. NMDRC summary

We have demonstrated that nonmonotonicity is a common occurrence after exposures to hormones and EDCs in cell culture and animals and across human populations. Because of the abundance of examples of NMDRCs, we expect that if adequate dose ranges are included in animal and cell culture studies, including the use of negative and well-chosen positive controls, NMDRCs may be observed more often than not. Here, we have focused mainly on studies that examined a wide range of doses, including many that examined the effects of doses that span the low-dose and toxicological ranges. We also discussed several mechanisms that produce NMDRCs. Each of these mechanisms can and does operate at the same time in a biological system, and this cooperative action is ultimately responsible for NMDRCs.

Understanding nonmonotonicity has both theoretical and practical relevance. When a chemical produces monotonic responses, all doses are expected to produce similar effects whose magnitude varies with the dose, but when a chemical produces a NMDRC, dissimilar or even opposite effects will be observed at different doses. Thus, monotonic responses can be modeled using the assumption that each step in a linear pathway behaves according to the law of mass action (43, 570); high doses are always expected to produce higher responses. In contrast, NMDRCs are not easy to model (although they are quite easy to test for), requiring detailed knowledge of the specific mechanisms operating in several biological components. From a regulatory standpoint, information from high doses cannot always be used to assess whether low doses will produce a biological effect (38).

IV. Implications of Low-Dose Effects and Nonmonotonicity

Both low-dose effects and NMDRCs have been observed for a wide variety of EDCs as well as natural hormones. Importantly, these phenomena encompass every level of biological organization, from gene expression, hormone production, and cell number to changes in tissue architecture to behavior and population-based disease risks. One conclusion from this review is that low-dose effects and NMDRCs are often observed after administration of environmentally relevant doses of EDCs. For both hormones and EDCs, NMDRCs should be the default assumption absent sufficient data to indicate otherwise. Furthermore, there are well-understood mechanisms to explain how low-dose effects and NMDRCs manifest *in vitro* and *in vivo*. Accepting these phenomena, therefore, should lead to paradigm shifts in toxicological studies and will likely also have lasting effects on regulatory science. Some of these aspects are discussed below. Additionally, we have briefly explored how this knowledge should influence future approaches in human and environmental health.

At a very practical level, we recommend that researchers publishing data with low-dose and nonmonotonic effects include key words in the abstract/article that identify them as such specifically. This review was unquestionably impeded because this has not been standard practice. We also strongly recommend that data showing nonmonotonic and binary response patterns not be rejected or criticized because there is no dose response.

A. Experimental design

1. Dose ranges must be chosen carefully

To detect low-dose effects or NMDRCs, the doses included for testing are of utmost importance. Most of the studies we examined here for nonmonotonicity tested

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doses over severalfold concentrations. Unfortunately, regulatory guidelines only require that three doses be tested. Both low-dose effects and NMDRCs can be observed when examining only a few doses, but some studies may detect significant results purely by luck, because a small shift in dose can have a large impact on the ability to observe differences relative to untreated controls.

In the multitude of chemicals that have never been tested at low doses, or in the development of new chemicals, to determine whether a chemical has low-dose effects in laboratory animals, we suggest setting the NOAEL or LOAEL from traditional toxicological studies as the highest dose in experiments specifically designed to test endocrine-sensitive endpoints. We suggest setting the lowest dose in the experiment below the range of human exposures, if such a dose is known. Several intermediate doses overlapping the range of typical human exposures should be included also, bringing the total number in the range of five to eight total doses tested. Importantly, although the levels of many environmental chemicals in human blood and/or urine have been reported by the CDC and other groups responsible for population-scale biomonitoring, it is often not known what administered doses are needed to achieve these internal exposure levels in animals (4, 253); thus, toxicokinetic studies are often needed before the onset of low-dose testing. This is important because the critical issue is to determine what effects are observed in animals when circulating levels of an EDC match what is measured in the typical human. Due to differences in metabolism, route of exposure, and other factors, a relatively high dose may need to be administered to a rodent to produce blood concentrations in the range of human levels; however, this should not be considered a high-dose study.

It has also been suggested that animal studies that are used to understand the potential effects of a chemical on humans should use a relevant route of administration to recapitulate human exposures (571, 572) because there may be differences in metabolism after oral and nonoral administration. Many chemicals that enter the body orally undergo first-pass metabolism and are then inactivated via liver enzymes, whereas other routes (*i.e.* sc) can bypass these mechanisms and lead to a higher concentration of the active compound in circulation (573). Studies indicate, however, that inactivation of chemicals via first-pass metabolism is not complete and also that deconjugation of metabolites can occur in some tissues allowing the rerelease of the active form (574, 575). Additionally, for some chemicals, it is clear that route of administration has little or no impact on the availability of the active compound in the body (241, 384), and other studies show that route of administration has no impact on the biological effects of these chemicals; *i.e.* regardless of how it enters the body, dioxin has similar effects on exposed individuals (384), and comparable results have been observed for BPA (141). Although understanding the typical route of human exposure to each environmental chemical is an important task, it has been argued that any method that leads to blood concentrations of a test chemical in the range they are observed in humans is an acceptable exposure protocol, and this is especially true with gestational exposures, because fetuses are exposed to chemicals only via their mothers' blood (31, 576).

2. Timing of exposures is important

Rodent studies indicate that EDC exposures during development have organizational effects, with permanent effects that can manifest even in late adulthood, whereas exposures after puberty are for the most part activational, with effects that are abrogated when exposures cease. For example, the adult uterus requires relatively large doses of BPA (in the parts-per-million range) to induce changes associated with the uterotrophic assay (555, 577), whereas parts-per-trillion and ppb exposures during the fetal period permanently and effectively alter development of the uterus (279, 310, 578). Thus, the timing of exposures is profoundly important to detect low-dose effects of EDCs.

Human studies also support this conclusion. The 1976 explosion of a chemical plant in Seveso, Italy, which led to widespread human exposure to large amounts of TCDD, a particularly toxic form of dioxin, and the deposition of this chemical on the land surrounding the chemical plant, provided evidence in support of the organizational and activational effects of endocrine-active chemicals in humans (579). Serum TCDD concentrations showed correlations between exposure levels and several disease outcomes including breast cancer risk, abnormal menstrual cycles, and endometriosis (580–582), but individuals who were either infants or teenagers at the time of the explosion were found to be at greatest risk for developing adult diseases (583, 584). Importantly, many scientists have argued that organizational effects can occur during puberty, *i.e.* that the period where hormones have irreversible effects on organ development extends beyond the fetal and neonatal period (585), and for some endpoints this appears to be the case (586, 587).

It has also been proposed that the endocrine system maintains homeostasis in the face of environmental insults (210). The adult endocrine system does appear to provide some ability to maintain a type of homeostasis; when the pharmaceutical estrogen DES is administered to pregnant mice, the circulating estradiol concentrations in the dam respond by decreasing linearly (224). In contrast, fetal concentrations of estradiol respond nonmonotonically in

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a way that is clearly not correlated with maternal levels. Similarly, there is evidence that BPA can induce aromatase and therefore increase estradiol levels *in situ* in the fetal urogenital sinus (588). This is an example of a feed-forward positive-feedback effect rather than a homeostatic response. The effects of EDCs on adult subjects, both animal and people, suggest that diseases often result from low-dose adult exposures (589–595); this argues against a view of the endocrine system as a means to maintain homeostatic control. Instead, individuals can be permanently changed, in an adverse way, after EDC exposures.

In one example, pregnant mice were exposed to low concentrations of BPA, and their male offspring had altered pancreatic function at 6 months of age (158). Surprisingly, however, the mothers (exposed only during pregnancy) were also affected, with altered metabolic machinery and body weight at 4 months postpartum, long after exposures had ended. The increased incidence of breast cancer in women that took DES during pregnancy also illustrates this point (596, 597). These studies suggest that even the adult endocrine system is not invariably capable of maintaining a so-called homeostatic state when exogenous chemicals affecting the endocrine system are present. Thus, although adult exposures to EDCs have been given some attention by bench scientists (29), more work of this kind is needed to better understand whether and how EDCs can have permanent organizational effects on adult animals.

At the beginning of this review, we justified the need to critically examine the low-dose literature because of recent epidemiological findings linking EDC exposures and diseases. Yet there is inherent difficulty in examining neonatal exposures to EDCs and their connection to diseases due to the length of time needed for these studies; thus, many studies of this type have examined high doses of pharmaceuticals (*i.e.* DES) or accidental exposures to industrial chemicals (*i.e.* dioxin) (66, 398, 399, 581, 597–601).

Only recently, with the availability of biomonitoring samples from large reference populations, have lower doses begun to receive widespread attention from epidemiologists. Many recent studies have examined adult exposures to EDCs and correlated exposures with disease statuses (see for example Refs. 15, 16, and 602–604). Human studies examining fetal/neonatal exposures to low-dose EDCs and early life effects have also begun to be studied (6, 333, 605–607), although studies linking these early life exposures to adult diseases are likely to be decades away. More than anything, these studies support our view that the effects of low-dose exposures should be considered when determining chemical safety.

3. Importance of endpoints being examined

Traditional toxicology testing, and in particular those studies performed for the purposes of risk assessment, typically adhere to guideline studies that have been approved by international committees of experts (608). The endpoints assessed in these guideline-compliant studies are centered around higher-order levels, including weight loss, mortality, changes in organ weight, and a limited number of histopathological analyses (609, 610). When pregnant animals are included in toxicological assessments, the endpoints measured typically include the ability to maintain pregnancies, the number of offspring delivered, sex ratios of surviving pups, and measures regarding maternal weight gain and food/water intake (610).

Yet low-dose EDCs are rarely toxic to the point of killing adult animals or causing spontaneous abortions, and traditional tests such as the uterotrophic assay have been shown to be relatively insensitive (72, 577). It has been argued that this type of testing is insufficient for understanding the effects of EDCs (31, 70, 495, 611). Many EDC studies have instead focused on examining newly developed, highly sensitive endpoints that span multiple levels of biological organization, from gene expression to tissue organization to organ systems to the whole animal (612), which may not be rapidly lethal but which nonetheless have enormous importance for health, including mortality. Thus, for example, studies designed to examine the effects of chemicals on obesity no longer focus on body weight alone but also analyze gene expression; fat content in adipose cells and the process of adipogenesis; inflammation, innervation, and vascularization parameters in specific fat pads; conversion rates of white and brown adipose tissues; systemic hormone levels and response to glucose and insulin challenges; and food intake and energy expenditures, among others (314, 613–615). As our knowledge of EDCs and the endocrine system continue to grow, the most sensitive endpoints should be used to determine whether a chemical is disrupting the development of organisms (70).

In moving beyond traditional, well-characterized health-related endpoints like mortality and weight loss, an important question has been raised: how do we define endpoints as adverse? This is an important point, because it has been suggested that the endpoints examined in independent EDC studies are not validated and may not represent adverse effects (609). There is also debate over whether the mechanism (or mode) of action must be explained for each effect to determine whether a relevant pathway is present in humans (616, 617). Yet, when originally assessing the low-dose literature, the NTP expert panel chose to examine all effects of EDC exposure, re-

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gardless of whether the endpoint could be deemed adverse (2). From the perspective of developmental biology, any change in development should be seen as adverse, even if the change itself is not associated with a disease or dysfunction. Some of these developmental changes, in fact, may increase sensitivity or susceptibility to disease later on in life but will otherwise appear normal. Furthermore, studies of heavy metals have shown that small shifts in parameters like IQ may not have drastic effects on individuals but can have serious repercussions on the population level (618), and therefore changes in the variance/observable range of a phenotype should also be considered adverse (52).

4. Importance of study size

National Institutes of Health guidelines require that the number of vertebrate animals used in experiments be as small as possible to show statistically significant effects based on power analysis. Yet many traditional toxicology studies have used large numbers of animals to draw conclusions about chemical safety. When the endpoints being assessed have binary outcomes (*i.e.* animal has a tumor *vs.* animal does not have a tumor) and the incidence of the phenotype is not high, a large number of animals is required to reveal statistically significant effects. In contrast, many of the endpoints examined in the field of endocrine disruption are more complex and are not binary; thus, power analysis allows researchers to determine how many animals are needed to observe statistically significant (and biologically relevant) differences between control and exposed populations. For this reason, arbitrary numbers set as cutoffs for determining whether a study is acceptable or unacceptable for risk assessments are not appropriate. Instead, the number of animals required for a study to be complete is dependent on the effect size, precision/variance, minimal meaningful difference to be considered between populations, and the α-value set in statistical tests.

B. Regulatory science

For decades, regulatory agencies have tested, or approved testing, of chemicals by examining high doses and then extrapolating down from the NOAEL, NOEL, and LOAEL to determine safe levels for humans and/or wildlife. As discussed earlier, these extrapolations use safety factors that acknowledge differences between humans and animals, exposures of vulnerable populations, interspecies variability, and other uncertainty factors. These safety factors are informed guesses, not quantitatively based calculations. Using this traditional way of setting safe doses, the levels declared safe are never in fact tested. Doses in the range of human exposures are therefore also unlikely to be tested. This has generated the current state of science, where many chemicals of concern have never been examined at environmentally relevant low doses (see Table 4 for a small number of examples).

Assumptions used in chemical risk assessments to estimate a threshold dose below which daily exposure to a chemical is estimated to be safe are false for EDCs. First, experimental data provide evidence for the lack of a threshold for EDCs (619). More broadly, the data in this review demonstrate that the central assumption underlying the use of high doses to predict low-dose effects will lead to false estimates of safety. The use of only a few high doses is based on the assumption that all dose-response relationships are monotonic and therefore that it is appropriate to apply a log-linear extrapolation from high-dose testing to estimate a safe reference dose (Fig. 4). The Endocrine Society issued a position statement on EDCs (620) and urged the risk assessment community to use the expertise of their members to develop new approaches to chemical risk assessments for EDCs based on principles of endocrinology. Undertaking this mission will represent a true paradigm shift in regulatory toxicology (79). The Endocrine Society statement was then supported in March 2011 by a letter to *Science* from eight societies with relevant expertise representing over 40,000 scientists and medical professionals (621).

Studies conducted for the purposes of risk assessment are expected to include three doses: a dose that has no effects on traditional toxicological endpoints (the NOAEL), a higher dose with effects on traditional endpoints (the LOAEL), and an even higher dose that shows toxicity. Although reducing the number of animals used for these types of studies is an important goal, more than three doses are often needed for a true picture of a chemical's toxicity. The examination of a larger number of doses would allow for 1) the study of chemicals at the reference dose, *i.e.* the dose that is calculated to be safe; 2) examination of doses in the range of actual human exposures, which is likely to be below the reference dose; and 3) the ability to detect NMDRCs, particularly in the low-dose range. The impact of testing more doses on the numbers of animals required can be mitigated by use of power analysis, as suggested above. Because no amount of research will ever match the diversity and reality of actual human experience, there should be ongoing epidemiological study of potential adverse effects of EDCs even after safe levels are published, with periodic reevaluation of those safe levels.

One issue that has been raised by regulatory agencies is whether animal models are appropriate for understanding the effects of EDCs on humans. These arguments largely center around observed differences in hormone levels during different physiological periods in rodents and humans (57), and differences in the metabolic machinery and ex-

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cretion of chemicals between species (622). To address the first issue, it should be noted that the FDA uses animals to test pharmaceuticals and other chemicals before any safety testing in humans because it is widely recognized that, although animals and humans do not have exactly the same physiologies, there is evolutionary conservation among vertebrates and specifically among mammals (62). Furthermore, animal studies proved to be highly predictive of the effects of DES on women, indicating that rodents are sufficiently similar to humans to reliably forecast affected endpoints in the endocrine system (64, 623). Thus, the default position must be that animal data are indicative of human effects until proven otherwise.

With regard to the second issue, BPA researchers in particular have examined species-specific differences in metabolism of this EDC. Interestingly, the pharmacokinetics of BPA in rodents, monkeys, and humans appear to be very similar (624), and regulatory agencies have subsequently concluded that rodents are appropriate models to assess the effects of this chemical (625, 626). Thus, researchers should select animal models that are sensitive to low doses of hormones and select appropriate species for the endpoints of interest. As the scope of our knowledge has broadened about how chemicals can alter the endocrine system, well beyond estrogens, androgens, and the thyroid, it is imperative that considerable thought be given to how to apply this for regulatory purposes.

C. Human health

As discussed several times throughout this review, there is now substantial evidence that low doses of EDCs have adverse effects on human health. Thus, although many epidemiological studies originally focused on occupationally exposed individuals and individuals affected by accidental exposures to high doses of environmental chemicals, these recent studies have suggested wide-ranging effects of EDCs on the general population.

Importantly, human exposures are examples of true mixtures; dozens if not hundreds of environmental chemicals are regularly detected in human tissues and fluids (91), yet very little is known about how these chemicals act in combination (627). Several studies indicate that EDCs can have additive or even synergistic effects (143, 323, 628–630), and thus these mixtures are likely to have unexpected and unpredictable effects on animals and humans. The study of mixtures is a growing and complex field that will require considerable attention in the years ahead as knowledge of EDCs in the laboratory setting are applied to human populations (631, 632).

How much will human health improve by testing chemicals at low, environmentally relevant doses and using the results to guide safety determinations? Current testing paradigms are missing important, sensitive endpoints; because they are often unable to detect NMDRCs, they cannot make appropriate predictions about what effects are occurring at low doses. At this time, it is not possible to quantify the total costs of low-dose exposures to EDCs. However, current epidemiology studies linking low-dose EDC exposures to a myriad of health problems, diseases, and disorders suggest that the costs of current low-dose exposures are likely to be substantial.

The weight of the available evidence suggests that EDCs affect a wide range of human health endpoints that manifest at different stages of life, from neonatal and infant periods to the aging adult. As the American population ages, healthcare costs continue to rise, and there are societal costs as well, with decreased quality of life concerns, decreases in work productivity due to illness or the need for workers to care for affected family members, and the psychological stresses of dealing with some outcomes like infertility. Thus, it is logical to conclude that low-dose testing, followed by regulatory action to minimize or eliminate human exposures to EDCs, could significantly benefit human health. This proposal effectively calls for greatly expanded research to give human communities feedback about themselves. It emanates from a view that human society benefits greatly from the many chemical compounds it uses but that extensive epidemiological surveillance and other focused research designs are needed to assure that the balance of risk/benefit from those chemicals is acceptable.

How much would human health benefit by a reduction in the use of EDCs? For some chemicals, minor changes in consumer habits or industrial practices can have drastic effects on exposures (633–636). Other chemicals like DDT that have been regulated in the United States for decades continue to be detected in human and environmental samples; the persistent nature of many of these agents suggests they may impact human health for decades to come. Even less-persistent chemicals like BPA are likely to remain in our environment long after a ban is enacted because of the large amounts of plastic waste leaching BPA (and other estrogenic compounds) from landfills into water sources (637) and its presence on thermal receipt paper and from there into recycled paper (638–640). Yet, despite these challenges, reducing human exposure to EDCs should be a priority, and one way to address that priority is to decrease the production and use of these chemicals. The Endocrine Society has called for such a reduction and the use of the precautionary principle, *i.e.* action in the presence of concerning information but in the absence of certainty to eliminate or cut the use of questionable chemicals even when cause-effect relationships are not yet established (620).

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D. Wildlife

Much of the recent focus on EDCs has been on the impact of these chemicals on human health. Yet the earliest studies of EDCs that focused on the impact of these chemicals on wildlife should not be forgotten. Rachel Carson's work on DDT and other pesticides provided some of the earliest warning signs that there were unintended consequences of chemical use. Carson's work was ahead of its time; she understood that exceedingly small doses of these chemicals produced adverse effects, that the timing of exposures was critical, and that chemical mixtures produced compounded effects (641). Now, decades after some of the most dangerous EDCs have been regulated, they continue to be measured in environmental samples as well as the bodies of wildlife animals.

Furthermore, it should be pointed out that humans, like wildlife, are not insulated from the environment, and effects in wildlife, including nonmammalian species, are indicative of and mirror effects in humans. For example, BPA has estrogen-like effects in fish (642–644), amphibians (645, 646), and reptiles (647, 648). A recent review showed that demasculinizing and feminizing effects of atrazine have been demonstrated in fish, amphibians, reptiles, birds, and mammals, *i.e.* every vertebrate class examined (326); and in fact, the first report to suggest that atrazine induced aromatase was conducted in reptiles (649). Similarly, perchlorate affects fish (650–653), amphibians (654–658), and birds (659–661) via mechanisms consistent with those described for humans, and some of the earliest reports on perchlorate's effects on thyroid function were conducted in amphibians (661, 662). Finally, ecological studies of dioxin and dioxin-like chemicals reveal effects on a range of exposed wildlife including birds (663, 664), fish (665, 666), and invertebrates (667). Although these studies have highlighted some of the species-specific effects of dioxin (389), and orders of magnitude differences in toxic equivalency factors between species (668), they also indicate the conservation of mechanisms for the effects of dioxin on a range of biological endpoints in wildlife, laboratory animals, and humans (384). In fact, in many cases, nonmammalian species are much more sensitive to EDC effects, and wildlife species serve as sentinels for environmental and public health (669–673). Thus, the effects of these chemicals on wildlife populations are likely to continue; for this reason, the low-dose effects of these chemicals are particularly worth understanding (674, 675).

V. Summary

In conclusion, we have provided hundreds of examples that clearly show that NMDRCs and low-dose effects are common in studies of hormones and EDCs. We have examined each of these issues separately and provided mechanistic explanations and examples of both. These topics are related, but they must be examined individually to be understood. The concept of nonmonotonicity is an essential one for the field of environmental health science because when NMDRCs occur, the effects of low doses cannot be predicted by the effects observed at high doses. In addition, the finding that chemicals have adverse effects on animals and humans in the range of environmental exposures clearly indicates that low doses cannot be ignored.

In closing, we encourage scientists and journal editors to publish data demonstrating NMDRCs and low-dose effects, even if the exact mechanism of action has not yet been elucidated. This is important because the study of EDC is a growing specialty that crosses many scientific fields, and scientists that work on or regulate EDCs should appreciate and acknowledge the existence of NMDRCs and low-dose effects and have access to this important information. We further recommend greatly expanded and generalized safety testing and surveillance to detect potential adverse effects of this broad class of chemicals. Before new chemicals are developed, a wider range of doses, extending into the low-dose range, should be fully tested. And finally, we envision that the concepts and empirical results we have presented in this paper will lead to many more collaborations among research scientists in academic and government laboratories across the globe, that more and more sophisticated study designs will emerge, that what we have produced herein will facilitate those making regulatory decisions, that actions taken in light of this information will begin to abate the use of EDCs, and ultimately that health impacts in people and in wildlife will be averted.

Acknowledgments

We thank many colleagues in the fields of endocrine disruption and environmental health science for fruitful discussions on the topics covered in this manuscript. We also thank three anonymous reviewers whose comments and suggestions greatly improved this review.

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This work was supported by National Institutes of Health (NIH) Grants GM 087107 (to L.N.V.), ES 08314 (to A.M.S.), ES 010026 (to R.T.Z.), ES018764 (to F.S.v.S.), HL 53560 (to D.R.J.), UMC MO-VMFC0018 (to W.V.W.), a Susan G. Komen for Cure Grant FAS0703860 (to T.S.), grants from the Mitchell Kapor Foundation, the

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Cornell-Douglas Foundation, and the Wallace Global Fund (to T.B.H.) and a grant from the Kendeda Foundation (to J.P.M.). This article may be the work product of an employee or group of employees of the National Institute of Environmental Health Sciences (NIEHS), NIH; however, the statements, opinions or conclusions contained therein do not necessarily represent the statements, opinions or conclusions of NIEHS, NIH, or the U.S. government.

We dedicate this manuscript to Professor Howard A. Bern. Dr. Bern was an exceptionally brilliant biologist and a generous and inspiring colleague. His work spanning a wide range of organisms addressed multiple aspects of organismal and evolutionary biology. He was one of the founders of the field of comparative endocrinology and a pioneer in the study of endocrine disruption, anticipating the deleterious effects of developmental exposure to estrogens one decade before the discovery of the effects of diethylstilbestrol in women fetally exposed to this chemical. His pioneering work included, among other subjects, neuroendocrinology, reproduction, and mammary cancer. He was also an excellent mentor to many researchers who, in turn, advanced these endeavors. He left an indelible mark on all of us that had the privilege of meeting him.

Disclosure Summary: Fred vom Saal worked as a consultant and provided expert testimony (<$10K). The authors have nothing to disclose.

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APPENDIX H-1

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---------- Forwarded message ---------
From: **Swain, Ken** <Ken.Swain@novascotia.ca>
Date: Mon, Jan 21, 2019 at 9:07 AM
Subject: RE: Test results
To: [redacted]@gmail.com>

Good morning, as attached, please see the sampling results for the raw effluent discharge ditch taken in October and November 2017. Note that the October sampling was during routine mill maintenance. Regards, Ken Swain

From: [redacted]@gmail.com>
Sent: Friday, January 18, 2019 3:54 PM
To: Swain, Ken <Ken.Swain@novascotia.ca>
Subject: Re: Test results

Thank you.

On Thu, Jan 17, 2019 at 6:52 PM Swain, Ken <Ken.Swain@novascotia.ca> wrote:

Good evening. We are accessing the specific sampling results from our consultant and will forward them to you once we receive them. This will probably be first of next week.

Regards,

Ken Swain

From: @gmail.com>
Sent: January 16, 2019 12:07 PM
To: Boat Harbour <BoatHarbour@novascotia.ca>
Subject: Test results

I understand that GHD had tests conducted to determine the nature of the raw effluent currently flowing into Boat Harbour. I would like a copy of these tests. Will you please forward them to me? If you are not able to forward them to me, where can I access or obtain them?

Thank you,

Table 9

Surface Water Analytical Resutls - Marine
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Field Parameters			
Conductivity, field	mS/cm	0.193	0.664
Dissolved oxygen (DO), field	µg/L	7480	6220
pH, field	s.u.	5.72	7.67
Temperature, field	Deg C	21.69	43.88
Turbidity, field	NTU	22.4	398
Metals			
Aluminum	µg/L	9400	2700
Antimony	µg/L	ND(1.0)	ND(1.0)
Arsenic	µg/L	2.1	1.4
Barium	µg/L	61	870[a]
Beryllium	µg/L	ND(1.0)	ND(1.0)
Bismuth	µg/L	ND(2.0)	ND(2.0)
Boron	µg/L	ND(50)	73
Cadmium	µg/L	0.35[a]	2.5[a]
Calcium	µg/L	20000	240000
Chromium	µg/L	2.8	6.9
Cobalt	µg/L	0.45	1.0
Copper	µg/L	9.7[a]	12[a]
Iron	µg/L	680	1300
Lead	µg/L	2.0	21[a]
Magnesium	µg/L	2800	7300
Manganese	µg/L	680	3200

Table 9

Surface Water Analytical Resutls - Marine
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

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Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Mercury	µg/L	ND(0.013)	0.088[a]
Molybdenum	µg/L	5.0	ND(2.0)
Nickel	µg/L	3.8	5.4
Phosphorus	µg/L	160	1500
Potassium	µg/L	3300	6900
Selenium	µg/L	ND(1.0)	ND(1.0)
Silver	µg/L	0.22	0.56
Sodium	µg/L	180000	240000[c]
Strontium	µg/L	54	300
Thallium	µg/L	ND(0.10)	0.22
Tin	µg/L	ND(2.0)	ND(2.0)
Titanium	µg/L	15	79
Uranium	µg/L	0.17	1.0
Vanadium	µg/L	5.4	4.1
Zinc	µg/L	35[a]	190[a]
Polychlorinated Biphenyls (PCBs)			
Aroclor-1016 (PCB-1016)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1221 (PCB-1221)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1232 (PCB-1232)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1242 (PCB-1242)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1248 (PCB-1248)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1254 (PCB-1254)	µg/L	ND(0.050)	ND(0.50)
Aroclor-1260 (PCB-1260)	µg/L	ND(0.050)	ND(0.50)
Total PCBs	µg/L	ND(0.050)	ND(0.50)

Table 9

Surface Water Analytical Resutls - Marine
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
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Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Petroleum Hydrocarbons (PHCs)			
Benzene	µg/L	ND(1)	ND(100)
Toluene	µg/L	ND(1)	ND(100)
Ethylbenzene	µg/L	ND(1)	ND(100)
Xylenes (total)	µg/L	ND(2)	ND(200)
Total Petroleum Hydrocarbons (C6-C10) Less BTEX	µg/L	ND(10)	ND(1000)
Total Petroleum hydrocarbons (>C10-C16)	µg/L	ND(50)	590
Total Petroleum Hydrocarbons (>C16-C21)	µg/L	92	960
Total Petroleum Hydrocarbons (>C21-C32)	µg/L	460	2400
Total Petroleum Hydrocarbons (Modified TPH)	µg/L	560[a]	4000[ac]
Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols			
1-Methylnaphthalene	µg/L	ND(0.050)	ND(0.050)
2,3,4,5-Tetrachlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,3,4,6-Tetrachlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,3,4-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,3,5,6-Tetrachlorophenol	µg/L	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2,3,5-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2,3,6-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2,3-Dichlorophenol	µg/L	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2,4,5-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2,4,6-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,4+2,5-Dichlorophenol	µg/L	ND(0.50)	ND(0.50)
2,4-Dichlorophenol	µg/L	ND(0.1)	ND(0.1)
2,4-Dimethylphenol	µg/L	ND(0.50) / ND(1)	1.6 / 2
2,4-Dinitrophenol	µg/L	ND(1)	ND(1)

Table 9

Surface Water Analytical Resutls - Marine
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
2,5-Dichlorophenol	µg/L	ND(0.1)	ND(0.1)
2,6-Dichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2-Chlorophenol	µg/L	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)
2-Methylnaphthalene	µg/L	ND(0.050)	ND(0.050)

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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
2-Methylphenol	µg/L	0.55 / ND(0.5)	5.7 / 7.5
2-Nitrophenol	µg/L	ND(1) / ND(1.0)	ND(1.0) / ND(1)
3&4-Methylphenol	µg/L	0.9	2.1
3,4,5-Trichlorocatechol	µg/L	ND(0.50)	ND(0.50)
3,4,5-Trichloroguaiacol	µg/L	ND(0.50)	ND(0.50)
3,4,5-Trichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
3,4,5-Trichlorosyringol	µg/L	ND(0.50)	ND(0.50)
3,4,5-Trichloroveratrol	µg/L	ND(0.50)	ND(0.71)
3,4-Dichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.64) / ND(0.1)
3,5-Dichlorocatechol	µg/L	ND(0.50)	ND(0.50)
3,5-Dichlorophenol	µg/L	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
3/4-Chlorophenol	µg/L	ND(0.1)	ND(0.1)
3-Chlorophenol	µg/L	ND(0.50)	ND(0.50)
3-Methylphenol	µg/L	0.75	0.56
4,5,6-Trichloroguaiacol	µg/L	ND(0.50)	ND(0.50)
4,5-Dichlorocatechol	µg/L	ND(0.50)	ND(0.50)
4,5-Dichloroguaiacol	µg/L	ND(0.50)	ND(0.58)
4,5-Dichloroveratrol	µg/L	ND(0.50)	ND(0.50)
4,6-Dichloroguaiacol	µg/L	ND(1.7)	ND(0.50)
4,6-Dinitro-2-methylphenol	µg/L	ND(1)	ND(1)
4-Chloro-3-methylphenol	µg/L	ND(0.1)	ND(0.1)
4-Chloroguaiacol	µg/L	ND(0.50)	2.7
4-Chlorophenol	µg/L	ND(0.50)	0.68
4-Methylphenol	µg/L	0.69	ND(27)
4-Nitrophenol	µg/L	ND(1) / ND(5.0)	ND(9.2) / ND(1)
5,6-Dichlorovanilline	µg/L	ND(0.50)	ND(0.50)

Table 9

Surface Water Analytical Resutls - Marine
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Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
6-Chlorovanilline	µg/L	ND(0.50)	14
Acenaphthene	µg/L	ND(0.010)	ND(0.010)
Acenaphthylene	µg/L	ND(0.010)	0.057
Acridine	µg/L	ND(0.050)	ND(0.050)
Anthracene	µg/L	ND(0.010)	ND(0.035)
Benzo(a)anthracene	µg/L	ND(0.010)	0.032
Benzo(a)pyrene	µg/L	ND(0.010)	ND(0.010)
Benzo(b)fluoranthene	µg/L	ND(0.010)	ND(0.010)
Benzo(b)pyridine (Quinoline)	µg/L	ND(0.050)	0.082
Benzo(g,h,i)perylene	µg/L	ND(0.010)	ND(0.010)
Benzo(j)fluoranthene	µg/L	ND(0.010)	ND(0.010)
Benzo(k)fluoranthene	µg/L	ND(0.010)	ND(0.010)
Benzo fluoranthenes	µg/L	ND(0.020)	ND(0.020)
Catechol	µg/L	0.61	6.3
Chlorocatechols	µg/L	ND(0.50)	ND(0.68)
Chrysene	µg/L	ND(0.010)	ND(0.033)
Dibenz(a,h)anthracene	µg/L	ND(0.010)	ND(0.010)
Eugenol	µg/L	ND(0.50)	19
Fluoranthene	µg/L	0.018	ND(0.015)
Fluorene	µg/L	ND(0.010)	0.18
Guaiacol	µg/L	19	2300
Indeno(1,2,3-cd)pyrene	µg/L	ND(0.010)	ND(0.010)
Isoeugenol	µg/L	ND(0.50)	1.1
Naphthalene	µg/L	ND(0.20)	ND(0.20)
Pentachlorophenol	µg/L	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
Perylene	µg/L	ND(0.010)	ND(0.010)

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Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Phenanthrene	µg/L	0.018	0.049
Phenol	µg/L	1.8 / 3.4c	52 / 120c
Phenolics (total)	µg/L	25	2500
Pyrene	µg/L	0.034[a]	ND(0.010)
Tetrachlorocatechol	µg/L	ND(0.50)	ND(0.50)
Tetrachloroguaiacol	µg/L	ND(0.50)	ND(0.50)
Tetrachloroveratrol	µg/L	ND(0.50)	ND(0.50)

Table 9

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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Resins and Fatty Acids			
-Chlorodehydroabietic acid	µg/L	ND(3.0)	ND(3.0)
-Chlorodehydroabietic acid	µg/L	ND(3.0)	ND(3.0)
9,10-Dichlorostearic acid	µg/L	ND(3.0)	6.9
Abietic Acid	µg/L	9.3	190
Dehydroabietic acid	µg/L	50	120
Hexadecanoic acid	µg/L	ND(30)	180
Isopimaric acid	µg/L	12	74
Levopimaric acid	µg/L	5.4 J	ND(3.0) J
Linoleic acid	µg/L	5.4	620
Linolenic acid	µg/L	ND(3.0)	7.4
Neoabietic acid	µg/L	ND(3.0)	12
Octadecanoic acid	µg/L	ND(30)	74
Oleic acid	µg/L	6.7	320
Palmitoleic acid	µg/L	ND(3.0)	ND(5.0)
Palustric acid	µg/L	ND(3.0)	21
Pimaric acid	µg/L	3.3	19
Sandarcopimaric acid	µg/L	3.9	21
Total of fatty acids detected	µg/L	ND(30)	1200
Total of resin acids detected	µg/L	83	460
Volitile Organic Compounds (VOCs)			
1,1,1-Trichloroethane	µg/L	ND(1.0)	ND(1.0)
1,1,2,2-Tetrachloroethane	µg/L	ND(0.50)	ND(0.50)
1,1,2-Trichloroethane	µg/L	ND(1.0)	ND(1.0)
1,1-Dichloroethane	µg/L	ND(2.0)	ND(2.0)

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Surface Water Analytical Resutls - Marine
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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
1,1-Dichloroethene	µg/L	ND(0.50)	ND(56)
1,2-Dibromoethane (Ethylene dibromide)	µg/L	ND(0.20)	ND(0.20)
1,2-Dichlorobenzene	µg/L	ND(0.50)	ND(0.50)
1,2-Dichloroethane	µg/L	ND(1.0)	ND(1.0)
1,2-Dichloropropane	µg/L	ND(0.50)	ND(0.50)
1,3-Dichlorobenzene	µg/L	ND(1.0)	ND(1.0)
1,4-Dichlorobenzene	µg/L	ND(1.0)	ND(1.0)
Benzene	µg/L	ND(1.0)	ND(1.0)
Bromodichloromethane	µg/L	2.7	ND(1.0)
Bromoform	µg/L	ND(1.0)	ND(1.0)
Bromomethane (Methyl bromide)	µg/L	ND(0.50)	ND(0.50)
Carbon tetrachloride	µg/L	ND(0.50)	ND(0.50)
Chlorobenzene	µg/L	ND(1.0)	ND(1.0)
Chloroethane	µg/L	ND(8.0)	ND(8.0)
Chloroform (Trichloromethane)	µg/L	22	25
Chloromethane (Methyl chloride)	µg/L	ND(8.0)	ND(8.0)
cis-1,2-Dichloroethene	µg/L	ND(0.50)	ND(0.50)
cis-1,3-Dichloropropene	µg/L	ND(0.50)	ND(0.50)
Dibromochloromethane	µg/L	ND(1.0)	ND(1.0)
Ethylbenzene	µg/L	ND(1.0)	ND(1.0)
m&p-Xylenes	µg/L	ND(2.0)	ND(2.0)
Methyl tert butyl ether (MTBE)	µg/L	ND(2.0)	ND(2.0)
Methylene chloride	µg/L	ND(3.0)	ND(3.0)
o-Xylene	µg/L	ND(1.0)	ND(1.0)
Styrene	µg/L	ND(1.0)	ND(1.0)
Tetrachloroethene	µg/L	ND(1.0)	ND(1.0)

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Surface Water Analytical Resutls - Marine
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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Toluene	µg/L	ND(1.0)	8.4
trans-1,2-Dichloroethene	µg/L	ND(0.50)	ND(0.50)
trans-1,3-Dichloropropene	µg/L	ND(0.50)	ND(0.50)
Trichloroethene	µg/L	ND(1.0)	ND(1.0)
Trichlorofluoromethane (CFC-11)	µg/L	ND(8.0)	ND(8.0)
Trihalomethanes	µg/L	25	25
Vinyl chloride	µg/L	ND(0.50)	ND(0.50)
Xylenes (total)	µg/L	ND(1.0)	ND(1.0)

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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
General Chemistry			
%difference/ion balance	%	7.65	32.4
Alkalinity, bicarbonate (calculated)	µg/L	86000	270000
Alkalinity, carbonate (calculated)	µg/L	290000	1500
Alkalinity, total (as CaCO3)	µg/L	390000	270000
Ammonia-N	µg/L	88	2300
Anion sum	meq/L(me/L)	10.8	11.8
Cation sum	meq/L(me/L)	9.30	23.0
Chlorate	µg/L	520	51000[a]
Chloride (dissolved)	µg/L	91000	190000
Chlorite	µg/L	ND(100)	ND(100)
Color	TCU	68	620
Conductivity	uS/cm	860	1300
Cyanide (strong acid extractable)	µg/L	1.7[a]	8.2[a]
Hardness	µg/L	61000	620000
Hydrogen sulfide (calculated)	µg/L	120	150
Langelier saturated index @ 20C	none	2.30	1.05
Langelier saturated index @ 4C	none	2.05	0.801
Langelier saturated pH @ 20C	none	8.25	6.73
Langelier saturated pH @ 4C	none	8.50	6.98
Nitrate (as N)	µg/L	55	220
Nitrite (as N)	µg/L	ND(10)	60
Nitrite/Nitrate	µg/L	55	280
Orthophosphate	µg/L	19	810
pH, lab	s.u.	10.6	7.78
Silica, reactive	µg/L	5200	9500

Table 9

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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Sulfate (dissolved)	µg/L	21000	45000
Sulfide	µg/L	110	140
Total dissolved solids (TDS) (calculated)	µg/L	560000	900000
Total organic carbon (TOC)	µg/L	18000	230000
Turbidity	NTU	58	390
Dioxins and Furans			
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	pg/L	2.55	ND(1.60)
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	pg/L	34.5 J	7.94
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	pg/L	ND(0.899)	ND(1.21)
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	2.09	ND(1.48)
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	pg/L	ND(1.20)	ND(1.61)
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	ND(0.531)	ND(1.50)
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	ND(1.22)	ND(1.30)
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	ND(0.516)	ND(1.46)
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	ND(1.22)	ND(1.31)
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	pg/L	ND(0.635)	ND(1.80)
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	ND(1.09)	ND(1.17)
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	ND(1.01)	ND(1.58)
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	ND(1.16)	ND(1.11)
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	pg/L	ND(0.580)	ND(1.64)
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	pg/L	ND(1.00)	ND(1.57)
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	pg/L	ND(0.968)	ND(1.61)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	ND(0.792)	ND(1.56)
Total heptachlorodibenzofuran (HpCDF)	pg/L	1.20	ND(1.38)
Total heptachlorodibenzo-p-dioxin (HpCDD)	pg/L	7.57	ND(1.48)

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APEC:		**Current Raw Effluent Discharge Ditch (CRED)**	
Sample Location:		**CRED-EFF-1**	**CRED-EFF-1**
Sample ID:		**CRED-EFF-1-1**	**CRED-EFF-1-2**
Sample Date:		**27-Oct-17**	**17-Nov-17**
Sample Matrix:		**Surface Water**	**Surface Water**
Sample Type:		**During Maintenance**	**During Operations**
Parameters	**Units**		
Total hexachlorodibenzofuran (HxCDF)	pg/L	ND(0.562)	ND(1.59)
Total hexachlorodibenzo-p-dioxin (HxCDD)	pg/L	ND(1.17)	ND(1.26)
Total pentachlorodibenzofuran (PeCDF)	pg/L	ND(1.01)	ND(1.58)
Total pentachlorodibenzo-p-dioxin (PeCDD)	pg/L	ND(1.16)	ND(1.11)
Total tetrachlorodibenzofuran (TCDF)	pg/L	ND(0.968)	ND(1.61)
Total tetrachlorodibenzo-p-dioxin (TCDD)	pg/L	ND(0.792)	ND(1.56)
Total Toxic Equivalency (TEQ)	pg/L	3.01	4.41

Table 10

Surface Water Analytical Results - Freshwater
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:						Background (BKGD) Chance Harbour Lake						Former Raw Effluent Discharge Ditch (FRED)	Former Settling Pond 1 (FSP1)	Former Settling Pond 2 (FSP2)		Former Settling Pond 3 (FSP3)	Sludge Disposal Cell (SDC)
Sample Location:						BKGD-SW-1	BKGD-SW-2	BKGD-SW-3	BKGD-SW-3	BKGD-SW-4	BKGD-SW-5	FRED-SW-1	FSP1-SW-1	FSP2-SW-1	FSP2-SW-2	FSP3-SW-1	SDC-SW-1
Sample ID:						BKGD-SW-1	BKGD-SW-2	BKGD-SW-3	BKGD-SW-DUP	BKGD-SW-4	BKGD-SW-5	FRED-SW-1	FSP1-SW-1	FSP2-SW-1	FSP2-SW-2	FSP3-SW-1	SDC-SW-1
Sample Date:						23-Nov-17	23-Nov-17	23-Nov-17	23-Nov-17	23-Nov-17	23-Nov-17	26-Oct-17	27-Oct-17	27-Oct-17	27-Oct-17	25-Oct-17	27-Oct-17
Sample Matrix:						Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Sample Type:						Original	Original	Original	Duplicate	Original	Original	Original	Original	Original	Original	Original	Original
		Freshwater Surface Water Criteria															
		Provincial	Federal	Provincial	Federal												
Parameters	**Units**	Ecological a	Ecological b	Human Health c	Human Health d												
Field Parameters																	
Conductivity, field	mS/cm					0.07	0.071	0.071	0.071	0.071	0.111	0.1	0.109	0.119	0.118	0.073	0.057
Dissolved oxygen (DO), field	µg/L					11350	12200	11300	11300	11460	12110	8350	6570	8400	7190	8730	8810
pH, field	s.u.		6.5-9			6.56	6.89	6.34[b]	6.34[b]	6.15[b]	5.3[b]	6.94	7.59	7.92	7.88	6.53	7.6
Temperature, field	Deg C					5.71	5.62	5.72	5.72	5.72	5.64	15.93	14.21	16.27	16.33	15.71	14.53
Turbidity, field	NTU					--	--	--	--	--	--	5.6	2	1.9	1.7	2.1	0.7
Metals																	
Aluminum	µg/L	5				19[a]	20[a]	21[a]	20[a]	20[a]	26[a]	34[a]	9.3[a]	14[a]	12[a]	5.3[a]	ND(5.0)
Antimony	µg/L	20		6		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Arsenic	µg/L	5		10		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Barium	µg/L	1000		1000		170	170	170	170	170	180	420	140	150	150	120	53
Beryllium	µg/L	5.3		4		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Bismuth	µg/L					ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Boron	µg/L	1200		5000		ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Cadmium	µg/L	0.01		5		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Calcium	µg/L					4300	4300	4400	4400	4300	4300	26000	26000	28000	27000	17000	14000
Chromium	µg/L		8.9 (trivalent)	50		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Cobalt	µg/L	10		10		ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)
Copper	µg/L	2				ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Iron	µg/L	300				140	150	150	150	150	200	75	140	210	200	390[a]	ND(50)
Lead	µg/L	1		10		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Magnesium	µg/L					1900	1900	1900	2000	1900	1900	3300	2100	2400	2300	1800	3300
Manganese	µg/L	820				140	140	140	140	140	200	33	46	71	68	210	27
Mercury	µg/L	0.026		1		ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)	ND(0.013)
Molybdenum	µg/L	73		70		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Nickel	µg/L	25		100		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Phosphorus	µg/L					ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)
Potassium	µg/L					810	810	830	820	830	840	1300	990	1000	980	320	300
Selenium	µg/L	1		10		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Silver	µg/L	0.1		100		ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Sodium	µg/L			200000		6100	6200	6200	6400	6300	6300	10000	16000	19000	19000	11000	5600
Strontium	µg/L	21000		4400		15	16	15	16	16	15	85	45	49	47	37	41
Thallium	µg/L	0.8		2		ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Tin	µg/L			4400		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Titanium	µg/L					ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Uranium	µg/L	300		20		ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Vanadium	µg/L	6		6.2		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Zinc	µg/L	30				ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Petroleum Hydrocarbons (PHCs)																	
Benzene	µg/L	2100		5		ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Toluene	µg/L	770		24		ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Ethylbenzene	µg/L	320		1.6		ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Xylenes (total)	µg/L	330		20		ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
Total Petroleum Hydrocarbons (C6-C10) Less BTEX	µg/L	see Modified TPH		see Modified TPH		ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Total Petroleum hydrocarbons (>C10-C16)	µg/L	see Modified TPH		see Modified TPH		ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Total Petroleum Hydrocarbons (>C16-C21)	µg/L	see Modified TPH		see Modified TPH		ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Total Petroleum Hydrocarbons >(C21-C32)	µg/L	see Modified TPH		see Modified TPH		ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)
Total Petroleum Hydrocarbons (Modified TPH)	µg/L	1500/100/100		4400/3200/7800		ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)
Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols																	
1-Methylnaphthalene	µg/L	2		12		ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2,3,4,5-Tetrachlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,3,4,6-Tetrachlorophenol	µg/L				100	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2,3,4-Trichlorophenol	µg/L					ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2,3,5,6-Tetrachlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,3,5-Trichlorophenol	µg/L					ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2,3,6-Trichlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2,3-Dichlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,4,5-Trichlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2,4,6-Trichlorophenol	µg/L				5	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
2,4+2,5-Dichlorophenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
2,4-Dichlorophenol	µg/L				900	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
2,4-Dimethylphenol	µg/L					ND(0.50) / ND(1)	ND(0.50) / ND(1)	ND(1) / ND(0.50)	ND(0.50) / ND(1)	ND(1) / ND(0.50)	ND(1) / ND(0.50)	ND(1) / ND(0.50)	ND(0.50) / ND(1)	ND(0.50) / ND(1)	ND(1) / ND(0.50)	ND(1) / ND(0.50)	ND(1) / ND(0.50)
2,4-Dinitrophenol	µg/L					ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
2,5-Dichlorophenol	µg/L					ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
2,6-Dichlorophenol	µg/L					ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
2-Chlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
2-Methylnaphthalene	µg/L	2		12		ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Methylphenol	µg/L					ND(0.5) / ND(0.50)	ND(0.5) / ND(0.50)	ND(0.5) / ND(0.50)	ND(0.5) / ND(0.50)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.5) / ND(0.50)	ND(0.50) / ND(0.5)
2-Nitrophenol	µg/L					ND(1.0) / ND(1)	ND(1.0) / ND(1)	ND(1) / ND(1.0)	ND(1) / ND(1.0)	ND(1) / ND(1.0)	ND(1.0) / ND(1)	ND(1.0) / ND(1)	ND(1.0) / ND(1)	ND(1) / ND(1.0)	ND(1) / ND(1.0)	ND(1) / ND(1.0)	ND(1) / ND(1.0)
3&4-Methylphenol	µg/L					ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
3,4,5-Trichlorocatechol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3,4,5-Trichloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3,4,5-Trichlorophenol	µg/L					ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)
3,4,5-Trichlorosyringol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3,4,5-Trichloroveratrol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3,4-Dichlorophenol	µg/L					ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)
3,5-Dichlorocatechol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3,5-Dichlorophenol	µg/L					ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
3/4-Chlorophenol	µg/L					ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
3-Chlorophenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
3-Methylphenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,5,6-Trichloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,5-Dichlorocatechol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,5-Dichloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,5-Dichloroveratrol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,6-Dichloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4,6-Dinitro-2-methylphenol	µg/L					ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)

Table 10

Surface Water Analytical Results - Freshwater
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:						Background (BKGD) Chance Harbour Lake						Former Raw Effluent Discharge Ditch (FRED)	Former Settling Pond 1 (FSP1)	Former Settling Pond 2 (FSP2)		Former Settling Pond 3 (FSP3)	Sludge Disposal Cell (SDC)
Sample Location:						**BKGD-SW-1**	**BKGD-SW-2**	**BKGD-SW-3**	**BKGD-SW-3**	**BKGD-SW-4**	**BKGD-SW-5**	**FRED-SW-1**	**FSP1-SW-1**	**FSP2-SW-1**	**FSP2-SW-2**	**FSP3-SW-1**	**SDC-SW-1**
Sample ID:						**BKGD-SW-1**	**BKGD-SW-2**	**BKGD-SW-3**	**BKGD-SW-DUP**	**BKGD-SW-4**	**BKGD-SW-5**	**FRED-SW-1**	**FSP1-SW-1**	**FSP2-SW-1**	**FSP2-SW-2**	**FSP3-SW-1**	**SDC-SW-1**
Sample Date:						**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**26-Oct-17**	**27-Oct-17**	**27-Oct-17**	**27-Oct-17**	**25-Oct-17**	**27-Oct-17**
Sample Matrix:						**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**
Sample Type:						**Original**	**Original**	**Original**	**Duplicate**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**
		Freshwater Surface Water Criteria															
		Provincial	**Federal**	**Provincial**	**Federal**												
		Ecological	**Ecological**	**Human Health**	**Human Health**												
		a	b	c	d												
Parameters	**Units**																
4-Chloro-3-methylphenol	µg/L					ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)
4-Chloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Chlorophenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methylphenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Nitrophenol	µg/L					ND(5.0) / ND(1)	ND(5.0) / ND(1)	ND(5.0) / ND(1)	ND(5.0) / ND(1)	ND(5.0) / ND(1)	ND(1) / ND(5.0)	ND(1) / ND(5.0)	ND(1) / ND(5.0)	ND(5.0) / ND(1)	ND(5.0) / ND(1)	ND(1) / ND(5.0)	ND(5.0) / ND(1)
5,6-Dichlorovanilline	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
6-Chlorovanilline	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acenaphthene	µg/L	5.8		1400		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acenaphthylene	µg/L	4.6		4.5		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Acridine	µg/L					ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Anthracene	µg/L	0.012				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(a)anthracene	µg/L	0.018				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(a)pyrene	µg/L	0.015		0.01		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(b)fluoranthene	µg/L	0.48				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(b)pyridine (Quinoline)	µg/L		3.4			ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Benzo(g,h,i)perylene	µg/L	0.17				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(j)fluoranthene	µg/L	0.48				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo(k)fluoranthene	µg/L	0.48				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Benzo fluoranthenes	µg/L					ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Catechol	µg/L	2000				ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Chlorocatechols	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Chrysene	µg/L	1.4				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Dibenz(a,h)anthracene	µg/L	0.26				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Eugenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Fluoranthene	µg/L	0.04				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Fluorene	µg/L	3		940		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Guaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Indeno(1,2,3-cd)pyrene	µg/L	0.21				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Isoeugenol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Naphthalene	µg/L	1.1		470		ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Pentachlorophenol	µg/L	0.5		30		ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)	ND(0.1) / ND(0.50)	ND(0.50) / ND(0.1)	ND(0.50) / ND(0.1)
Perylene	µg/L					ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Phenanthrene	µg/L	0.4				ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Phenol	µg/L	4000		0.8		ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.5) / ND(0.50)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.5) / ND(0.50)	ND(0.50) / ND(0.5)	ND(0.50) / ND(0.5)	ND(0.5) / ND(0.50)
Phenolics (total)	µg/L		0.004			ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Pyrene	µg/L	0.025		710		ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Tetrachlorocatechol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Tetrachloroguaiacol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Tetrachloroveratrol	µg/L					ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Resins and Fatty Acids																	
-Chlorodehydroabietic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
-Chlorodehydroabietic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
9,10-Dichlorostearic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Abietic Acid	µg/L					ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Dehydroabietic acid	µg/L					ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Hexadecanoic acid	µg/L					ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)
Isopimaric acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Levopimaric acid	µg/L					ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J	ND(3.0) J
Linoleic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Linolenic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Neoabietic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Octadecanoic acid	µg/L					ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)
Oleic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Palmitoleic acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Palustric acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Pimaric acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Sandarcopimaric acid	µg/L					ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
Total of fatty acids detected	µg/L					ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)	ND(30)
Total of resin acids detected	µg/L					ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)

Table 10

Surface Water Analytical Results - Freshwater
Phase 2 Environmental Site Assessment
Boat Harbour Effluent Treatment Facility
Pictou Landing, Nova Scotia

APEC:						Background (BKGD) Chance Harbour Lake						Former Raw Effluent Discharge Ditch (FRED)	Former Settling Pond 1 (FSP1)	Former Settling Pond 2 (FSP2)		Former Settling Pond 3 (FSP3)	Sludge Disposal Cell (SDC)
Sample Location:						**BKGD-SW-1**	**BKGD-SW-2**	**BKGD-SW-3**	**BKGD-SW-3**	**BKGD-SW-4**	**BKGD-SW-5**	**FRED-SW-1**	**FSP1-SW-1**	**FSP2-SW-1**	**FSP2-SW-2**	**FSP3-SW-1**	**SDC-SW-1**
Sample ID:						**BKGD-SW-1**	**BKGD-SW-2**	**BKGD-SW-3**	**BKGD-SW-DUP**	**BKGD-SW-4**	**BKGD-SW-5**	**FRED-SW-1**	**FSP1-SW-1**	**FSP2-SW-1**	**FSP2-SW-2**	**FSP3-SW-1**	**SDC-SW-1**
Sample Date:			Freshwater Surface Water Criteria			**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**23-Nov-17**	**26-Oct-17**	**27-Oct-17**	**27-Oct-17**	**27-Oct-17**	**25-Oct-17**	**27-Oct-17**
Sample Matrix:		**Provincial**	**Federal**	**Provincial**	**Federal**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**
Sample Type:		**Ecological** a	**Ecological** b	**Human Health** c	**Human Health** d	**Original**	**Original**	**Original**	**Duplicate**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**	**Original**
Parameters	**Units**																
Volitile Organic Compounds (VOCs)																	
1,1,1-Trichloroethane	µg/L	10		200		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,2,2-Tetrachloroethane	µg/L	70		1		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
1,1,2-Trichloroethane	µg/L	800		5		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1-Dichloroethane	µg/L	200		5		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
1,1-Dichloroethene	µg/L	40		14		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
1,2-Dibromoethane (Ethylene dibromide)	µg/L	5		0.2		ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
1,2-Dichlorobenzene	µg/L	0.7		200		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
1,2-Dichloroethane	µg/L	100		5		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,2-Dichloropropane	µg/L	0.7		5		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
1,3-Dichlorobenzene	µg/L	150		59		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,4-Dichlorobenzene	µg/L	26		5		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Benzene	µg/L	2100		5		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Bromodichloromethane	µg/L	200		100		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Bromoform	µg/L	60		100		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Bromomethane (Methyl bromide)	µg/L	0.9		0.89		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Carbon tetrachloride	µg/L	13.3		2		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Chlorobenzene	µg/L	1.3		30		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Chloroethane	µg/L	1100				ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)
Chloroform (Trichloromethane)	µg/L	1.8		100		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Chloromethane (Methyl chloride)	µg/L	700		38		ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)
cis-1,2-Dichloroethene	µg/L	200		20		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
cis-1,3-Dichloropropene	µg/L	7		0.5		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Dibromochloromethane	µg/L	40		100		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Ethylbenzene	µg/L	320		1.6		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
m&p-Xylenes	µg/L			20		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Methyl tert butyl ether (MTBE)	µg/L	10000		15		ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)
Methylene chloride	µg/L	98.1		50		ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)	ND(3.0)
o-Xylene	µg/L			20		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Styrene	µg/L	72		100		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Tetrachloroethene	µg/L	111		30		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Toluene	µg/L	770		24		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
trans-1,2-Dichloroethene	µg/L	200		20		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
trans-1,3-Dichloropropene	µg/L	7		0.5		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Trichloroethene	µg/L	21		5		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Trichlorofluoromethane (CFC-11)	µg/L					ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)	ND(8.0)
Trihalomethanes	µg/L					ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Vinyl chloride	µg/L	600		2		ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Xylenes (total)	µg/L	330		20		ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
General Chemistry																	
%difference/ion balance	%					1.49	1.49	1.49	0.740	0.00	0.740	7.73	6.75	3.70	4.16	7.32	3.61
Alkalinity, bicarbonate (calculated)	µg/L					16000	16000	16000	15000	15000	15000	84000	96000	97000	95000	65000	50000
Alkalinity, carbonate (calculated)	µg/L					ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)	ND(1000)
Alkalinity, total (as CaCO3)	µg/L					16000	16000	16000	15000	15000	15000	84000	97000	98000	96000	65000	50000
Ammonia-N	µg/L		pH and temp dependent			ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	54[a]
Anion sum	meq/L(me/L)					0.680	0.680	0.660	0.670	0.670	0.680	2.37	2.53	2.66	2.63	1.76	1.29
Cation sum	meq/L(me/L)					0.660	0.660	0.680	0.680	0.670	0.670	2.03	2.21	2.47	2.42	1.52	1.20
Chlorate	µg/L	30000				ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)
Chloride (dissolved)	µg/L		120000			9700	9600	9100	9800	9600	9900	20000	21000	23000	24000	16000	7700
Chlorite	µg/L					ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)
Color	TCU					27	26	26	27	26	28	11	14	17	15	16	17
Conductivity	uS/cm					76	76	77	76	76	77	210	220	240	240	160	120
Cyanide (strong acid extractable)	µg/L	5				1.1	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	1.1	ND(1)
Hardness	µg/L					19000	18000	19000	19000	19000	19000	77000	73000	80000	78000	50000	47000
Hydrogen sulfide (calculated)	µg/L					ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)	ND(21)
Langelier saturated index @ 20C	none					-2.41	-2.41	-2.38	-2.33	-2.37	-2.52	-0.0860	-0.0740	-0.0500	-0.0690	-1.09	-1.05
Langelier saturated index @ 4C	none					-2.66	-2.67	-2.63	-2.58	-2.62	-2.77	-0.336	-0.325	-0.301	-0.320	-1.34	-1.30
Langelier saturated pH @ 20C	none					9.47	9.47	9.47	9.47	9.48	9.48	8.03	7.96	7.92	7.94	8.29	8.49
Langelier saturated pH @ 4C	none					9.73	9.73	9.72	9.72	9.73	9.73	8.28	8.21	8.18	8.19	8.54	8.74
Nitrate (as N)	µg/L		13000		1000	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Nitrite (as N)	µg/L		60 (as NO2-N)		45000	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Nitrite/Nitrate	µg/L					ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)
Orthophosphate	µg/L					ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
pH, lab	s.u.		6.5-9			7.07	7.06	7.09	7.14	7.11	6.96	7.94	7.88	7.87	7.87	7.20	7.44
Silica, reactive	µg/L					3100	3100	3100	3100	3200	3200	8000	ND(500)	ND(500)	ND(500)	2400	1200
Sulfate (dissolved)	µg/L					4500	4400	4400	4400	4400	4400	5500	ND(2000)	2200	2200	ND(2000)	3100
Sulfide	µg/L					ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)	ND(20)
Total dissolved solids (TDS) (calculated)	µg/L					40000	40000	40000	40000	40000	40000	130000	130000	140000	130000	89000	65000
Total organic carbon (TOC)	µg/L					6300	6300	6100	6200	6400	6200	2000	5100	6000	6100	5000	4800
Turbidity	NTU					0.79	0.70	0.73	0.72	1.1	1.5	0.43	0.80	1.5	1.4	1.7	0.56

Notes:

19[a] Exceeds applicable criteria; superscript identifies exceeded criteria

Provincial Ecological[a] Nova Scotia Contaminated Sites Regulation Table A2 References for Pathway Specific Standards for freshwater surface water

Federal Ecological[b] Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the protection of Aquatic Life for freshwater surface water

Provincial Human Health[c] Nova Scotia Contaminated Sites Regulation Table A3 References for Pathway Specific Standards for agricultural/residential land use and coarse-grained soil, potable groundwater drinking water pathway

Federal Human Health[d] Canadian Drinking Water Quality Guidelines

BTEX Benzene, Toluene, Ethylbenzene, and total Xylenes

ND (1.0) Not detected at the associated reporting limit

J The associated value is an estimated concentration

-- Parameter not analysed

APPENDIX H-2

DILLON
CONSULTING

January 26, 2000

CANSO CHEMICALS LIMITED
P.O. Box 484
New Glasgow, Nova Scotia
B2H 5E5

ATTENTION:
General Manager

Canso Chemicals Site Decommissioning Final Report

We are pleased to present six copies of our final report documenting decommissioning activities at the Canso Chemicals Limited site. The report also documents the results of an ecological and human health risk assessment relative to an area with residual mercury that did not meet the 1993 remedial action plan cleanup objectives. A Certificate of Compliance for the facility has been prepared, under the Nova Scotia Contaminated Sites Management Program, and is included with this report. App-F

It has been a pleasure to work with you on this project. If we can be of further assistance, please contact the undersigned at your convenience.

Yours truly,

DILLON CONSULTING LIMITED

Project Manager

cc: P.Eng.
Pioneer Chemicals Limited

L:\PROJECTS\FINAL\985519\TEXT\Site Decommissioning Final Report.wpd

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1.0 INTRODUCTION

1.1 Purpose

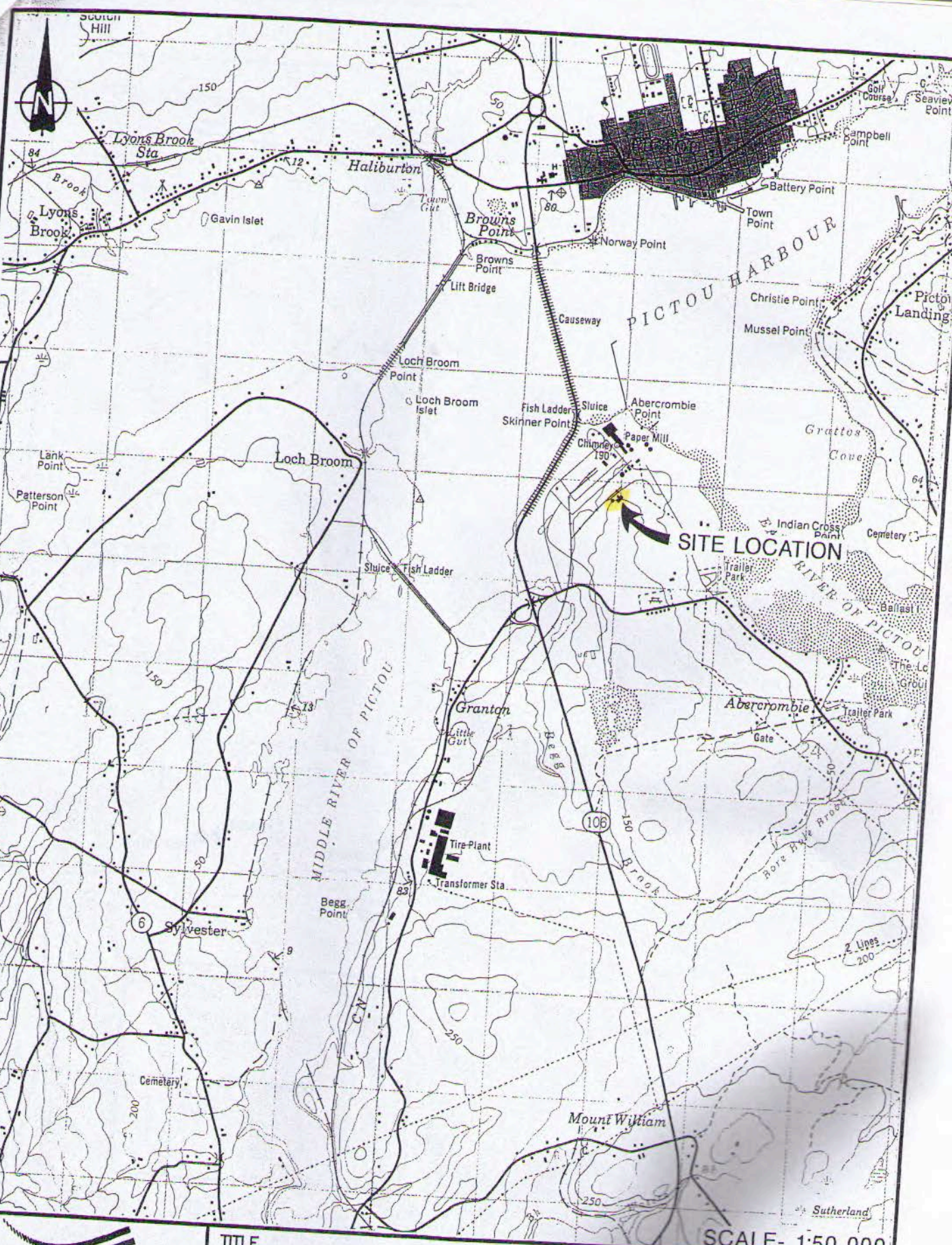
The purpose of this report is to document remedial activities carried out at Canso Chemicals Limited, located at Abercrombie Point (refer to Figure 1-1). Canso Chemicals Limited is a former chloro-alkali plant, which used mercury in its process to generate chlorine and caustic soda for the pulp and paper industry. Upon ceasing operations at the plant in 1992, a program was put in place to decommission the site, including remediation of environmental contaminants. Included in this report is a description of demolition activities relating to the process building (housing the cell room and brine basement) in 1999 (refer to Figure 1-2).

This report provides an overview of site remedial activities surrounding the processing and chlorate buildings, documents confirmatory sampling completed to demonstrate adherence to generic remedial objectives, and proposes site specific remedial objectives for a limited area of the site, based on an assessment of risk to human health and the environment. Recommendations are made for the long term monitoring of the site.

1.2 Background

Canso Chemicals Limited was formed in 1968. A chloro-alkali plant was commissioned in 1970 at Abercrombie Point to produce bleaching chemicals used in the production of pulp and paper (i.e., liquid chlorine and liquid caustic soda). In 1971 a chlorate plant (producing liquid sodium chlorate) was constructed on the site and was operated until 1981.

In 1992, the chloro-alkali plant was shut down. The site is currently used as a caustic soda shipping and receiving facility.



20000109.0845

G:\CAD\985519\FIG1-1

DILLON CONSULTING

DATE JAN. 2000	TITLE SITE LOCATION	SCALE- 1:50 000
	PROJECT CANSO CHEMICALS SITE DECOMMISSIONING	PROJECT No. 98-5519
		FIGURE No. 1-1

The products made at Canso Chemicals Limited were the result of the electrolysis of a brine solution over mercury electrolytic cells. The primary contaminant of concern on the site is mercury. During 1973-1975, a series of equipment failures in the cell room resulted in high mercury consumption and mercury was lost to the floor (Canso Chemicals Limited, 1993). After that time a comprehensive mercury inventory was maintained, and mercury losses were more tightly controlled (pers. comm. D. Currie). Mercury was also found in process by-products (e.g., brine sludge), which were managed on-site.

Canso Chemicals Limited submitted a site remedial action plan to Nova Scotia Department of the Environment on June 21, 1993 (Canso Chemicals Limited, 1993). This plan outlined an approach to manage site contaminants, including mercury. The plan established an objective of meeting Canadian Council of Ministers of the Environment (CCME) industrial land use guidelines for soil.

1.3 Regulatory Context

The 1993 remedial action plan (RAP) committed to meeting CCME industrial land use guidelines for soil. The Interim Canadian Environmental Quality Criteria for Contaminated Sites (CCME, 1991) established a remedial objective of 10 mg/kg mercury in soil for commercial/industrial sites. The Recommended Canadian Soil Quality Guidelines (CCME, 1997) adopt 30 mg/kg as the soil quality guideline for mercury at industrial sites, superseding the 1991 guideline.

The Nova Scotia Department of the Environment have established guidelines for management of contaminated sites (NSDOE, 1996). These guidelines outline two approaches to contaminated site management. Tier I requires the owner to remediate the site to guideline concentrations appropriate for the future use of the property. Tier II identifies potential risk by comparing detected concentrations of contaminants with site specific criteria. Site specific criteria are determined by calculating potential adverse effects associated with exposure to contaminants at the concentrations detected on site.

The 1993 RAP adopted a Tier I approach, committing to cleanup the site to CCME industrial land use guidelines. Until June 1999, remedial activities were completed in accordance with the RAP. During final phases of demolition of the cell room/brine basement structure (in the process building), elemental mercury was found in an area that could not be excavated in the context of current site conditions. To address this area of concern, an assessment of risks to human health and the environment was completed to establish site specific remedial objectives. This report presents the findings of the assessment of these risks.

As an result of the decommissioning activities and the implementation of remedial actions, a Certificate of Compliance has been prepared, under the Nova Scotia Contaminated Sites Management Program, and is included with this report.

2.0 APPROACH AND METHODOLOGY

Site assessment and remedial activities have been ongoing at Canso Chemicals since cessation of chlorine/caustic production in 1992. An overview of these activities is presented in Section 3 of this report. Work completed between 1992 and 1997 has focussed on recovery of mercury and disposal of mercury contaminated materials without demolition of site buildings. Work completed in 1998/1999 has addressed demolition of the process (including cell room and brine basement) and chlorate buildings, and disposal of mercury contaminated materials previously not acceptable due to presence of the building structures. Site materials contaminated with mercury have been disposed in an on-site secure landfill. Section 4 documents groundwater sampling completed by Canso Chemicals Limited as part of its ongoing monitoring program, as well as additional investigations completed specifically for this assessment.

Remedial activities have been implemented to meet the objectives of the 1993 RAP. In June 1999, elemental mercury was identified in the bedrock beneath the area of the former cell room/brine basement. This material could not be excavated in the context of current site conditions (i.e., potential impact on remaining site buildings and potential for increasing the areal extent and depth of mercury impact due to mercury's physical properties). Section 5 of this report presents findings of ecological and human health risk assessments pertaining to the area of the site that has not been remediated to the generic RAP objectives. These risk assessments evaluate potential impacts associated with assumed levels of contaminants. Section 6 presents recommendations for long term monitoring at the site to evaluate the risk assessment assumptions over time.

site rainfall runoff. Mercury was not detected at depths greater than 0.5 metres, but in all cases, the ditches were excavated to a depth of 0.6 metres or more.

By 1996 decommissioning of the facility was essentially complete and the site stabilized for use as an industrial storage space. Little, if any, further remedial work was undertaken until 1998 when the process buildings were removed.

3.2 Remedial Activities 1998-1999

Remedial activities undertaken at Canso Chemicals during 1998 and 1999 have focussed on demolition of site process buildings (the process building and the chlorate building), excavation of remaining mercury contaminated soil (facilitated by removal of building footings) and disposal of mercury contaminated materials in the on-site secure landfill.

The requirements for demolition activities are outlined in the engineering drawings and specifications for the site (Porter Dillon Limited, 1998). Demolition was completed in two phases: building structures were demolished during the fall of 1998. Mercury contaminated debris was stockpiled for disposal in the secure landfill. Other materials were set aside for use as backfill, or disposed off-site. During the spring/early summer of 1999, building foundations and footings were removed and stockpiled for disposal in the on-site landfill. Mercury contaminated soil in the vicinity of the building foundations and footings, which was previously inaccessible, was also excavated for on-site disposal.

Excavation of the mercury contaminated soil was completed to meet the requirements of the 1993 RAP. The RAP objectives were achieved at all locations within the demolition excavation, with the exception of an area in the vicinity of the cell room/brine basement interface. Figure 3-1 presents locations of confirmatory soil sampling undertaken by Porter Dillon upon completion of excavation activities. These samples supplement sampling undertaken by both

5.0 ASSESSMENT OF RISK

5.1 Ecological Risk Assessment

5.1.1 Approach & Methodology

As described in Section 3, elemental mercury has migrated into the bedrock below the former cell room. Due to the practical limitations of excavation, the remedial program was unable to remove mercury below a depth of eight metres. The remaining mercury is located in bedrock, approximately five metres below the water table, and hence there is potential for it to dissolve into groundwater and migrate towards Pictou Harbour.

An ecological risk assessment was carried out to determine whether the mercury remaining in the ground below the former cell room could pose a risk to ecological receptors in the harbour. The assessment was carried out based on procedures described in CCME's Framework for Ecological Risk Assessment at Contaminated Sites (CCME, 1994). The assessment used a preliminary quantitative approach that involved contaminant fate and transport modelling to estimate the potential mercury concentration in the harbour water and sediment. The concentration estimates were compared to CCME Freshwater Aquatic Life Guidelines and Sediment Quality Guidelines for Aquatic Life to determine whether ecological receptors could be at risk.

The ecological risk assessment involved four main components as follows:

- **Receptor Characterization** - evaluation of potential contaminant receptors
- **Exposure Assessment** - evaluation of exposure pathways and exposure concentrations

- **Hazard Assessment** - evaluation of hazards and their possible effects on receptors

- **Risk Characterization** - evaluation of risk based upon the above three inputs

In addition to the above components, a uncertainty analysis was carried out to evaluate the effect of assumptions used in the risk assessment.

5.1.2 Receptor Characterization

A receptor is an ecosystem component that may be adversely affected by a contaminant. Receptors may include biological (e.g., aquatic life) or abiotic (e.g., water quality, sediment quality).

Groundwater flow data presented in Section 4 indicates that the horizontal direction of groundwater flow in the shallow and deep bedrock aquifer is northwest, towards the confluence of the Middle River and West River of Pictou in Pictou Harbour. The data indicate that the vertical direction of groundwater flow at the site is downwards.

There are no water supply wells located down-gradient of the former cell room where the source of mercury is located. The only down-gradient property between the mercury source and the harbour is the Kimberly-Clark paper mill which uses the Middle River of Pictou for process water and bottled water for drinking (pers. comm., Penny MacLeod). Therefore, the receptor of mercury-impacted groundwater is expected to be Pictou Harbour, and the plume is expected to eventually discharge to the harbour approximately 700 m northwest of the former cell room. Both water quality and sediment quality could be affected since dissolved mercury may adsorb to sediments as it discharges through bottom sediments into the harbour.

Aquatic plant life observed by Porter Dillon in July 1999 indicate the harbour can be considered an estuary to marine habitat in the area where the plume may discharge. An electrical conductivity (EC) measurement of the harbour water in this area (EC = 30,000 μS/cm) indicated that the water is in the estuary to marine range (EC = 800 to 55,000 as/cm).

There is also a small pond located adjacent to the harbour in the area where the plume could discharge. The pond is physically separated from the harbour by a causeway, but is hydraulically connected to the harbour by two culverts. Although the pond is a potential receptor of mercury impacted groundwater, is it likely that deep groundwater originating from the Canso Chemical site will bypass the pond and discharge to the harbour further from the shoreline. Shallow groundwater in the vicinity of the pond is more likely to discharge to the pond.

5.1.3 *Exposure Assessment*

Exposure assessment is the estimation of the exposure resulting from the presence of contaminants in air, soil/sediment or water. It often involves contaminant fate and transport modelling to assess the exposure associated with indirect pathways in which contaminants must travel some distance before they reach a receptor.

The data in Section 4 indicate that mercury-impacted groundwater is present down-gradient of the former cell room but the plume has not reached the northern property boundary, located approximately 100 m from the former cell room. Because the impacted groundwater is located at depth, and is not currently discharging to an ecological habitat, there are currently no complete exposure pathways for ecological receptors. However, there is potential for mercury-impacted groundwater to migrate and discharge to Pictou Harbour in the future.

A two-dimensional contaminant fate and transport model was used to predict mercury concentrations that could discharge to the harbour in the future. The

model assumes a constant uniform groundwater flow and accounts for the following contaminant transport features:

- advection (i.e., transport at the speed of groundwater);
- longitudinal and transverse dispersion (i.e., plume spreading), and
- retardation (slowing down of mercury migration due to sorption to aquifer material).

For modelling purposes, the source of mercury contamination below the former Cell Room was approximated as a rectangular mass measuring 18 m wide and 10 m deep. Although the width of the mercury-impacted zone has been measured during the remedial program, the vertical extent is uncertain. The maximum concentration of dissolved mercury in groundwater at the source was assumed to be 60 μg/L. Literature values for the solubility of mercury are in the range of 25 μg/L to 60 μg/L (Environmental Canada, 1984) and the maximum concentration measured in groundwater at the site is 45 μg/L (see Section 4). The mercury source in the bedrock was modelled as a long-term, continuous source that remains at a constant concentration of 60 μg/L (i.e., there is no source decay). Further details about the assumptions and input parameters used in the model are presented in Section 5.1.6 and Appendix E.

The potential concentration of mercury in the harbour was predicted by dividing the maximum predicted mercury concentration in groundwater discharging to the harbour by a dilution factor. The dilution factor was estimated by assuming complete mixing between the plume and the harbour. The flow rate in the harbour available for diluting the plume was estimated from reported flow rates for the Pictou Harbour, East River and Middle River of Pictou. A review of the watershed areas for the East, Middle and West Rivers of Pictou was also carried out. Further details about the assumptions and input parameters used for predicting potential mercury concentrations in harbour water are presented in Section 5.1.6 and Appendix E.

Table 5-1 Summary of Modelling Results	
Parameter	**Predicted Value**
Time for leading edge of Hg plume to reach the harbour (based on a leading edge plume concentration of 0.1 μg/L)	200 years
Maximum Hg concentration in groundwater discharging to harbour (prior to dilution in harbour)	6.3 μg/L
Hg concentration in harbour water (after dilution in harbour)	0.0001 μg/L
Total amount of Hg discharging to harbour	28 grams/year
Hg concentration in harbour sediment	0.0001 mg/kg

5.1.4 Hazard Assessment

A hazard assessment determines the existence of a hazard by investigating the relationship between a contaminant and the receptors exposed to the contaminant.

The fate and transport modelling in Section 5.1.3 indicated that there is potential for mercury to migrate from the site and discharge to the harbour. This may cause aquatic life to be exposed to elevated mercury concentrations in the harbour water and sediment. The main concern regarding elemental mercury in the environment is bacterial conversion to methyl mercury, which is highly toxic to aquatic life, and mercury's ability to bio-accumulate in the food chain. Aquatic organisms may accumulate mercury either directly from water or through the food web. The biological half-life for mercury in fish is approximately two years. Because of rapid uptake and slow cleansing rates, bio-accumulation factors for aquatic organisms are high (approximately 10,000) (CCME, 1987). Table 5-2 presents CCME ecological guidelines for mercury in soil and sediment.

5.1.6 *Uncertainty Analysis*

Risk characterization involves a number of assumptions. In particular, the models used to estimate exposure concentrations in the harbour use a number of simplifying assumptions to facilitate contaminant transport calculations.

A qualitative uncertainty analysis was carried out to assess the degree of uncertainty associated with the modelling assumptions and whether or not the uncertainty was acceptable. The uncertainty analysis evaluated the applicability of the major modelling assumptions and the confidence in key model input parameters. An assessment of whether the assumption could lead to an over-estimate or under-estimate of risk was also carried out.

The results presented in Table 5-4 indicate that exposure concentrations and risks are generally expected to be over-estimated. This is considered acceptable because it is protective of the environment. Some assumptions involving the amount of plume dilution in the harbour may lead to an under-estimation of risk. This is not considered to be an immediate concern because of the length of time estimated for the plume to reach the harbour (200 years) and the very low levels that are predicted to result in the harbour (i.e., three orders of magnitude below guidelines). However, as a precaution, it is recommended that a monitoring program be put in place to confirm the modelling predictions.

5.1.7 *Summary of Ecological Risk Assessment Findings*

The risk assessment indicated that there is potential for mercury-impacted groundwater at the site to migrate and discharge to Pictou Harbour and this could cause ecological receptors to be exposed to elevated mercury concentrations in harbour water and sediment. However, due to slow rate of mercury migration, groundwater plume dispersion, and dilution in the harbour, the mercury is expected to pose negligible risk to ecological receptors.

Canso Chemicals Limited
Site Decommissioning
Final Report

APPENDIX H-3

From:	20(1)
To:	20(1) (20(1) northernpulp.com); Porter, Gary S
Cc:	20(1) (20(1) northernpulp.com); 20(1) 20(1) @northernpulp.com); Ken Frei
Subject:	Envoi électronique - Alt D 2D modelling results.pdf
Date:	May 29, 2017 3:14:19 PM
Attachments:	Alt D 2D modelling results.pdf

20(1)/ Gary,

Attached please find the superimposition of the 2D modelling results for Alternate outfall locations D (500m further and 0.5m deeper than Alt.C) and D2 (1,000m further and 1.0m deeper than Alt.C). Both D and D2 show no backwash of effluent to Boat Harbour while D2 shows no presence of effluent (I'm not calling it an impact…) in traditional lobster fisheries off of Chance Harbour and a minor residual in herring fisheries off of Cole Point and Bay View.

My recommendation would be to proceed with 3-D modelling using the furthest point (D2)

Let me know what you think and when you would be available to have a chat with Stantec on this.

20(1)

.....

20(1)

Conseiller Principal, Procédés et Environnement /
Principal Consultant, Process and Environment

KSH Consulting
1 Place Alexis Nihon
3400 de Maisonneuve O., bureau 1500
Montréal (Québec) Canada H3Z 3B8
T 20(1) **M** 20(1) **F** 514.939.5266

www.ksh.ca

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mail in our communications with you.

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APPENDIX H-4

Introduction

Mandate

1. KSH Consulting was requested to prepare a study benchmarking Canadian effluent discharge permits from chemical pulp mills in order to assess current industrial practices in terms of effluent treatment systems performance and how they compare to proposed new limits facing the Northern Pulp Nova Scotia (NPNS) facility in New Glasgow.
2. The study is required by NPNS for their discussions with government authorities (Nova Scotia Environment) to ascertain if proposed new effluent permits for the mill are comparable and achievable given the age of the mill, technologies employed and the nature of the effluent treatment facilities at NPNS.

Background

3. The Kraft mill located on Abercrombie Point, in the town of New Glasgow NS, has been in operation since 1967. The mill produces bleached (ECF) Kraft market pulp at a current rate of ~300,000 ADt/a. At the time of construction, the Government of Nova Scotia agreed to build and operate a treatment system for the mill's process effluent, which was constructed in the western portion of an area known as Boat Harbour. The system was refurbished in 1996, at which time the mill took over operation of the system. The effluent treatment system consists of constructed sedimentation basins followed by aeration in a natural basin with baffle curtains directing flow. A large, natural final polishing/stabilization basin follows prior to release to the Northumberland Straight.
4. While the system has met federal and provincial standards since 1996, there has been pressure to return some of the natural waterways to their original state and increasingly stringent environmental regulations are being proposed that may require modifications to the system or the effluent streams that feed it to continue operating in the years to come.

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Total Suspended Solids (TSS)

1. TSS limits (along with BOD_5) are the longest established pulp and paper emission regulations on the books. From early on, even before organic load mitigation, mills would collect solids coming from their process that were found to be overloading local waterways. Mitigation has ranged from settling ponds to raked clarifiers.
2. As mills have evolved, more and more fibre (the main solid waste) has been retained in the process and sold as product instead of being lost to effluent. This has resulted in a steady reduction in TSS losses.
3. NPNS's proposed TSS daily limit of 4,100 kg/d and monthly limit of 2,460 kg/d equates to approximately 5 and 3 kg/tADt of production respectively, based on 800 ADt/d.
4. As can be seen in the following charts, this would place NPNS as the one of the most tightly restricted emitters of the mills compared for both the daily and monthly limits.
5. NPNS has been able to maintain levels just below this new limit performing at annual average levels of 3.26, 2.61 and 2.05 kg/ADt at Point C for 2011, 2012, and 2013 respectively. In fact, a marked downward trend can be seen.
6. Continued TSS compliance is in fact more difficult for NPNS since there is no final clarifier and lagoons can be prone to rising solids and upsets. Point C of the effluent treatment system also benefits from the settling effect of Boat Harbour prior to Point D, so the impact on marine environments is even less pronounced.
7. Historic data over the past two years has shown 10-15% better performance for TSS losses in the summer. This may be due in part to less solids degradation in the ASB in the winter when temperatures are lower. Seasonal differences in performance (winter to summer) are similar to those reported in the BOD section for NPNS.

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APPENDIX H-5

From: 20(1)
To:
Cc: 20(1)
Subject: Metals in Effluent
Date: April 7, 2017 9:42:31 AM
Attachments: Was ewa e_Me als - Middle Rive_ ¯ in_C and ¯ Hawk sbu y.xlsx

---

Hi,

Port Hawkesbury contacted me after our meeting yesterday. They found an old metal analysis from 2001 and forwarded it to me. I asked 20(1) to add a column in our chart for PHP. Everything in yellow is above the CCME guideline. So basically, they are just the same as us. Neither of us can meet that standard.

Cheers,

20(1)
Technical Manager
Northern Pulp Nova Scotia
20(1)

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Wastewater Metals Analysis

			Middle River	Middle River	NPNS Point C	NPNS Point C	NPNS Point C	Port Hawkesbury
Parameter (Total)	RDL	Guideline FWAL	Raw Apr 2016	Raw Jan 2016	2-15-2015	2-16-2016	2-17-2017	PHP 2001
Aluminum	5	5	420	448	2330	1710	1800	200
Antimony	2		<1	2	<2	<2	<1	<2
Arsenic	2	5	<1	<2	<2	<2	1.2	9
Barium	5		30	36	339	354	450	92
Beryllium	2		<1	<2	<2	0	<1	0
Bismuth	2		2	<2	<2	2	<2	
Boron	5	29,000	<50	7	58	61	94	<2
Cadmium	0.017	1.0,0.9	<0.010	<0.17	1.11	0.898	1.4	1.86
Chromium	1		<1	<1	3	2	2.1	2.8
Cobalt	1		<0.040	<1	<1	<1	0.67	1.3
Copper	1		<2	<1	6	5	7.5	55.6
Iron	50	300	480	367	439	718	530	1220
Lead	0.5	1	0.061	<0.5	3	2.7	2.8	8
Manganese	2		1800	70	2710	2490	2800	2510
Molybdenum	2	73	2	<2	4	2	2.7	<4
Nickel	2	25	<2	<2	5	4	2.9	7.5
Selenium	1	1	<1	<1	<1	2	<1	1.7
Silver	0.1	0.25	0.2	<0.1	0.2	0.2	0.37	<0.2
Strontium	5		30	38	163	144	160	118
Thallium	0.1	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	0.8
Tin	2			<2	<2	<2		<2
Titanium	2			9	11	14		
Uranium	0.1	33,15		<0.1	0.9	0.7		3.95
Vanadium	2		5	<2	4	5	4.8	19.9
Zinc	5	30	<5	<5	127	76	160	184
Mercury	0.026	0.026	0.026	<0.026	0.037	0.026	0.028	<0.1

All units ug/L.
Lead FWAL guideline based on hardness of 26ppm,
Nickel FWAL guideline based on hardness of 26ppm.

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APPENDIX H-6

NOVA SCOTIA
NOUVELLE-ÉCOSSE
Environment
Environnement

14/06/17

Northern Pulp Nova Scotia Corporation
PO Box 594, Station Main
New Glasgow, NS
B2H 5E8

Attn: 20(1)
General Manager

Dear 20(1):

RE: Minimum Requirements of a Receiving Water Study

Further to our meeting on June 7, 2017, at your request, the Department offers the following general guidance with respect to the terms of reference for receiving water studies and how they are used to establish end of pipe effluent discharge criteria:

A mixing zone is defined as an area of water contiguous to a point source discharge. A mixing zone is, under no circumstances, to be used as an alternative to reasonable and practical treatment. It must be designed to be as small as possible and it is only one factor to be considered in establishing effluent requirements.

The concept of mixing zones recognizes that the release of the aqueous component of adequately-treated municipal or industrial wastes to watercourses or water resources does occur. As a general principle, the use of mixing zones should be minimized and limited to conventional pollutants. The mixing zone principle does not apply to hazardous wastes or dangerous goods. Mixing zones also do not apply to bio-accumulative or persistence substances and despite the allowance of a mixing zone, effluent shall not be acutely toxic. It should be noted that in this particular case, a receiving water study must address all potential substances of concern not limited to those outlined in the Federal Pulp & Paper Effluent Regulations.

Conditions within a mixing zone must not result in irreversible environmental damage, risk to ecosystem integrity or risk to human health. Mixing zones cannot interfere with other water uses such as drinking water supply, active fisheries or recreation.

As effluent loading requirements are based on careful design, so too should mixing zones be carefully planned on a site-specific basis including consideration of water quality, seasonal streamflow and current patterns, physical factors, biotic communities and spawning areas in and adjacent to the mixing zone, nearby water uses such as public or private beaches and drinking water intakes as well as other wastewater discharges. This information should be provided to the Department.

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As general guidance in the design of mixing zones, the following range of concerns should be adequately addressed:

1. In order to protect important aquatic communities (fish, invertebrates and plants) in the vicinity of mixing zones, no conditions within the mixing zone will be permitted which:
    a. are acutely lethal to aquatic life;
    b. cause irreversible responses which could result in detrimental post-exposure effects;
    c. result in bioconcentration of toxic materials which are harmful to the organism or its consumer;
    d. attract organisms to the mixing zones, resulting in a prolonged exposure;
    e. create a barrier to the migration of fish or other aquatic life.
2. To ensure the protection of acceptable aesthetic conditions, mixing zones should not contain:
    a. materials which form objectionable deposits (e.g. scums, oil or floating debris);
    b. substances producing objectionable colour, odour, taste or turbidity;
    c. substances which produce or contribute to the production of objectionable growths of nuisance plants and animals;
    d. substances that render the mixing zone aesthetically unacceptable.
3. Mixing zones should not impinge upon existing municipal and other water supply intakes, public or private beaches or important fish spawning and/or fishing areas. Conversely, new intakes or aquatic recreation areas should not be constructed within the boundaries of existing mixing zones.
4. Mixing zones may overlap unless the combined effects exceed acceptable conditions.
5. When background water quality conditions at a proposed mixing zone site are degraded, effluent discharge requirements established must ensure, at the very least, that background water quality is not further degraded.

The Department requires enough information to ensure each of the above concerns is adequately addressed. Specifically including but not limited to:

- information about the effluent (substances of potential concern, volumes, etc.);
- information about the receiving water (physical characteristics, size, upstream and downstream water quality);
- the location of the receiving water in relation to the facility, the treatment system and the outfall (including a drawing or plan); and
- location of any nearby receptors

With respect to derivation of effluent limits, effluent requirements can be established based on treatment-technology, receiving water concerns, aquatic habitat concerns as well as community concerns including recreational uses. An important factor in the assessment is the use of the principles of assimilative capacity and mixing zone, but it is not the only factor.

The information provided to the Department should include one year's worth of effluent characterization data. For contaminants which are not considered to be designated hazardous

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contaminants, every watercourse/water resource has a definable assimilative capacity. Once the assimilative capacity of the receiving water has been determined, end of pipe discharge criteria can be calculated. Water quality considerations take precedence when contaminant discharges exceed the assimilative capacity of the receiving waters, even if the discharged loadings are within the treatment technology based effluent requirements based on the guidelines, regulations or policies. Receiving-water based effluent requirements also take precedence when ambient levels of contaminants are above acceptable levels. Biological effluent requirements may also be specified.

All effluent discharges must not be acutely lethal.

CCME has a guidance document, ***Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedure for Deriving Numerical Water Quality Objectives,*** which you can reference which may be of assistance to you. It can be obtained at the following link: http://ceqg-rcqe.ccme.ca/download/en/221 .

Should you have any questions or concerns regarding this information, please do not hesitate to contact Paul Keats, District Manager at 902-863-7600.

Regards,

Kathleen Johnson, P.Eng.
Engineering Specialist

cc: Sarah Jadot, P.Eng., Regional Engineer
Paul Keats, District Manager
Adrian Fuller, Executive Director
Frances Martin, Deputy Minister

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APPENDIX H-7

From: 20(1)
To: 20(1) 20(1) 20(1) Porter, Gary S
Subject: Open houses - ideas for story boards
Date: November 15, 2017 6:57:49 PM
Attachments: image002.png

Hi All,

This is a combination of things that Mike and I have put together as things we should think about addressing through the EA process:

TV screens for 2-D videos. How to present at the meeting?

3 D story board – show effluent plume in relation the background mixing zone and point of outfall for major parameters

EEM summary

History of effluent – existing limits and data over the years (maybe production or maybe express in units/t)

History of effluent – Canso Chemicals, ECF bleaching

History of effluent – how BH came about, legal and historical timelines and possible etc upgrades over the years

Metals in effluent – recent facebook questions (NSE has a piece of this)

Water quality of middle river – not drinking water standards, has color is Michelin effluent. Spills over to harbour if not used.

Effluent parameters – difference from today. Jars made up for color (show historical) and possibly jars made up for TSS. – have several sets of jars made up

Cartoon diagram of AST system – dynamic model showing water going through it.

Aerial maps of areas

Air emissions - difference in odour from existing (septic settling stage, etc), burning of sludge will have to be identified. Possibly get samples of sludge from Port Hawkesbury.

Possibly bring microscope.

History of kraft mills in North America – details of what their systems are.

Ask Domtar is we can use their pictures

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Should we bring lobster taste test studies from the 90s?

Where are the moreturium areas for shellfish in the strait?

Background samples of water – GHD ??

No backflow into BH after return to tidal

Show layout – federal water vs provincial water

In mill processes - o2 delig & process water cooling towers (non-contact & water recycle)

Show that fresh water goes over dam and into strait whether or not it goes through the mill or not (out at lighthouse beach). Concern over big fresh water influx.

Michelin effluent is our influent

Fisherman talking about lobster larvae and 30 ft depth that they float and then sink.

Explain toxicity testing – usually means low oxygen & explain how test is done with fish (how to visualize)

Biologist question about adding heat to the strait – RWS less than 1 C (will be higher temp than today however)

Fisherman concerned about stirring up Mercury while we build near the Canso property

Goldboro experience - increase in lobster habitat

Fisherman worried about build up of bottom sludge – specific reference to scallop fishing

Biologist worried about low water circulation in the strait – bottom warming (explain large study area)

Fisherman worried about contamination in BH now and when opened up – mixing up the 2 projects

Worried about oxygen in the effluent – dead zone for fish

Why is new AST better than ASB?

Facebook reference to Paul Klopping Supreme Court appeal letter – odour issues with ASTs too

Bring piece of HDPE outfall pipe – comparison to fiberglass line current

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Fisherman concern about difference between PHP and NPNS is that strait of canso is ice fee and Northumberland is not – will effluent get trapped and not flow? How does ice cover affect outfall?

20(1) – right now mill has BH as large buffer zone, so effluent at point C is not comparable to new effluent. Need to compare to Point D or speak to difference between current point C and D.

20(1) - Why not closed loop system? Offering up a cheap solution, not a good solution

20(1) has 2012 KSH study that says AST quality not significantly different than ASB

20(1) – all toxic sludge will now be burned in the PB and end up as air emissions.

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20(1)
Technical Manager
Northern Pulp Nova Scotia
P:
C: 20(1)
Paper Excellence Canada
www.paperexcellence.com

Excellence… It is in our name, our vision, and our values

Since its inaugural year in 2010, Paper Excellence Canada (PEC) has evolved from a new entrant as an exporter to a leader in Canada's value-added natural resources (pulp) industry. Achieving sales in excess of $1 billion through its seven Canadian mills, PEC has accomplished this level of sales volume through innovation and best practices in all areas with a commitment to deliver premium quality products to all customers. Through its Richmond-based headquarters which hosts an employee base of 100 supporting over 2300 employees in Canada and Europe, PEC continues to lead by example operating through economic and environmentally sustainable best practices.

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APPENDIX H-8

From: 20(1)
To: 20(1)
Cc: 20(1) dillon.ca; Porter, Gary S; 20(1) 20(1) 20(1)
Subject: Re: Media Inquiry
Date: November 17, 2017 12:45:51 PM

Article is up from CBC

http://www.cbc.ca/news/canada/prince-edward-island/pei-peifa-wastewater-treatment-plant-1.4406788

20(1)
Dillon Consulting Limited
137 Chain Lake Drive Suite 100
Halifax, Nova Scotia, B3S 1B3
T - 20(1)
F - 902.450.2008
M - 902.240.7311
20(1) dillon.ca
www.dillon.ca

Please consider the environment before printing this email

On Wed, Nov 15, 2017 at 7:03 PM, 20(1) 20(1) @northernpulp.com> wrote:

FYI. Late afternoon media inquiry from CBC PEI. Original questions plus reporters follow up below.
20(1)

20(1)
Communications Director
Paper Excellence
Northern Pulp Nova Scotia Corporation
20(1)
20(1) (cell)
260 Granton Abercrombie Branch Rd
Abercrombie, NS B2H 5C7

Begin forwarded message:

From: "20(1) paperexcellence.com" <20(1) paperexcellence.com>
Date: November 15, 2017 at 3:59:38 PM AST
To: 20(1) @CBC.CA"
20(1) @CBC.CA>
Subject: Re: Media Inquiry

Hi 20(1)
See updated responses to your additional questions below
20(1)

Thanks for getting back to me. I do have a few more questions.

1. Would the new facility fall under the current lease with the province?

The facility will be built on the mill site.

2. When would you expect a formal application to be made to the province for the plans?
Dillon Consulting has been hired to assist in the Environmental Assessment (EA) process. There is much work to be completed before the application can be filed. One of the first steps will be public consultations.

3. There are a lot of concerned fishermen that are worried about how this new treatment facility will affect the water in the Northumberland Strait. Are they right to be concerned?
Treated effluent has been flowing through Boat Harbour and into the Northumberland Strait for over 50 years. The new treatment facility and diffused outfall will reduce the impact on the Strait. For example, the new outfall is designed to meet the Canadian Council of Ministers of the Environment (CCME) guidelines for effluent discharges which stipulate that all effluent parameters of concern should meet background concentrations of the receiving water in less than 100 metres from the outfall.

4. If the plans are rejected by the province, what is the next step for the company?
We are working cooperatively with the Government of Nova Scotia to design a treatment facility that meets all environmental requirements.

On Wed, Nov 15, 2017 at 2:54 PM, <20(1) paperexcellence.com> wrote:
Hello 20(1)

Thank you for your email. Please see below bulleted information answering your query. Please feel free to email me if you have further specific questions and deadline you are working with. I am in meetings for the remainder of the day but will be able to access email periodically.

You may attribute the response to 20(1) Director of Communications, Paper Excellence
Kindly
20(1)

-KSH Solutions Inc has recently completed preliminary engineering where all available technologies were reviewed. Activated Sludge Treatment (AST) was recommended as the best and most reliable process for treatment for the new facility to be located on existing mill property.

-The proposed new treatment system will be a modern AST system that mills and other facilities (industrial, municipal, etcetera) throughout the world have in place.

-The current effluent treatment system is an ASB system. In North American Kraft mills, there are predominantly two systems used to biologically treat industrial wastewater, the aerated stabilization basin (ASB or aerated lagoon) and the activated sludge system (AST). These two systems have far more similarities than differences. Both processes are based on the utilization of dissolved oxygen by microorganisms in converting organic and inorganic matter into a settleable form. The ASB process uses a large aerated lagoon and long retention times (days) whilst the AST process treats the wastewater in hours and involves two stages – an aeration stage and a clarification and recycle stage. AST systems generally operate at higher removal efficiencies as compared to ASB systems.

-In early October, Dillon Consulting of Halifax was contracted to provide professional guidance throughout the entire Environmental Assessment process, including creation of the Environmental Impact Assessment (EIA) project registration document.

-Presentation of all scientific information as well as documentation of public and stakeholder concerns, complete with how they will be addressed, are an important and vital part of the consultation process and EIA document.

-The effluent pipeline (outfall) will be designed with an engineered diffuser which is also an improvement from the current system.

-The new outfall is designed to meet the Canadian Council of Ministers of the Environment (CCME) guidelines for effluent discharges which stipulate that all effluent parameters of concern should meet background concentrations of the receiving water in less than 100 metres from the outfall.

-Construction would begin upon registration and approval of the project by Nova Scotia Environment.

From: 20(1) [redacted] @CBC.CA]
Sent: Wednesday, November 15, 2017 1:50:37 PM
To: Media
Subject: Boat Harbour Plans
Auto forwarded by a Rule

Good afternoon, I am working on a story about the proposed plans for the new

wastewater treatment facility in Pictou, N.S.

I am hoping to speak to someone from Northern Pulp about how the wastewater system will work, and why that location and type of treatment system was chosen as well as what the next steps in the application process would be.

Feel free to shoot me an email or give me a call on my cell, the number is listed below.

Thanks very much.

--
20(1)
Video Journalist/ Web Writer CBC PEI
20(1)
20(1)@cbc.ca

--
20(1)
Video Journalist/ Web Writer CBC PEI
20(1)
20(1)@cbc.ca

This message is directed in confidence solely to the person(s) named above and may contain privileged, confidential or private information which is not to be disclosed. If you are not the addressee or an authorized representative thereof, please contact the undersigned and then destroy this message.

Ce message est destiné uniquement aux personnes indiquées dans l'entête et peut contenir une information privilégiée, confidentielle ou privée et ne pouvant être divulguée. Si vous n'êtes pas le destinataire de ce message ou une personne autorisée à le recevoir, veuillez communiquer avec le soussigné et ensuite détruire ce message.

APPENDIX H-9

CBC

Northern Pulp's plans for pipeline, effluent treatment plant now public

Environment minister has until March 29 to decide whether plan is acceptable

Jean Laroche · CBC News · Posted: Feb 07, 2019 1:15 PM AT | Last Updated: February 7

Northern Pulp has released details of its plan to build a new effluent treatment plant and discharge pipe. (Jeorge Sadi/CBC)

Nova Scotians now have access to the details of Northern Pulp's controversial plan to build a new effluent treatment plant and discharge pipeline that will empty into the Northumberland Strait.

The Pictou County pulp mill's 614-page document, including 18 appendices, was filed with Nova Scotia's Environment Department a week ago and was posted Thursday on the

department's website.

The plan put forward to the Environment Department is to build a "biological activated sludge" treatment facility purchased from a Paris-based multinational corporation called Veolia Water Technologies.

The corporate website says Veolia Water "specializes in water treatment solutions and provides the complete range of services required to design, build, maintain and upgrade water and wastewater treatment facilities for industrial clients and public authorities."

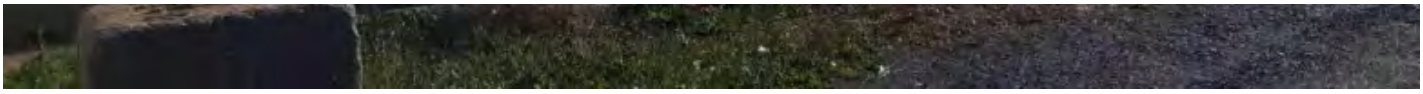
Nova Scotia Environment Minister Margaret Miller said the nearly 2,000-page submission was not a surprise.

"I think it's pretty much what the department was expecting," she said.

Safe drinking water a concern

The treatment facility would be located on Northern Pulp property not far from the existing plant.

The 15.5-kilometre pipeline would run from the new facility along the shoulder of Highway 106 to Caribou before entering Caribou harbour next to the Northumberland Ferries terminal. From there, it would discharge roughly four kilometres into the Northumberland Strait.



A boat doing survey work for the proposed Northern Pulp effluent pipe is tied to the wharf in Pictou, N.S. (Submitted by Ben Anderson)

That route is a concern for the town of Pictou. Mayor Jim Ryan said it means wastewater will be piped over the town's main watershed.

"This particular issue is about safe drinking water," he said in a telephone interview Thursday.

Ryan said he told Northern Pulp general manager Bruce Chapman in November that any plans for a pipe that carries treated or untreated effluent through the watershed would be unacceptable to the town.

Work would take 21 months

Northern Pulp's plan to discharge treated effluent into the strait has also been controversial.

Thousands protested last July over concerns it would hurt the environment. Fishermen had also prevented a survey crew from doing work for the company, but agreed last month to a court injunction ordering them not interfere.

Northern Pulp protesters outside a Supreme Court injunction hearing late last year. (Preston Mulligan/CBC)

Company owners have also sought a one-year extension of the provincial law requiring the mill's current treatment facility in Boat Harbour to close in January 2020. The company has argued it needs more time to build a replacement, but Premier Stephen McNeil has refused to extend the deadline.

According to company documents, the plan is to complete the work within 21 months, starting this spring. That means a working system would not be in place until 11 months — at the earliest — after the provincial government is legally mandated to turn off the tap to the provincially owned treatment plant.

Pipe would mostly be buried

The company has proposed using a polyethylene pipe that's 90 centimetres in diameter to carry the treated effluent from the plant to the dispersal site.

"The terminus of the effluent pipe consists of an outfall location with the three-port diffuser, situated at the depth of approximately 20 [metres]," says the project description.

The plan is to bury the pipe along most of the route, but the company is proposing suspending it to the exterior of the bridge that crosses the Pictou Causeway "due to the limited roadway width."

"The exposed area will be protected from damage by existing guard rails," says the document.

Northern Pulp's proposed route for the effluent pipe would go from a new treatment plant into the Northumberland Strait. (Nic Meloney/CBC)

The company has promised to mark the pipeline location with signs and post markings at public and private roads and water crossings. The system will also need a pumping station which the company states "will operate in a similar manner to municipal pumping station."

Serious impact on lobster 'highly unlikely'

The company said it looked at alternatives to the plan it has submitted for provincial approval, including simply shutting down or creating a closed wastewater recovery system, but none was feasible.

An indication of how much the company wants an extension is the people it has hired to lobby the governing Liberals on its behalf: Kirby McVicar, McNeil's former chief of staff; Stephen Moore, McNeil's former director of communications; and Trevor Floyd, a one-time executive assistant to Health Minister Randy Delorey when he held the environment portfolio.

- **Premier unmoved by Northern Pulp's ask for more time to close waste water facility**

As for concerns expressed by opponents to the plan, the company has included a response to 38 questions or comments, ranging from the possible harm to lobster stocks to heavy metal

contamination and the environmental review process.

The company stated "it is highly unlikely that there will be serious impact on lobster," and that heavy metals occurred naturally in the environment "and are released to the environment from a range of human and natural sources."

Public invited to submit comments

As for the review process, Northern Pulp noted it was a provincial process but the Canadian Environmental Assessment Agency would review the company's application to determine whether a federal environmental assessment was necessary.

Nova Scotia Environment Minister Margaret Miller has until March 29 to make a decision on Northern Pulp's plan. (CBC)

The public now has until March 9 to digest the information and submit their comments, either by mail or using an online form.

Miller has until March 29 to decide if the project will be granted conditional environmental assessment approval. Officials in her department will sift through the material to ensure it provides a complete picture of the plan and its potential impact on the environment.

If additional work is needed, they can ask the company to provide it. But Miller said the consultation period would not be extended beyond the 30 days if that were to happen.

She acknowledged the existing file could be a challenge for Nova Scotians to assess.

"I don't know that the public is really going to be able to fully digest everything that's been submitted."

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Visitez Radio-Canada.ca

APPENDIX H-10

From: 20(1)
To: 20(1) 20(1) 20(1) 20(1) 20(1) 20(1) 20(1) Porter, Gary S; 20(1) 20(1) 20(1) 20(1)
Cc: 176461
Subject: RE: Mill proposed slides - story we need to tell (updated with people in charge of slide preparation
Date: November 30, 2017 4:59:18 PM
Attachments: image002.png
image007.png
image008.png

Hi All – I am pairing these down to a story board, so don't put any time into these yet.

Northern Pulp Nova Scotia
P:
C:
Paper Excellence Canada
www.paperexcellence.com

Excellence… It is in our name, our vision, and our values

Since its inaugural year in 2010, Paper Excellence Canada (PEC) has evolved from a new entrant as an exporter to a leader in Canada's value-added natural resources (pulp) industry. Achieving sales in excess of $1 billion through its seven Canadian mills, PEC has accomplished this level of sales volume through innovation and best practices in all areas with a commitment to deliver premium quality products to all customers. Through its Richmond-based headquarters which hosts an employee base of 100 supporting over 2300 employees in Canada and Europe, PEC continues to lead by example operating through economic and environmentally sustainable best practices.

From: 20(1) [mailto:20(1) ksh.ca]
Sent: Thursday, November 30, 2017 2:52 PM
To: 20(1) <20(1) northernpulp.com>; 20(1) <20(1) dillon.ca>; 20(1) <20(1) dillon.ca>; 20(1) 20(1) r@northernpulp.com>; 20(1) <20(1) dillon.ca>; 20(1) <20(1) northernpulp.com>; 20(1) <20(1) northernpulp.com>; Gary Porter <gary.s.porter@novascotia.ca>; 20(1) <20(1) raycon.ca>; 20(1) <20(1) dillon.ca>; 20(1) <20(1) dillon.ca>; 20(1) 20(1) @dillon.ca>
Cc: 176461 <176461@dillon.ca>
Subject: RE: Mill proposed slides - story we need to tell (updated with people in charge of slide preparation

Hi 20(1)

Here's what I was able to put together, based on the comments in your e-mail. It's all under the same file (the zero-effluent file I sent yesterday), which is dated today and is in PowerPoint format (easier to extract)

I included some additional info that could be useful to others as well.

Let me know if you need anything else

20(1)

Intended for Public Use

.....

20(1)
Conseiller Principal, Procédés et Environnement /
Principal Consultant, Process and Environment

KSH Consulting
1 Place Alexis Nihon
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Montréal (Québec) Canada H3Z 3B8
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KSH

www.ksh.ca

From: 20(1) [mailto:20(1) northernpulp.com]
Sent: November 30, 2017 8:53 AM
To: 20(1) 20(1) 20(1) 20(1) 20(1) 20(1) Gary Porter; 20(1) 20(1) 20(1) 20(1) 20(1)
Cc: 176461
Subject: Mill proposed slides - story we need to tell (updated with people in charge of slide preparation

Hi – please see additional notes below.

20(1)
Technical Manager
Northern Pulp Nova Scotia
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From: 20(1)
Sent: Wednesday, November 29, 2017 8:34 PM
To: 20(1) <20(1) dillon.ca>; 20(1) <20(1) dillon.ca>; 20(1) <20(1) 20(1) <20(1) dillon.ca>; 20(1) <20(1) northernpulp.com>; 20(1) <20(1) northernpulp.com>; Gary Porter <gary.s.porter@novascotia.ca>; 20(1) <20(1) raycon.ca>; 20(1)

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<20(1) dillon.ca>; 20(1) <20(1) dillon.ca>; 20(1) <20(1) @dillon.ca>
Cc: 176461 <176461@dillon.ca>
Subject: Mill proposed slides - story we need to tell

This is the story I think we need to tell:

Simplified description of EA process – Class I and II (show timeline schematic on handouts that ends in June/July 2018, make a second schematic that starts at Registration and ends at decision and show steps or milestones, point out that other agencies involved (DNR, DFO, trans, ECCC) not just NSE. (Dillon)

What is effluent? Why treat it? What is in it? (20(1)

Map of existing ETC – point out pipeline, current process equipment and dam and outfall to Pictou Road (Dillon)

Water supply to the mill – aerial picture (attached) – will explain 3 rivers running to harbour, Michelin and NPNS water supply, unused water spills over dam, RV Anderson report on sustainability (incredible # of people worried we are going to dilute the Strait with fresh water – they need to know it goes there anyway) – (Dillon to identify 3 rivers, dam, pumping station, causeway underflow, Michelin, NPNS and existing and new outfall on the map) (mill– sample bottle and talking points)

- Sample bottle of color, doesn't meet CCME drinking water standards.

Options considered – how did we pick AST? BAETA methodology. Why not zero effluent, table (summary) of North American systems who has ASB, AST and marine or FW discharges? no mills in NA running anything else. Speak to Europe and asia . Closed loop build up of chloride in our boilers, corrosion control – cathodic protection on your boats. (20(1) to provide)

In mill changes to support ETF – O2 delig and cooling tower slide (and picture of CT) – run seasonally only to reduce summer cooling water flow, RWS did not consider O2 delig improved quality, not sure of start-up and commissioning times, ETC more conservatively designed for extra aeration. Cooling towers use more fresh water due to evaporation. Water and effluent flows not equal. (20(1) – moved after why we picked AST, improvement to support new AST)

New system – 3 pics - block diagram (20(1) aerial layout and pipeline aerial layout (Dillon 2 aerials) – point out that old pipeline was untreated and new pipeline is after treatment.

Differences between AST and ASB – why better process. more modern, confidence in best system. 20(1))

RWS - 30 day lunar cycle July 2016 – most challenging month for river inflow (conservative case) – show map of study area from stantec report. High effluent loading for 30 days straight with no biological degredation. (Dillon)

Why outfall selected where it was? Locations considered in RWS – both inside and outside harbour

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Inside harbour could lead to build up of nutrients (nitrogen and phosphorous) – eutrophication. Had to be far enough from entrance to BH to ensure no eutrophication there either. (Dillon)

Design of line – marine geotech, ROV to confirm path not impacting sensitive habitat or marine protected areas. Picture or sample of HDPE pipeline for thickness. Rock mattress, diameter of line, 1 m estimated armour stone cover, create habitat. Why we show a corridor, not a line. Questions about top of line being hazard to navigation – someone said 9 ft minimum at entrance to harbour at low tide – check. Show we are OK? (Dillon)

Design of the diffuser – pictures of diffuser (schematic and photograph - attached), (Dillon)

6 ports chosen – modelled 1, 3 and 6

Meet guidelines for CCME – table of parameters and distances (include 20(1) note on salinity)

Aerial showing mixing zone

stantec sensitivity maps considered – show?

History of Effluent Quality – time/project/impact/effluent sample bottles. Last line will be predictions for the project (NPNS to provide mark up, Dillon to draw up) including 1992 and 1997 changes. Possibly by increments of decades. How do we explain difference between in and out of BH? ASB data from 2009 to present is into BH, data before 2009 is out of BH. Some say effluent quality will be worse than today because of all the polishing that is happening across the BH basin – and they are correct to some extent.

Summary of EEMs – chart of year/study/result (not sure if this is a good idea or not?) 20(1)

Effluent temperature – hotter than now (BH big basin provides a lot of natural cooling today). Give temperatures and explain CCME meeting 1C guideline (0.2 or 0.3 in 100 m this is in July when ocean the warmest. 3 dimensional plume. Mixing zone above the benthic layer. Add Table from Stantec report showing 0.2 C increase. (Dillon)

Solids – concern about large amount of solids (greater than 1000 kg/d). GUY – what percentage of solids is organic or bug bodies? Compare future to current – speak of high solids in history (especially pre 1990s). One of lower mills in Canada. Concern over build-up of bottom sludge and scallop fishing. 20(1) – will we speak to odour m??

Metals/Dioxans and Furans – don't know what to do with this. How to handle questions around burning of sludge that all other mills do? Are municipal ETC's burning sludge? (Dillon) metals from wood – also burned in wood stoves.

List EA studies completed, ongoing and planned. (Dillon)

Like the "anticipated change chart" in LaFarge Cement EA also Irving EA – could we make same? Include positive and negative and things that stay the same – odour, sludge burn vs landfill, color

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and organic improvements, solids about same, rock cover, energy reduction, less CO2 emissions, economic, etc. – work on this together on Friday

Four studies to share: Timeframe?

1. RV Anderson – Middle River Sustainability
2. KSH Phase I
3. KSH Phase II ??
4. Stantec RWS

To add to frequently asked questions:

Is dilution the solution to pollution for Northern Pulp? Industry standard limits as well as current PPER limits are mass-based (ex. kg/day) and not based on volume. Therefore adding more fresh water to the effluent does not make effluent limits easier to meet. The RWS was conducted at design flow. Reducing effluent flow results in an improvement in meeting CCME guidelines compare to the higher design flow. Therefore, there is no benefit to adding dilution to the effluent.

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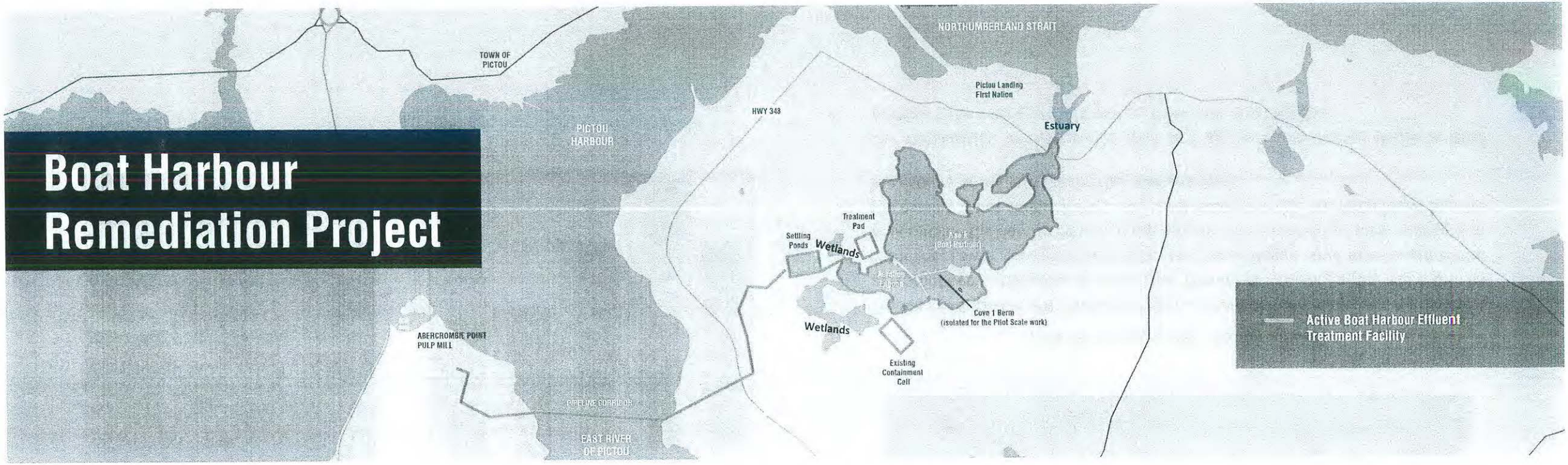
APPENDIX H-11

Boat Harbour Remediation Project



Boat Harbour Sludge – Our Problem

What contaminants are in Boat Harbour?

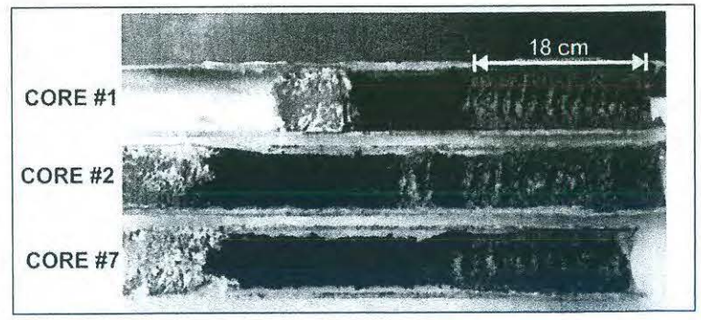
A layer of contaminated sludge has settled on top of the Boat Harbour bottom. This sludge has been accumulating since 1967. It has been sampled many times over the years. A full suite of testing was completed in 2017 which has confirmed the contaminants in the sludge. Over time, the contaminants have not changed.

We know the sludge contains:

- Dioxins and furans, the principal contaminants of concern are carcinogens which are residues of industrial processes
- Metals such as mercury, cadmium and zinc, which are residues of industrial processes
- Polycyclic aromatic hydrocarbons (PAHs), which can be produced by incomplete combustion of fossil fuels in engines and boilers or from forest fires
- Total petroleum hydrocarbons (TPH), a term used for any mixture of hydrocarbons that are found in crude oil and petroleum products
- Volatile organic compounds (VOCs), include human made residues from industrial processes and naturally occurring chemical compounds.

The contaminated sludge is generally less than a foot, or 30 centimeters, thick and is black in colour while the underlying marine sediment is brownish gray and is not contaminated.

The wetlands above Boat Harbour have also been impacted from the early years of Mill operations and contains contaminated sediments.



This image shows several core samples taken from Boat Harbour, the black contaminated sludge is clearly visible; the brownish gray is the clean Pre-industrial marine sediment and, the bentonite is a clay product put in the core during sampling as a plug - **Note:** The figure shows from left to right bentonite plug, black contaminated sludge, brownish gray pre-industrial marine sediment

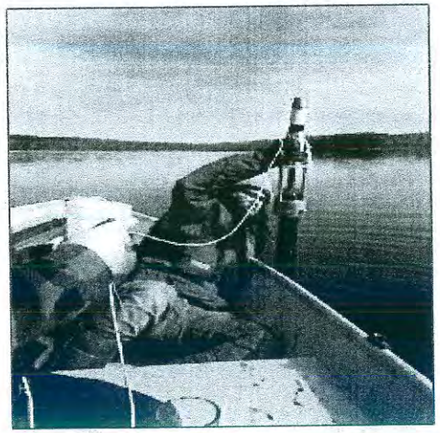
Boat Harbour Remediation Project

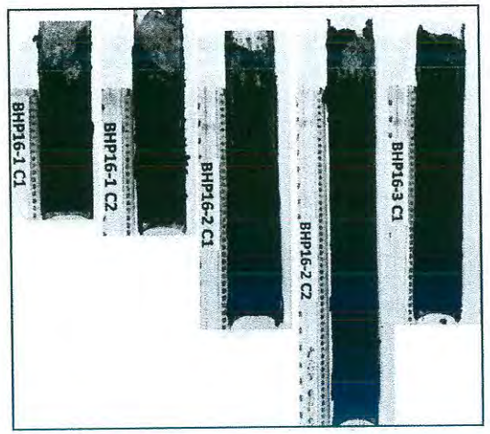
How much is there?

The contaminated sludge in Boat Harbour is of a soft, wet nature and is unevenly distributed along the harbour bottom. We have estimated the volume of material to be removed from Boat Harbour to be as much as 1,000,000 cubic meters. This number includes some of the marine sediment on the harbour bottom that will accompany removal of the contaminated sludge. To effectively remove the contaminated sludge, we need to take some of the marine sediment. Once the material is removed it will be treated, dewatered and its volume will be significantly reduced to about 500,000 cubic meters.

Sampling procedure

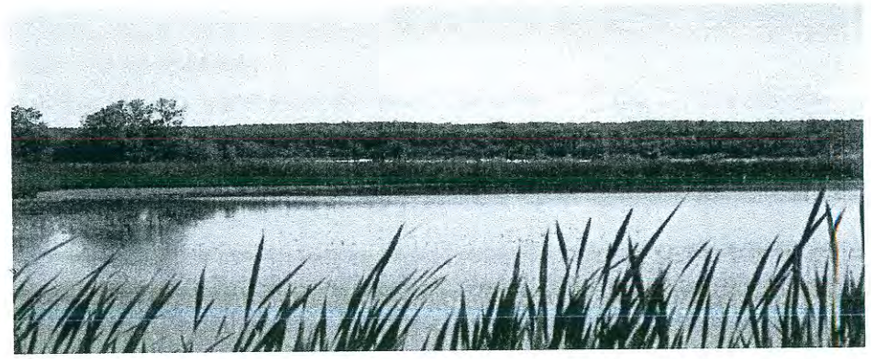
All sampling followed scientific protocols based upon generally accepted procedures. These protocols were vetted with Dr. Ian Spooner, a geoscientist and sampling expert from Acadia University.





The wetlands

Twenty-five wetland areas are around Boat Harbour and are identified as marsh and/or swamp complexes. One wetland of about 36 hectares in area, pictured below, is situated near the existing settling ponds and was impacted by early years of effluent discharge. The remediation planning is considering either removal of all the impacted sediments or a risk-based approach which may involve removal of areas of higher contamination and allowing monitoring and natural attenuation (treatment) for the balance of the wetland.



How far has the contamination spread?

Studies conducted in 2017 show that the contaminated sediments are, for the most part, confined to the active Boat Harbour Effluent Treatment Facility and within its shoreline. Lower concentrations of contaminated sludge have been found in the area outside the dam structure, in the estuary. The underlying marine sediment in the estuary is not contaminated. No contaminated sludge has been found beyond the estuary or out into the Northumberland Strait.

Our remediation will ensure we deal with all the contaminated sludge in Boat Harbour before we allow tidal waters to re-enter Boat Harbour.

APPENDIX H-12

Chapter 4: Environment – Environmental Assessments

Overall Conclusion:

- Poor monitoring of projects increases risks to the environment
- Monitoring of terms and conditions of project approvals is weak
- Department not evaluating whether terms and conditions are working
- Department meeting legislative requirements for issuing approvals

Why we did this audit:

- Protecting the environment is important to Nova Scotians
- Environmental impacts should be known before a project begins
- Steps should be taken to limit environmental impacts of projects
- Projects should be monitored to ensure the environment is protected

What we found in our audit:

Monitoring of approved projects

- Monitoring not done for almost half the project terms and conditions we tested
- Department not appropriately recording all approved projects in tracking system
- Department hasn't assessed if terms and conditions have decreased environmental risks
- Department taking steps to improve monitoring

Setting terms and conditions for project approval

- Some terms and conditions lack details such as deadlines and reporting requirements
- Approvals issued without consulting inspectors who know risks
- Lack of discussion with project owners on understanding terms and conditions
- Department doesn't follow up with project reviewers to ensure responses provided

Approving project applications

- Applications for approvals contained information required by legislation
- Minister given all required information to make project approval decision
- Terms and conditions of approvals can reduce risks, but are less useful because of poor monitoring

Recommendations at a Glance

Recommendation 4.1
Environment should develop and implement a process for entering approved projects and the associated terms and conditions into the Department's tracking system to help ensure regular monitoring is completed.

Recommendation 4.2
Environment should regularly review whether standard terms and conditions of approved projects are effective at addressing identified risks.

Recommendation 4.3
Environment should develop terms and conditions for approved projects in consultation with the inspectors responsible for ensuring they are met. Terms and conditions should include clear timeframes for completion and requirements to provide documentation to confirm terms and conditions have been satisfied.

Recommendation 4.4
Environment should provide relevant draft terms and conditions of approved projects that involve other departments to the respective departments for review and confirmation of their responsibility under the terms and conditions.

Recommendation 4.5
Environment should meet with project owners to discuss the terms and conditions once projects are approved. There should also be regular meetings between Nova Scotia Environment and project owners to discuss the status of terms and conditions of approved projects.

Recommendation 4.6
Environment should document and implement a process for using government reviewers on environmental assessment applications. The process should include how reviewers are selected, the Department's expectations of reviewers and a follow-up process if responses are not provided by the deadline.

Recommendation 4.7
Environment should complete and document a review of information sent to the Minister of Environment for deciding on whether to approve or reject a project.

4 Environment: Environmental Assessments

Background

4.1 Nova Scotia Environment uses environmental assessments to identify potential negative environmental impacts of proposed projects before they begin. The goal is to approve sustainable projects while also promoting the protection and appropriate use of the environment. The Minister of Environment decides whether a project can proceed if the results of the assessment determine the potential impacts can be properly managed.

4.2 An environmental assessment is not required for every proposed project. In Nova Scotia, the Environmental Assessment Regulations list the types of projects that require an environmental assessment. Projects requiring an environmental assessment can include wind farms, quarries, pipelines and energy facilities. From 2013 to 2016, 53 of 54 environmental assessments conducted were approved.

4.3 Terms and conditions that project owners must meet are attached to project approvals. The purpose of these is to address environmental risks identified through the assessment process and ensure steps are taken to reduce the impact of the project on the environment. A typical approval includes approximately 30 terms and conditions such as monitoring programs for wildlife, habitat and groundwater well surveys. Nova Scotia Environment is responsible for ensuring project owners are complying with the terms and conditions of the approval and determining whether risks to the environment are being reduced.

4.4 An environmental assessment approval allows a project owner to proceed with the proposed project. However, projects may not immediately start when the approval is received and for some types of projects, additional approvals, such as industrial approval or wetland approval issued by Nova Scotia Environment, are needed before the project can begin.

Significant Audit Observations

Monitoring of Environmental Assessment Approvals

Terms and conditions are not monitored

4.5 Nova Scotia Environment is not monitoring terms and conditions attached to approved projects. Terms and conditions are future actions added to

approved projects to address risks projects pose to the environment. These can include various wildlife and habit monitoring programs, or restricting construction during animal breeding seasons. Failure to properly monitor compliance with these requirements increases the risk that project owners are not protecting the environment. Without monitoring, Nova Scotia Environment does not know if the terms and conditions of approved projects are effective in reducing impacts on the environment.

4.6 We reviewed a sample of 22 approved projects which contained 672 terms and conditions. We then selected two to three terms and conditions from each approved project to determine if Nova Scotia Environment had evidence to confirm the term and condition had been satisfied. In total, we examined 53 of the 672 terms and conditions identified. For 23, the Department did not confirm the term and condition had been satisfied. For example, Nova Scotia Environment did not have evidence to confirm requirements such as groundwater well and wildlife surveys were completed by the project owner or work was completed outside of animal breeding seasons.

List of approved projects and terms and conditions not complete

4.7 Nova Scotia Environment did not record approved projects and their associated terms and conditions in its electronic tracking system. This meant inspectors were not assigned responsibility for monitoring terms and conditions of approved projects and were unable to take advantage of system features that help in monitoring. Features include reminders of when inspections and audits are due, and allows managers to monitor the work of inspectors.

4.8 Management uses the information included in the tracking system to ensure the required monitoring is completed. If approved projects are not in the tracking system, managers do not have access to complete information and may not know if terms and conditions are properly monitored.

4.9 Other approvals, such as industrial and wetland approvals issued by the Department, are automatically loaded into the Department's tracking system and assigned to an inspector. One division within Nova Scotia Environment is responsible for approving projects while another division oversees whether project owners are satisfying the terms and conditions of approved projects. Once the approval is issued, it must be manually entered by the division responsible for monitoring project owners for compliance with the terms and conditions. However, this did not happen.

4.10 Nova Scotia Environment conducted an internal review in 2015, finding that only 75 of the 276 environmental assessment approvals issued between 1989 and 2015 had been recorded in the tracking system. They also concluded for almost all the approved projects entered in the tracking system, the terms and conditions of the approval were not included. Until the Department identified

this issue there was nearly no monitoring of the terms and conditions attached to approved projects.

4.11 Nova Scotia Environment has worked to address these issues, but our work found that there are still problems. Four of the 22 approved projects we examined were not recorded in the tracking system. For 15 of the remaining 18 approvals, the terms and conditions were not added to the tracking system in a way which allowed the inspectors to use the system features for monitoring.

4.12 Information on terms and conditions was not stored in a single file for each approved project, making it difficult to confirm if terms and conditions had been met. When completing our work, we often had to look in several different locations to determine if terms and conditions had been satisfied.

4.13 For example, we identified several cases in which the project owner provided requirements such as wildlife surveys and confirmation of site restoration insurance to staff at Nova Scotia Environment or other government departments, but it was not passed on to the inspectors responsible for monitoring the approval. Inspectors did not know the information was provided nor did they follow up with the project owners to request the information.

4.14 All information related to the terms and conditions of approved projects should be kept in a central location so it can be quickly determined which ones have been satisfied and those that still require monitoring.

Recommendation 4.1
Environment should develop and implement a process for entering approved projects and the associated terms and conditions into the Department's tracking system to help ensure regular monitoring is completed.

Environment Response: *Agree. In February 2017, NSE implemented a System of Notification and Approval Processing (SNAP). Going forward, approvals will be captured in the system to enable terms and conditions to be tracked. Timing: Currently underway*

Regular assessments of terms and conditions not completed

4.15 Neither the Department nor project owners completed the required assessments for any of the projects we examined. Without this reporting, Nova Scotia Environment does not have the necessary information to ensure terms and conditions of approved projects were satisfied and environmental risks were properly managed.

4.16 Nova Scotia Environment's documented process for monitoring the terms and conditions of approved projects includes:

- a Department assessment of whether terms and conditions are met and effective at reducing risk; and
- a review of the project owner's assessment of whether terms and conditions are met along with comments or suggestions for future environmental assessments.

4.17 Nova Scotia Environment's evaluation of the effectiveness of the terms and conditions of approved projects for reducing risks to the environment is especially important. This evaluation considers things such as the results of water or wildlife monitoring completed by the project owner, results of Departmental inspections, and complaints received against the project. Without this information, the Department may not be aware of the need for additional monitoring or changes to the terms and conditions. This process also provides information that can be used by the Department when approving future projects.

4.18 Nova Scotia Environment staff acknowledged this process is not followed and noted it needs to be updated since it was developed and implemented in 2002. While we recognize the process is old and there have been changes within the Department since 2002, regularly assessing the status and effectiveness of the terms and conditions of approved projects is an important practice that should be completed.

Recommendation 4.2
Environment should regularly review whether standard terms and conditions of approved projects are effective at addressing identified risks.

Environment Response: *Agree. We have committed to reviewing and updating the Internal Guide to EA Follow-up Procedures. This guide will establish procedures for reviewing Environmental Assessment terms and conditions to ensure enforceability leading to better compliance. Timing: 2017-18*

Approval of Projects

Wording of terms and conditions attached to approvals not clear

4.19 Applications are reviewed by Nova Scotia Environment to identify risks to the environment posed by the project. Approvals are subject to owners satisfying the terms and conditions included with it. If terms and conditions are not properly developed it is possible risks to the environment may go unaddressed.

4.20 The terms and conditions attached to approved projects were not always clear and well defined. We found problems with 11 of the 53 terms and conditions we examined. Specific issues included no established timelines for when the project owner must comply, no requirement to submit documentation to confirm a term and condition has been satisfied, and no indication of who the supporting documentation must be submitted to.

4.21 For example, one term and condition stated *"The Approval Holder must develop a turbine lighting plan in consultation with CWS [Canadian Wildlife Services] and Transport Canada"*. There was no deadline for the development of the plan and no requirement for the plan to be submitted to Nova Scotia Environment. The Department did not know this was completed until we asked about it as part of the audit.

4.22 Nova Scotia Environment's ability to hold project owners accountable is limited when terms and conditions of approved projects are not clear. This increases risk to the environment. For example, if a project owner is not required to provide documentation to confirm a term and condition has been satisfied, it is difficult for the Department to act against the project owner if nothing is submitted. Inspectors told us they had concerns related to the enforceability of some terms and conditions. Inspectors believed their lack of involvement in the development of the terms and conditions contributed to this issue.

4.23 The Department's process states draft terms and conditions are to be given to inspectors for review and feedback before final approval. However, based on our work, this did not always happen. For 11 of the 22 approved projects we examined, the terms and conditions were not given to inspectors for review before the approval was issued. Inspector input on terms and conditions is an important step in setting clear and enforceable expectations for project owners and limiting impacts on the environment.

Recommendation 4.3
Environment should develop terms and conditions for approved projects in consultation with the inspectors responsible for ensuring they are met. Terms and conditions should include clear timeframes for completion and requirements to provide documentation to confirm terms and conditions have been satisfied.

Environment Response: *Agree. NSE is undertaking a larger project to review terms and conditions of its approvals including EA authorizations. The project is intended to update/review existing terms and conditions to ensure requirements are relevant, clear, consistent and enforceable. Timing: 2018-19*

Responsibility for some terms and conditions not established

4.24 Nova Scotia Environment did not review terms and conditions of approved projects with other departments before approval. Departments other than Nova Scotia Environment are often responsible for receiving information from project owners and confirming if terms and conditions have been satisfied. However, Nova Scotia Environment did not consult with other departments on the terms and conditions before issuing the approval. For example, the project owner might have to develop a moose monitoring program that is to the satisfaction of the Department of Natural Resources. If Nova Scotia Environment does not discuss terms and conditions assigned to other departments with those departments, those other departments may not be aware of their responsibility or understand of what is expected of them. This could result in terms and conditions not being properly monitored or information not passed on to Nova Scotia Environment.

Recommendation 4.4
Environment should provide relevant draft terms and conditions of approved projects that involve other departments to the respective departments for review and confirmation of their responsibility under the terms and conditions.

Environment Response: *Agree. The review and update of the EA Checklists will ensure a record of communication with other departments is clear and a record is maintained. Timing: June 2017*

Review of terms and conditions with project owners not done

4.25 The Department did not review terms and conditions of approved projects with the project owners as required. These meetings help ensure project owners fully understand what is required of them and the expectations of Nova Scotia Environment. For example, meetings can provide an opportunity to discuss periods during the year when project owners are not allowed to clear land or steps that must be taken to monitor wildlife within the project area.

4.26 The Department's process is to meet with the project owner within four weeks of the project being approved to review the terms and conditions. This meeting did not occur for three of the 22 approved projects we examined. For another seven projects, the meeting was not held within four weeks of the approval being granted. In two of these, approximately a year had passed before Nova Scotia Environment met with the project owner.

Recommendation 4.5
Environment should meet with project owners to discuss the terms and conditions once projects are approved. There should also be regular meetings between Nova Scotia Environment and project owners to discuss the status of terms and conditions of approved projects.

Environment Response: *Agree. The Internal Guide to EA Follow-up Procedures will be updated to ensure the initial meeting with the approval holder is completed. Subsequent meetings with the approval holder to review terms and conditions will be captured during an audit or inspection process. Timing: 2017-18*

Better processes needed for reviewers of environmental assessment applications

4.27 Government reviewers were used to assess each of the 22 approved projects we examined. As an example, applications were sent to divisions within Nova Scotia Environment to assess a proposed project's impact on groundwater, while the Department of Natural Resources was used to identify risks to wildlife. Comments from reviewers were considered in developing terms and conditions for approved projects.

4.28 While the use of reviewers provides valuable feedback on proposed projects, improvements are needed. Currently, applications are sent to a broad list of reviewers. For some of the environmental assessment applications we examined, the documentation was provided to over 40 individuals. The Department does not have a process to identify the specific reviewers that should be used. Furthermore, no guidance is provided to reviewers on what Nova Scotia Environment's expectations are for the review. For example, it isn't clear whether the individuals are to review the entire application or just sections.

4.29 Also, Nova Scotia Environment does not have a process to follow up with reviewers if a response is not received. While comments from some reviewers were provided for each of the applications we examined, not all reviewers responded. The Department did not know if a reviewer did not respond because the request was not received, not enough time was given to review the application, or if the reviewer had no comments to provide.

Recommendation 4.6
Environment should document and implement a process for using government reviewers on environmental assessment applications. The process should include how reviewers are selected, the Department's expectations of reviewers and a follow-up process if responses are not provided by the deadline.

Environment Response: *Agree. The review and update of the EA Checklists will ensure interactions with reviewers are identified, carried out and documented. Timing: June 2017*

Project owners are submitting required information

4.30 The Environmental Assessment Regulations outline the minimum information project owners are to include with their application for an approval and what

the Minister of Environment must consider in making the decision to approve or reject the project. For example, project owners are to provide information on the purpose and need for the project, along with details on the potential effects on groundwater, vegetation, and wildlife in the area. Factors the Minister is to consider in making a decision include the nature and sensitivity of the project area, along with any potential or known environmental impacts on species at risk and their habitats.

4.31 For each of the 22 approved projects selected we examined whether project owners provided the required information and whether the summary of the project included all factors to be considered by the Minister in making a decision. We did not find any significant instances in which the legislative requirements were not met for the applications we examined. In all cases, the information provided by the project owners met the legislative requirements and the Minister was provided with all required information to be used in deciding to approve the project.

4.32 Terms and conditions to manage the risks of the project identified during the application process were attached to each of the approved projects we examined. However, the lack of monitoring of the terms and conditions of approved projects previously discussed weakens the work done by Nova Scotia Environment in deciding to approve a project. The value of the terms and conditions can only be achieved if there is regular monitoring to ensure project owners comply.

4.33 One area in which Nova Scotia Environment can improve its process is the review of an application before it goes to the Minister for a decision. When staff within the Department complete their review, a summary of the project and associated risks is compiled and forwarded to the Minister. However, there is no review of the summary to ensure the details and risks of the project are accurately and completely captured.

Recommendation 4.7
Environment should complete and document a review of information sent to the Minister of Environment for deciding on whether to approve or reject a project.

Environment Response: *Agree. A routing sheet will be instituted to ensure a review of information is in place before it is sent to the Minister. Timing: June 2017*

Appendix I

Audit Objectives and Scope

In winter 2017, we completed a performance audit at Nova Scotia Environment on the Environmental Assessment program. The audit was conducted in accordance with sections 18 and 21 of the Auditor General Act, and auditing standards of the Chartered Professional Accountants of Canada.

The purpose of the audit was to determine whether Nova Scotia Environment is appropriately reviewing environmental assessments to ensure potential impacts to the environment are avoided or reduced, monitoring the risks identified, and taking action when necessary.

The objectives of the audit were to determine whether Nova Scotia Environment:

- conducted environmental assessments that are consistent with relevant legislation, policies and procedures;
- has processes to monitor compliance with terms and conditions of environmental assessment approvals;
- has a process to evaluate the effectiveness of the environmental assessment program in reducing the impact of adverse effects or significant environmental effects.

Generally accepted criteria consistent with the objectives of the audit did not exist. Audit criteria were developed specifically for this engagement. Criteria were accepted as appropriate by senior management of Nova Scotia Environment.

Our audit approach included an examination of documentation of systems and processes; examination of legislation, policies, guidelines, standards, and other documentation; and testing compliance with legislation, policies, guidelines, and standards. We interviewed management and staff at Nova Scotia Environment. Our main audit period included activities between January 2013 to August 2016. However, we examined activities outside of this period when necessary.

We did not comment on the accuracy of the information provided by project owners included in environmental assessment applications, nor did we comment on the technical feedback provided on applications by government reviewers. Our work focused on whether the required steps were followed in issuing environmental assessment approvals and whether the Department ensured project owners met the terms and conditions of the approvals.

APPENDIX H-13

PRINCE EDWARD ISLAND LEGISLATIVE ASSEMBLY

Speaker: Hon. Francis (Buck) Watts

Published by Order of the Legislature

Standing Committee on Agriculture and Fisheries

DATE OF HEARING: 1 FEBRUARY 2019

MEETING STATUS: PUBLIC

LOCATION: LEGISLATIVE CHAMBER, HON. GEORGE COLES BUILDING, CHARLOTTETOWN

SUBJECT: BRIEFING FROM REPRESENTATIVES OF ENVIRONMENT AND CLIMATE CHANGE CANADA RE: PROPOSED WASTE WATER TREATMENT PROJECT AT NORTHERN PULP

COMMITTEE:

Allen Roach, MLA Montague-Kilmuir [Chair] (replaces Hal Perry, MLA Tignish-Palmer Road)
Dr. Peter Bevan-Baker, Leader of the Third Party
Hon. Richard Brown, Minister of Communities Land and Environment (replaces Hon. Paula Biggar, Minister of Transportation, Infrastructure and Energy)
Jamie Fox, MLA Borden-Kinkora
Hon. Sonny Gallant, Minister of Workforce and Advanced Learning
Colin LaVie, MLA Souris-Elmira
Hon. Chris Palmer, Minister of Economic Development and Tourism

COMMITTEE MEMBERS ABSENT:

Alan McIsaac, MLA Vernon River-Stratford

MEMBERS IN ATTENDANCE:

Darlene Compton, MLA Belfast-Murray River

GUESTS:

Environment and Climate Change Canada (Caroline Blais; Geoff Mercer)

STAFF:

Ryan Reddin, Clerk Assistant (Research and Committees)

Edited by Hansard

The Committee met at 10:00 a.m.

Clerk Assistant (Reddin): Good morning everyone.

The Chair of the committee, Mr. Perry, is absent today, so, I'll open the meeting to ask for a nomination for a temporary Chair.

Mr. R. Brown: Allen Roach.

Clerk Assistant: Hearing Mr. Roach; any other nominations?

An Hon. Member: I'll second that motion.

Clerk Assistant: All in favour please signify by saying "aye".

Some Hon. Members: Aye!

Clerk Assistant: Any opposed say "nay".

Motion is carried.

Mr. Roach, please take the chair.

Chair (Roach): Good morning everyone.

First of all I'd like to welcome our guests that are here today; welcome to Prince Edward Island. Welcome to the cold weather, but I guess no matter where you go in Canada today you're going to get the same.

We're here today to talk about the Northern Pulp effluent treatment plan and what's taking place in Nova Scotia. Just before we get started I'd like to – anyone who's going to speak – the first time you speak I would ask you to identify yourself and that way our good folks over in the corner will be able to know who's speaking when they're doing their transcribing over there.

The other thing I've been doing at committee meetings is, when it comes time for questions later on, I'd like to give each minister and MLA the opportunity to ask three questions and then that way everybody in the room gets an equal opportunity to ask questions and at the end of that, if there's more time then we'll just start that process again. That seems to work quite well, so unless there're any objections, I'd like to continue it that way.

Having heard none; thank you.

I would invite whoever would like to speak to go ahead.

Could I also get an adoption of the agenda for today?

An Hon. Member: So moved.

Chair: Thank you.

Okay, Geoff and Caroline, whoever would like to go first?

Geoff Mercer: Thank you Mr. Chair, it's a pleasure to begin.

Good morning everyone, it's a pleasure to be here today in front of the Standing Committee on Agriculture and Fisheries. It's an absolute pleasure to be here in Charlottetown; of course on lovely Prince Edward Island despite the frigid Canadian winter.

Mr. Chair, my name is Geoff Mercer; I have the pleasure to be the Regional Director General for Atlantic and Quebec Regions of Environment and Climate Change Canada. I'm headquartered in Halifax, Nova Scotia and I'd like to introduce my colleague Ms. Caroline Blais. Ms. Blais is the director responsible for forest products and the policy administration of the pollution prevention provisions. You'll hear that term today, the pollution prevention provisions we refer to as subsection 36(3) to 36(6) of the *Fisheries Act*, with, and under, the administration of Environment and Climate Change Canada. I sincerely appreciate Caroline's travel last night from Ottawa. Thanks for being here, Caroline.

In follow up to my department's letter to this committee dated on the 19th of December, we are here today to provide more details on the Environment and Climate Change Canada's responsibilities under section 36(3) of the *Fisheries Act*, as they relate to the regulations for the release of effluents into waterways as was requested in the letter we received.

It's important to understand that Environment and Climate Change Canada is a science-based department. We develop policies, we deliver programs, we make

decisions based on scientific evidence. The departments programming focus is on minimizing threats to Canadians and their environment, including climate change, conserving and restoring Canada's natural environment and providing data and information to Canadians to make informed decisions on weather and weather conditions.

Secondly, please note that we are a regulator. As a regulator, the department is committed to maintaining a regulatory system in Canada that is evidence-based, effective, efficient, transparent and adaptable. We enforce Canada's environmental laws. Those laws include – just to name a few – the *Canadian Environmental Protection Act* which was recent – amended in 1999 last. We refer to it as CEPA (CEPA 99). The *Species at Risk Act*, you'll hear the acronym SARA used for that; the *Migratory Bird Convention Act, 1994*, just to name a few pieces of the legislation that we enforce. But we are here today to talk to you about the pollution prevention provisions, remember section 36(3) to 36(6) of the *Fisheries Act*, which is why we're here.

Ms. Blais will provide the committee with information on the department's rules and responsibilities for the pollution prevention provisions of the *Fisheries Act*, and specifically, the Pulp and Paper Effluent Regulations.

Following our presentation, we look forward to receiving any questions you may have on these regulations.

So, with further ado, Mr. Chair, I'd like to ask my colleague, Ms. Blais to begin with her presentation.

Caroline Blais: Thank you, Geoff.

Good morning everyone; Chair, members of the committee, thank you for the opportunity to appear here today. My name is Caroline Blais; I'm the Director of the Forest Product and *Fisheries Act* Division at Environment and Climate Change Canada. My team and I are responsible for implementing the Pulp and Paper Effluent Regulations.

So, I'd like to start with some information regarding the *Fisheries Act*. The *Fisheries Act* is the oldest piece of environmental legislation in Canada. It was first enacted in 1868. It applies to all Canadian fishing zones, territorial seas and inland waters, so that's our basis.

The Minister of Fisheries and Oceans is responsible for most of the act. The minister of environment is responsible for the pollution prevention provision for all activities, except aquaculture, the control and eradication of aquatic invasive species and aquatic pests. That stays with the Minister of Fisheries and Oceans.

The sharing of the responsibility was confirmed in 2014 through a designation Order in Council that gave the minister of the environment primary responsibilities for the pollution prevention provision and those are the section 36(3) to 36(6).

There are two of these subsections that are key: first the subsection 3, which really prohibits the deposit of any deleterious substance pollution in waters frequented by fish, or in any place under any circumstances where it may enter such water unless authorized by regulations. That's our basis.

Second, the Governor in Council may make a regulation under subsection 36(5) authorizing certain deposit under conditions. In 1992, the Government of Canada promulgated the Pulp and Paper Effluent Regulations also known by its acronym PPER; we love acronyms. The regulations apply to all pulp and paper mills in Canada by setting national effluent quality standards.

The purpose of the regulations is to manage threats to fish, fish habitat and the use of fish by humans, i.e. when we eat the fish, by limiting the deposit of deleterious substances into fish bearing waters. All 90 pulp and paper mills in Canada, across Canada, must comply with these regulations.

The regulations set maximum quantities of amount of biochemical oxygen demand matter and suspended solid that may be deposited by mills and prohibit the deposit of effluent that are acutely lethal to fish. I will explain some of these terms.

Biochemical oxygen demand matter; it represents the amount of matter that consumes oxygen dissolved in water. It is determined using biochemical oxygen demand test, which is the measure of dissolved oxygen in the water consumed by the organisms to break down the organic material present in the effluent. It is used as one of the measures of the degree of pollution in that effluent. The higher the value, the more pollution in the effluent. So it is important to limit BOD matter so that an effluent does not reduce the available oxygen in the receiving environment. If oxygen levels in water are too low, aquatic organism will be negatively impacted.

Total suspended solids are essentially solids that are not dissolved in the water and are also a measure of pollution. This is an important perimeter to control because high levels of suspended solid can harm fish gills, so those are two substances that are regulated under PPER.

Finally, acute lethality to fish is determined when more than 50% of rainbow trout die when they are placed in the effluent at 100% concentration level over a 96-hour period. This test is used to make sure that the effluent as a whole does not kill fish.

The maximum quantity set in the PPER are national standards based on what was achievable by pulp and paper mills using secondary wastewater treatment system at the time the regulations were developed. The regulations sets a number of conditions that pulp mills must meet in order to be authorized to deposit biochemical oxygen demand matter and suspended solids.

The regulatees must; install, maintain, calibrate monitoring equipment, monitor effluent and submit monthly report of the monitoring results and production information, notify an inspector without delay of any results of a test conducted that indicates failure or non-compliance, submit identifying information, prepare and update annually a remedial plan, prepare an emergency response plan, submit information on all outfall structures and deposit effluent only through these outfall structures, comply with the requirements of environmental effects monitoring studies and keep records on sites for inspections.

Environmental effects monitoring done by the mills is the ultimate performance measurement tool for the Pulp and Paper Effluent Regulations. It measures, directly in the receiving environment, the effects of effluent on fish, fish habitat and human use of fisheries resources to assess how well the regulations protect fish, fish habitat and the use of fish by human.

This is achieved by comparing a number of measures taken in the area exposed to the effluent and a similar area not exposed to the effluent. These measures include data on water, sediment, fish, fish tissue, fish habitat. Environmental effects monitoring also includes sub-lethal toxicity of final effluent. So, this test is performed in a laboratory to provide information on the potential effect of effluent on biological component in the receiving environment and it's a longer test.

Under the regulations, mills are required to identify and investigate potential effects on their effluent on fish, fish habitat and the use of fisheries resources. When environmental effect studies show effects as a result of the discharge of the pulp and paper effluent, mills are then required to conduct studies to understand the causes and identify potential solutions to mitigate these effects.

Now I'd like to explain the results that have been achieved by the Pulp and Paper Effluent Regulations since it came into force in 1992. Since then, mills across the country have made significant improvement in their effluent quality; in most cases by implementing secondary biological treatment system. Between 1987 and 1996 – so total discharge of suspended solids and biochemical oxygen demand matter decreased approximately by 60 and 90% – so that's across the country. Compliance rates with the regulations is high and based on the self-reported data, over 97% attest that mills across the country conduct are compliant with the regulations.

Despite this high level of compliance with the existing effluent standard, the environmental effect studies have shown that the effluents from 70% of the pulp and paper mills across the country are having an effect on fish and/or, depending, fish habitat.

So on the national basis, like the most prevalent impact of mill effluents are eutrophication, which is when there is too much nutrient in the body of water and reduced size of reproductive organs in fish. Eutrophication can lead to oxygen depletion and decrease in species diversity. Reduce reproductive organs in fish can lead to reproduction in species, diversities and imbalance in the fish communities.

In taking this information – in September 2017, the department launched a process to modernize the Pulp and Paper Effluent Regulations.

The modernization is focused on four key areas: 1) winding the scope of the regulations to capture new and innovative products being produced by the sector; 2) reviewing the regulatory limits for existing and new deleterious substances 3) improving the administration of the regulations and; 4) streamlining the reporting and administrative requirements.

A key area of the modernization is increasing environmental protection. The department has publicly proposed to reduce maximal allowable biochemical oxygen demand matter and suspended solids and to add new substances to regulate, such as nutrients.

A first round of engagement with interested parties occurred between fall of 2017 and spring 2018. A second round of engagement is planned for winter/spring 2019.

In closing, I would to emphasis that notwithstanding the evolution of the regulations effluent from pulp and paper mills across Canada are regulated and the effluent of any new treatment facility at a mill in Canada would be subject to these regulations.

That concludes my remarks and happy to answer any questions.

Chair: Thank you both very much.

First question is from MLA Compton.

Ms. Compton: Thank you, Chair. I want to thank both of you for coming in today.

I'm not actually on this committee but it's of great impact to my district and had a lot of constituents reach out. We've had a number of people come in, including Northern Pulp and it seems every question we asked it was someone else's department or no, we can't answer that, or no, that's environment, or no, that's fisheries.

I guess my first question would be – looking down the road, I mean 50 years ago they thought Boat Harbour was going to be the answer and we now know that it wasn't. Fifty years down the road what are we going to be saying about the Northumberland Strait and the impact that this is going to have on fishery? I don't know if you can comment.

Thank you for all that information; it was a lot to process and maybe we could have that given to us in written form or online, that would be great. But if you can just answer how we can be assured that 50 years down the road this process – which the only answer we've gotten is it's going to better than it was – is not going to be better than it was – or is going to impact the environment and the fisheries.

Geoff Mercer: I think I'll start general. Thanks very much MLA Compton for the question, first and foremost.

Environment and Climate Change Canada like I said in the beginning is a science-based department and we're a regulator. The development and implementation of the Pulp and Paper Effluent Regulations in 1992, as my colleague Ms. Blais indicated, markedly improved the performance of mills in protecting the environment, particularly, the decrease in toxins or furans in the environment. Toxins and furans are cancer-causing agents that were released up until then.

In today's world in environmental standards, we use the absolute best practices that are available and the leading class science that we can in this country to make sure that the regulations are written in a way and are applied consistently across this county, as Caroline has indicated, from coast to coast to coast in all 90 mills. When those regulations are applied consistently and with world class enforcement officers that we have through our environmental

enforcement officers program, then we have absolute certainty that those regulations are being applied as the laws are written in Canada.

Ms. Compton: I wondered if either of you could answer the question as to, if there was a new mill being built that was proposing the same effluent treatment, would that be approved through the regulations that both your departments have?

Caroline Blais: Thank you for the question.

As a regulator, a regulation does not approve single projects. So if there is a new mill, from the beginning, they will be subject to the effluent standard. We don't prescribe the technology; they just have to meet the effluent standard for biochemical oxygen demands, suspended solid acute lethality of the existing reg. When the new regs are coming into force they will be subject to those levels.

Ms. Compton: You did state that of the mills that are existing, 70% of those mills are having an impact on the fish that the effluent is going into the water. I'm not even sure I'd ask the question, but the concern that we have here is it's going to ruin the fishery in the Northumberland Strait. If right now 70% of the mills which supposedly meet the criteria by both the regulators that are represented here, there's still a problem and how do we move forward from that? If we take 70% of the fishing in our Strait or 70% of the mills, this is included I'm sure – and maybe can you answer: Is Northern Pulp one of the mills and the effluent coming out of there now is affecting the fisheries?

Caroline Blais: So effluent standards – okay, so I'll answer the question (Indistinct) two steps. The first part of the question is that we are aware that despite the high level of compliance with the effluent standard, effluents across Canada are having an impact on fish, which is why in September 2017, the department launched a process to modernize these regulations, so to update the effluents limit. The second part is, if Northern Pulp has an impact and our information looking at their (Indistinct) studies, we found that yes, they have an impact on fish habitat and the company is at the stage where they are looking for the cause of the impact and their last study is posted on their website. That's where they are in the process.

Ms. Compton: Do you want me to keep going?

Chair: No.

MLA Fox.

Mr. Fox: Thanks, Chair. Thank you very much for attending today.

In your submission there, you talk about installing and maintaining and calibrating and monitor equipment. I'm interested in: How often do the inspectors actually check and verify that the equipment they're using to test the water is actually calibrated?

Caroline Blais: Our colleagues in the enforcement branch have a prioritization exercise and on a yearly basis they kind of look at all of their regulations across the department and the regulatee and to set up a schedule to go and inspect a number of facilities, including pulp and paper mills. In terms of the exact frequency, I don't have that information here, but they do have a process to go and inspect and verify those documents.

Mr. Fox: Chair, a follow up to that, is it possible to get a list of how many times inspectors attended Northern Pulp and found them to be non-compliance to the act or the regulations, or the standards that are required?

Caroline Blais: We'll take that information back (Indistinct)

Mr. Fox: Thank you.

If we recognize that the effluent going into the Strait or into a waterway is above the temperature of the water and we know that that rise in temperature affects the oxygen levels in the water which has a negative effect on the species, any species of fish in the water – we also know that climate change is real – why would we allow any substance to go into a waterway that is above the average temperature of the water, which is actually worsening the climate effect change?

APPENDIX H-14

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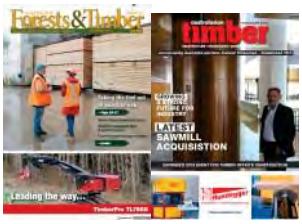

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Gunn's pulp mill permit lapses so land now for sale

31 August 2017

Andrea Dawkins

One of Tasmania's most controversial issues – a proposal for a $2.5 billion pulp mill at Bell Bay – is finally over. Sources: The Mercury, The Examiner, The Bendigo Advertiser

Permits to build the pulp mill, originally proposed by collapsed timber giant Gunns Limited, lapsed.

A spokesman for Gunns Limited receivers, Korda Mentha, said it would not contest the lapsing of the permits because there was no prospect of a developer being interested.

He said Korda Mentha would instead try to sell the land at Bell Bay and that they had been obliged to wait until the permits lapsed before proceeding with an attempt to sell the land.

"Receivers will now be able to start serious discussions with parties who expressed an interest," he said.

The land, with or without the permits, has been on the market for more than two years.

Gunns Ltd spent about $230 million on research and getting the pulp mill permits in place before collapsing in 2012.

The spokesman said conditions in the international pulp market meant a sale would not occur.

The pulp mill saga ran from 2007 and involved political drama over the approval processes and huge opposition from environmentalists.

Gunns bankers ANZ bank would not finance the mill and Gunns attempted to bring in partners without success.

Daily Timber News Archives

The Greens will table a bill when Parliament resumes next month to repeal the Pulp Mill Assessment Act and bury the project for good.

The previous Labor government, with support from the Liberals, extended the permit conditions under the act to this year

Bass Greens MHA Andrea Dawkins said the party would table legislation in the spring session of Parliament to repeal the entire act.

"The expiration of the pulp mill permits means the Tamar Valley community is one step closer to ending this sorry saga that has plagued them for fifteen years," Ms Dawkins said.

"People within that community were vilified and abused for standing up for their right to live in a place with clean air and water."

A previous move to repeal the Pulp Mill Assessment Act was defeated in 2011.

The state government have said it would not be offering the project any more support.

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APPENDIX H-15

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18(1)(a)

October 5, 2017

[redacted]General Manager
Northern Pulp Nova Scotia Corporation
PO Box 549, Station Main
New Glasgow, NS
B2H 5E8

Dear [redacted]

RE: Review of Preliminary Receiving Water Study for Northern Pulp Effluent Treatment Plant Replacement, Pictou Harbour, Nova Scotia

As you are aware, the Northern Pulp Effluent Treatment Plant replacement requires a Class I Environmental Assessment (EA). This letter provides results of a preliminary review done by the department of the above mentioned receiving water study. This study is expected to form part of the registration package that you would provide when Northern Pulp officially registers the project for EA. Please note, this represents only a preliminary examination of the report and does not preclude further assessment and consideration of information that is received as part of the EA.

As this review was undertaken only by Nova Scotia Environment (NSE), you are advised to seek input from Fisheries and Oceans Canada and Environment and Climate Change Canada, as well as other federal and municipal agencies, to ensure their requirements are addressed prior to final design of the treatment facility and selection of the discharge location. The intent of this input is to assist you in finalizing the design and preparing your documents for Environmental Assessment and does not in any way encumber the Minister's decision following the EA process.

Following are key comments on the report:

1.0 Based upon the modelling data provided, the report identifies the following maximum allowable concentrations:

- Maximum daily flow - 85,000 m^3
- BOD_5 – 48 mg/L
- TSS – 48 mg/L
- Colour – 750 TCU*
- AOX – 7.8 mg/L
- Nitrogen – 3.0 mg/L
- Phosphorous – 1.5 mg/L
- pH – 7-8.5

  * Note: color must achieve background concentrations prior to the effluent surfacing at 90 meters.

.../2

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[redacted] 18(1)(a)

Department reviewers are generally supportive of these numbers. They make sense from a science perspective. As mentioned however, additional information may become available during the EA that will also need to be assessed. We are however comfortable with using these numbers for the design of the project.

2.0 NSE is aware that current data from the facility indicates possible exceedances at point C for many of the parameters. As part of the EA, Northern Pulp must demonstrate that the new treatment facility can achieve the numbers highlighted in 1.0 above. If any of the parameters, including maximum flow, require modifications to the Mill itself to achieve the volumes and concentrations modelled in the study, Northern Pulp must also submit a plan to the Department indicating what changes are required to the Mill to achieve the maximum concentrations. Should additions/modifications be required to the Mill itself, an application for amendment to the current Industrial Approval will be required prior to implementation of any modification.

3.0 With respect to the current Industrial Approval the maximum Chemical Oxygen Demand (COD) concentration discharged from the Kraft Pulp Mill into the effluent treatment facility is:

- COD – 950 mg/L (570 mg/L at point of discharge, assuming a 40% reduction in the SBR)

4.0 NSE Accepts that a flow of 85,000 m^3/day is appropriate for design of the new system. However, Northern Pulp must continue to meet the current maximum daily water intake requirement of 92,310 m^3 outlined within the existing approval that expires January 30, 2020.

Should you have any questions or concerns regarding this information, please do not hesitate to contact me at 902-483-2696 or via email at helen.macphail@novascotia.ca.

Regards,

Helen MacPhail

Helen MacPhail
Supervisor of Environmental Assessment

c. Paul Keats, Regional Director
Kathleen Johnson, P.Eng., Engineering Specialist
Stefan Furey, P.Eng., Engineering Specialist
Adrian Fuller, Executive Director, ICE
Frances Martin, Deputy Minister

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APPENDIX H-16

Lack of public consultation ahead of Northern Pulp's submission of Environmental assessment sparks backlash

Brendan Ahern (brendan.ahern@ngnews.ca)
Published: Jan 16 at 2:13 p.m.

An aerial view of the Town of Pictou, with the Northern Pulp mill across the harbour. August 21, 2014. - Christian Laforce

Pictou

Northern Pulp's decision not to hold public consultations before filing its environmental assessment has received blowback from groups representing Northumberland fishermen.

In a statement issued from Friends of the Northumberland Strait, the group decries the company's decision, stating that, "Concerned citizens and fishermen say they are appalled that Northern Pulp

does not plan to hold any open houses or public consultation before filing for environmental assessment."

The statement emphasizes Northern Pulp's past promise to hold further open house events designed to keep the public up to date on the company's plan.

"We were told Northern Pulp were wanting to be transparent during this process," said Friends of the Northumberland Strait president Jill Graham-Scalan in an interview. "They had promised us during that time that as the studies they were conducting on the route and the receiving waters were completed that they would be making those studies available to the public."

An addendum to Northern Pulp's water receiving study was posted after the press release, but Graham-Scalan says that this is not the level of transparency that was promised form the company back in December 2017.

With the company's environmental assessment being submitted at the end of January, Graham-Scalan says that it could be difficult to properly analyze the information and provide feedback.

"Not only do we have to read it, we have to absorb and reply to it," she said. "That 30-day period is the only period of time that the public has to come up to speed on the proposal and respond to the province in a way that is complete."

Northern Pulp has cited 'significant' delays and a need to move forward under an impending deadline as it's reason for filing the assessment without holding the open houses.

"We've experienced a significant number of delays through the fall in attempting to get some of the information compiled," said Northern Pulp director of communications, Kathy Cloutier. "We're at a point now where we want the project to move forward."

Cloutier added that the blockades Pictou Harbour by strait fishermen of the company's survey boat was a major factor in the need to push ahead to make up for the lost time.

When asked if the incomplete survey of the sea-floor will impact the quality of environmental data submitted to the province, Cloutier said that the only gaps will have to do with the pipe's construction.

"There may be some constructability gaps, but the environmental assessment will be a complete document."

"Another major factor to delays is the number of studies and expanded studies that were done," said Cloutier. "When the process began there were seven studies that we were aware that we'd need to submit for an environmental assessment. Since then we've moved from seven to 17, to 20, we're now at 28."

The validity of that data revealed in those studies will then be determined by the provincial assessment.

After Jan 31. Cloutier says that that information will be in the hands of the public and the provincial government.

"I can't speak to a government process, but what I can say is that there will be time for people to submit comment, and that will help the minister."

The statement issued by Friends of the Northumberland Strait remains skeptical that Northern Pulp's assessment will accurately measure the outfall's effect on marine life in the strait.

"Knowing the composition of the treated effluent they plan to release is critical," wrote president of the Northumberland Fishing association Carl Allen. "We've asked for this information for almost a year, and have never received it. If the effluent is as harmless as Northern Pulp tells the public, why haven't they provided the information?"

APPENDIX H-20

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NOV 3 0 2017

Bruce Chapman, P.Eng., General Manager
Northern Pulp Nova Scotia Corporation
PO Box 594, Station Main
New Glasgow NS B2H 5E8

Dear Mr. Chapman,

Re: Industrial Approval Clarification

In response to your letter of November 3rd, 2017 and subsequent email of November 14th, 2017 to Deputy Martin and Helen MacPhail, the Inspection, Compliance and Enforcement Division would like to provide clarification on some of the issues raised in your correspondence. Final regulatory effluent discharge limits will be established once the environmental assessment process is complete.

Northern Pulp's receiving water study for flow, BOD_5, TSS, Colour, AOX, Nitrogen, Phosphorous and pH will be taken into consideration. Requirements of the current industrial approval for influent COD reductions from benchmark concentrations by 2020 as submitted by Northern Pulp on December 14, 2016 and accepted by NSE on February 27, 2017 will also be considered. The upcoming environmental assessment will also be used to establish those limits. Currently, NSE has indicated support for discharge concentrations as indicated in the October 5th, 2017 correspondence from Helen MacPhail. These effluent concentrations may be subject to change, depending on the outcome of the environmental assessment.

In general, NSE considers operational variations when determining compliance for items such as monitoring parameters through the industrial approval process. Industrial approval application submission requirements include a detailed engineering report. Northern Pulp will also need to submit plans for an effluent treatment plant design which will meet the effluent discharge requirements, taking all the factors listed above into consideration.

With respect to the regulation of COD, as you may recall, during early industrial approval discussions, Northern Pulp indicated it did not wish to have a study style approach to reduction of black liquor spills. Instead, the company requested the approval contain a compliance limit your company could work to achieve. Through discussions with third-party experts, it was recommended the best way to manage black liquor spills is through regulation of COD. NSE recognizes COD is not a widely-regulated parameter in North America for the pulp and paper industry, although there are individual facilities which do have COD limits within their individual operational permits. During discussions between Northern Pulp and NSE following Northern Pulp's appeal of the industrial approval, Northern Pulp agreed that an influent concentration of 1900 mg/L was a reasonable benchmark for COD reductions. Northern Pulp confirmed it could achieve a 50 per cent reduction from this benchmark by January 2020 would be achieved in the December 14, 2016 submission. That is why correspondence from the Environmental Assessment branch regarding effluent discharge limits references the current industrial approval requirements for COD rather than the receiving water study, as not to create a conflict between the two.

.../2

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With respect to your comment from your email dated November14th on the renewal of the industrial approval and the ability to start discussions on a future IA, NSE offers the following comment. As you have stated and agree, there are many items in a future IA that will be determined once the EA process is completed. NSE agrees with this comment and recognizes that large industrial applications such as a pulp and paper approval can take several months of review and discussions between the proponent prior to any issuance of an approval. It is not uncommon for this size of an industrial file to take up to 12 to 24 months to complete a review process. Therefore, it would be prudent for both Northern Pulp and Nova Scotia Environment to begin discussions on a future industrial approval sometime soon. As stated above these discussions will be solely focused on the items in the industrial approval that are not impacted by the future environmental assessment process and those items will be dealt with after the environmental assessment. As this industrial approval process will be completed by the Inspection, compliance and enforcement division of Nova Scotia Environment, you can contact me as the lead for this industrial file at your convenience.

Should you have any further questions or concerns, please do not hesitate to contact me at 902-863-7600.

Regards

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APPENDIX H-21

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

April 9, 2015

The Honourable Randy Delorey
Minister of Environment
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Dear Minister Delorey:

Re: Industrial Approval No. 2011-076657-A01
Appeal pursuant to Section 137 of the *Environment Act*

Northern Pulp Nova Scotia Corporation ("Northern Pulp") appeals Industrial Approval No. 2011-076657-A01 (the "Approval") issued by Jay Brenton of the Nova Scotia Department of Environment (the "Department") on March 9, 2015 for the operation of Northern Pulp's mill in Abercrombie Point, Nova Scotia (the "Mill").

Northern Pulp makes this appeal (the "Appeal") to you, the Minister of Environment, pursuant to section 137 of the *Environment Act*, SNS 1994-1995, c 1 (the "Act"). In the sections below, Northern Pulp states its reasons for this Appeal, outlines its specific objections to various provisions in the Approval and sets out its requested relief.

While Northern Pulp considers it necessary to proceed with this Appeal to protect the long term economic viability of the Mill, Northern Pulp remains open to working with the Department and the Province to achieve a long term solution with respect to the Mill.

SUMMARY OF APPEAL

In summary, Northern Pulp requests that certain provisions (identified below) of the Approval be removed or revised on the grounds that these provisions:

(i) are in breach of the Province's contractual obligations to Northern Pulp under various agreements (which agreements the Department refused to consider in issuing the Approval) and impose conditions that in essence seek to achieve indirectly what the Province is not permitted to do directly, namely, require Northern Pulp to cease using its current effluent treatment facility ("Effluent Treatment Facility");

(ii) impose conditions that are impossible to meet and/or are prohibitory rather than regulatory in nature;

(iii) impose conditions that are too vague or uncertain;

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(iv) are unrealistic and otherwise unreasonable; and/or

(v) are inconsistent with the protection granted to Northern Pulp by the *Freedom of Information and Protection of Privacy Act* ("FOIPOP").

Northern Pulp respectfully requests that you exercise your powers under Section 137(4) of the Act to allow Northern Pulp's Appeal and remove or revise the provisions of the Approval as further outlined in this letter. Doing so would ensure that the Approval contains conditions that: (i) do not breach the Province's obligations under the various agreements between the Province and Northern Pulp and do not effectively require Northern Pulp to change the location of its current Effluent Treatment Facility; (ii) are not impossible to achieve and are regulatory rather than prohibitory in nature; (iii) are not vague or uncertain, (iv) are realistic and otherwise reasonable; and (v) are not inconsistent with the protection granted under FOIPOP.

GROUNDS OF APPEAL

I. Department's Refusal to Consider Province's Contractual Obligations - Section 8(2)(c) of the Act

As you are aware, Northern Pulp and the Province are parties to a number of agreements in respect of the operation of the Mill, including:

1) Memorandum of Understanding dated December 1, 1995 ("MOU");

2) Lease dated December 31, 1995 ("Lease");

3) License Agreement dated December 31, 1995;

4) Indemnity Agreement dated December 31, 1995 ("Indemnity Agreement");

5) Water Supply Agreement dated June 30, 1995 ("Water Supply Agreement");

6) Lease Extension Agreement dated October 22, 2002; and

7) Acknowledgement Agreement by the Province dated May 12, 2008 ("Acknowledgement Agreement").

(collectively, the "Agreements").

Northern Pulp wrote to you on December 18, 2014 in order to ensure that the Department reviewed the Approval in light of the Province's contractual obligations to Northern Pulp under the Agreements prior to issuing the final Approval. In addition, Northern Pulp requested a joint meeting with the Department of Environment and Department of Internal Services to discuss how a long term solution can be achieved in compliance with the terms of the Agreements and the Approval.

In a letter dated January 8, 2015, you responded: "While my department is aware of the existence of agreements between the Province and your company, the Province has maintained independence between the regulation of environmental issues and management of the various agreements with the mill." You encouraged Northern Pulp to meet with Internal Services to discuss the Agreements and any implications that may arise from the issuance of the Approval

by your Department, thereby refusing Northern Pulp's request to meet jointly with Northern Pulp and Internal Services.

Your express refusal to consider the Province's various contractual obligations in issuing the Approval and your refusal to meet jointly with Northern Pulp and Internal Services as requested by Northern Pulp is not in compliance with the mandatory requirement of Section 8(2)(c) of the Act which provides:

> 8 (2) The Minister, for the purposes of the administration and enforcement of this Act, and after engaging in such public review as the Minister considers appropriate, shall
>
> [...]
>
> (c) consult with and co-ordinate activities with other departments, Government agencies, municipalities, governments and other persons; [emphasis added]

Any provision in the Approval which is inconsistent with the provisions of the Agreements is necessarily the result of the Department's refusal to consider those Agreements when it issued the Approval. Northern Pulp submits that those provisions of the Approval are unreasonable due to the failure of the Department to comply with the process of consultation and co-ordination required by its own governing statute in issuing the Approval.

In the Acknowledgement Agreement, the Province acknowledged, agreed and confirmed that each of the Agreements and understandings between the Province and the Mill's prior owner Scott Maritimes Limited ("Scott") are in good standing and will continue in full force and effect for the benefit of Northern Pulp.

Northern Pulp's current owners acquired the shares of Northern Pulp and have continued to invest substantial amounts in the Mill on the understanding that the Province could and would comply with its obligations under the Agreements. It is not unreasonable to anticipate and expect that government will comply with the contracts which it has entered into. It is unreasonable for the Department to issue the Approval with a stated disregard for those contractual obligations. Northern Pulp does not waive any of its rights under any of the Agreements.

Northern Pulp submits that, taken together, the objectionable conditions included by the Department in the Approval that are in breach of the Province's obligations under the Agreements are an attempt by the Department to indirectly achieve the Province's stated goal of closing the Effluent Treatment Facility (see, e.g., Agreement in Principle between the Province and Pictou Landing First Nation dated June 16, 2014). These provisions would force Northern Pulp to apply for an approval for and build an alternative effluent treatment system that meets conditions that would be applicable to a substantially new Mill. This is a goal which cannot be achieved directly under the Agreements which the Province has entered into with the Mill's owners or under the Department's own regulatory jurisdiction. Government cannot do indirectly what it cannot do directly and it is unreasonable for the Department to seek to do so by imposing conditions as part of a regulatory approval process aimed at achieving that indirect goal.

These provisions of the Approval, in addition to being in breach of the Province's obligations under the Agreements, impose conditions which are unreasonable for a mill that was built in the 1960s to meet without requiring that a substantially new Mill be built. While Northern Pulp has

invested in upgrades at the Mill, such equipment modifications will not achieve the requirements of the Approval. The Approval therefore essentially prohibits Northern Pulp from operating the current Mill, and requires Northern Pulp to construct a substantially new Mill, in breach of the Agreements. The cumulative cost and uncertainty associated with the approval and construction of a new effluent treatment system jeopardize the long term economic viability of the Mill and is inconsistent with the Agreements.

Government cannot arbitrarily revoke Northern Pulp's contractual rights under the Agreements with the Province by way of an administrative approval process. Any re-negotiation of Northern Pulp's rights or the Province's obligations under the Agreements must necessarily be the result of written amendment to the Agreements. Northern Pulp approached the Department and the Province indicating that it was prepared to cooperatively work with the Province, as stated in Northern Pulp's December 18, 2014 letter to you:

> "We look forward to working with your department and Internal Services. We hereby request a meeting the first week of January with Internal Services and Nova Scotia Environment to discuss how a long term solution can be achieved in compliance with the terms of the above agreements and the Industrial Approval."

Absent any such cooperation between the Province and Northern Pulp, certain provisions of the Approval cannot reasonably stand given their clear breach of Northern Pulp's rights and the Province's obligations under the Agreements. Any provision in the Approval that is inconsistent with the Agreements must be removed or revised so that the Approval is consistent with the Agreements, including:

A. Definition of Effluent Treatment System – Clause 1(t)

The defined term "Effluent Treatment System" in Clause 1(t) of the Approval now includes the "former stabilization lagoon (known as Boat Harbour)". The defined term "Effluent Treatment System" is included as part of the definition of "Facility" and both terms are referred to throughout the Approval. Northern Pulp has never leased and has never been in control of Boat Harbour. The Mill discharges effluent into Boat Harbour at Point C in compliance with its obligations under applicable approvals and regulations, and has received a broad indemnification from the Province for claims and expenses related to Boat Harbour.

Under Section 4.01(g) of the MOU, the Province remained in possession of and responsible for the stabilization basin. The Lease definition of "Reconfigured Facility" or "Facility" makes it clear that the stabilization basin is not included as part of the Facility. Any terms in the Approval which impose responsibility on Northern Pulp for the stabilization basin known as Boat Harbour ("Boat Harbour") by virtue of:

- including the "former stabilization lagoon (known as Boat Harbour)" into the definition of Effluent Treatment System, including Clauses 5(h) and (i), 6 (h) and (i), 7(j) and (n), 12(au) and 16(b); or

- indirectly including the "former stabilization lagoon (known as Boat Harbour)" into the definition of the Facility, including Clauses 2(c), 3(a), 12(ac) and (am), 24(a) and 25(a),

are inconsistent with the terms of the Lease and Indemnity Agreement.

Northern Pulp therefore requests that the reference to the "former stabilization lagoon (known as Boat Harbour)" be removed from Clause 1(t) of the Approval.

B. Responsibility for Restoration of Stabilization Basin - Clause 7(n)

Clause 7(n) of the Approval requiring Northern Pulp to develop a plan for the long term environmental management and/or rehabilitation of Boat Harbour is expressly contrary to the Agreements. Under Sections 4.01(g) and 4.01(c)(ii) of the MOU, that responsibility falls upon the Province. Further, Section 4.01(f) of the MOU provides that Northern Pulp shall have no obligation or responsibility to restore the stabilization basin, which restoration will be undertaken by the Province. Northern Pulp is entitled to indemnification for any such costs under the broad provisions of the Indemnity Agreement.

Northern Pulp therefore requests that Clause 7(n) be removed from the Approval.

C. Spill Containment Plans – Clauses 14(m) and 14(n)

Clauses 14(m) and 14(n) require Northern Pulp to submit plans to the Department with respect to spill containment. However, Northern Pulp under the Lease is entitled to the use of the Effluent Treatment Facility until 2030 and presently uses that facility for spill containment, which use has been wholly adequate to date.

Requiring Northern Pulp to undertake a new spill containment system when Northern Pulp already has an adequate containment system available to it, which it is contractually entitled to use, provides no additional benefit to the environment and is in breach of the Province's obligations under the Agreements. As Northern Pulp's current system is adequate to protect the public and environment, Clauses 14(m) and 14(n) are inappropriate. Requiring Northern Pulp to undertake a new spill containment system would also be in breach of Northern Pulp's contractual rights under the Agreements. Northern Pulp requests that these Clauses be removed entirely.

D. Water Supply Agreement – Clauses 5(d) and 5(e)

Clause 5(d) of the Approval limits daily water consumption to a rate of 63,000 cubic meters per day by January 30, 2020. For comparison purposes, this represents an intensity of 72.2 m3/Adt. Clause 5(e) of the Approval also requires Northern Pulp to achieve certain water reduction milestones in the meantime. Clause 2.01 of the Water Supply Agreement says that the Province is obliged to continue to supply up to 25 million imperial gallons (or 113,652 m3) of fresh water per day to the Mill until 2021.

The intention of the parties in agreeing to the Water Supply Agreement is clearly contravened by the reductions required by Clauses 5(d) and 5(e) of the Approval. Northern Pulp remains willing to work cooperatively with the Department, as part of an overall negotiation with the Province with respect to the Agreements, to achieve water reductions that benefit the environment but are also practical and realistic. In the absence of such discussions, however, Northern Pulp requests that Clauses 5(d) and 5(e) be removed as they are clearly in breach of the Province's obligations under the Water Supply Agreement and are therefore unreasonable.

E. Surface Run-Off Diversion - Clause 6(c)

The AMEC Report[1] at p. 26 estimates that surface run-off accounts for 2.0 m3/ADt of effluent (rain water entering process sewers). See enclosed KSH Memo[2], at p. 6-8, where KSH has provided more extensive calculations that indicate a similar volume. As a very small fraction of the total flow (less than 1.5% of the total effluent flow for the highest month of the year, April), requiring Northern Pulp to divert surface run-off water into the Pictou Harbour is unreasonable.

Northern Pulp's current practice with respect to the surface run-off stream is to treat it with the Mill effluent, which system (as discussed above in Section I.C.) Northern Pulp is entitled to use until 2030. Clause 6(c) is improper as Northern Pulp's current system is adequate in protecting the public and environment and requiring Northern Pulp to undertake a new surface run-off water diversion program would be in breach of Northern Pulp's contractual rights under the Agreements.

Therefore, Northern Pulp requests that Clause 6(c) be removed.

F. Point D Monitoring – Clause 7(o)

Clause 7(o) requires monitoring at Point D for the parameters in Table 6 of Appendix A. As Northern Pulp's obligations cease at Point C under the Agreements, Northern Pulp cannot properly be responsible for monitoring at Point D, a location in the control of the Province. Northern Pulp therefore requests that Clause 7(o) be removed entirely.

G. Limits in Excess of Pulp & Paper Effluent Regulations – Clauses 6(e), 6(f), 8(d) and 8(f)

Section 4.01(k) of the MOU provides that the Province will impose operating limits on Northern Pulp that reflect and do not exceed or apply more stringently than the standards set out in the *Pulp and Paper Effluent Regulations* (Canada) ("PPER").

As the PPER does not contain limits on COD and TRS, the Approval under Clause 6(e), with respect to COD, and Clause 8(d), with respect to TRS, imposes more stringent operating limits on the Mill than are reflected in the PPER.

Further, to the extent that limits on COD have a limiting effect on BOD, the required reductions in COD under Clause 6(e) of the Approval result in more stringent conditions being imposed on the Mill, notwithstanding that Table 6 of the Approval indicates that limits for BOD are at the rate set by the PPER.

BOD_5 (Biochemical Oxygen Demand) is the amount of oxygen required to biologically oxidize the soluble components in an effluent sample incubated for a 5-day period. It is a measure of easily biodegradable organics that can be utilized as food by naturally occurring organisms. BOD_5 is an indirect measure of how the easily biodegradable organics in the effluent will consume dissolved oxygen in the receiving waters as natural microorganisms consume these

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[1] The Department indicated to Northern Pulp that AMEC was consulted during the development of the Approval. The April, 2010 AMEC Report entitled "Boat Harbour Return to Tidal Re-Evaluation Final Report" ("AMEC Report") is the latest report that was made available to Northern Pulp.

[2] Memo from KSH Solutions Inc. ("KSH") dated March 31, 2015 entitled "Technical Assistance with Appeal of Final Industrial Approval" ("KSH Memo").

organics, thus potentially affecting flora and fauna due to reduced dissolved oxygen concentrations. COD (Chemical Oxygen Demand) is the amount of oxygen required to chemically oxidize the soluble components in an effluent sample. COD is a measure of all organics (lower molecular weight biodegradable and higher molecular weight non-biodegradable) as well as oxidizable inorganics.

COD will always be the greater of the two, as BOD_5 is a percentage of COD. It is generally accepted that COD and BOD share an empirically demonstrated relationship. Fairly regular relationships exist between COD and BOD_5 for any given industrial or municipal wastewater stream. Once the average COD:BOD_5 ratio for a particular wastewater stream is established, a relatively simple and quick 1-hour COD test can be used to predict BOD_5 with relative reliability. This is why COD tests are often done, but rarely reported. Kraft mill lignin and cellulose contain both low and high molecular weight organics. Therefore, any measures undertaken to reduce COD at the Mill will undoubtedly reduce BOD_5 as well, in breach of the MOU. See enclosed Klopping report at p. 3-4.[3]

As a result of the inconsistency of these provisions with the MOU, Northern Pulp submits that Clauses 6(e) and 8(d) are unreasonable and therefore requests that these provisions, as well as the related provisions at Clauses 6(f) and 8(f), be removed.

H. Precluding Use of Boat Harbour Effluent Treatment Facility – Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A

Under the Lease, as extended, Northern Pulp has the right to exclusive possession and occupation of the Effluent Treatment Facility until 2030. The provisions of the Approval that effectively preclude Northern Pulp from using the Effluent Treatment Facility for the Mill's operations are inconsistent with the provisions of the Lease, including Clauses 5(b) and Clause 14 of the Lease.

The effect of Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) of the Approval is to require Northern Pulp to apply for an amendment to the Approval if Northern Pulp's modeling of water use reduction projects shows that the final wastewater effluent quality will not meet the requirements of Table 6 of the Approval, without modification or addition to the Effluent Treatment System as configured as of the date of the Approval. The application for an amendment must include a plan for alternative effluent management and/or treatment designed to meet the requirements of Table 6A of the Approval.

These provisions make it clear that the Department intends to require Northern Pulp to discharge its effluent at a treatment facility at a location which has yet to be determined if it is unable to comply with the conditions imposed. By specifically not contemplating or providing a means for compliance to be achieved through modifications or additions to the current Effluent Treatment System, the Province is in breach of the Agreements with Northern Pulp that entitle Northern Pulp to use the Effluent Treatment Facility until 2030. The estimated capital cost of constructing a new effluent treatment plant is in excess of $100 million.

Northern Pulp therefore requests that any Clause in the Approval which contemplates that Northern Pulp cease using the Effluent Treatment Facility prior to 2030, including Clauses 5(h), 5(i), 5(j), 6(h), 6(i) and 6(j) and Table 6A, be removed.

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[3] Report from Paul H. Klopping dated April 8, 2015 ("Klopping Report"). Paul Klopping has been auditing the Mill since 2005.

I. Rehabilitation Plans – Clause 24

Clause 24(a) of the Approval provides that Northern Pulp must submit a detailed closure plan to the Department one year prior to the decommissioning or closure of the Facility or any part thereof. To the extent that the definition of Facility in the Approval incorporates by reference to Effluent Treatment System the "former stabilization lagoon (known as Boat Harbour)", Northern Pulp refers to Sections I.A., I.B. and I.H. above and submits that any requirement under Clause 24 for Northern Pulp to cease using its current Effluent Treatment Facility, or submit any plan or undertake any costs or rehabilitation with respect to Boat Harbour is in breach of the Lease and the Indemnity Agreement. Northern Pulp is entitled to indemnification from the Province in respect of any cessation by Northern Pulp of the Effluent Treatment Facility and any costs for any rehabilitation of Boat Harbour imposed by the Province on Northern Pulp, under the Approval or otherwise.

Northern Pulp requests that Clause 24 be revised to acknowledge that any cessation of Northern Pulp's use of the Effluent Treatment Facility and any rehabilitation of Boat Harbour are the Province's responsibility and the plans and costs thereof will be assumed by the Province.

II. <u>Prohibitory and/or Impossible Provisions</u>

A. Capital Investment Required to Comply with Approval is Prohibitory - Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n)

In addition to being in breach of the Agreements as discussed throughout Section I above, Northern Pulp's compliance with the Approval will require Northern Pulp to undertake significant capital expenditures estimated to be in excess of $90 million, to divert surface run-off water to the Pictou Harbour, to implement a new spill containment system, and to reduce COD. See enclosed EKONO Memo, p. 2.[4]

The estimated $90 million in capital expenditures referred to above does not include the capital expenditures to construct a new effluent treatment plant in order to comply with Clauses 5(i) and 6(i) of the Approval, estimated to be in excess of $100 million. This requirement is also in breach of Northern Pulp's rights under the Lease, as discussed in Section I. H. above

The cumulative effect of the capital cost associated with Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n) of the Approval is effectively the prohibition of Northern Pulp's operation by the Department, instead of the Department's regulation of it.

With respect to COD, Clause 6(g) requires Northern Pulp to develop a plan for additional reductions to achieve a maximum effluent COD of 11,890 kg/day at Point C. This equates to a 77% reduction from the Mill's present operation.[5] Such a provision is not regulatory in nature. It is prohibitory. That is, the Approval through Clause 6(g) has the effect of prohibiting Northern Pulp's activities, rather than regulating them. As discussed further in Section II.B. below, the

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[4] Memo from Heikki Mannisto and Eva Mannisto dated April 6, 2015 entitled "Possibility to meet COD limit of 11,890 kg/day" ("EKONO Memo").

[5] The average annual COD at Point C for the period of January 1, 2010 to December 31, 2014 is 58.8 kg/Adt. At 873 Adt/day, that equates to 51,350 kg/day at the end of the Approval if the Mill is running at current levels. 11,890 kg/day represents an intensity of 13.6 kg/Adt at Point C.

COD reduction may not even be possible and any capital investments in an attempt to achieve this requirement would be prohibitory.

With respect to surface run-off diversion under Clause 6(c), the new segregated system would require a new sewer network, retention ponds, oil and sediment traps, sample collection, alarms and a mechanism to divert this stream back to the main Mill effluent stream if contamination was detected. This new non-contact outfall will require permits from the Department as well as Environment Canada and the Department of Fisheries and Oceans. Northern Pulp has no guarantee that the Mill will receive these required approvals from these departments.

A new spill containment system under Clause 6(g) is also unreasonable in that it imposes significant cost on Northern Pulp without additional environmental or public benefit and is in breach of the Agreements.

The high capital cost of complying with any or all of Clauses 6(c), 6(g), 14(m) and 14(n) are completely disproportionate to the benefit, if any, to the public and the environment of these measures. The surface run-off diversion requirement is disproportionate given the small fraction of the flow that surface run-off represents and the fact that it is presently treated with the Mill effluent. The spill containment requirement is not only disproportionate but unnecessary because Northern Pulp already has an adequate spill containment system available to it. The Department is aware through the AMEC Report that process technologies for reducing COD to the requirement of Clause 6(g), assuming those reductions are achievable, would be prohibitory. The timelines contained in the Approval for achieving these Clauses are too short for such major construction projects to be completed. Therefore, the conditions in the Approval are impossible for Northern Pulp to meet and are prohibitory.

Through the cumulative effect of these Clauses, and the capital cost associated therewith, the Department is prohibiting the Mill from operating. Instead of regulating the existing Mill, the Department is requiring that Northern Pulp build a substantially new Mill. Provisions of regulatory approvals that prohibit rather than regulate operations are unreasonable and ultra vires. Therefore, Northern Pulp requests that Clauses 5(i), 6(c), 6(g), 6(i), 14(m) and 14(n) be removed from the Approval.

B. COD Reduction is Prohibitory and Impossible to Meet – Clause 6(g)

As noted in Section II.A. above, the proposed COD reduction of 77% under Clause 6(g) of the Approval is prohibitory not only because of the capital investments in order to attempt to achieve this requirement but also because the proposed COD reduction is unrealistic and is essentially impossible for Northern Pulp to meet.

The AMEC Report provided an assessment of the status and operation of the existing treatment facility for the Mill as well as preliminary engineering for several effluent treatment alternatives. The assessment was conducted at the time that the regulatory discharge for the Mill was located at Point D. The AMEC Report concluded that the Mill's Aerated Stabilization Basin ("ASB") was operating well. Since the regulatory discharge point was moved to Point C on July 1st, 2010, there have been no incidences of daily or monthly BOD_5 or TSS being over the limits in the PPER. In fact, all tests have shown that the Mill is well below the regulated limits.

Even though the AMEC Report was based on outdated information and therefore could not recognize the current operational attainments of the Mill, the AMEC Report itself demonstrates that it is simply not possible for the Mill to achieve this COD reduction. As such, the

requirement that the Mill achieve the reduction required by Clause 6(g) amounts to a prohibition of the Mill's operations, rather than the regulation of it, and therefore is unreasonable.

Appendix 2 of the AMEC Report contains the preliminary engineering for the effluent treatment alternatives with mass balances (annual averages and not daily limits). The most stringent case in the AMEC Report, Case 3, completely abandons the Mill's effluent treatment facility and replaces it with a new Activated Sludge Treatment ("AST") system and includes "Significant Improvements & Water Use Reduction", as outlined in section 4.2.3 of the AMEC Report. Drawing #158229-100-6-923 is the mass balance for the New Treatment Plant – Case 3. This Case assumes a 50% reduction in liquor losses will be achieved (20,400 kg/day to 11,400 kg/day). It also assumes marginal increase in production with a design capacity of 908 Adt/day. Incineration of Waste Activated Sludge would occur in the Recovery Boiler, which at present is not permitted in Northern Pulp's Approval. The predicted effluent flow is 65,151 m3/d as an annual average; the new daily limit of 67,500 m3/d required in the Approval is even more stringent than the AMEC mass balance and does not consider seasonal variations.

The predicted COD for Case 3 is 70,900 kg/day. The typical COD removal for a new AST system would be in the neighbourhood of 50 – 60%. Even at the higher end of that removal efficiency (60%), the final COD discharge would be 28,360 kg/day (70,900 kg/day x 0.4). In summary, Case 3 demonstrates that even with significant in-Mill improvements and a brand new AST treatment system, the Mill would still exceed, by more than double, the COD daily limit of 11,890 kg/day at Point C as set out in the Approval at Clause 6(g). AMEC recognizes that other process technologies that were not included in Case 3 would be economically prohibitive to the Mill. The Klopping Report, EKONO Memo and McCubbin Report[6] all agree that the requirement contained in Clause 6(g) is unrealistic and that the associated costs would be significant.

Therefore, the requirement contained in Clause 6(g) of the Approval, as a daily limit representing a 77% reduction from the Mill's current annual average for the Mill's current operations, is impossible for Northern Pulp to meet. The Department included the requirement of Clause 6(g) in the Approval knowing that the AMEC Report says that the Mill cannot achieve that requirement even if the Mill adopted the strictures of Case 3 including installing a completely new treatment system. The requirement of Clause 6(g) is completely untenable, even according to the Report on which the Approval is based. The Department therefore must be considered to have included this provision in order to prohibit the Mill's operations.

The Approval contains conditions that treat the Mill as if it is a new mill and as such the Department has imposed regulatory standards on the Mill that are prohibitory to the existing Mill operating. Provisions of regulatory approvals that prohibit instead of regulate and that are impossible to meet are unreasonable and ultra vires. Therefore, Northern Pulp requests that Clause 6(g) be removed from the Approval.

C. Modeling Deadlines are Impossible to Meet - Clauses 5(h) and 6(h)

Clauses 5(h) and 6(h) of the Approval require Northern Pulp to submit to the Department modeling for all reduction stages along with a list of planned projects required under Clauses 5(e) and 6(e) no later than October 30, 2015.

Northern Pulp's consultants have indicated that it is impossible to complete in-Mill engineering studies and then adequately complete effluent quality modeling to predict Mill wastewater

[6] Report from Neil McCubbin dated April 6, 2015 ("McCubbin Report").

changes for submission to the Department by October 30, 2015. It is not reasonable to require such a deadline considering the impossibility of meeting that deadline as well as the fact that the modeling is for reductions that are not required until 2017.

In Northern Pulp's submission, October 30, 2016 is more reasonably attainable and appropriate. Therefore, Northern Pulp requests that Clauses 5(h) and 6(h) each be revised to change the deadline for this study from October 30, 2015 to October 30, 2016.

D. Regulatory Compliance without Modification or Addition - Clauses 5(i), 6(i) and 6(j)

Northern Pulp is also precluded through Clauses 5(i) and 6(i) from achieving the requirements of the Approval through modification or addition to the effluent treatment system as configured as of the date of the Approval, and through Clause 6(j) from reduction and prevention of liquor losses entering the effluent system. In addition to being contrary to the Agreements as discussed in Section I.H. above, requirements that a proponent achieve regulatory compliance without making improvements to the existing system are prohibitory on their face, and do not serve the public or benefit the receiving environment. Northern Pulp again requests that Clauses 5(i), 6(i) and 6(j) be removed.

III. Vague and Uncertain Provisions

A. New Treatment Facility - Clauses 5(h), 5(i) and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A

In addition to the objection noted in Section I.H. above, the majority of parameters and discharge limits in Table 6A in the event that Northern Pulp is required to discharge its effluent at a treatment facility at a different location have yet to be determined. Those limits are specifically contemplated as being determined based on an unknown location of a new treatment facility and on results of a receiving water study yet to be completed. That receiving water study must meet the satisfaction of the Department, yet the Approval does not indicate any criteria upon which such water study will be considered satisfactory. Northern Pulp considers the requirement to apply for and obtain approval of an as-yet-unidentified discharge location to be unreasonable.

At present, there is an absence of standards and guidelines in Clauses 5(h), 5(i), and 5(j) and Clauses 6(h), 6(i) and 6(j) and Table 6A. These provisions are too vague and uncertain to be considered reasonable. The conditions contain no limitation on the Department's discretion and as a result Northern Pulp has no fair notice of the conditions it must meet. Therefore, Northern Pulp requests that these provisions be removed.

B. COD Reductions - Clause 6(e)

The provisions in Clause 6(e) requiring reductions in COD do not specify or provide a means for calculating the base point for measuring such reductions. These provisions are therefore too vague to be reasonable and therefore must be removed.

IV. Unrealistic and Otherwise Unreasonable Provisions

It is clear that many provisions of the Approval are based on the AMEC Report. However, as noted in Section II.B. above, the AMEC Report is outdated and does not represent the Mill's

current operations and its operational achievements since the date of the AMEC Report. As such, certain provisions imposed by the Department in reliance of this Report are unreasonable.

The AMEC Report ranks Northern Pulp in the 95th – 100 percentile on water usage in Canada. In 2007, the year that Northern Pulp was benchmarked in this 2010 study, the Mill's regulated effluent discharge point was Point D exiting the Boat Harbour basin. In July 2010, the regulated effluent discharge point was moved back to Point C exiting the ASB. Point D is not representative of the Mill effluent flow when compared to other mills because it is downstream of the treatment plant. Effluent flow at Point D is historically 25% higher than at Point C due to surface run-off from the large Boat Harbour basin. Surface run-off was not taken into account in the AMEC Report, and therefore comparisons are not valid. Comparison of Point C data at the end of the treatment process is appropriate for benchmarking purposes. Table I shows the decrease in effluent flow from 2010 forward:

Table I: Effluent Flow Intensity (m3/Adt) – Annual Averages

Regulated Outfall Location	2007	2008	2009	2010	2011	2012	2013	2014
Point D	112	133	129					
Point C				94	89	87	86	88

As the Approval is clearly based on a lack of appreciation for the Mill's current operations, including an outdated report from AMEC which contains conclusions that are no longer correct, the Department has no basis for many provisions contained in the Approval. It is unreasonable for the Department to impose regulatory standards based on a report that relies on almost 10-year-old data and disregards the achievements of the Mill since that time.

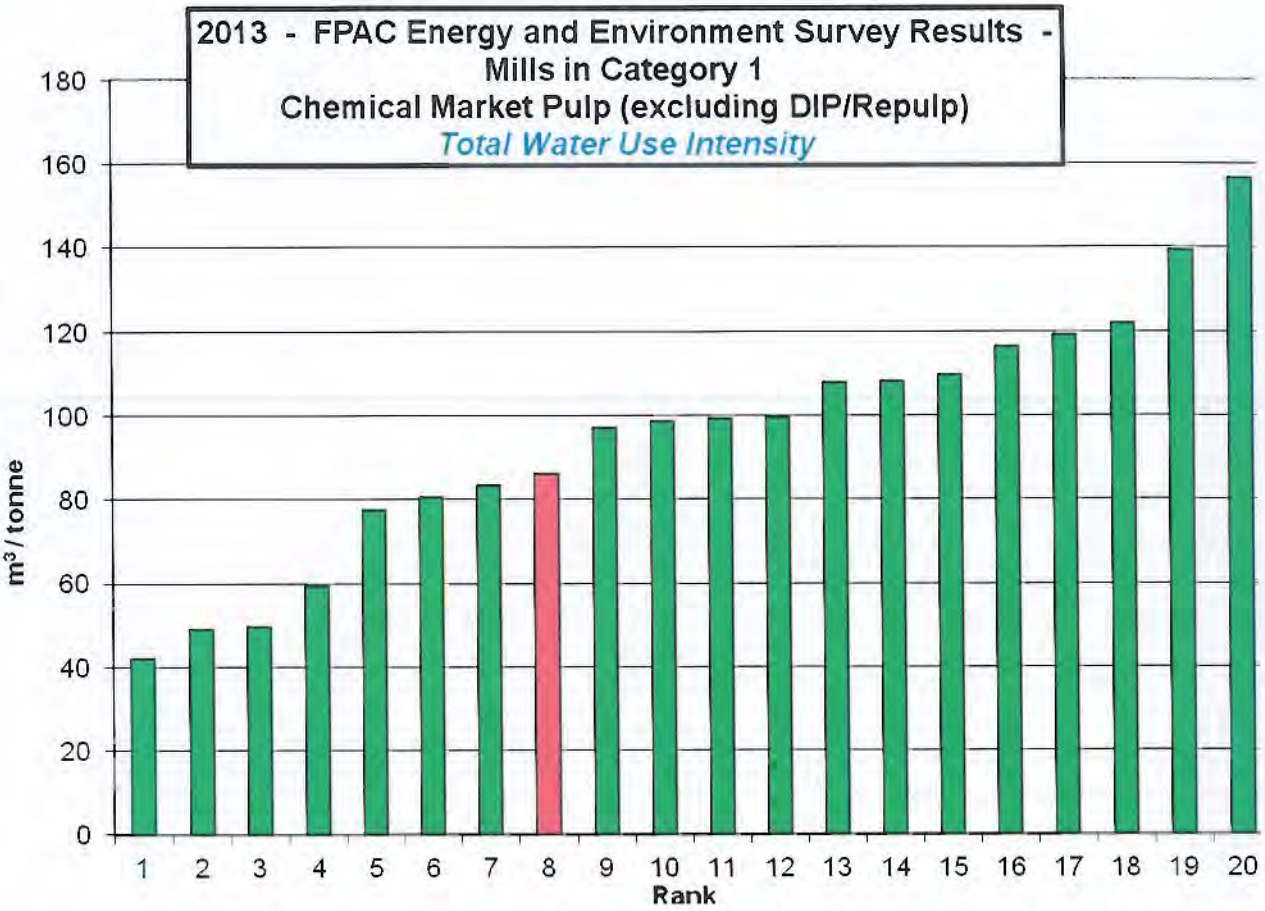
Other provisions in the Approval are unreasonable as they provide little or no additional environmental benefit but impose very significant costs on Northern Pulp and therefore are improper. As well, statements made by the Department in issuing the Approval make it clear that some provisions of the Approval are based on a misunderstanding of or lack of appreciation for the Mill's operations, which make those provisions unrealistic. Some provisions in the Approval are unreasonable as they fail to recognize industry norms or factors outside of Northern Pulp's control. Others are simply inaccurate. Those provisions must therefore be removed or revised as set out in the Sections below.

A. Water Reduction Requirement – Clauses 5(d) and 5(e)

As stated by all effluent experts (Ken Frei and Guy Martin of KSH, Paul Klopping, Neil McCubbin, and Heikki Mannisto and Eva Mannisto of EKONO), the daily limits for water intake and effluent contained in the Approval are highly unusual. Few jurisdictions place flow limits in general on intake and effluent; exceptions are generally where the mill makes up a large percentage of the waters (usually rivers) that it is drawing its water supply from or is discharging effluent into. Mills that ultimately discharge into marine environments do not typically have these restrictions: see KSH Memo, p. 4. The AMEC Report at p. 30 refers to the 2007 EKONO study which also recognizes that such limits will only be placed on mills in certain circumstances, which Northern Pulp notes are not applicable to the Mill.

The requirements related to water reductions in the Approval appear to be based on a mischaracterization of the Mill's water usage. A Departmental document accompanying the

release of the January 30, 2015 version of the Approval stated that "The Mill is a large consumer of water, especially compared to other mills." In fact, Northern Pulp's water usage is average by comparison to other Canadian mills. Enclosed is a copy of the Forest Products Association of Canada survey entitled "FPAC 2013 Energy and Environment Benchmarking Report – Pulp and Paper Sector" dated March 10th, 2015 ("FPAC Report"). The following graph is an excerpt from the FPAC Report. With 20 out of a possible 30 mills reporting, Northern Pulp ranks the 8th best in the survey for water use intensity:



Reductions of water flow of the magnitude contained in the Approval could have negative effects on the biological treatment process and ultimately the receiving water, increasing odour for residents who live in the vicinity of the effluent treatment centre.

As noted in Section I.D above, Clauses 5(d) and 5(e) should be removed from the Approval for being in breach of the Water Supply Agreement. Clauses 5(d) and 5(e) are also unreasonable as they ignore industry norms and are based on a mischaracterization of the Mill's water usage, as a result of the Department's reliance on an outdated report. Therefore, Northern Pulp repeats its requests that these Clauses be removed.

B. TRS Reduction Requirement – Clauses 8(d), 8(e) and 8(f)

The new requirement under Clause 8(d) for water-phase TRS measurements in the effluent are best described by the KSH Memo at p. 14-16. In summary, Clause 8(d) is modeled after

Ontario's new 2014 Air Pollution – Local Air Quality Regulation (which imposes certain air standards, including TRS) and the Ontario Technical Standards to Manage Air Pollution. To Northern Pulp's knowledge, Ontario is the only other province that is introducing this standard. Mills may comply with the Regulation by electing to register under the optional Technical Standard which has phased-in limits for TRS in water entering the wastewater treatment system. The Ontario Ministry of the Environment researched the relationship between TRS effluent loading and TRS in ambient air originally reported by the US EPA. Because the understanding of the relationships of TRS effluent loading and TRS in ambient air are still in their infancy and the influence of other parameters (including pH, temperature and the various types of odorous compounds present) are not well known, the Ontario government introduced this as an optional standard that mills could choose to apply for. Mills that choose to apply will, over time, provide data that will lead to improved understanding of the relationships between effluent concentrations and air quality. The optional nature of the standard gives Ontario the ability to modify the standard as is deemed necessary as information and data become available. By imposing Clause 8(d) in the Approval, the Department has applied the optional Ontario standards as a hard and fast requirement that must be abided by without regard for the outcome of the Ontario mill experiences. If the limits are deemed to be unrealistic, Ontario has allowed room for possible changes; the Department has not.

It is of particular note that Northern Pulp is regulated to fixed TRS limits, including 3-fold reductions in coming years, when the Mill does not have any baseline data. The limits in Clause 8(d) have been set by the Department before any data has been gathered and before it is known if there is even an environmental reason to impose such limits. Ontario has recognized that there is not enough known yet about the relationship between TRS effluent loading and TRS in ambient air to justify the regulation. What is an optional consideration in Ontario because the precise relationship between TRS effluent loading and TRS in ambient air has not yet been demonstrated, the Department has made a mandatory requirement of the Approval. It is unreasonable for the Department to impose a limit before knowing if there is a relationship necessitating that limit.

Northern Pulp has contacted a mill in Ontario and all of the major laboratories in Canada. It appears that no Canadian laboratories (after conferring with their satellite offices) are capable of performing the test required by Clause 8(d), NCASI Method RSC – 02.02. At this point, the closest capable lab that Northern Pulp has found is located in Simi Valley, California. This demonstrates that the Department is imposing a requirement on the Mill is entirely inconsistent with other Canadian jurisdictions.

As noted in Section I.G above, Clauses 8(d) and 8(f) should be removed from the Approval as they are in breach of the MOU. Clauses 8(d) and 8(f) should also be removed as there is no known scientific basis for the limit, which regulators elsewhere have recognized. Northern Pulp does not object to performing testing of TRS in accordance with Table 6 for the benefit of residents, as such monitoring is contemplated in Clause 8(e). However, the imposition of the regulatory requirement to achieve the TRS limits imposed in Clauses 8(e) to 8(f) is unreasonable.

Northern Pulp requests that Clauses 8(d) and 8(f) be removed entirely and that Clause 8(e) be revised to impose only a requirement that Northern Pulp test TRS in accordance with Table 6.

C. Effluent Flow Reduction Requirements – Clauses 5 and 6(a)

The reductions in Clauses 5 and 6 of the Approval are inconsistent. As water use and effluent flow are directly related in terms of the Mill's mass balance, the water use restrictions outlined in Clause 5 of the Approval effectively restrict the effluent limit contained in Clause 6(a) of the Approval to less than 67,500 m3/day or 77.3 m3/Adt. The effect of the water use restrictions in Clause 5 is to impose a greater effluent flow reduction requirement than the Department requires in Clause 6(a).

The AMEC Report (p. 25-26) indicates that consumptive water use (water taken but not returned as effluent) with the power boiler scrubber in operation is estimated at approximately 2 m3/ADt. In essence, from a mass balance perspective, Clause 5(d) is more stringent and practically translates to an effluent limit of 70.1 m3/Adt (72.2 – 2) or 61,200 m3/day. This represents a further reduction of 6,300 m3/day or an additional 9%. The McCubbin Report indicates that the net water consumption of 2 m3/Adt is very conservative and could be as high as 5 m3/Adt, which could lead to even further reduction requirements. KSH indicates that 8% of incoming water supply to the mill would be lost to evaporation. All three consultants (AMEC, Neil McCubbin and KSH) support this reduction of an additional 9-10%.

In addition to the arguments set out in Section IV.A above, the water use restrictions in Clause 5 are unreasonable because they impose conditions that are more onerous than the effluent control limits in Clause 6(a) of the Approval. Therefore, Northern Pulp requests that the water use restrictions in Clause 5 be removed.

D. COD Limits – Clauses 6(d) to 6(j)

The COD limits in Clauses 6(d) to 6(j) of the Approval are based on the outdated AMEC Report and are unreasonable.

Table II below summarizes the Mill COD data at several locations in the treatment plant.

Table II: Effluent COD Intensity (kg/Adt)

Location	2007	2008	2009	2010	2011	2012	2013	2014
Point A	154.6	124.7	103.5	123.4	99.6	92.2	82.5	87.8
Point C	**71.7**	**82.3**	**76.7**	**70.1**	**63.1**	**56.0**	**53.6**	**51.4**
Point D	74.0	78.6	71.3	65.1	62.8	56.0	55.2	50.8

The improvements in COD intensity beginning in 2011 reflected in Table II are in part the result of the Green Transformation Projects carried out by the Mill that year. Continuous improvement initiatives at the Mill have continued to provide COD reduction through to 2014.

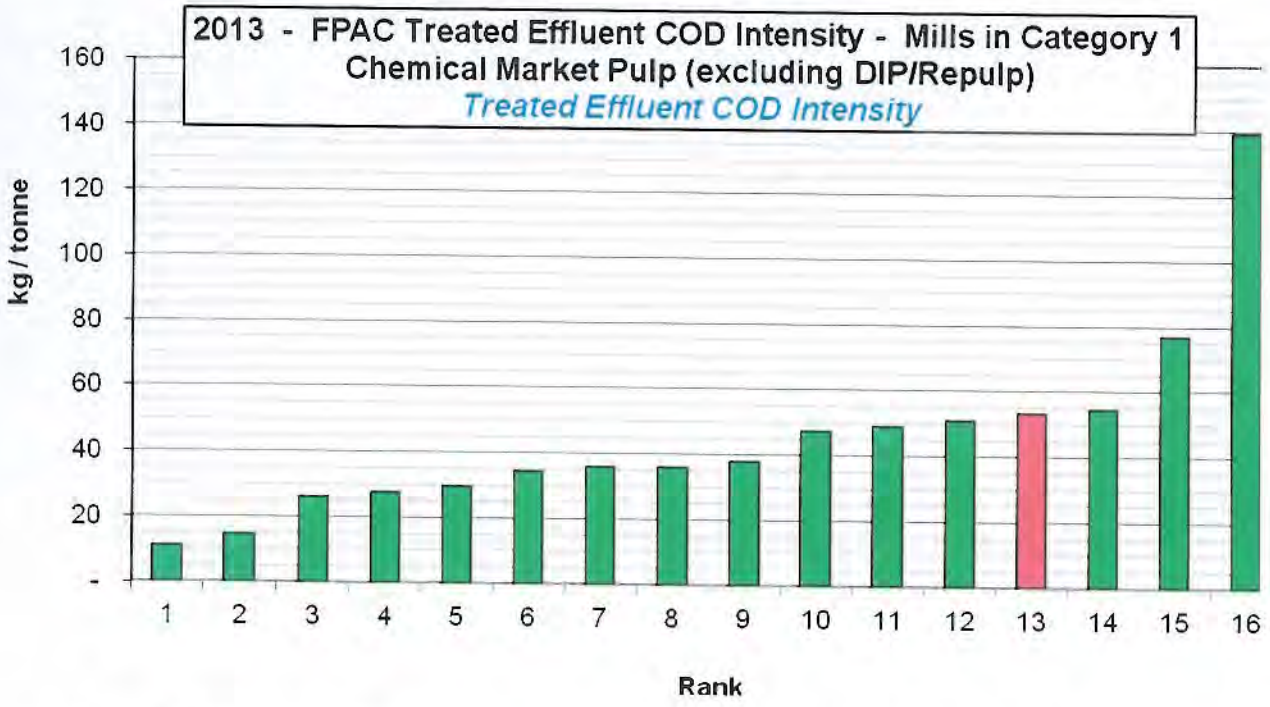
Since the AMEC Report was written, many of the proposed projects for effluent quality improvements identified in the Report have been completed, including: improvements to brown stock washing including two new washer drums and closing of the screen room with true counter-current washing, recycle of PM rejects, Stage 1 DNCG system, sludge removal plan, PB scrubber and a new emergency spill tank. A COD reduction of 30% has been achieved from the 2007 benchmark conducted in the AMEC Report.

Although not clearly stated, Northern Pulp has assumed that the COD reductions in Clause 6(e) of the Approval are based on the five year annual average COD at Point A that was reported pursuant to Clause 6(d).

Northern Pulp's average COD intensity at Point A for 2010 through 2014, as requested in Clause 6(d), is 97.1 kg/Adt. At 873 Adt/day[7], the daily discharge would be 84,800 kg/day. The 50% reduction in COD required by Clause 6(e) would mean a daily discharge of 42,400 kg/day at Point A.

There is very little published data for COD in North America, and virtually nothing from the United States. Data that is published, and all third party data presented in this Appeal, refer to "after treatment" and would be comparable to Point C in the above Table II, not point A (the inlet to treatment).

The Department has recently made statements in media interviews that Northern Pulp has four times greater COD than mills of similar size. This is clearly wrong. The following graph is an excerpt from the FPAC Report. With 16 out of a possible 30 mills in Canada reporting, this graph shows that Northern Pulp clearly does not have four times greater COD than mills of similar size, nor does it have the highest COD discharge.



The AMEC Report indicates (on p. 29) that benchmarking of effluent was done using the widely accepted EKONO study of September, 2007, which is based on 2005 data. The enclosed EKONO Memo compares COD and BOD data from Northern Pulp to the results found in the EKONO database. The EKONO benchmarking and analysis of the new COD limits concludes

[7] 310,000 Adt/year at 355 days is 873 Adt/day at the end of the Approval, assuming that the Mill is able to increase production to this limit by that time.

that the two lowest COD discharge mills are hardwood mills with oxygen delignification, modified cooking, condensate stripping, etc. and the lowest COD discharge in a Canadian bleached softwood kraft pulp mill in the database is 28-30 kg/Adt. The EKONO Memo also concludes that more than 40% of the North American bleached market kraft pulp in 2013 was produced by mills with BOD discharges higher than those at Northern Pulp's Mill. This proves once again that the Department is not working with current data and does not understand the influences of mill process equipment and wood species on COD.

It is clear that the Department was relying on outdated studies and analysis in setting the COD limits in Clause 6. This is based on outdated data and is unreasonable. Therefore, Northern Pulp requests that Clauses 6(d) to 6(j) be removed.

E. Production Limit – Clause 4(a)

Clause 4(a) of the Approval limits the maximum production rate of the Mill to 310,000 Adt/yr. Not only does this Clause prohibit the Mill's future expansion, it also offers no additional environmental benefit. The production capacity of the Mill is and should properly be limited by the existing equipment of the Mill and the other requirements of the Approval. So long as Northern Pulp is in compliance with the other requirements of the Approval, whatever the Mill's production limit happens to be when it complies with those requirements has no environmental relevance.

There is no additional environmental basis or additional public benefit for including in the Approval a provision that arbitrarily limits the production of the Mill. Northern Pulp therefore requests that Clause 4(a) be removed entirely.

F. Phenanthrene Testing – Clause 12(ag)

Clause 12(ag) requires semi-annual testing of Phenanthrene at Surface Water station SW12-3. The trend analysis requested is not warranted because the measurement was at or near the detection limit. See enclosed Dillon Consulting Memo[8]. The requirement of Clause 12(ag) therefore has no justification. It only adds cost to Northern Pulp with no corresponding additional benefit to the environment. The requirement in Clause 12(ag) is therefore unreasonable and Northern Pulp requests that it be removed.

G. Daily Limits for Water and Effluent Usage – Clauses 5(d), 5(e), 6(a) and 6(b)

The reference to water and effluent usage in the Approval in terms of daily limits is contrary to the way that effluent data is compared and benchmarked in the industry. See the AMEC Report and the enclosed EKONO Memo, FPAC Report, KSH Memo, McCubbin Report, and Klopping Report. As stated in the KSH Memo at p. 5, "Effluent flow restrictions are usually stated on an average basis, usually monthly or annually since there is no measurable risk to the environmental [sic] by one day of effluent flow above a certain amount."

The imposition of daily limits for water usage that do not consider seasonality are of particular concern to the Mill. Based on data from the last three years, the Mill's water intake has peaked at 87,000-91,000 m3/day (23-24 million gallons/day), even though the Mill's annual average water usage is 75,000 m3/day (20 million gallons/day). These peak days do not occur during the highest surface run-off months. Rather, they historically occur during the hottest days

[8] Letter from Dillon Consulting Limited dated February 11, 2015 ("Dillon Consulting Memo").

during the summer when the incoming Middle River water is at its warmest and cooling systems are most heavily loaded. Cooling towers will be an essential component of water reduction that will recycle "once-through" cooling water for re-use. Cooling towers are driven by temperature differential (water to ambient air) and relative humidity and are a very effective means of cooling. However, heat transfer during hot, humid spells can be challenging. The cooling towers offer significant water reduction on an annual basis, but daily reductions will be highly influenced by weather. It is therefore clear that the Mill will not be able to operate and comply with the daily water usage requirements of the Approval on certain days of the year. Therefore, daily limits on water usage are unreasonable as they effectively preclude the Mill from operating on a consistent basis.

There is no environmental reason to impose a daily limit in Northern Pulp's circumstances. Northern Pulp therefore requests that all water and effluent usage restrictions in the Approval, including Clauses 5(d), 5(e), 6(a) and 6(b), be revised to be based on yearly averages, not daily limits.

H. $PM_{2.5}$ Contributors – Clauses 9(a) to 9(e)

Clauses 9(a) to 9(e) of the Approval transform the voluntary objectives of the Canadian Ambient Air Quality Standards ("CAAQS") into mandatory compliance requirements without any consideration given to other local sources of $PM_{2.5}$, especially other local heavy industry, wood-burning stoves and other non-commercial sources, or the not insignificant contribution of interprovincial and international transport of $PM_{2.5}$ from other sources.

It is unreasonable to require the Mill's mandatory compliance with the limits in the CAAQS without taking into account other industrial facilities, residential sources and transportation that are also contributors to $PM_{2.5}$ in the area. See KSH Memo, p. 16-18. As the Mill's compliance with Clauses 9(a) to 9(e) is outside of the Mill's own control, such mandatory compliance requirements are unreasonable.

Northern Pulp is confident that the Mill will meet these limits as a contributor; however, imposing mandatory compliance on the Mill without taking into account other contributors is unreasonable. Northern Pulp therefore requests that Clauses 9(a) to 9(e) be revised to acknowledge that Northern Pulp is only required to demonstrate that its relative contribution to the local air quality meets the limits of the CAAQS.

I. Particulate Limit – Clause 9(h)

Clause 9(h) imposes a regulatory limit on the Recovery Boiler for particulate of 77 mg/Rm^3 @ 11% O_2. We understand, based on discussions with the Department, that this limit is based on the performance expected by the manufacturer of the new electrostatic precipitator ("ESP"). This limit does not properly take into consideration the variables that can affect actual boiler performance on a day-to-day basis, particularly in the case of a new ESP attached to an existing boiler. Contrary to North American regulatory convention, the approach taken by the Department in setting the particulate limit for the Recovery Boiler treats the installation of the new ESP as if it were a significant modification to an existing boiler and, as such, treats it as a new boiler and sets emission limits that are in line with such units: KSH Memo, p. 21-22. This is inconsistent with the approach taken in most North American jurisdictions. For example, under the U.S. Air Quality Regulations, the addition and/or replacement of pollution control equipment, such as a new ESP, is not, in itself, considered to be a modification to an existing boiler, and would not result in treating such existing boiler as if it were a new boiler for the purposes of

setting a particulate limit. As the particulate limit imposed by Clause 9(h) fails to recognize that the ESP is being connected to Northern Pulp's existing boiler system and the variables that can affect the performance of that boiler system on a day-to-day basis, Clause 9(h) is unreasonable.

The limit imposed on Quebec's existing recovery boilers of 153.5 mg/Rm^3 @ 11% O_2 represents a more reasonable and appropriate limit, as it represents state-of-the-art performance for a boiler and direct contact evaporator system of the same vintage as Northern Pulp's boiler. See KSH Memo at p. 18-22. Northern Pulp therefore requests that Clause 9(h) be revised accordingly.

J. Middle River Study – Clause 5(f)

Clause 5(f) makes Northern Pulp responsible for conducting a maximum sustainable yield study of the Middle River watershed. In the 47 years of the Mill's operation, neither the Department nor any other stakeholder has ever raised a concern about water usage impacts on the Middle River watershed. The Michelin, Granton facility also draws its fresh water supply from the Middle River and discharges its effluent back into Middle River upstream of the Mill's water supply. As well, the river is dammed to prevent salt water intrusion and the spillway dam is controlled by the Province. See KSH Memo at p. 2. No low-level warnings have ever been communicated to the Mill.

In addition, the December 15, 2015 deadline does not allow for a full year study to cover all seasons which would be normal for this type of assessment, implying that existing data must be used. The responsibility of Northern Pulp to conduct this maximum yield study of the watershed (which is usually directed towards new applicants for a water removal permit) is unreasonable, especially considering the Mill does not have access to or control of pertinent data that would be required to properly complete this study.

Northern Pulp therefore requests that Clause 5(f) be removed.

K. Waste Dangerous Goods – Clause 4(i)

Northern Pulp requests that Clause 4(i) be revised to replace the words "all wastes generated" with "all waste dangerous goods generated" in order to clarify this Clause and ensure its consistency with the preceding Clause 4(h), which deals only with waste dangerous goods.

L. TRS Reporting – Clause 7(m)(i)

The monthly reporting requirement for TRS in Clause 7(m)(i) is internally inconsistent with the reporting requirement for TRS in Table 6 of Appendix A. Clause 7(m)(i) should therefore be amended to include an exception for TRS reporting of every three months.

M. Cardlock Facility Wells – Clauses 12(a) and 12(g)

The Approval at Clause 12(a) requires Northern Pulp to maintain the Cardlock Facility Wells. The Cardlock Facility Wells are owned and operated by Parkland Fuels. Northern Pulp has permission from Parkland Fuels to sample the Wells, but the maintenance of the Wells is not under the control of Northern Pulp. Further, Clause 12(g) requires Northern Pulp to maintain records, including borehole logs, construction details and maintenance records, in respect of the Cardlock Facility Wells. This information is the property of Parkland Fuels and Parkland Fuels has no obligation to provide it to Northern Pulp.

Clauses 12(a) and 12(g) are unreasonable to the extent that these Clauses impose an obligation on Northern Pulp to maintain Wells which are not under Northern Pulp's ownership or control and require Northern Pulp to maintain with respect to those Wells records of information to which Northern Pulp is not entitled. Northern Pulp therefore requests that Clauses 12(a) and 12(g) be revised accordingly.

N. Surface Water Stations – Clause 12(ad)

Several of the Surface Water stations listed do not exist, while other new stations are not listed in Clause 12(ad). See enclosed Dillon Consulting Memo. Northern Pulp requests that this Clause be revised accordingly.

O. Stantec Report – Clause 12(au)

Clause 12(au) is inaccurate as it refers to the Stantec "Hydrogeological and Hydrological Evaluation of the Boat Harbour Treatment Facility Report" as being dated April 30, 2012. Rather, the Report is dated September 28, 2011. Northern Pulp requests that this Clause be revised accordingly.

V. Inconsistency with FOIPOP – Clause 22

The requirements in Clause 22 of the Approval that Northern Pulp provide information to the Pictou Landing First Nation ("PLFN"), including a copy of all reporting information and reports that are required to be submitted under the Approval, is inconsistent with the protection granted to Northern Pulp under FOIPOP. The public accessibility to information under the control of the Department under section 10 of the *Environment Act* is subject to the important restrictions of FOIPOP: section 10(2) of the Act.

Specifically, section 21 of FOIPOP provides that a head of a public body (such as the Minister and Administrator of the Department of Environment) must refuse to disclose information:

> (a) That would reveal
>
> (i) trade secrets of a third party, or
> (ii) commercial, financial, labour relations, scientific or technical information of a third party;
>
> (b) That is supplied, implicitly or explicitly, in confidence; and
>
> (c) The disclosure of which could reasonably be expected to
>
> (i) harm significantly the competitive position or interfere significantly with the negotiating position of the third party,
> [...]
> (iii) result in undue financial loss or gain to any person or organization, or

Much of the information required to be provided by Northern Pulp to the Department constitutes commercial, financial and technical information. That information is supplied to the Department in confidence. The disclosure of this information could reasonably be expected to harm both

Northern Pulp's competitive position as well as its negotiating position with respect to an action that has been brought by PLFN against Northern Pulp. The competitive position of Northern Pulp would be harmed because its competitors in a global market and others having interests adverse to Northern Pulp would become fully aware of the Northern Pulp's commercially sensitive information.

Requiring Northern Pulp to comply with Clause 22 of the Approval is contrary to Section 10 of the *Environment Act* and Section 21 of FOIPOP. The Department through the Approval is circumventing the due process provided for under FOIPOP and the procedural fairness afforded to Northern Pulp with respect to the release of Northern Pulp's confidential and commercially sensitive information to third parties. The Department cannot by administrative fiat overcome a legislative requirement. Clause 22 of the Approval therefore is an unreasonable and ultra vires condition imposed by the Department. Accordingly, Northern Pulp requests that Clause 22 of the Approval be removed entirely.

Northern Pulp hereby confirms that any documents submitted by Northern Pulp to the Department at any time, including but not limited to this Appeal and its enclosures, are being submitted with the expectation that the Department will observe the protections afforded to Northern Pulp by FOIPOP in respect of such documents.

CONCLUSION

In light of the above, Northern Pulp respectfully requests that you exercise your powers under Section 137(4) of the Act to allow Northern Pulp's Appeal and remove or revise the provisions of the Approval as outlined in this letter.

Yours truly,

Northern Pulp Nova Scotia Corporation

Encl.[9]

1.
2.
3. EKONO Memo, Heikki Mannisto and Eva Mannisto Resumes
4.
5. Dillon Consulting Memo
6. FPAC Report

..., Northern Pulp (via email)
Northern Pulp (via email)

[9] The enclosures refer to Approval No. 2011-076657-R03 but remain valid with respect to the Appeal.

APPENDIX H-22

DILLON CONSULTING

NORTHERN PULP NOVA SCOTIA

Replacement Effluent Treatment Facility

Information Submission to CEAA

Internal Use Only

April 2018

4.1.3 Emissions, discharges and waste

Dewatered solids ('sludge') is collected as a waste material from the ETF. The sludge includes clay, sand, silt, organic matter, nutrients, microorganisms and metals. It is proposed that the sludge is mixed with the existing biomass feeding the NPNS Biomass Power Boiler. Combustion will occur as it does now, which is on a travelling grate at the bottom of the boiler, using the same controls and combustion temperatures as are currently being used. Quantity of sludge generated will be determined after detailed engineering is complete, but will be approximately 5 - 10% of the biomass currently fed to the boiler.

With the proposed future addition of sludge into the power boiler, potential for changes to air quality are being assessed using air dispersion modelling as part of the Environmental Assessment. Effluent quality is discussed under operation of the ETF in **Section 4.1.1** above.

The replacement ETF will significantly reduce odour emissions relative to existing conditions. Core to the treatment difference between the existing and proposed facility is how accumulated solids are handled. In the new system they will be continuously removed as underflow from the clarifiers. In the existing facility, solids settle over time in both the primary sedimentation basins and the aerated stabilization basin and decompose under anaerobic conditions, generating hydrogen sulfide, hence creating odour. Additionally, air needed in the process will be injected subsurface in the new facility. In the existing facility, aeration stages occur at the surface, by the action of the surface aerators that throw the effluent into the air to allow it to absorb oxygen. This action also allows sulphur compounds to be released to the atmosphere by volatilization. The new cooling stage was also designed with odour in mind. NPNS has opted to install indirect effluent cooling to completely eliminate any chance for odour release from this stage in the process.

4.2 Proposed in-Plant Upgrades

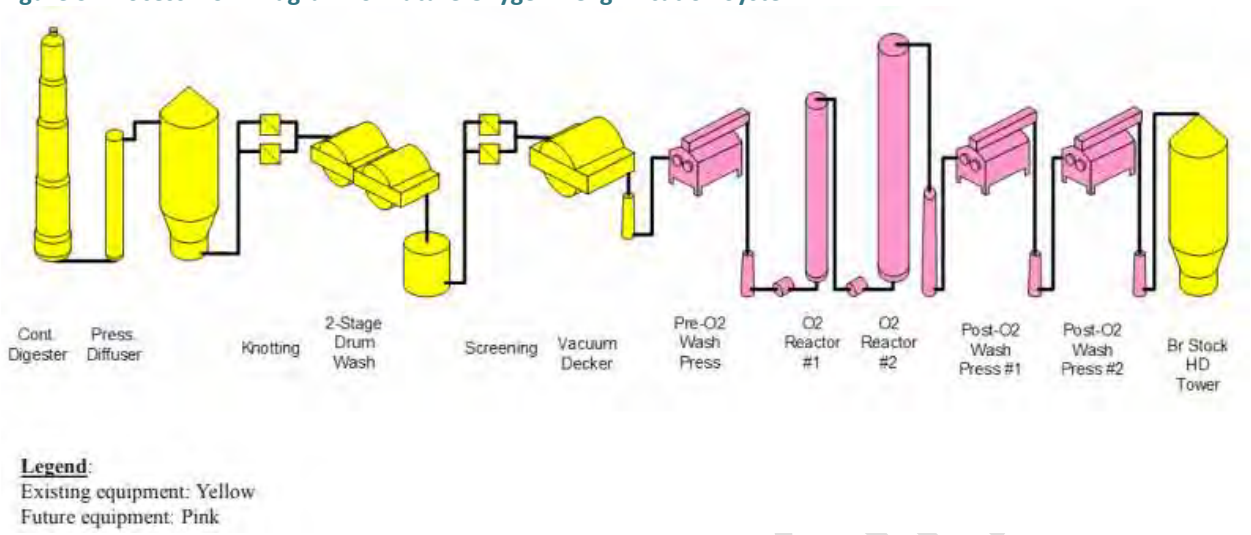
There are several in-plant upgrades proposed subsequent to the ETF project which are anticipated to further improve effluent quality, including the addition of an oxygen delignification system and fresh-water cooling towers. The environmental improvements resulting from the proposed upgrades described are not included as part of the EA. The proposed in plant upgrades will occur subsequent to the commissioning of the Effluent Treatment Facility, and therefore, the ETF must be able to meet approvals for construction without the upgrades in place.

4.2.1 Oxygen Delignification System

Two stage oxygen delignification technology will be incorporated into the pulp making process. The system includes oxygen reactors and wash presses. It will be installed after the brown stock washing stage and before the existing bleaching stages. A process flow diagram is included in **Figure 3** below.

Internal Use Only

Figure 3: Process Flow Diagram for Future Oxygen Delignification System



Oxygen delignification systems use oxygen gas to react with residual lignin that remains in the pulp after brown stock washing. The lignin removed in this new stage will result in the use of less bleaching chemicals to whiten the pulp in the existing bleach plant. It is a significant and well-proven process for Elemental-Chlorine-Free (ECF) pulp and as such it is often referred to as the first stage of bleaching (oxygen bleaching). Benefits of oxygen delignification include:

- Reduces chlorine dioxide bleaching chemicals by 30-40% leading to a decrease in effluent loading for BOD, COD and AOX;
- Improvement in aesthetics of effluent (colour);
- A reduction in wood losses;
- Increase in recovery of lignin that can be used in the boiler thus reducing carbon footprint; and
- A reduction in nutrients added to the effluent.

4.2.2 Water Cooling Towers

A significant portion of water consumption at the NPNS facility is using non-contact water systems for cooling and maintaining temperatures within the kraft pulp system. NPNS will install water cooling towers (subsequent to the ETF Project) to decrease the temperature of water used in the cooling systems. This will allow for water to be recycled within the system, as well as making the cooling itself more efficient. Water used in the cooling system, once too warm to be recycled, is fed into the effluent treatment facility. By making the cooling system more efficient, less volume of water in total will be used and ultimately less water will be transferred to the effluent treatment facility. The current cooling systems are once-through services with no segregation from the main effluent stream.

The water reduction as a result of the anticipated future cooling towers will be considered under the cumulative effects assessment in the EA.

Internal Use Only

APPENDIX H-23

Westhaver, Erna B

From: Martin, Frances R
Sent: Tuesday, November 14, 2017 9:01 PM
To: Keats, Paul J
Subject: Fwd: Phone call November 14
Attachments: image002.png

Sent from my iPhone

Begin forwarded message:

From: "Chapman, Bruce" [redacted]@northernpulp.com> 20(1)
Date: November 14, 2017 at 6:36:00 PM AST
To: "Martin, Frances R" <Frances.Martin@novascotia.ca>
Cc: "Fraser, Terri" [redacted]@northernpulp.com>
Subject: Phone call November 14 20(1)

During our telephone call today, you stated that your department is working on a response on my letter of November 3. I would like to clarify a few points:

Receiving Water Study and ETP Design
Your department has reviewed the Receiving Water Study (RWS) and have indicated that ENS is generally supportive of the concentrations used as inputs for the RWS and that these concentrations can be used as a basis for detailed design of the treatment plant. I would like to explain how those concentration inputs were derived. For normally regulated discharge limits (BOD, TSS and AOX), our consultants used the monthly limits as outlined in the Quebec regulations for existing pulp and paper mills. The Quebec regulations were reviewed in 2016. For effluent parameters that are generally not regulated, the consultants used the expected concentrations from the preliminary design. To recognize that there are daily variations in the operation, the Quebec regulations and most other regulations in Canada use the monthly limit and a multiplier to set daily limits.
Understanding that the EA outcome will be used to set the actual limits for a future IA, please confirm that the limits will allow for variations in daily operation as is the case in most regulations in Canada.

COD
We do not understand NSE's position on COD as outlined in the letter of October 5th. COD is normally not a regulated limit in North America. BOD is normally used to regulate oxygen demand in North America. Can you explain why COD is listed separately in the letter and why the concentrations listed do not match with those used in the RWS?

Water
NPNS understands that the we must continue to meet the current maximum daily water intake as outlined in the letter of October 5th.

Renewal of the Industrial Approval
As we discussed, regulatory certainty is important to the executives and the owners of PEC as the province and NPNS move forward on the Effluent Treatment Plant project. As such, NPNS would prefer for discussions on a future IA to begin as soon as possible. It is understood that there are many items in

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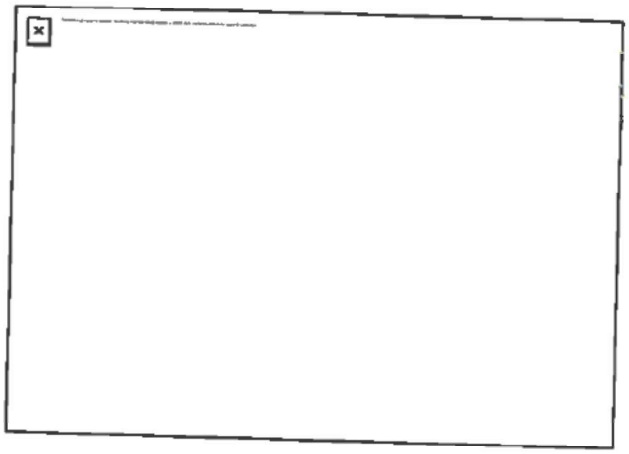
a future IA that will be determined by the EA process, so only items not associated with the EA will need to be discussed.

Is there a time tomorrow that you will be available for a short telephone call on these items?



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APPENDIX H-24

January 22, 2018

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Northern Pulp Nova Scotia, Effluent Treatment Facility Replacement Project Update

Thank you for engaging with the Environmental Assessment (EA) study for Northern Pulp's replacement Effluent Treatment Facility. The feedback we receive during the EA study process will guide the environmental planning for the project.

A Class 1 EA process is being followed for this project. Nova Scotia Environment's (NSE) Environmental Assessment Branch determined that the project is a modification of an existing undertaking.

Engagement activities will continue to occur throughout the EA study. Our next steps are described below. At the completion of the EA study, the EA Registration Document is submitted to NSE for review. NSE's review process includes making the Registration Document available to the public and seeking public comment.

The proposed effluent treatment system is being designed to Pulp and Paper Effluent Regulations. Additional consideration of the Canadian Council of Ministers of Environment (CCME) Marine Guidelines and other national and international standards has been made. The design engineers, KSH Solutions with support from Stantec, used complex hydrodynamic models to develop the appropriate system to meet the guidelines. This replacement system is similar in design to many other North American and international Kraft pulp mills. KSH Solutions is a Canadian Engineering company with worldwide experience in the design of effluent treatment systems and has based their design on industry best practice to serve Northern Pulp's operations.

We are following up with key stakeholders and Pictou Landing First Nation for feedback on limitations and environmental conditions related to the outfall pipeline route and diffuser location.

The scientific modelling completed predicts there will be minimal impact on water quality in the Northumberland Strait, Pictou Harbour, Boat Harbour, and the near shore areas.

We have heard many questions related to the interaction of the treated effluent and the valued marine environment. Further studies to identify potential impacts and necessary mitigation measures will be completed.

Responses to Your Questions

Open Hause Format

Thank you for sharing feedback on how you found the Open House session. The format with the display panels allows for many voices to be heard through small groups or one-on-one conversations, facilitates a large number of participants, and respects different needs in communication. We will continue to try to create sessions where many people can engage in meaningful dialogue and consider this and other feedback received as we move forward.

Potential for Marine Enviranmental Impacts

The proposed effluent treatment system is designed to meet federal Pulp and Paper Effluent Regulations, similar to the existing effluent treatment system. Additional, more stringent, guidelines were also considered to achieve best practice in the design and operation of pulp and paper effluent treatment facilities. The development of monitoring programs will be an outcome of the regulatory process for approval of the facility. Under the Pulp and Paper Regulations, an Environmental Effects Monitoring Program is required. A copy of the Cycle 7 EEM report for the current treatment facility can be found on the project website. Additional monitoring programs will be designed based on approvals requirements.

i.e. monitoring won't be figured out until after approval

The Receiving Water Study, available on the project website, reports the modeled performance of how the treated effluent will mix into the Northumberland Strait through the outfall (the six port diffuser) and the resulting predicted water quality. One pipe will carry treated effluent from the treatment facility, located on the mill property, through Pictou Harbour to the outfall location. Six 'diffusers', or engineered outlets, will be installed at the end of the pipe. The Receiving Water Study also discusses how the diffuser design was determined.

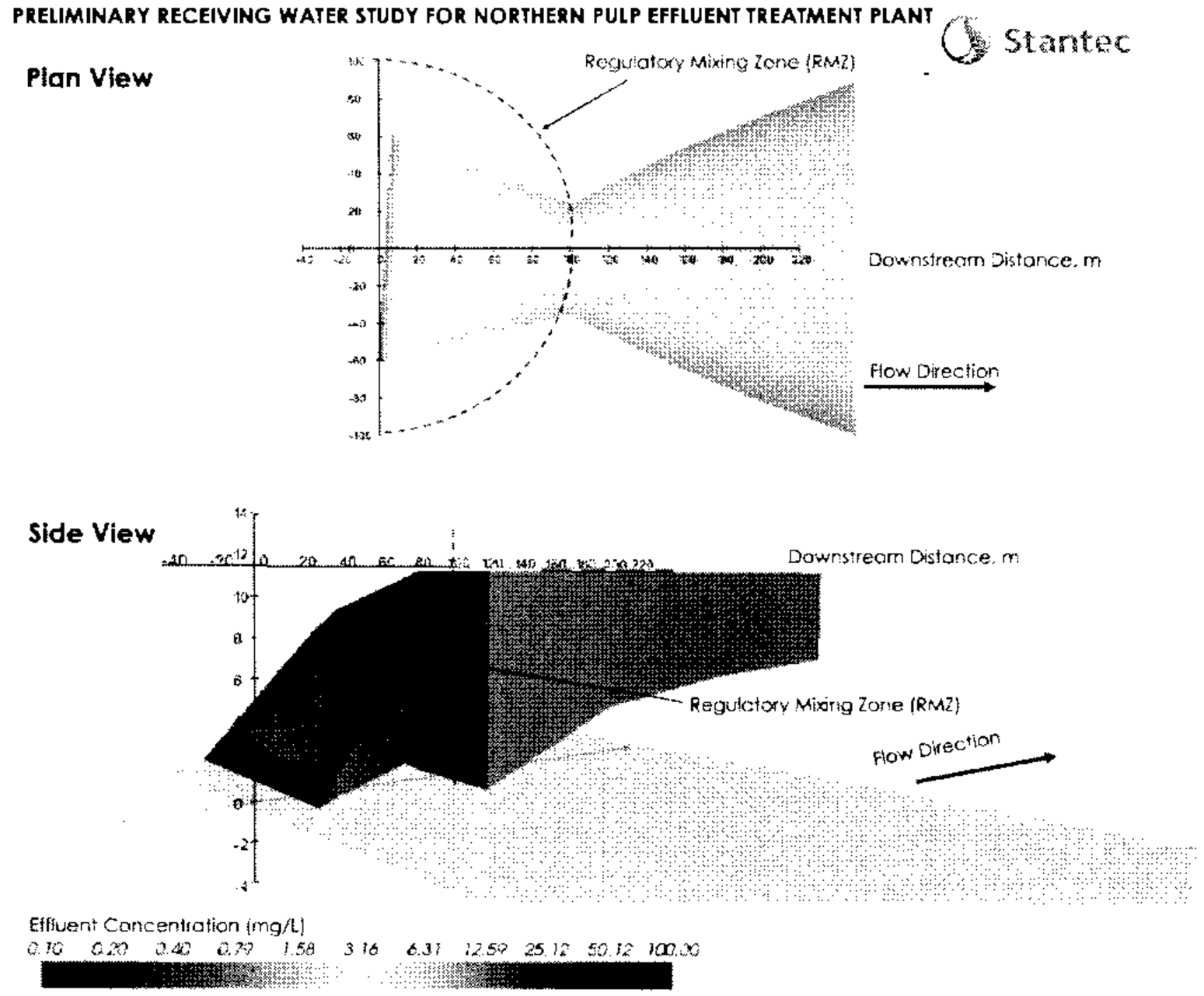
Available studies completed in the area will be reviewed, such as the Environmental Effects Monitoring of Northern Pulp, and the many studies being completed related to Boat Harbour.

The Mixing Zone

The water depth at the proposed location of the outfall pipe is 11.3 m (Mean Water Level). The mixing zone for the discharged effluent was defined as the lateral 100-m distance from the outfall following the Canadian Council of Ministers of the Environment (CCME) guidelines. To assess the impacts on the surrounding environment, be that lobsters at different life stages, or the plants on the bottom of the Strait which support the ecosystem, we must also understand where in the water column the mixing occurs. The effluent plume does not move upwards in a block, it expands from the diffusers upward but also laterally. Figure 3.7 of the Receiving Water Study, shown below, shows the shape of the effluent plume. The Receiving Water Study is available on the project website. The plume from the six port diffuser in the location chosen reaches the surface water at about 90 m from the diffuser. The dilution ratio in the receiving environment is 109 times at the end of the 100 m mixing zone as measured laterally from the point of discharge. Colour, for example, is

predicted to reach background levels within 40 m of the diffuser ports. At 40 m laterally from the diffuser, the effluent plume is still more than 1 m below the surface of the water.

Figure 3-7. Effluent Plume Scenario 6 - Six Ports Diffuser at Alt-D



Potential for Sediment Accumulation at the Outfall

The effluent is a liquid. Within the liquid will be an amount of 'suspended solids', similar to how silt can be suspended in a river. The amount of total suspended solids (TSS) discharged in the effluent in 2017 was 1,563 kg/day. By volume, this represents approximately 25 mg/L or 0.002S%.

The federal Pulp and Paper Effluent Regulations (PPER) manage threats to fish, fish habitat and human health from fish consumption by governing the deposit of deleterious substances from pulp and paper mills into waters frequented by fish for the protection of aquatic life. PPER specify a discharge limit of 11,500 kg/day for NPNS. The current discharge is significantly under the limit as significant improvements have been made over the years. The new ETF anticipates TSS discharges to remain low, in the range of 25 - 35 mg/L or 0.0025 - 0.0035%.

The solids which are present in the treated effluent will be very small particles left from the wood, and organics from the microorganisms used in the treatment process and are 98% biodegradable.

what are remaining 2%?

The Environmental Assessment (EA) will evaluate expected long term implications and potential environmental impacts related to the proposed replacement Effluent Treatment Facility. The replacement treatment facility design will incorporate the components needed to address regulations established with consideration of the longer term implications. As well, Environmental Effects Monitoring (EEM), which is a science-based performance measurement tool used to evaluate the adequacy of effluent regulations, will use baseline information to determine if any effects occur as a result of the TSS from the treated effluent discharge and to measure those effects, should they occur.

for where?

what about remediation?

Air Quality: Burning the Sludge

Being able to burn the sludge in the power boiler is the preferred approach as it increases power generation from green energy sources at Northern Pulp.

The dewatered solids include clay, sand, silt, organic matter, nutrients, microorganisms and metals. Sludge is typically either burned for fuel at treatment facilities, or used as soil or a soil additive as in all other Canadian provinces as well as in the USA, Europe, South America, Africa and Asia.

Changes to air quality will be assessed during the Environmental Assessment and will include alternative uses for the sludge.

Unrelated to the effluent treatment, Northern Pulp is separately addressing air quality concerns associated with its operations and working closely with the provincial government and regulatory authorities to continue to improve air quality.

Sharing Information

Results of specialist studies completed as part of the EA study will be made available upon their completion on the project website:
www.northernpulpeffluenttreatmentfacility.ca.

The study which looked at the initial siting of the outfall location and diffuser performance, and the study of treatment facility alternatives are posted on the project website now. Environmental monitoring (EEM) reporting of the existing Boat Harbour facility is also provided. The EEM is not directly applicable to the proposed replacement effluent treatment facility and the associated treatment effluent.

A "Frequently Asked Questions" list has also been added to the project website. Additions will be made to it as the project evolves.

Next Steps

Over the coming months, the project team will be continuing conversations with First Nations and key stakeholders, and completing environmental and engineering studies. Environmental plans to protect and/or mitigate potential impacts will be developed based on this information and input and dialogue.

In Spring 2018 we will return to the community with another series of Open House sessions which will provide answers to questions raised during the initial phase of engagement and present the recommended environmental plans and seek feedback.

If you have further questions or comments, please contact the project team at npns.effluenttreatmentfacility@dillon.ca, 1-877-635-8553 x 5050 and/or visit the project website www.northernpulpeffluenttreatmentfacility.ca.

Again, thank you for your time and interest. We look forward to continued engagement with you on this important project.

Sincerely,

DILLON CONSULTING LIMITED

Project Coordinator
Northern Pulp Effluent Treatment Facility Environmental Assessment
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APPENDIX H-25

July 9, 2018

@ns.sympatico.ca

Northern Pulp Nova Scotia, Effluent Treatment Facility Replacement Project Update

Thank you for continuing to engage with the Environmental Assessment (EA) study for Northern Pulp's replacement Effluent Treatment Facility. The feedback we receive during the EA study process is important and will continue to guide the environmental planning for the project.

Responses to Your Questions

On page 2.22 of Stantec's Receiving Water Study, it is stated: "Characteristics of the expected treated effluent from the NPNS mill for the new wastewater treatment plant were provided by KSH (KSH, 2016) as summarized in Table 2-6."
How did KSH determine these characteristics?
KSH determined the effluent characteristics identified in Table 2-6 from an evaluation and benchmarking of the NPNS operations and the predicted effluent quality that will result from changing from the ASB (Aerated Stabilization Basin) process to the AST (Activated Sludge Treatment) process for effluent treatment.

Are these characteristics expected after the oxygen delignification system is installed, or prior to its installation?
The results of the Receiving Water Study (RWS) do not account for the improvements that the Oxygen Delignification system will provide.

The RWS was conducted without considering the benefits of the Oxygen Delignification system. This way, the EA is assessing a conservative or 'worst case' scenario. A brief description of Oxygen Delignification and its environmental benefits are available on the project website*(*www.northernpulpfuture.ca*, Project overview drop down menu/in-mill improvements tab)*.

Will the oxygen delignification system be installed and operating when the AST system is in place, or is the plan to install the oxygen delignification sometime in the future, after the AST system is in place? If the oxygen delignification will not be installed at the same time as the AST system is in place, when will the oxygen delignification be installed?
The Oxygen Delignification Project will start-up after the new AST system is operational.

Sharing Information
In fall 2018 we will return to the community with another Open House session which will provide answers to questions raised during the initial phase of engagement and

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present the recommended environmental plans. Indigenous community and stakeholder engagement has also been ongoing through this phase of the project.

If you have further questions or comments, please contact the project team at npns.effluenttreatmentfacility@dillon.ca, 1-877-635-8553 x 5050 and/or visit the project website www.NorthernPulpFuture.ca. The website is updated as new information becomes available.

Again, thank you for your time and interest. We look forward to continued engagement with you on this important project.

Sincerely,

DILLON CONSULTING LIMITED

Project Coordinator
Northern Pulp Effluent Treatment Facility Environmental Assessment
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1-877-635-8553
www.NorthernPulpFuture.ca

APPENDIX H-26

Project Materials

Specialist Studies and Engagement Materials

Specialist Studies

Addendum Receiving Water Study for Outfall Location at Caribou Point

- During preliminary design, a discharge location for the marine outfall was selected in the Northumberland Strait as a preferred option. After subsequent marine geophysical and geotechnical field investigations, it was determined this outfall was not technically feasible. This addendum to the Receiving Water Study was completed to investigate two alternative outfall locations off of Caribou Point.

Brochure with information on the New Effluent Treatment Facility, Northern Pulp

- Brochure providing additional details on the new effluent treatment facility.

NPNS Global Market Study, Brian McClay & Associates Inc.

- The NPNS Global Market Study assesses the viability of converting the existing Pictou Northern Bleached Softwood Kraft (NBSK) mill to produce either Unbleached Kraft Pulp (UKP) or Bleached Chemi-Thermo-Mechanical Pulp (BCTMP). For the reasons outlined in the market report, it can be concluded that continuing to produce premium reinforcement NBSK is the most competitively viable option by far for Northern Pulp.

Receiving Water Study, Stantec Consulting Ltd.

- The Receiving Water Study was completed during preliminary design to (1) evaluate potential locations for a marine outfall and identified the recommended area, (2) evaluate and made recommendations for the design and performance of the diffuser at the end of the outfall, and (3) model how the treated effluent will mix with the water

at the end of the outfall, and (3) model how the treated effluent will mix with the water at the outlet in the Northumberland Strait.

2016 EEM Report, ECOMETRIX

- The Environmental Effects Monitoring (EEM) study gives the results of the environmental effects monitoring from the existing Boat Harbour Treatment Facility. This EEM study is not directly applicable to the proposed replacement effluent treatment facility and associated treated effluent, but was provided upon request.

Technology Selection Summary Report, KSH

- This report documents the Preliminary Engineering for which reviewed the technology alternatives when determining the approach for the treatment facility at Northern Pulp.

Middle River Water Availability Report

- Completed in 2015 by RV Anderson for the Government of Nova Scotia, this report reviewed the sustainability of the water intake used by Northern Pulp.

Engagement Materials

Materials used at project engagement meetings, and summaries of those meetings will be posted here. This way we will increase the transparency of our process, and allow as many people as possible to engage with the project.

Project Launch: Summary of Engagement - What We Heard

Project Launch Open House Materials (December 2017 & January 2018)

Project Launch: Initiation Newsletter

APPENDIX H-27

copied from NPRI - March 7, 2019

Company/Facility information: Northern Pulp Nova Scotia Corporation/Northern Pulp Nova Scotia Corporation (2017)

Information for Northern Pulp Nova Scotia Corporation

Company	Northern Pulp Nova Scotia Corporation
Facility	Northern Pulp Nova Scotia Corporation
NPRI ID	815
Address	260 Abercrombie Branch Road New Glasgow, NS B2H 5E8 Canada

(1) NOTE: as of the 2006 reporting year, the Disposal columns include information on tailings and waste rock disposals. Negative numbers are possible for on-site disposal of tailings and waste rock, which would reflect a net removal of the substances from the tailings or waste rock management area.

(2) NOTE: Off-site column under Disposal in this table includes 'Off-site Disposal' and 'Off-Site Treatment Prior to Final Disposal'

Acenaphthene (83-32-9)

Historical reports for Acenaphthene (83-32-9)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	224	-	-	224	-	-	-	kg
2016	216	-	-	216	-	-	-	kg
2015	208	-	-	208	-	-	-	kg
2014	227	-	-	227	0	-	-	kg
2013	227	-	-	227	-	-	-	kg
2012	224	-	-	224	-	-	-	kg
2011	202	-	-	202	-	-	-	kg
2010	230	-	-	230	-	-	-	kg
2009	200	-	-	200	-	-	-	kg
2008	209	-	-	209	-	-	-	kg
2007	214	-	-	214	-	-	-	kg
2006	214	-	-	214	-	-	-	kg

[Back to top]

Acenaphthylene (208-96-8)

Historical reports for Acenaphthylene (208-96-8)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	2,741	-	-	2,741	-	-	-	kg
2016	2,645	-	-	2,645	-	-	-	kg
2015	2,542	-	-	2,542	-	-	-	kg
2014	2,776	-	-	2,776	0	-	-	kg
2013	2,776	-	-	2,776	-	-	-	kg
2012	2,741	-	-	2,741	-	-	-	kg
2011	2,472	-	-	2,472	-	-	-	kg
2010	2,804	-	-	2,804	-	-	-	kg
2009	2,443	-	-	2,443	-	-	-	kg
2008	2,553	-	-	2,553	-	-	-	kg
2007	2,613	-	-	2,613	-	-	-	kg
2006	2,613	-	-	2,613	-	-	-	kg

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Acetaldehyde (75-07-0)

Historical reports for Acetaldehyde (75-07-0)

Year	On-Site Releases	Disposal(1)	Off-Site	Units

Year	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	Units
2017	21	0.03	-	21	-	-	-	tonnes
2016	21	0.032	-	21	-	-	-	tonnes
2015	21	0.03	-	21	-	-	-	tonnes
2014	23	0.033	-	23	0	-	-	tonnes
2013	24	0.034	-	24	-	-	-	tonnes
2012	24	0.031	-	24	-	-	-	tonnes
2011	21	0.03	-	21	-	-	-	tonnes
2010	24	0.035	-	24	-	-	-	tonnes
2009	21	0.037	-	21	-	-	-	tonnes
2008	23	0.045	-	23	-	-	-	tonnes
2007	25	0.035	-	25	-	-	-	tonnes
2006	21	0.035	-	21	-	-	-	tonnes
2005	18	0.268	-	19	0.005	-	-	tonnes
2004	18	0.539	-	19	0.005	-	-	tonnes
2003	18	0.529	-	18	0.005	-	-	tonnes
2002	18	0.61	-	19	0.005	-	-	tonnes
2001	18	0.54	-	18	0.005	-	-	tonnes
2000	17	0.57	-	18	0.005	-	-	tonnes
1999	13	0.57	-	13	0.005	-	-	tonnes

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Ammonia (total) (NA - 16)

Historical reports for Ammonia (total) (NA - 16)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	37	-	-	37	-	-	-	tonnes
2016	36	-	-	36	-	-	-	tonnes
2015	37	-	-	37	-	-	-	tonnes
2014	42	-	-	42	0	-	-	tonnes
2013	48	-	-	48	-	-	-	tonnes
2012	50	-	-	50	-	-	-	tonnes
2011	42	-	-	42	-	-	-	tonnes
2010	46	-	-	46	-	-	-	tonnes
2009	42	-	-	42	-	-	-	tonnes
2008	50	-	-	50	-	-	-	tonnes
2007	41	-	-	41	-	-	-	tonnes
2006	40	-	-	40	-	-	-	tonnes
2005	49	-	-	49	-	-	-	tonnes
2004	49	-	-	49	-	-	-	tonnes
2003	48	-	-	48	-	-	-	tonnes
2002	47	-	-	47	-	-	-	tonnes
2001	46	-	-	46	-	-	-	tonnes
2000	44	-	-	44	-	-	-	tonnes

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Benzo(a)anthracene (56-55-3)

Historical reports for Benzo(a)anthracene (56-55-3)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	9.7	-	-	9.7	1.9	-	-	kg
2016	9.4	-	-	9.4	1.7	-	-	kg
2015	9	-	-	9	0.719	-	-	kg
2014	9.8	-	-	9.8	0.797	-	-	kg
2013	9.9	-	-	9.9	0.753	-	-	kg
2012	9.7	-	0	9.7	0.753	-	-	kg
2011	8.8	-	-	8.8	0.694	-	-	kg
2010	10	-	-	10	0.665	-	-	kg
2009	8.7	-	-	8.7	0.665	-	-	kg
2008	9.1	-	-	9.1	0.434	-	-	kg
2007	9.3	-	-	9.3	0.68	-	-	kg
2006	9.3	-	-	9.3	0.68	-	-	kg
2005	6.4	-	-	6.4	0.616	-	-	kg
2004	8.9	-	-	8.9	0.301	-	-	kg
2003	8.6	-	-	8.6	0.311	-	-	kg
2002	8.3	-	-	8.3	0.26	-	-	kg
2001	8.1	-	-	8.1	0.666	-	-	kg
2000	8.1	-	-	8.1	0.65	-	-	kg

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Benzo(a)phenanthrene (218-01-9)

Historical reports for Benzo(a)phenanthrene (218-01-9)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	6.7	-	-	6.7	0.122	-	-	kg
2016	6.5	-	-	6.5	0.117	-	-	kg
2015	6.2	-	-	6.2	0.063	-	-	kg
2014	6.8	-	-	6.8	0.142	-	-	kg
2013	6.8	-	-	6.8	0.142	-	-	kg
2012	6.7	-	-	6.7	0.142	-	-	kg
2011	6	-	-	6	0.13	-	-	kg
2010	6.9	-	-	6.9	0.125	-	-	kg
2009	6	-	-	6	0.125	-	-	kg
2008	6.2	-	-	6.2	0.059	-	-	kg
2007	6.4	-	-	6.4	0.052	-	-	kg
2006	6.4	-	-	6.4	0.052	-	-	kg
2005	6.1	-	-	6.1	0.047	-	-	kg
2004	6.2	-	-	6.2	0.172	-	-	kg
2003	6	-	-	6	0.178	-	-	kg
2002	5.8	-	-	5.8	0.15	-	-	kg
2001	5.6	-	-	5.6	0.381	-	-	kg
2000	5.6	-	-	5.6	0.37	-	-	kg

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Benzo(a)pyrene (50-32-8)

Historical reports for Benzo(a)pyrene (50-32-8)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2006	3	-	-	3	0.657	-	-	kg
2005	0.582	-	-	0.582	0.595	-	-	kg
2004	0.584	-	-	0.584	1.6	-	-	kg
2003	0.565	-	-	0.565	1.6	-	-	kg
2002	0.55	-	-	0.55	1.3	-	-	kg
2001	0.53	-	-	0.53	3.5	-	-	kg
2000	0.53	-	-	0.53	3.4	-	-	kg

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Benzo(b)fluoranthene (205-99-2)

Historical reports for Benzo(b)fluoranthene (205-99-2)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2006	2.7	-	-	2.7	0.87	-	-	kg
2005	2.5	-	-	2.5	0.591	-	-	kg
2004	2.6	-	-	2.6	0.285	-	-	kg
2003	2.5	-	-	2.5	0.295	-	-	kg
2002	2.4	-	-	2.4	0.24	-	-	kg
2001	2.4	-	-	2.4	0.632	-	-	kg
2000	2.4	-	-	2.4	0.62	-	-	kg

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Benzo(e)pyrene (192-97-2)

Historical reports for Benzo(e)pyrene (192-97-2)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2006	0.127	-	-	0.127	-	-	-	kg

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Benzo(g,h,i)perylene (191-24-2)

Historical reports for Benzo(g,h,i)perylene (191-24-2)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2006	1.1	-	-	1.1	0.665	-	-	kg
2005	0.993	-	-	0.993	0.603	-	-	kg
2004	1	-	-	1	0.289	-	-	kg
2003	0.968	-	-	0.968	0.299	-	-	kg
2002	0.94	-	-	0.94	0.25	-	-	kg
2001	0.9	-	-	0.9	0.64	-	-	kg
2000	0.9	-	-	0.9	0.62	-	-	kg

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Benzo(j)fluoranthene (205-82-3)

Historical reports for Benzo(j)fluoranthene (205-82-3)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2006	0.148	-	-	0.148	-	-	-	kg

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Benzo(k)fluoranthene (207-08-9)

Historical reports for Benzo(k)fluoranthene (207-08-9)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2006	0.937	-	-	0.937	0.627	-	-	kg
2005	0.864	-	-	0.864	0.569	-	-	kg
2004	0.871	-	-	0.871	0.258	-	-	kg
2003	0.843	-	-	0.843	0.267	-	-	kg
2002	0.81	-	-	0.81	0.22	-	-	kg
2001	0.8	-	-	0.8	0.571	-	-	kg
2000	0.79	-	-	0.79	0.56	-	-	kg

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Carbon monoxide (630-08-0)

Historical reports for Carbon monoxide (630-08-0)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	2,498	-	-	2,498	-	-	-	tonnes
2016	787	-	-	787	-	-	-	tonnes
2015	831	-	-	831	-	-	-	tonnes
2014	987	-	-	987	-	-	-	tonnes
2013	890	-	-	890	-	-	-	tonnes
2012	878	-	-	878	-	-	-	tonnes
2011	829	-	-	829	-	-	-	tonnes
2010	800	-	-	800	-	-	-	tonnes
2009	897	-	-	897	-	-	-	tonnes
2008	824	-	-	824	-	-	-	tonnes
2007	3,816	-	-	3,816	-	-	-	tonnes
2006	3,796	-	-	3,796	-	-	-	tonnes
2005	3,316	-	-	3,316	-	-	-	tonnes
2004	3,341	-	-	3,341	-	-	-	tonnes
2003	3,321	-	-	3,321	-	-	-	tonnes
2002	3,291	-	-	3,291	-	-	-	tonnes

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Carbonyl sulphide (463-58-1)

Historical reports for Carbonyl sulphide (463-58-1)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2008	15	-	-	15	-	-	-	tonnes
2007	15	-	-	15	-	-	-	tonnes

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Chlorine (7782-50-5)

Historical reports for Chlorine (7782-50-5)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	2.9	-	-	2.9	-	-	-	tonnes
2016	2.9	-	-	2.9	-	-	-	tonnes
2015	3.1	-	-	3.1	-	-	-	tonnes
2014	3.2	-	-	3.2	0	-	-	tonnes
2013	3.6	-	-	3.6	-	-	-	tonnes
2012	3.6	-	-	3.6	-	-	-	tonnes
2011	3.9	-	-	3.9	-	-	-	tonnes

2010	3.9	-	-	3.9	-	-	-	tonnes
2009	3.5	-	-	3.5	-	-	-	tonnes
2008	3.6	-	-	3.6	-	-	-	tonnes
2007	3.6	-	-	3.6	-	-	-	tonnes
2006	3.9	-	-	3.9	-	-	-	tonnes
2005	3.8	-	-	3.8	-	-	-	tonnes
2004	3.8	-	-	3.8	-	-	-	tonnes
2003	3.3	-	-	3.3	-	-	-	tonnes
2002	3.4	-	-	3.4	-	-	-	tonnes
2001	3.5	-	-	3.5	-	-	-	tonnes
2000	3.7	-	-	3.7	-	-	-	tonnes
1999	2.6	-	-	2.6	-	-	-	tonnes
1998	15	-	-	15	-	-	-	tonnes
1997	47	-	-	47	-	-	-	tonnes
1996	50	-	-	50	-	-	-	tonnes
1995	78	-	-	78	-	-	-	tonnes
1994	97	-	-	97	-	-	-	tonnes
1993	123	0	0	123	0	-	0	tonnes

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Chlorine dioxide (10049-04-4)

Historical reports for Chlorine dioxide (10049-04-4)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	

2017		77	-	-		77	-	-	-	tonnes
2016		23	-	-		23	-	-	-	tonnes
2015		0	-	-		0	-	-	-	tonnes
2014	-	-	-	-		0	0	-	-	tonnes
2013	-	-	-	-		0	-	-	-	tonnes
2012		0	-	-		0	-	-	-	tonnes
2011		0	-	-		0	-	-	-	tonnes
2010		0	-	-		0	-	-	-	tonnes
2009		0	-	-		0	-	-	-	tonnes
2008		0	-	-		0	-	-	-	tonnes
2007		0	-	-		0	-	-	-	tonnes
2006		0	-	-		0	-	-	-	tonnes
2005		0	-	-		0	-	-	-	tonnes
2004		0	-	-		0	-	-	-	tonnes
2003		0	-	-		0	-	-	-	tonnes
2002		0	-	-		0	-	-	-	tonnes
2001		0	-	-		0	-	-	-	tonnes
2000		0	-	-		0	-	-	-	tonnes
1999		0	-	-		0	-	-	-	tonnes
1998		12	-	-		12	-	-	-	tonnes
1997		63	-	-		63	-	-	-	tonnes
1996		63	-	-		63	-	-	-	tonnes
1995		50	-	-		50	-	-	-	tonnes
1994		67	-	-		67	-	-	-	tonnes
1993		62		0	0	62		0 -	0	tonnes

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Chloromethane (74-87-3)

Historical reports for Chloromethane (74-87-3)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	16	0.04	-	16	-	-	-	tonnes
2016	15	0.05	-	15	-	-	-	tonnes
2015	15	0.04	-	15	-	-	-	tonnes
2014	16	0.05	-	16	0	-	-	tonnes
2013	16	0.05	-	16	-	-	-	tonnes
2012	16	0.05	-	16	-	-	-	tonnes
2011	15	0.05	-	15	-	-	-	tonnes
2010	17	0.06	-	17	-	-	-	tonnes
2009	15	0.07	-	15	-	-	-	tonnes
2008	16	0.07	-	16	-	-	-	tonnes
2007	15	0.03	-	15	-	-	-	tonnes
2006	15	0.03	-	15	-	-	-	tonnes
2005	15	0.03	-	15	-	-	-	tonnes
2004	15	0.03	-	15	-	-	-	tonnes
2003	14	0.03	-	14	-	-	-	tonnes
2002	14	0.028	-	14	-	-	-	tonnes
2001	14	0.029	-	14	-	-	-	tonnes
2000	13	0.25	-	14	-	-	-	tonnes

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Dibenzo(a,h)anthracene (53-70-3)

Historical reports for Dibenzo(a,h)anthracene (53-70-3)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2006	0.613	-	-	0.613	0.663	-	-	kg
2005	0.579	-	-	0.579	0.601	-	-	kg
2004	0.583	-	-	0.583	0.287	-	-	kg
2003	0.565	-	-	0.565	0.297	-	-	kg
2002	0.54	-	-	0.54	0.25	-	-	kg
2001	0.55	-	-	0.55	0.636	-	-	kg
2000	0.53	-	-	0.53	0.62	-	-	kg

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Dioxins and furans - total (NA - D/F)

Historical reports for Dioxins and furans - total (NA - D/F)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	0.008	-	-	0.008	-	-	-	g TEQ(ET)
2016	0.008	-	-	0.008	-	-	-	g TEQ(ET)
2015	0.008	-	-	0.008	-	-	-	g TEQ(ET)
2014	0.008	-	-	0.008	0	-	-	g TEQ(ET)

2013		0.008	-	-	0.008	-	-	g TEQ(ET)
2012		0.008	-	-	0.008	-	-	g TEQ(ET)
2011		0.008	-	-	0.008	-	-	g TEQ(ET)
2010	-	-	-	-	0	-	-	g TEQ(ET)
2009	-	-	-	-	0	-	-	g TEQ(ET)
2008	-	-	-	-	0	-	-	g TEQ(ET)
2007	-	-	-	-	0	-	-	g TEQ(ET)
2006		0.008	-	-	0.008	-	-	g TEQ(ET)
2005		0.009	-	-	0.009	-	-	g TEQ(ET)
2004		0.012	-	-	0.012	-	-	g TEQ(ET)
2003		0.012	-	-	0.012	-	-	g TEQ(ET)
2002		0.011	-	-	0.011	-	-	g TEQ(ET)
2001		0.012	0.538	-	0.55	-	-	g TEQ(ET)

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Fluoranthene (206-44-0)

Historical reports for Fluoranthene (206-44-0)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	95	-	-	95	1.7	-	-	kg
2016	91	-	-	91	1.6	-	-	kg
2015	88	-	-	88	0.722	-	-	kg
2014	96	-	-	96	1.1	-	-	kg
2013	96	-	-	96	1.1	-	-	kg

2012	95	-	-	95	1.1	-	-	kg
2011	86	-	-	86	1	-	-	kg
2010	97	-	-	97	0.973	-	-	kg
2009	85	-	-	85	0.947	-	-	kg
2008	88	-	-	88	0.53	-	-	kg
2007	91	-	-	91	0.648	-	-	kg
2006	91	-	-	91	0.648	-	-	kg
2005	85	-	-	85	0.588	-	-	kg
2004	86	-	-	86	0.43	-	-	kg
2003	84	-	-	84	0.444	-	-	kg
2002	81	-	-	81	0.37	-	-	kg
2001	79	-	-	79	0.952	-	-	kg
2000	78	-	-	78	0.93	-	-	kg

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Fluorene (86-73-7)

Historical reports for Fluorene (86-73-7)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	21	-	-	21	-	-	-	kg
2016	20	-	-	20	-	-	-	kg
2006	20	-	-	20	-	-	-	kg

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Fluorine (7782-41-4)

Historical reports for Fluorine (7782-41-4)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2015	19	-	-	19	-	-	-	tonnes
2014	21	-	-	21	0	-	-	tonnes
2013	21	-	-	21	-	-	-	tonnes
2012	21	-	-	21	-	-	-	tonnes
2011	19	-	-	19	-	-	-	tonnes

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Formaldehyde (50-00-0)

Historical reports for Formaldehyde (50-00-0)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	12	-	-	12	-	-	-	tonnes
2016	12	-	-	12	-	-	-	tonnes
2015	12	-	-	12	-	-	-	tonnes
2014	12	-	-	12	0	-	-	tonnes

2013	12	-	-	12	-	-	tonnes
2012	12	-	-	12	-	-	tonnes
2011	12	-	-	12	-	-	tonnes
2010	12	-	-	12	-	-	tonnes
2009	12	-	-	12	-	-	tonnes
2008	12	-	-	12	-	-	tonnes

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Hexachlorobenzene (118-74-1)

Historical reports for Hexachlorobenzene (118-74-1)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	1.6	-	-	1.6	-	-	-	grams
2016	1.5	-	-	1.5	-	-	-	grams
2015	1.5	-	-	1.5	-	-	-	grams
2014	1.5	-	-	1.5	0	-	-	grams
2013	1.6	-	-	1.6	-	-	-	grams
2012	1.6	-	-	1.6	-	-	-	grams
2011	1.4	-	-	1.4	-	-	-	grams
2010	1.6	-	-	1.6	-	-	-	grams
2009	1.4	-	-	1.4	-	-	-	grams
2008	1.5	-	-	1.5	-	-	-	grams
2007	1.4	-	-	1.4	-	-	-	grams
2006	1.4	-	-	1.4	-	-	-	grams

2005	-	-	-	0	-	-	grams
2004	-	-	-	0	-	-	grams
2003	-	-	-	0	-	-	grams
2002	-	-	-	0	-	-	grams
2001	-	-	-	0	-	-	grams
2000	-	-	-	0	-	-	grams

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Hydrochloric acid (7647-01-0)

Historical reports for Hydrochloric acid (7647-01-0)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	3.8	-	-	3.8	-	-	-	tonnes
2016	3.8	-	-	3.8	-	-	-	tonnes
2015	3.7	-	-	3.7	-	-	-	tonnes
2014	3.7	-	-	3.7	0	-	-	tonnes
2013	3.8	-	-	3.8	-	-	-	tonnes
2012	3.8	-	-	3.8	-	-	-	tonnes
2011	3.5	-	-	3.5	-	-	-	tonnes
2010	3.9	-	-	3.9	-	-	-	tonnes
2009	3.3	-	-	3.3	-	-	-	tonnes
2008	3.4	-	-	3.4	-	-	-	tonnes
2007	3.7	-	-	3.7	-	-	-	tonnes
2006	3.6	-	-	3.6	-	-	-	tonnes

2005	3.5	-	-	3.5	-	-	-	tonnes
2004	3.6	-	-	3.6	-	-	-	tonnes
2003	3.5	-	-	3.5	-	-	-	tonnes
2002	3.6	-	-	3.6	-	-	-	tonnes
2001	3.5	-	-	3.5	-	-	-	tonnes
2000	3.5	-	-	3.5	-	-	-	tonnes
1999	2.4	-	-	2.4	-	-	-	tonnes
1998	2.9	-	-	2.9	-	-	-	tonnes
1997	2.7	-	-	2.7	-	-	-	tonnes
1996	2.7	-	-	2.7	-	-	-	tonnes
1995	3.5	-	-	3.5	-	-	-	tonnes
1994	6.8	-	-	6.8	-	-	-	tonnes
1993	2.7	0	0	2.7	0	-	0	tonnes

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Hydrogen sulphide (7783-06-4)

Historical reports for Hydrogen sulphide (7783-06-4)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	24	-	-	24	-	-	-	tonnes
2016	23	-	-	23	-	-	-	tonnes
2015	21	-	-	21	-	-	-	tonnes
2014	27	0.41	-	27	0	-	-	tonnes
2013	35	0.42	-	35	-	-	-	tonnes

2012	23	0.39	-	24	-	-	-	tonnes
2011	21	0.4	-	21	-	-	-	tonnes
2010	24	0.48	-	24	-	-	-	tonnes
2009	21	0.58	-	21	-	-	-	tonnes
2008	52	0.61	-	52	-	-	-	tonnes
2007	60	0.53	-	61	-	-	-	tonnes
2006	32	0.54	-	32	-	-	-	tonnes
2005	31	0.58	-	31	-	-	-	tonnes
2004	58	0.53	-	58	-	-	-	tonnes
2003	56	0.49	-	56	-	-	-	tonnes
2002	55	0.5	-	55	-	-	-	tonnes
2001	53	0.43	-	54	-	-	-	tonnes
2000	52	0.43	-	53	-	-	-	tonnes
1999	176	0.43	-	176	-	-	-	tonnes

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Indeno(1,2,3-c,d)pyrene (193-39-5)

Historical reports for Indeno(1,2,3-c,d)pyrene (193-39-5)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2006	0.486	-	-	0.486	0.029	-	-	kg
2005	0.39	-	-	0.39	0.027	-	-	kg
2004	0.39	-	-	0.39	0.153	-	-	kg
2003	0.378	-	-	0.378	0.158	-	-	kg

2002	0.36	-	-	0.36	0.13	-	-	kg
2001	0.35	-	-	0.35	0.339	-	-	kg
2000	0.35	-	-	0.35	0.33	-	-	kg

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Methanol (67-56-1)

Historical reports for Methanol (67-56-1)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	69	-	-	69	-	-	-	tonnes
2016	69	-	-	69	-	-	-	tonnes
2015	98	-	-	98	-	-	-	tonnes
2014	218	-	-	218	0	-	-	tonnes
2013	381	-	-	381	-	-	-	tonnes
2012	334	-	-	334	-	-	-	tonnes
2011	268	-	-	268	-	-	-	tonnes
2010	220	-	-	220	-	-	-	tonnes
2009	217	0	-	217	-	-	-	tonnes
2008	228	0	-	228	-	-	-	tonnes
2007	472	0	-	472	-	-	-	tonnes
2006	168	0	-	168	-	-	-	tonnes
2005	173	0	-	173	-	-	-	tonnes
2004	177	0	-	177	-	-	-	tonnes
2003	172	0	-	172	-	-	-	tonnes

2002	172	0	-	172	-	-	-	tonnes
2001	169	0	-	169	-	-	-	tonnes
2000	110	0	-	110	-	-	-	tonnes
1999	36	-	-	36	-	-	-	tonnes
1998	42	-	-	42	-	-	-	tonnes
1997	213	44	-	258	-	-	-	tonnes
1996	220	43	-	263	-	-	-	tonnes
1995	227	46	-	272	-	-	-	tonnes
1994	230	-	-	230	-	2,667	-	tonnes
1993	217	0	0	217	0	1,953	0	tonnes

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Nitrate ion (NA - 17)

Historical reports for Nitrate ion (NA - 17)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2015	-	12	-	12	-	-	-	tonnes
2014	-	13	-	13	0	-	-	tonnes
2013	-	13	-	13	-	-	-	tonnes
2012	-	0.53	-	0.53	-	-	-	tonnes
2011	-	0.34	-	0.34	-	-	-	tonnes
2010	-	32	-	32	-	-	-	tonnes
2009	-	41	-	41	-	-	-	tonnes
2008	-	43	-	43	-	-	-	tonnes

2007	-	37	-	37	-	-	tonnes
2006	-	38	-	38	-	-	tonnes
2005	-	75	-	75	-	-	tonnes
2004	-	126	-	126	-	-	tonnes
2003	-	174	-	174	-	-	tonnes
2002	-	72	-	72	-	-	tonnes
2001	-	44	-	44	-	-	tonnes
2000	-	28	-	28	-	-	tonnes

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Nitrogen oxides (expressed as nitrogen dioxide) (11104-93-1)

Historical reports for Nitrogen oxides (expressed as nitrogen dioxide) (11104-93-1)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	436	-	-	436	-	-	-	tonnes
2016	331	-	-	331	-	-	-	tonnes
2015	364	-	-	364	-	-	-	tonnes
2014	436	-	-	436	-	-	-	tonnes
2013	405	-	-	405	-	-	-	tonnes
2012	478	-	-	478	-	-	-	tonnes
2011	770	-	-	770	-	-	-	tonnes
2010	676	-	-	676	-	-	-	tonnes
2009	688	-	-	688	-	-	-	tonnes
2008	524	-	-	524	-	-	-	tonnes

2007	585	-	-	585	-	-	tonnes
2006	505	-	-	505	-	-	tonnes
2005	539	-	-	539	-	-	tonnes
2004	527	-	-	527	-	-	tonnes
2003	528	-	-	528	-	-	tonnes
2002	214	-	-	214	-	-	tonnes

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PAHs, total unspeciated (NA - P/H)

Historical reports for PAHs, total unspeciated (NA - P/H)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2006	-	1.1	-	1.1	-	-	-	kg

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Perylene (198-55-0)

Historical reports for Perylene (198-55-0)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		

2006	0.023	-	-	0.023	-	-	-	kg

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Phenanthrene (85-01-8)

Historical reports for Phenanthrene (85-01-8)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	647	-	-	647	5.8	-	-	kg
2016	629	-	-	629	5.5	-	-	kg
2015	600	-	-	600	2.5	-	-	kg
2014	654	-	-	654	3.9	-	-	kg
2013	655	-	-	655	3.8	-	-	kg
2012	647	-	-	647	3.8	-	-	kg
2011	583	-	-	583	3.5	-	-	kg
2010	661	-	-	661	3.4	-	-	kg
2009	577	-	-	577	3.4	-	-	kg
2008	602	-	-	602	1.8	-	-	kg
2007	617	-	-	617	2.3	-	-	kg
2006	617	-	-	617	2.3	-	-	kg
2005	584	-	-	584	2	-	-	kg
2004	590	-	-	590	1.9	-	-	kg
2003	571	-	-	571	1.9	-	-	kg
2002	551	-	-	551	1.6	-	-	kg
2001	538	-	-	538	4.1	-	-	kg

2000	536	-	-	536	4	-	-	kg

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Total particulate matter (NA - M08)

Historical reports for Total particulate matter (NA - M08)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	255	-	-	255	-	-	-	tonnes
2016	250	-	-	250	-	-	-	tonnes
2015	1,263	-	-	1,263	-	-	-	tonnes
2014	2,255	-	-	2,255	-	-	-	tonnes
2013	1,248	-	-	1,248	-	-	-	tonnes
2012	1,500	-	-	1,500	-	-	-	tonnes
2011	1,477	-	-	1,477	-	-	-	tonnes
2010	1,914	-	-	1,914	-	-	-	tonnes
2009	1,828	-	-	1,828	-	-	-	tonnes
2008	2,418	-	-	2,418	-	-	-	tonnes
2007	695	-	-	695	-	-	-	tonnes
2006	520	-	-	520	-	-	-	tonnes
2005	966	-	-	966	-	-	-	tonnes
2004	947	-	-	947	-	-	-	tonnes
2003	968	-	-	968	-	-	-	tonnes
2002	896	-	-	896	-	-	-	tonnes

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PM10 (NA - M09)

Historical reports for PM10 (NA - M09)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	149	-	-	149	-	-	-	tonnes
2016	127	-	-	127	-	-	-	tonnes
2015	1,210	-	-	1,210	-	-	-	tonnes
2014	1,823	-	-	1,823	-	-	-	tonnes
2013	1,023	-	-	1,023	-	-	-	tonnes
2012	1,294	-	-	1,294	-	-	-	tonnes
2011	1,241	-	-	1,241	-	-	-	tonnes
2010	1,280	-	-	1,280	-	-	-	tonnes
2009	1,603	-	-	1,603	-	-	-	tonnes
2008	2,128	-	-	2,128	-	-	-	tonnes
2007	586	-	-	586	-	-	-	tonnes
2006	425	-	-	425	-	-	-	tonnes
2005	940	-	-	940	-	-	-	tonnes
2004	947	-	-	947	-	-	-	tonnes
2003	941	-	-	941	-	-	-	tonnes
2002	870	-	-	870	-	-	-	tonnes

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PM2.5 (NA - M10)

Historical reports for PM2.5 (NA - M10)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	1.6	-	-	1.6	-	-	-	tonnes
2016	110	-	-	110	-	-	-	tonnes
2015	823	-	-	823	-	-	-	tonnes
2014	1,291	-	-	1,291	-	-	-	tonnes
2013	734	-	-	734	-	-	-	tonnes
2012	1,011	-	-	1,011	-	-	-	tonnes
2011	986	-	-	986	-	-	-	tonnes
2010	937	-	-	937	-	-	-	tonnes
2009	1,274	-	-	1,274	-	-	-	tonnes
2008	1,689	-	-	1,689	-	-	-	tonnes
2007	457	-	-	457	-	-	-	tonnes
2006	325	-	-	325	-	-	-	tonnes
2005	828	-	-	828	-	-	-	tonnes
2004	834	-	-	834	-	-	-	tonnes
2003	829	-	-	829	-	-	-	tonnes
2002	632	-	-	632	-	-	-	tonnes

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Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (NA - D/F)

Historical reports for Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (NA - D/F)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2000	0.006	-	-	0.006	-	-	-	g TEQ(ET)

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Pyrene (129-00-0)

Historical reports for Pyrene (129-00-0)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	56	-	-	56	1.7	-	-	kg
2016	53	-	-	53	1.6	-	-	kg
2015	51	-	-	51	0.767	-	-	kg
2014	56	-	-	56	1.3	-	-	kg
2013	56	-	-	56	1.3	-	-	kg
2012	56	-	-	56	1.3	-	-	kg
2011	50	-	-	50	1.2	-	-	kg
2010	57	-	-	57	1.1	-	-	kg
2009	50	-	-	50	1.1	-	-	kg
2008	52	-	-	52	0.587	-	-	kg
2007	53	-	-	53	0.68	-	-	kg

2006	53	-	-	53	0.68	-	-	kg
2005	48	-	-	48	0.616	-	-	kg
2004	48	-	-	48	0.481	-	-	kg
2003	47	-	-	47	0.498	-	-	kg
2002	45	-	-	45	0.41	-	-	kg
2001	44	-	-	44	1.1	-	-	kg
2000	44	-	-	44	1	-	-	kg

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Sulphur dioxide (7446-09-5)

Historical reports for Sulphur dioxide (7446-09-5)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	92	-	-	92	-	-	-	tonnes
2016	45	-	-	45	-	-	-	tonnes
2015	182	-	-	182	-	-	-	tonnes
2014	135	-	-	135	-	-	-	tonnes
2013	141	-	-	141	-	-	-	tonnes
2012	129	-	-	129	-	-	-	tonnes
2011	96	-	-	96	-	-	-	tonnes
2010	89	-	-	89	-	-	-	tonnes
2009	246	-	-	246	-	-	-	tonnes
2008	761	-	-	761	-	-	-	tonnes
2007	457	-	-	457	-	-	-	tonnes

2006	18	-	-	18	-	-	tonnes
2005	18	-	-	18	-	-	tonnes
2004	18	-	-	18	-	-	tonnes
2003	18	-	-	18	-	-	tonnes
2002	17	-	-	17	-	-	tonnes

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Sulphuric acid (7664-93-9)

Historical reports for Sulphuric acid (7664-93-9)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	4.2	-	-	4.2	-	-	-	tonnes
2016	4.5	-	-	4.5	-	-	-	tonnes
2015	4.3	-	-	4.3	-	-	-	tonnes
2014	5.1	-	-	5.1	0	-	-	tonnes
2013	4.9	-	-	4.9	-	-	-	tonnes
2012	4.7	-	-	4.7	-	-	-	tonnes
2011	5.1	-	-	5.1	-	-	-	tonnes
2010	5.5	-	-	5.5	-	-	-	tonnes
2009	7.3	-	-	7.3	-	-	-	tonnes
2008	8.8	-	-	8.8	-	-	-	tonnes
2007	7.7	-	-	7.7	-	-	-	tonnes
2006	7	-	-	7	-	-	-	tonnes
2005	14	-	-	14	-	-	-	tonnes

2004	10	-	-	10	-	-	-	tonnes
2003	12	-	-	12	-	-	-	tonnes
2002	13	-	-	13	-	-	-	tonnes
2001	8.5	-	-	8.5	-	-	-	tonnes
2000	10	-	-	10	-	-	-	tonnes
1999	7.9	-	-	7.9	-	-	-	tonnes
1998	-	-	-	0	-	-	-	tonnes
1997	0.98	-	-	0.98	-	-	-	tonnes
1996	1.9	-	-	1.9	-	-	-	tonnes
1995	1.5	-	-	1.5	-	-	-	tonnes
1994	73	-	-	73	-	-	-	tonnes
1993	0	0	0	0	0	-	0	tonnes

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Total reduced sulphur (expressed as hydrogen sulphide) (NA - M14) (3)

Historical reports for Total reduced sulphur (expressed as hydrogen sulphide) (NA - M14)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	84	-	-	84	-	-	-	tonnes
2016	43	-	-	43	-	-	-	tonnes
2015	160	-	-	160	-	-	-	tonnes
2014	165	-	-	165	-	-	-	tonnes
2013	210	0.42	-	211	-	-	-	tonnes
2012	241	-	-	241	-	-	-	tonnes

2011	294	-	-	294	-	-	tonnes
2010	249	0.48	-	249	-	-	tonnes
2009	267	0.58	-	267	-	-	tonnes
2008	293	0.61	-	293	-	-	tonnes
2007	318	0.53	-	318	-	-	tonnes

(3) NOTE: Total reduced sulphur consists of 6 substances. Three of these substances (hydrogen sulphide [H2S], carbon disulphide [CS2] and carbonyl sulfide [COS]) are also listed individually in the NPRI substance list. If a facility meets the 10 tonne reporting threshold for any of H2S, CS2 or COS, it should report total reduced sulphur and the individual substance(s). Therefore, there is a potential for "double counting" of total reduced sulphur and the individual substance(s).

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Volatile organic compounds (NA - M16)

Historical reports for Volatile organic compounds (NA - M16)

Year	On-Site Releases				Disposal(1)		Off-Site	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)	Recycling	
2017	143	-	-	143	-	-	-	tonnes
2016	136	-	-	136	-	-	-	tonnes
2015	132	-	-	132	-	-	-	tonnes
2014	140	-	-	140	-	-	-	tonnes
2013	144	-	-	144	-	-	-	tonnes
2012	143	-	-	143	-	-	-	tonnes
2011	108	-	-	108	-	-	-	tonnes

2010	118	-	-	118	-	-	tonnes
2009	103	-	-	103	-	-	tonnes
2008	107	-	-	107	-	-	tonnes
2007	407	-	-	407	-	-	tonnes
2006	392	-	-	392	-	-	tonnes
2005	352	-	-	352	-	-	tonnes
2004	366	-	-	366	-	-	tonnes
2003	351	-	-	351	-	-	tonnes
2002	356	-	-	356	-	-	tonnes

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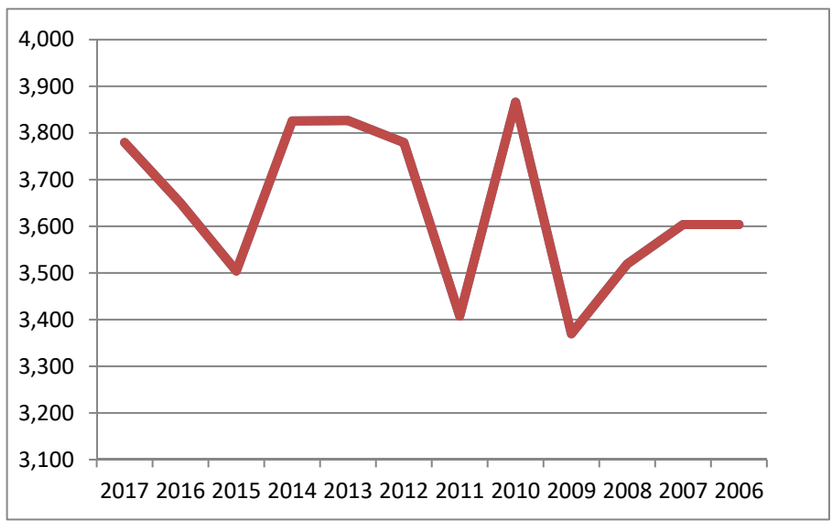
Units:

tonnes
g - grams
kg - kilograms
g TEQ - grams of Toxic Equivalent

NPRI air releases for Northern Pulp

Year	Dioxins and Furans		Acenaphthene		Acenaphthylene		Benzo(a)anthracene		Benzo(a)phenanthrene		Fluoranthene (206-44-0)		Phenanthrene (85-01-8)		Pyrene (129-00-0)		VOCs	
2017	0.008	TEQ (g)	224	kg	2,741	kg	9.7	kg	6.7	kg	95	kg	647	kg	56	kg	143	tonnes
2016	0.008		216		2,645		9.4		6.5		91		629		53		136	
2015	0.008		208		2,542		9		6.2		88		600		51		132	
2014	0.008		227		2,776		9.8		6.8		96		654		56		140	
2013	0.008		227		2,776		9.9		6.8		96		655		56		144	
2012	0.008		224		2,741		9.7		6.7		95		647		56		143	
2011	0.008		202		2,472		8.8		6		86		583		50		108	
2010	-		230		2,804		10		6.9		97		661		57		118	
2009	-		200		2,443		8.7		6		85		577		50		103	
2008	-		209		2,553		9.1		6.2		88		602		52		107	
2007	-		214		2,613		9.3		6.4		91		617		53		407	
2006	0.008		214		2,613		9.3		6.4		91		617		53		392	

Year	total PAHs	
2017	3,779	kg
2016	3,650	kg
2015	3,504	kg
2014	3,826	kg
2013	3,827	kg
2012	3,779	kg
2011	3,408	kg
2010	3,866	kg
2009	3,370	kg
2008	3,519	kg
2007	3,604	kg
2006	3,604	kg
Average	3,645	kg



APPENDIX H-28

Project Materials

Specialist Studies and Engagement Materials

Brochure with information on the New Effluent Treatment Facility, Northern Pulp

- Brochure providing additional details on the new effluent treatment facility.

NPNS Global Market Study, Brian McClay & Associates Inc.

- The NPNS Global Market Study assesses the viability of converting the existing Pictou Northern Bleached Softwood Kraft (NBSK) mill to produce either Unbleached Kraft Pulp (UKP) or Bleached Chemi-Thermo-Mechanical Pulp (BCTMP). For the reasons outlined in the market report, it can be concluded that continuing to produce premium reinforcement NBSK is the most competitively viable option by far for Northern Pulp.

Receiving Water Study, Stantec Consulting Ltd.

- The Receiving Water Study was completed during preliminary design to (1) evaluate potential locations for a marine outfall and identified the recommended area, (2) evaluate and made recommendations for the design and performance of the diffuser at the end of the outfall, and (3) model how the treated effluent will mix with the water at the outlet in the Northumberland Strait.

2016 EEM Report, ECOMETRIX

- The Environmental Effects Monitoring (EEM) study gives the results of the environmental effects monitoring from the existing Boat Harbour Treatment Facility. This EEM study is not directly applicable to the proposed replacement effluent treatment facility and associated treated effluent, but was provided upon request.

Technology Selection Summary Report, KSH

- This report documents the Preliminary Engineering for which reviewed the technology alternatives when determining the approach for the treatment facility at Northern Pulp.

Middle River Water Availability Report

- Completed in 2015 by RV Anderson for the Government of Nova Scotia, this report reviewed the sustainability of the water intake used by Northern Pulp.

Engagement Materials

Materials used at project engagement meetings, and summaries of those meetings will be posted here. This way we will increase the transparency of our process, and allow as many people as possible to engage with the project.

Project Launch: Summary of Engagement - What We Heard

Project Launch Open House Materials (December 2017 & January 2018)

Project Launch: Initiation Newsletter

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 6:06:35 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

In my option, everyone should be celebrating the incredible advancements being taken here to protect our environment. After the new effluent treatment facility is completed and the oxygen delignifacation process is added to the mixture, I think the owner will be leading the pulp and paper industry with remarkable numbers that will far exceed any standards set in the world. I'm also very pleased that the boat harbor clean up is coming in the future for everyone. I'm confident that there could be even more positive environmental tasks completed at the Northern Pulp site in the future, if we decide to work together with this valued employer in Nova Scotia today. We all want the same things, we all live here in Nova Scotia and the Northumberland Strait belongs to all of us and no one wants to hurt the Strait. My confidence comes from trusting the men and women that work in the Oceans and Fisheries Science Divisions of Canada, who are doing constant studies of our Strait everyday to ensure our ecosystem and environment is protected. Thank You for taking the time to read my option.

Signed by:

@northernpulp.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 6:11:46 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

My parents owned at cottage that was located between Boat Harbour and Lighthouse Beach. We remained at the summer dwelling until . I was a teenager and I watched the water, and marine life change with the discharge . Nature was destoyed. Why can't this pulp mill and the government have a better solution for the waste , it is 2019 and not 1967.

Signed by:

@gmail.com)

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 7:22:19 PM

Project: replacement_effluent_treatment_facility_project Comments: Honorable Minister, I am writing to offer my support for Northern Pulps new effluent treatment project. This new system will incorporateÂ the best modern technology and science available and will allow Northern Pulp to continue to operate into the future and reduce its environmental footprint.Â I am confident this onsite facility in its operation will allow this company to continue to not only meet but exceedÂ any guidelines as set by Dept of Environment, Provincial or Federal, today and in the future. This project is a milestone for the Pulp and Paper industry in Nova Scotia and will allow forestry,Â fishing, and community to coexist.Â Name:
Email: @ns.sympatico.ca Address:

Privacy-

Statement: agree x: 57 y: 26

From:
To: Environment Assessment Web Account
Subject: NP Environmental Assessment Concerns
Date: March 8, 2019 7:22:32 PM

Dear Minister of Environment...and Protector of the Future for Young Nova Scotians:

While the latter might not be your "official title", it certainly describes the effects of your decisions and who they will actually impact the most.

I read through some of NP's Environmental Assessment and the biggest thing that jumped out at me, was that the assessment is incomplete! Throughout the document, Northern Pulp promises/assures that the effluent will not cause harm to the environment. On CBC, I listened to workers of the mill assure people and cameras, that "the effluent will be some of the best effluent in North America." However, in the company's environmental assessment, it states:

At this time, effluent chemistry characteristics (***including the specific substances present in treated effluent and their anticipated concentrations***) will not be known with certainty ***until the project is operational***. (p. 489)

I am an educator (currently living in born and raised in Pictou) and I always encourage my learners to "back-up" their answers. I want them to show me evidence of their thinking, and if we're talking science, I want to see results from experimentation.
It appears to me, this is a step that was missed out in Northern Pulp's Environmental Assessment! Where is the data saying what the effluent is made of? The science that shows exactly how it's going to be treated and its effects on the environment? And what about the lobster larvae tests that should have been done to reassure scared fishers that there is, in fact, nothing to worry about?!

Putting the pipe in the water and then waiting to see what happens, is not acceptable and it shouldn't be allowed - just based on the lack of effluent science alone!
In its 'uncertainties', this pipe would threaten and/or violate several of the United Nations Sustainable Development Goals - something that you wouldn't expect to see in First World Canada, but alas, here I am writing you this letter, hoping for an outcome that values:
Life on land;
Life under water;
Good health and well-being;
Clean water and sanitation;
Sustainable cities and communities;
Responsible consumption and production;
Climate action.

It doesn't seem worth it, to jeopardize all of the above, for an out-dated pulp mill that created the biggest case of environmental racism in the province. It's time we create opportunities for woodlot, sawmill owners and pulp mill employees to get together, be thinkers, and innovate for the future. I mean, how is Nova Scotia curbing the global

temperature rise of 1.5 degrees? Not putting in a pipe and shutting down a nasty precipitator would be one step in the right direction! :)

Please, please, please do right by Nova Scotians, our youth and our natural environment - no pipe in our Strait!

Kindest regards,

From:	
To:	Environment Assessment Web Account
Cc:	
Subject:	Response to Northern Pulp"s EA Application
Date:	March 8, 2019 8:11:20 PM
Attachments:	NP EA comments.doc

Attached are the same comments that are in this email. I wasn't if there would be an issue with fomatting to I put it in both places.

Dear Premier Stephen McNeil and Minister for the Environment Margaret Miller,

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility project.

My name is I grew up in Pictou, moved to Halifax in and then moved back home in I have followed and been very involved in most things related to Northern Pulp since 2013.

I know you are aware of the history of the pulp mill. I would like to use a brief summary of what I have witnessed as my preamble to why I oppose this project and will express my concerns. I feel their history is important and should be considered when trusting them with a project of this immense stature and historical significance.

Back in 2013, before Northern Pulp had their electrostatic precipitator installed, NP's emissions amounted for 63% of all particulate matter released in the province. They were allowed to exceed limits because a ministerial order allowed them to do so while they were working towards compliance. People in the area including area doctors and the Nova Scotia Lung Association complained that this was not acceptable. Northern Pulp's response was 'give us a chance, we need more time'. While their recovery boiler was failing stack tests, so were the stack tests for their power boiler. The following year they upped their emissions to 78% of what was being released in the province while hitting production records. That was the year of the pipe leak.

In June 2014, Northern Pulp had a leak in their effluent pipe that took a couple of weeks to clean up (1). When the numbers were initially released we were told that there was 4-5 million litres that had spilled onto Mi'kmaq burial grounds and into the Northumberland Strait. Through the federal investigation, it turned out to be 47 million litres. Northern Pulp's negligence to properly maintain this pipe lead to the Boat Harbour Act. Without the Act, Northern Pulp would likely have had to close. The closure date was set for Jan 31, 2020 and mill officials said they would honour the act and honour the closure date although they admitted that they found the date rather tight.

With their next Industrial Approval looming, NSE set water reduction targets. Once the approval was put forward, Northern Pulp threatened to sue the government over the reduction targets. The govt eventually allowed for higher reduction targets. Northern Pulp has cited this litigation for being a reason for their late start despite the fact that they knew they couldn't operate without a new ETF to replace Boat Harbour and that they felt there was a time crunch. That is admission that NP chose not to start working on their ETF right away creating more of a time crunch.

After having the new precipitator installed, Northern Pulp were still failing their stack tests routinely on their power boiler. They no longer had to report the results and the only way to find the results were through Northern Pulp's Community Liaison Committee. When I contacted , NP and Paper Excellence's Communications Director, said that I couldn't talk directly to the CLC. I had to ask questions, would relay them to the CLC, they would respond to and would relay that back to me. Checking on each stack test after this, the response that I got on everyone from was that they were passing. They were not (2). This resulted in a fine for $697.50 and a directive that the company had to reveal their test results.

During this time, they could have filed for their EA submission but according to a recent FOIPOP they were busy demanding a 10 year Industrial Approval, despite not having gone one year without failing to meet at least one term of their Approvals and demanding that an increase in their water usage stating that they wouldn't go forward with their EA as these terms didn't work for them. Another indication that the time crunch was brought on by themselves. All along officials for the mill continued to state that they would honour the closure date.

Another recurring theme that has been presented by the mill is that the effluent will be cleaner than what comes out of Boat Harbour. According to recent FOIPOP, Northern Pulp's technical engineer admitted that the new effluent will be worse that the present effluent.

They finally announced open house dates to educate the public on their ETF plan. They put forward a plan that included a pipe that would go through the Pictou Harbour and have an outflow location in shallow waters with 6 ports spread over a distance of 125 metres in order to bring readings to background levels within 100 metres. They also showed in schematics an Oxygen Delignification system that one of their reps said would be crucial to the process at a cost of $70M that would be completely funded by the Mill owners. Concerns that were raised that night included a very well publicised shipwreck that had been found and mapped in 2015 (3), the shallow waters of the area that would cause ice scouring and requiring 125 metres of release from start to finish to reach background levels within 100 metres. KSH consultants also seemed unaware that fishing took place in the area where the outflow pipe was to be located.

FOIPOPPED information showed that by May 2018, Northern Pulp knew this plan would fail because of the shipwreck and ice scouring. This is just speculation but it seems being that this information was readily available that there was a planned failure to create even more of a time crunch. In July, they said they would file an EA submission on their ETF in the fall while admitting they knew the shipwreck was there all along (4).

Early in 2018 there was an ash spill resulted from a pipe leading to the power boiler that received an environmental directive. The big news on pipe leaks came on Northern Pulp pipe leaks came in October when NP had another large raw effluent leak that took more than two weeks to clean up. The amount is currently not known to the public because it is currently under investigation. A key point to note with this is the manner in which the leak was found. The mishap was discovered by someone randomly walking

their dog through the woods. This is very similar to how the 47 million litre leak that precipitated the Boat Harbour Act and brought assurances from the mill that this would not happen again(5).

Northern Pulp didn't plan for new survey work for Caribou Harbour to take place until the end of October into November. Adding this new component by not starting the survey work so late would have resulted in NP not being able to submit until January 2019 at the earliest. The fishers and the First Nations blockaded work against the surveryors. Despite all of the delays that NP created for themselves and their filing in January 2019 which followed a time line that, as stated, they created, they blamed the fishers blockade as a major reason for the delays.

After years of saying that Northern Pulp would honour the Boat Harbour Act, announced on Jan 31, 2019, along with their EA submission, that they would seek an extension on the use of Boat Harbour indefinitely while also stating that the continued sad history between the Mill, the Pictou Landings First Nations and Boat Harbour could no longer continue (6). A statement that completely contradicts itself. To add to that she stated that the Pictou Landings First Nations and Northern Pulp had shared goals. This announcement was made on the day the PLFN were celebrating that Boat Harbour would finally be able to be returned to what it was before it was stripped from them five decades ago. Despite the Boat Harbour Act negotiated by the NS govt and the PLFN that five years before gave Northern Pulp a fighting chance at continuing while clearing the way for Boat Harbour remediation, Northern Pulp and the PLFN clearly don't have shared goals anymore.

From a personal perspective of this process, a couple of the questions that I submitted to Dillon Consulting were "What is the effect this effluent will have on lobster?" and "Will there be testing done with the proposed effluent on lobster." In the EA there is a section that lists questions that the public submitted. Those questions don't appear there. In fact, there is not one reference to studies done on lobster in the entire EA because they never completed any.

My concerns with Northern Pulp's EA submission for their ETF broken down into sections:

1) The process

2) The pipeline route

3) The outflow location and plan

4) air emissions

5) ETF location

6) Integrity of the proponent, ability to comply with the Industrial Approval

7) Impacts on Fishing and Economic reasons

8) municipal laws and other factors

1) The Process

A class one assessment was chosen for this project. According to then Minister for the Environment Iain Rankin that classification was automatic (7). Looking at Nova Scotia's guidelines on classifications of environmental assessments, a class two definition is described as "undertakings are typically larger in scale and are considered to have the potential to cause significant environmental impacts and concern for the public... These undertakings require an environmental assessment report and formal public review which may include hearings." (8)

Northern Pulp's submission is approximately 1700 pages for an ETF that will cost about $130M of taxpayer money IF the court case between the province and Northern Pulp against the First Nations reverses a decision that found that the province had to consult with the First Nations before money could be handed to Northern Pulp. This project will have lasting affects on both the forestry and the fishing industry for decades to come. That should be by definition 'larger scale'. There have been Class two assessments for projects in this province before. To get a better understanding of perspective on the Class one decision, where does the government see Northern Pulp's ETF submission in relation to those other projects and what were those other projects that warranted more scrutiny in terms of scale?

A plan with the capacity to pump up to 85 million litres of effluent into prime breeding grounds of the Northumberland Strait not only will cause a significant environmental impact but also has drawn a large concern for the public. The Land and Sea rally brought over 3000 people and 200 Boats to Pictou for a protest (9). Thousands of letters representing First Nations, Fishers, Citizens, Tourism and Fishing Associations from 3 provinces and 19 Federal Senators have been sent to the federal government asking for a federal assessment. This demonstrates 'concern for the public'.

Mr. Rankin's decision on the project warranting a Class one assessment can still be properly applied when present Minister for the Environment Margaret Miller conducts her review. The details of the project, possibly being larger than Mr. Rankin expected when he made his decision, can still face proper scrutiny under a class one as there is a caveat that allows "Other opportunities may exist if the Minister decides that a focus report or an environmental assessment report is required" (8) Barring either the submission being denied or an about face to allow for a Class two assessment, it would seem that adding the focus report or environmental assessment report would be the logical next step.

In Northern Pulp's EA submission they explain the process of informing the public. This included open houses, mail outs, press releases and the like. A major concern here is their original presentations reached a lot of people with details that are no longer part of their plan and the change in outflow location changes the amount of concern some people would have for the project. When the original open houses were conducted, the plan was to pump effluent to the mouth of Pictou Harbour. People who live in the Caribou area may not have been as concerned or followed the plan as the outflow wasn't going to be close to their property. With a submission of a 1700 page document, someone finding out about this large scale project would not have the time to decipher such an immense technical document in 30 days. Even on a recent episode of "The National" CBC had a graphic showing the proposed pipe going out through the mouth of Pictou Harbour instead of the submitted plan for the pipe going out Caribou Harbour (10). Northern Pulp's website that was set up to educate the public still has a lot information that is now incorrect due to their change in plans (11). Northern Pulp also set up a facebook group requesting that people have an open mind and ask questions. Shortly after that, they banned a lot of people who were asking questions and routinely delete comments of concern. Due to the level of effort made by Northern

Pulp to educate people on their original plan, there should have to be at least equal effort for Northern Pulp to consult and educate the public on their actual submission to ensure the public actually understands what NP plans to do and not rely on what NP had originally told them their plan was.

To this date, Northern Pulp still has not held an open house in the Town of Pictou even though their original plan was to have the outflow point at the mouth of the Pictou Harbour or with their submitted plan that has raised concerns over the plan to due work over and put an effluent pipe through the town's watershed.

During the original open houses, Chief Andrea Paul pointed out that there wasn't an open house scheduled in Pictou Landing. Northern Pulp agreed and after word got out, tried to discourage people who weren't from the PLFN from attending. Chief Paul correct that stating that anyone wanting to understand this project were welcome to attend.

There is a lot of concern over the perceived conflict of interest around the NS govt role in making a decision on NP's ETF approval with the indemnity agreement (12) possibly influencing Nova Scotia's decision in that the province could be financially motivated to find in favour of the proponent to avoid litigation. This was one of the reasons for requesting a Federal Assessment.

2) The pipe route.

The plan submitted has the pipe's route to go along the Harvey A Veinot Causeway, over Pictou's watershed along the Trans Canada Highway and out 4kms into the Northumberland Strait.

On page 11 it is explained that "An EA identifies potential environmental affects, proposes measure to mitigate adverse environmental effects, predicts whether there will be significant adverse environmental affects after mitigation measures are implemented, and includes a follow up program to verify the accuracy of the EA and/or the affects of the mitigation measures."

Early in the submission on page 12, it states that NP did not "facilitate full biological field assessments for the current proposed transmission pipeline corridor". It goes on to state that this nor studies on the marine environment weren't completed in time for their registration. Their 'commitment' to follow up shows that they recognize that this work is important to their submission. It continues on page 13 to say this work will be done in the spring and summer. If it's important to the submission, then it should have been completed and included in the submission. How can the quote in the previous paragraph be followed if studies have not been completed?

One of the first issue with the pipe route has to do with migratory birds. In the EA submission, it says that there is non significant affects on migratory builds yet from late April until early October, cormorants make the side of the Causeway their home. There is nothing in the EA that addresses this. Any construction of a pipeline would damage where they live and do them significant harm. This shows just one of the many potential omissions with relying on desktop studies instead of doing the actual work.

After you get across the causeway, you are moving the pipe across the town of Pictou's watershed. The construction of and the use of an effluent pipeline puts Pictou's source of water at risk. The town is in the process of its own major project to finally secure drinkable water for the citizens who have not been able to have drinkable water. Whether the risk arises during the construction or 50 years down the road, as mentioned in my opening preamble, Northern Pulp does not have a demonstrated history of showing either proper maintenance of pipelines nor monitoring for when damage of pipelines arise. This is a risk that is not worth taking.

The pipe then moves along the shoulder of the Trans Canada Highway near water courses and wetlands on its way towards where it reaches the Northumberland Strait. The aforementioned lack of studies on biological and marine environments and Northern Pulp's previously mentioned history is cause for concern here as well. With their not having done the studies and no plans to have them completed until the summer, I don't see how the NS Department of Environment can even make a judgement on the potential risk for this area.

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3) The effluent pipe's outflow location and plan

The plan is to extend the pipe about 4 kms from the shore through Caribou Harbour to an outflow location that appears to have a debth of about 40-65 feet made of mud, sand and rock (13). To put this depth into perspective, 60 feet 6 inches is the distance from home plate to pitchers mound on a baseball field. That's deeper than the original outflow point near Pictou Road but still not very deep. This is adjacent to the PEI ferry route and requires routine dredging do to shifting sand and silt. Dredging generally seems to be done approximately every 10 years (14). The end of the pipe itself will have three ports with a plan of dispersing the effluent, that as described by NP's technical engineer in the preamble, will be worse than what is coming out of Boat Harbour now. In the EA it states that the characteristic of the effluent will not be known until project completion. They know it will be worse, but don't know how bad and can't submit a testimony to that quality in time for NSE to make a ruling on whether it is okay for an ETF with a capability of producing up to 85 million litres of that unknown effluent each and every day.

The original plan called for six ports being required for the dispersal. The present plan calls for three ports. This is one of those facts that anyone going by Northern Pulp's open houses and distributed material are not aware. Under ideal conditions, this is supposed to bring the effluent to background conditions within 100 metres to meet Federal Guidelines. Although this trench is deeper than the original outflow location it is a narrow trench with a shifting bottom. It is also a very important area for among other like lobster, crab and herring, it also includes species of concern like Atlantic Salmon and Stripe Bass. Northern Pulp and their consultants/contractors have not completed the survey work for the area yet somehow concluded that there will be no adverse affects.

Concerns with this location that are not known include the affects that the shifting bottom will cause, the ability for the outflow pipe to remain free of mud and silt and the extent and characteristic of monitoring to ensure there are no issues. Monitoring on other components of NP's Industrial Approval are infrequent and lack any consequences that would motivate concern from NP. The indemnity agreement absolves the mill and its successors from harm. The province owns the effluent.

According to the EA, the effuent will contain 4,000 kg total suspended solids each day.

This would add to the build up that would end up in this narrow channel that is only about 60 feet deep.

Ice scouring was a major factor that prevented the first plan from working. Ice scouring and ice build up is an occurrence throughout the Northumberland Strait. Stantec's research has shown there to have been 133 features during their 2015 survey that was completed for the PEI-New Brunswick cable interconnection upgrade project (15). Just to reiterate the point, Northern Pulp have not completed their assessments on this and again have concluded there will be no adverse affects.

Page 21 of the EA shows that assessments by NP need to be completed for DFO in relation to fish habitats. "Geotechnical investigation will be completed inorder to facilitate detailed design and provide sufficient information to estimate the harbour/marine footprint of the pipeline/outfall. Habitat assessment and preliminary proposed project footpring infomration will form a component of a DFO Request for Review to determine authorization requirements under the Federal Fisheries Act." If this study hasn't been done and DFO can't authorize the pipe due to concern over potential serious harm to fish, the province shouldn't be able to authorize the project as Northern Pulp wouldn't have been able to show that it would be operational before the decision by the Minister for the Environment is made.

According to CLC meeting minutes from Spring 2017, Northern Pulp required both the Boat Harbour ETF and the New ETF to run concurrently for six months while the biology developed in the AST system (B). According to page 81 of the EA, the commissioning phase would take between one and three months. This is concerning because it sounds like the timeline is being rushed to compensate for money that could be lost should the appropriate time be taken for the biology to develop.

4) Air emissions.

There's a section in the EA that addresses VOCs on page 141. In it Northern Pulp tried to discredit the findings that showed we have elevated levels of VOCs while trying to pass the blame off on a combination of Michelin and NSP Trenton. I found it interesting that the EA found it not credible because the study to which they referred went with "a statistical evaluation of ambient data in correlation with wind direction, without further site specific investigation" yet the EA surmised that the VOCs may have come from other sources like "transportation sources, or other industrial sources like the Michelin Tire plant or the Trenton coal-fired power plant, **presumably** all sources of VOC emissions to some degree." The EA also stated that VOCs had elevated levels when the prevailing winds were from the northeast of the mill. Given the locations of Michelin (to the west) and NSP Trenton (to the south) it would seem that there must be more validity to the data collected in the paper by Hoffman et al. then the 'presumption' that this EA submission is making. At the very least, it strengthens a case for having continual emissions monitors on not only Northern Pulp's stacks but possibly those of Michelin and NSP Trenton as opposed to making presumptions and allowing elevated levels of VOCs to continue based on the failed logic that, since you can't tell whether it's one or all three of the main sources of air pollution in the county, it doesn't require further investigation.

Emma Hoffman recently defended Northern Pulp's presumptions in a recent article for The Examiner. (A) " Northern Pulp's EA also stated that the study did not attempt to rule out the contributions of other potential sources. But Hoffman, Guernsey, and Walker say this "is clearly not a true statement," and that the study did not disregard other potential sources of VOC emissions. The study openly acknowledged and discussed in detail the other potential local emission sources in the area, including a coal-fired generating station in Trenton and a tire manufacturing facility. The study even provided a map indicating these other potential sources relative to the Granton NAPS site." Just because Northern Pulp states something, doesn't mean it's true.

With the new ETF, sludge is to be dewatered and burned in the power boiler. This will cause an increase of about 5% more pollutants in coming from the power boiler. Northern Pulp has only managed to stay under the emissions limits as lain out in their Industrial Approval for just over a year now which only spans six tests. Again, a change like this with a company that has a reputation for failing its emissions tests would warrant Continuous Emissions Monitoring system in place. Page 148 even has Northern Pulp stating that they believe there should not be increased monitoring despite the adding of a new element to what they are burning in their power boiler. This demonstrates that they don't want more scrutiny on part of their process that has failed in the recent past.

The EA states that they won't know the effluent's chemical makeup until after the project is complete. If that is the case, how can they know the chemical makeup of the sludge that they plan to burn in their power boiler? What will that chemical makeup be once it becomes airborne? How will that increase the level of VOCs in the area?

During the open houses a key component that also appears pictured in the EA submission is the Oxygen Delignification system. Consultants said that this would cost about $70M and be paid for by the mill owners. In the EA it is highlighted in a different colour and it says that it would be built in the future. If this is a key part of the operation to reduce emissions, smell and make the effluent better (which as we covered before, is actually going to be worse) why is it not part of this project? With the length of time it is taking Northern Pulp to get this $130M project underway where they may not even have to foot the bill, I am concerned that this promised oxygen delignification system will not come to fruition.

5) ETF Location

The plan is to locate the ETF next to where Canso Chemicals was/is. Knowing the history of the missing mercury, what sort of excavating/site cleaning will go on here? I have concerns over any chemical from or near the former site being unearthed. Who would over see this work? I would expect it would be some third party agency like NS Lands who have experience with this sort of work. What would be the process for doing any of the clearing? Knowing the concerns facing the removal and disposing of anything on the mill property or on the property of Canso Chemical be treated with the same care that is being applied to Boat Harbour which received both a Class Two provincial assessment as well as a Federal Assessment? If not, why not?

I did not find a mention of mercury in Northern Pulp's EA submission and considering the history that the two properties share, that should have been given consideration and seems perplexing with its absence. Is there any chance if this place isn't excavated properly, that any mercury that is on site could seep into the sludge and end up burned in the power boiler?

Are Canso Chemicals, it's current or previous owners protected by the Indemnity Agreement? Are people who are connected to Canso Chemicals that are also connected to the mill held free of harm should any wrongdoing be uncovered that relates to their connection to Canso Chemicals?

6) Integrity of the proponent, ability to comply with the Industrial Approval

Any decision to grant an approval on a project like NP's ETF should take into consideration the people in charge of the work and overseeing its operation. If I were to submit this identical proposal, I wouldn't expect NSE to grant my approval because I have not demonstrated the capabilities of completing a project of this size.

Northern Pulp has had about a dozen infractions, ministerial orders and pipe leaks. They are on Canada's Environmental Offenders registry. They are currently still under investigation for their most recent pipe leak. I realize the timing of Northern Pulp's EA submission and the 30 day public consult period followed by the 20 days to make a decision period was not precipitated by actions of the Minister for the Environment or NSE. Making a decision on granting a project of this magnitude prior to completing an investigation for an event that could lead to criminal charges just doesn't sound prudent. It feels akin to making a decision to leave your child with a babysitter this weekend even though you know a decision on child abuse charges for that babysitter will be announced the following Monday.

Any approval for this project hands over responsibility for monitoring and maintaining operations this project to a proponent with a horrible track record who has stated in a number of spots in this EA that studies that it agrees should be done, have not been completed.

Northern Pulp, as explained in my preamble, have a demonstrated history of saying one thing and doing something different. Examples previously given and cited include failure to do proper maintenance and monitoring of an effluent pipe.

Concerning is the combination of lax regulations, lack of monitoring and weak enforcement and penalties that was cited by the auditor general (16) not only in general in this province but how that applies to Northern Pulp. During the installation of the precipitator, NP was allowed to keep operating because it was "working towards compliance". That took a few years. That is not acceptable. When talking about an effluent pipe that could put the ecology of the Northumberland Strait and its corollary fishing industry at risk, allowing a mistake to continue for years while working towards compliance is not an acceptable option. If there is a malfunction that is noticed, what steps are going to be taken to properly empty the 15km pipe before its contents are pumped out into the Northumberland Strait?

7) Impacts on Fishing and the Economy

One of the big rallying cries from Northern Pulp has been what the closure of Northern Pulp will do to jobs in the province. Stepping away from the very real fact that the dilemma of Northern Pulp closure has been brought on by their neglect of their effluent pipe followed by their not coming up with a suitable replacement plan for the Boat Harbour ETF, jobs are important. What seems to get lost in all of this is the fact that fishing and tourism jobs matter as well. Those industries are not doing anything to put Northern Pulp's business in peril. Northern Pulp did that to themselves.

There are about 300 people who work for Northern Pulp. Their economic activity accounts for 5 indirect jobs for everyone direct job so a total of about 1800 jobs. There are over 3000 fishermen who work in the Strait. Applying that same metric would mean 18,000 jobs would be at risk if we kill the Northumberland Strait fishing industry. Tourism was not even considering in Northern Pulp's submission.

In 2003 Alberta had a case of mad cow disease (17). This was estimated to have caused a $5B hit to beef producers. Stewardship over fishing happens in much the same way. If one lobster is contaminated, just like the Alberta mad cow incident, hamper the Atlantic region's ability to sell seafood. It took about two years before Alberta was allowed to resume business as usual. It took remedying the situation and reassuring the markets Alberta beef was safe to eat. Those factors would not be in play with Atlantic seafood because we likely would still be pumping the effluent that caused the problem each and every day over that two year period and continue until the end of the life of the mill.

Northern Pulp exported about $220M in product in 2017. Fishing topped $2B last year in exports. Tourism on the North Shore topped $200M with the NS economy growing by about a half billion in the last few years to the $2.7B mark (18). The Ivany Report set a goal of expanding tourism to $4B. Nova Scotia's brand is the based on the lobster and being Canada's Ocean Playground. We have the warmest waters north of the Carolinas due to the Northumberland Strait being shallow and warming quickly in the summer. If we develop a reputation sick lobster and unswimmable waters, there goes fishing and tourism.

On page 110 of the EA, Northern Pulp draws the conclusion that there will be no harm to the commercial fishing industry without doing any tests on fish.

8) Municipal laws, PLFN and other factors

Currently, Northern Pulp does not have permits for running a pipe through the town of Pictou or the County of Pictou. I do not believe a project should be given the ok until these can be obtained.

At the start of this process we've heard repeatedly about the indemnity agreement, Nova Scotia taxpayers being on the hook for costs and negotiations being ongoing when it comes to who is paying for the ETF project. In the fall, a Supreme Court decision came forward that the province would have to consult with the PLFN on any funding that would go to Northern Pulp (20). Northern Pulp has recently joined the province in its fight against that decision although the current situation is that Northern Pulp will not get money from the province to pay for this ETF project. Being the current situation, Northern Pulp should not be allowed to move forward on this project without showing that they would completely fund this project.

At least fifteen First Nations fishermen, fish out of the area of the outflow pipe. "The Supreme Court of Canada confirmed that the Mi'kmaq and Maliseet First Nations continue to have treaty rights to hunt, fish and gather towards earning a moderate livelihood. These Treaty rights must be implemented. Along with these treaty rights, First Nations maintain that they continue to hold Aboriginal rights and title throughout their traditional territory. This creates a special situation unlike any other found in Canada. There is no model or generic approach to follow on how to prceed in these gegotiations. All parties must be prepared to consider how to devise a negotiation process which meets everyone's circumstances, needs and interests." (21) This would seem to indicate that if the Mi'kmaq of the Pictou Landings First Nations are not in agreement with risking their ability to fish in a this area where they hold Aboriginal rights and title, then the NS govt can't approve this project.

My understanding of the Boat Harbour extension that was signed by then Premier John Hamm may not have been legal and faces future legal challenges. I believe that should be dealt with before any 'compensation' on ending the Boat Harbour lease before 2030 should be given.

On page 70 Section 5.2.1 it says that Northern Pulp will be in charge of monitoring effluent quality discharged to the receiving environment. They are supposed to be in charge of that now and that has lead to two large raw effluent leaks in less than five years. I believe they've demonstrated an inability to complete these tasks.

Page 82 lists a number of things that Northern Pulp should have completed before filing let alone obtaining approval. They include: various approvals, avian/turtle studies, MEKS field studies, Archaeological shovel testing for pipeline, geotechnical land surveys for land portion of pipeline, marine seismic testing, habitat and confirmation of marine pipeline alignment. Still no mention of testing effluent on creatures like lobster, crab, Atlantic Salmon, striped bass...

I do not believe the effluent test of putting ten trout in a bucket of effluent for 96 hours to see if more than half survive could ever be described as adequate testing regulations to meet effluent quality. Throwing that kind of testing at the our fishing industry is plotting a course for disaster.

On page 106 of the EA, NP states that neither the Fishermen nor the PLFN offered any input to the outflow location evaluation other than expressed opposition. This seems to try to discount their opposition to a pipe going into the Northumberland Strait as the Fishers and the PLFN not helping with the decision. At the open houses, NP was told by the fishers and PLFN that the water was too shallow and there would be ice scouring. The prevalence of ice at the Caribou Harbour location would not be much different. Either way, a plan that would put their fishing livelihood at risk was not going to be

acceptable. The fishers' associations even offered to help cost share any project that didn't involve putting a pipe into the Northumberland Strait. Basically, this amounted to the fishers and PLFN evaluating the plan based on their vast knowledge of the Northumberland Strait as a bad idea and Northern Pulp disagreed based on their wanting to put a pipe in the Strait.

My Conclusions.

I believe the repeated mentions of studies that have not been concluded demonstrates that the proponent has still not completed all of the work necessary for this to have been submitted in the first place. Seeing their comment that the AST system could be brought up to speed in 1-3 months after telling their CLC that it would take six months adds concern that this project is being rushed and proper care is not taking place. Changing the outflow location doesn't really change the concern of ice scouring that caused their first option to fail.

From a purely environmental side of things, having effluent that is worse than what is going into Boat Harbour and pumping that into the prime breeding grounds of the Northumberland Strait seems completely ill-fated considering what the current process has done to Boat Harbour. At least with Boat Harbour, most of the damage was contained to the receiving basin, Boat Harbour and the shoreline.

From a legacy point of view, look at what the legacy of the decision to strip Boat Harbour away from the Pictou Landings First Nations has created. It's one of the worst cases of environmental racism this country has seen. Pumping this effluent into the Strait has the very real potential of poisoning our water and our food. I know not being able to prevent the disaster that became Boat Harbour weighed heavily on the PLFN. I can't imagine what making a similar decision with the potential for similar consequences on behalf of everyone would be the legacy I'd want to leave to our children.

From a point of having faith in the people running the mill, I don't understand how they could have a new Industrial Approval approved. About a dozen infractions, ministerial orders and pipe leaks. At some point they should be held accountable for not meeting the terms of their approval or what is the point of issuing terms with an approval?

If the decision is being weighed as a protector of jobs or from a purely economical stance, there's more at risk with harming our fishing industry. If that pipe goes in, we're likely locked into the ramifications of living with a bad decision if things don't go well for the next 50 years with a pulp mill that will be over 100 years old.

There really hasn't been an effort made to come to a reasonable agreement with the Fishers or the First Nations. Throughout the process it has been Northern Pulp dictating what they want to do with their tag line 'no pipe = no mill'. That really causes concern in that it wouldn't be surprising if instead of trying to come up with a plan that works, this process feels like it was 'this is the plan', now how do we dress it up to look like it works.

Northern Pulp have stated that they require an extension on their use of Boat Harbour. As outlined early on in this, they've had over five years and chose initially to take other actions instead of getting the ball rolling. This latest ask for more time is far from being their first ask. The mill has been failing since they took it over and we've been hearing the phrase 'we need more time, just give us a chance' since the beginning of their ownership. The mill was designed to last 25 years and was 40 years old. According to Lana Payne from Unifor, the concessions made in their contract were to allow the owners to renovate the mill because proper upkeep hadn't gone on in 40 years. If the decision were made to okay this new ETF, when would the province be buying a new mill because it feels like we're putting brand new tires on a car that won't last the week.

Please see the EA submission as the large incomplete document that it is. At the very least, the immense size of this project, the material put forth, the potential risk to the environment and the large amount of concern that people have for the risk to their health, the environment and their livelihoods, if this EA submission isn't rejected, it definitely warrants a focus report (environmental assessment report).

Thanks for taking the time to read this. Making a decision on this, even if the choice is clear, is not an easy task.

(1) https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-mill-shut-down-due-to-effluent-leak-1.2670721

(2) https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-air-emission-tests-fails-again-1.4295686

(3) https://globalnews.ca/news/2131146/pictou-harbour-shipwreck-could-be-over-120-years-old-diver/

(4) https://www.cbc.ca/news/canada/nova-scotia/proposed-northern-pulp-pipe-route-ocean-problems-1.4733101

(5) https://www.thechronicleherald.ca/news/regional/northern-pulp-scrambles-to-clean-up-effluent-spill-252239/

(6) http://www.paperexcellence.com/news/opening-remarks-northern-pulp-ea-submission-press-conference

(7) https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-proposal-boat-harbour-waste-water-facility-1.4270995

(8) https://novascotia.ca/nse/ea/faqs.asp

(9) https://www.theguardian.pe.ca/news/local/paper-excellence-quells-rumours-protests-are-causing-company-that-owns-northern-pulp-to-pull-out-of-pictou-county-226139/

(10) https://www.youtube.com/watch?v=rHqSqZF0OYM&feature=youtu.be

(11) https://www.northernpulpfuture.ca

(12) https://www.change.org/p/minister-environment-of-nova-scotia-save-the-northumberland-strait-protect-our-atlantic-salmon-and-sea-trout/u/22909966

(13) http://fishing-app.gpsnauticalcharts.com/i-boating-fishing-web-app/fishing-marine-charts-navigation.html?title=Northumberland+Strait+boating+app#12.29/45.7433/-62.6335

(14) https://www.canada.ca/en/news/archive/2008/05/federal-government-improves-caribou-nova-scotia-ferry-terminal.html

(15)https://www.princeedwardisland.ca/sites/default/files/publications/cle_vol4.pdf?fbclid=IwAR3wj2twWKWHLzW8M6tr5AfucodL5eQ3y6Ynskj881fMu8rBljgEIX0T1q4

(16) https://www.cbc.ca/news/canada/nova-scotia/auditor-general-environment-approvals-1.4381562

(17) https://globalnews.ca/news/1830438/timeline-canadas-2003-mad-cow-disease-crisis/

(18) https://tourismns.ca/2017-record-year-tourism-nova-scotia

(A) https://www.halifaxexaminer.ca/province-house/dalhousie-researcher-breaks-silence-over-pulp-mills-cancer-causing-air-emissions/?fbclid=IwAR0GdA9CCoyPkhKuIsOk2lUOBUe-h-NX-NzR-GN1RX3L3gIUonzcA2emCIA#Boat%20Harbour%20could%20be%20adding%20to%20the%20problem

(20) https://www.cbc.ca/news/canada/nova-scotia/consultations-mi-kmaq-financing-northern-pulp-effluent-plant-1.4931101

(21) https://www.rcaanc-cirnac.gc.ca/eng/1100100028589/1539608999656

(B) http://docs.wixstatic.com/ugd/7a1cbf_5006cfe89b9a41b79ed44ed39a5960b3.pdf

* There is no 19 footnote. A and B were added as I was working out of sequence at times out of this and I'm too tired to go back and try to rearrange the numbers. (-:

From:
To: Environment Assessment Web Account
Subject: Northern Pulp's Replacement Effluent Treatment Facility
Date: March 8, 2019 8:22:31 PM
Attachments: NS Environment letter.docx

March 8, 2019

Hon. Margaret Miller

Minister of the Environment

Government of Nova Scotia

Via email: EA@novascotia.ca

Re: Northern Pulp's Replacement Effluent Treatment Facility

Dear Madam Minister:

I am a resident of Pictou County on land that borders on the eastern end of Caribou Harbour. My family and I regularly walk and swim at the beach that is part of the Caribou Provincial Park. We bird watch on Munroe's Island. We regularly kayak and sail the waters of Caribou Harbour. I have accompanied fishers as they pull lobster traps off of Caribou Point and hunt for herring off of Pictou Island.

I am also a Professor of Fine Art at York University in Toronto and a professional artist. I have produced several works based on my research and experience of Caribou Harbour. These can be found at the following web addresses: http://memoryfactory.sitemedia.ca and http://www.cariboumottos.ca

I am writing in response to Northern Pulp's submission of its plan for a replacement effluent treatment facility and the proposal to place an effluent pipe not far off of Caribou Point into the waters of the Northumberland Straight.

Caribou Harbour is a unique estuarial environment that has been a source of food and therefore human culture for hundreds, if not thousands of years. It is a significant part of Pictou County's Northumberland Coast, its history and cultural identity. It is also a highly changeable body of water subject to tides, ice, fierce storm surges and fluctuating temperatures. Caribou Harbour is shallow and prone to silting to the degree that access to fishing wharves requires occasional dredging.

Our website www.memoryfactory.ca referenced above is dedicated to local memories of the Maritime Packer's plant at the east end of Caribou Harbour, adjacent to the Little Entrance, a channel through the isthmus between the mainland and Munroe's Island. The Little Entrance provided a safe harbour and immediate access to the rich fishing grounds between Caribou and Pictou Island. Maritime Packers for many years was the largest lobster processing plant in the area, some say the world.

In the mid 1980's the Little Entrance started to silt up permanently. Some say this was due to dredging the channel for the PEI ferry. Whatever the case, the Little Entrance completely silted over and the flow of water in Caribou Harbour completely changed. It is now much shallower and the bottom changes due to tides, storms and ice. The beach at Caribou Provincial Park can be sandy one year and rocky the next, the bottom of Caribou Harbour shifts over each winter. Concrete blocks as big and heavy as an automobile used as barriers to erosion can be tossed like skittles by storm surges. The point is Caribou Harbour is an ever-shifting, highly sensitive environment that is rich in life. Lobster, herring, crab, oysters and other species are abundant. Fishing has shaped the history and the culture of this particular spot.

In Northern Pulp's proposal for a new effluent treatment facility I have found no mention of the impact of one tonne of solids to released daily into waters at the entrance to Caribou Harbour. In section 7.4.1 of Northern Pulp's registration document prepared by Dillon Consulting, there is no mention of a survey of Caribou Harbour or any studies of how water flows in an out of the harbour. The effect of the introduction of a massive infusion of water estimated to be over 62,000 cubic meters on a daily basis combined with a tonne of semi solid material has not been mentioned let alone analysed in terms of its impact on the harbour itself. Instead, Table E1.1-1 the claim is made that there will be No Significant Residual Environmental Effect Predicted. To anyone who witnesses the way Caribou Harbour subtly changes almost on a daily basis this seems to be an audacious claim. Caribou Harbour is a living entity and as such will be affected by the introduction of an effluent pipe.

I believe that Northern Pulp's Environmental Assessment regarding the issue of Caribou Harbour's Physical Environment, Water Quality and Sediment Quality is inadequate. I strongly recommend that your Ministry order an Environmental Assessment Report on this entire proposed project.

I also have very strong concerns about the location of the outlet for this pipe and its potential effect on the fisheries in area 26A. Figure 6.3-1 of the Executive Summary prepared by Dillon Consulting purports to represent the fishing done in the vicinity of Caribou Harbour, yet there is no indication of the herring fishery or the fact that the area around the north side of Pictou Island is a important herring spawning ground. Personally, I have seen herring swarming in Caribou Harbour to its most easterly extent up to the wharf operated by the Little Entrance Fishermen's Association. Again, I find the data presented in Northern Pulp's Environmental Assessment Registration Document raises more questions than answers. Given the significance of the fishery in Caribou Harbour, I feel that the Precautionary Principle that guides consideration of the environmental impact of an effluent pipe into the area of Caribou Harbour should preclude any potential threat to the rich aquatic life that spawns in these shallow waters. Caribou Harbour should be a protected estuarial zone and in no way should it be considered an appropriate location for an outlet for industrial effluent.

I would also like to ask the question: What significance is given to the cultural and historical aspect of Caribou Harbour? What consideration is there for the fact that generations of families living in the area consider Caribou Harbour a sanctuary for wildlife, a safe harbour for swimming, kayaking and sailing? It is the location of the Monroe's Island wildlife reserve, the Caribou Provincial Park and the Pictou Lodge, which has been in operation since 1927. The area has long been identified as a major area for outdoor recreation. Pictou County is defined by the generations of families who have earned their living from fishing lobster and other species in the immediate vicinity of Caribou Harbour. Within the communal rights of people living in the area to the peaceful enjoyment of nature and the established right of fishers to work in the area, the designation of Caribou Harbour as a location for an outlet of industrial waste seems to afford Northern Pulp a disproportionate right to the use of the waters of Caribou Harbour. This access threatens other citizens with the potential for an environmental disaster, the loss of livelihood and the loss of a unique habitat.

Fifty years ago, the proposal to put an effluent pipe from the Northern Pulp mill into the waters of Caribou Harbour where Maritime Packers was the largest employer in the county would certainly be met with disbelief and resistance. Is it surprising that disbelief and resistance is the response to such a proposal today? The reason remains the same: Caribou Harbour is too sensitive, too changeable, and too culturally important as a source of enjoyment and delight to be used as a sewer. With the fish stocks of Eastern Canada under threat and with the significance of Caribou Harbour to the tourist industry of the area this important marine environment should be afforded every protection from any source of pollution. I urge your Ministry not to approve Northern Pulp's proposal to install an effluent pipe into Caribou Harbour.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: NP Effluent treatment plan
Date: March 8, 2019 8:53:03 PM

Dear Minister,

I implore you to reject Northern Pulp's effluent treatment replacement proposal on the grounds that it will cause serious adverse effects to the environment.

My name is and I've lived in Pictou essentially my whole life excluding getting my education degree in NL. I hope to remain here.

I've never been a fan of the mill, especially when the wind is blowing a certain direction, but the economic benefits have always been impressed on me by others. Those no longer find merit with me. The environment has always lost against economic concerns. But I think the industry of the fishermen is equally as important as mill jobs. Tourism jobs as well. Also, I'd like to continue to enjoy my Caribou Island swims. That would end with the waste being dumped in the strait. Not to mention the environmental racism that has persisted for years here. Time's up for that.

Minister, it's 2019. The mill is well past it's intended lifespan. Let's innovate and re-train the mill workers. The treatment plan is dangerous and awful, this is your chance to be on the right side of history.

Sincerely.

Sent from my iPhone

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 9:10:38 PM

Project: replacement_effluent_treatment_facility_project Comments: In regards to the effluent pipe being proposed. I was really looking forward to visiting and swimming in the Northumberland Straight for the first time, its quite unfortunate that this would be even considered. There is such a lack of empathy for people living in this area and the effects on their health. Ignoring the high rates of cancer hurts any opportunity for developing any other sort of economy, limiting Nova Scotias opportunities in the future and making the inevitable clean up more costly which the taxpayer will end up paying. To summarize I am against this proposal. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 60 y: 17

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Replacement Effluent Treatment Facility Project
Date: March 8, 2019 9:31:08 PM
Attachments: NP Effluent Proposal EA .doc

Hon. Margaret Miller
Minister of Environment

Please find attached my submission to this environmental assessment.

Sincerely,

March 8, 2019

Hon. Margaret Miller
Minister of Environment
Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Submitted via email ea@novascotia.ca

Dear Minister Miller,

I am writing to you with respect to the **Northern Pulp Replacement Effluent Treatment Facility Proposal.**

I live along the Northumberland Strait coast on Route 6, known popularly as the Sunrise Trail extending from Amherst to Pictou. Since emigrating from Scotland and landing in Pictou in the late 1700s, the Ferguson family has called the North Shore home.

I am very concerned about the future of the Northumberland Strait and the communities along its shores. I am requesting you reject the project proposal from Northern Pulp on the following grounds:

1. Adverse impact on commercial fisheries

Northern Pulp's proposal lacks important data on the risk to the fisheries making its claims that harm is "not likely" not credible.

I have family, friends and neighbours who depend economically on the commercial fisheries in the Northumberland Strait, notably lobsters and shellfish.

The Malagash Oyster has a flavour second to none. It is indigenous to the Malagash Harbour, once gathered by native Mi'kmaq and later by European settlers. This is a well established and reproducing oyster region. Bay Enterprises, operated by my neighbours the Purdy family, have been producing oysters since 1867. Today they use traditional and modern methods to sustainably farm oysters and quahogs, enjoying an international reputation.

Each oyster growing region in Nova Scotia possesses its own unique marine environment, including variations in salinity, temperature, tidal shifts, and mineral/chemical composition. This in turn, leads to the oysters of each area expressing different characteristics in shell shape, and, more importantly, in taste. Anything that alters or destroys this rare environment is putting this oyster at risk. Malagash Oysters are unique. To protect these delicious indigenous oysters we must protect their habitat from contamination.

Caribou Harbour, the proposed receiving site for the effluent pipe, is a critically important fishing and spawning ground for lobster, rock crab, herring, ground fish, and many other species. Damage to that habitat will have an adverse impact on communities throughout the Strait region.

2. Adverse impacts on human health

The Northern Pulp treatment system proposal includes a plan to burn the waste sludge. The waste sludge contains toxins which would be released through the stacks of the mill's power boiler. The proposal is to "dewater the sludge prior to mixing it with bark and other wood waste for combustion in the mill's power boiler."

This is the same power boiler that is currently and repeatedly failing stack emissions tests. Problems with air quality from mill emissions have been documented for years. Adding sludge containing toxins to the combustion mix increases the health risks from the mill's air emissions.

I don't have to go to Pictou to experience the air emissions from Northern Pulp. These emissions, depending on the winds, find their way to the trails I like to hike, the beaches I enjoy and the homes of friends I like to visit.

Airborne emissions of the mill are a significant health concern to me and I can find no evidence that Northern Pulp's proposal mitigates those pollutants.

3. Adverse impacts on the environment

The proposed treatment system runs the risk of harming the growing tourism industry along the North Shore which promotes the area's warm, clean water and world class sandy beaches.

Visitors are attracted to the North Shore by the many opportunities to enjoy the natural world, to consume high quality local food and beverage products, and experience small town life. Many of the thriving new businesses market these experiences.

Northern Pulp is already threatening the eco-tourism experience offered by these North Shore businesses. According to Deputy Minister of Environment, Frances Martin, your Department has taken 12 enforcement actions against Northern Pulp since 2012.[1]

With such a poor track record, how are we to have confidence in the claims from Northern Pulp that there will be no residual damage, by accident or design?

Moreover, monetary compensation is not meaningful mitigation for the destruction of natural ecosystems and their inhabitants.

In conclusion, with so much at risk, I urge you to honour the precautionary principle and reject this effluent treatment facility proposal.

Sincerely,

@gmail.com

[1] Hansard, Nova Scotia Public Accounts Committee, February 14, 2018, Page 10. Accessed at https://nslegislature.ca/sites/default/files/pdfs/committees/pa/pa_20180214.pdf

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 9:47:06 PM

Project: replacement_effluent_treatment_facility_project Comments: My submission is 8 pages and contained via this sharable link https://docs.google.com/document/d/1_8Y75LF30qtK8t9r_6AXynb4ZPT-SND-V5CQ9YQIq9s/edit Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 69 y: 20

New Glasgow Nova Scotia

I would like to first present some background before my submission. I am a proud of the late , from the 1930s to the 1950s ,was a Master Mechanic and efficiency genius in the employment of Maritime Steel and Foundries Limited , P&H heavy equipment of Milwaukie, Wisconsin, USA and the United States Department of War during the latter part of World War 2 . His innovations included the design of the mechanics of the Canso Strait Canal Locks, the design of Structural Lattice for the Canso Causeway Swing Bridge. , and I have generally inherited our quest to how things work and what are the most efficient practices in processes.

In the age of Internet research the abilities to find scholarly articles on subjects are indeed vast and instant on ones desktop . Choosing between truthful content or false leading information, to an ultimate political agenda, is not difficult. , was a highly respected journalist for and his teaching to us was to critically think and examine with an open mind. Everyone has Bias however there are sources that are honest and accurate. Tone and language used to communicate their given thesis or pronouncements is always the great indicator .

Before the Proposal for the Effluent Treatment facility for the Abercrombie Mill the Antigonish Town and County Library in their quest to have the ultimate in energy efficient computing.[1] A relatively unknown technology company named was what I found, recommended and sold to the Library. The task to find the solution was certainly not a simple one, considering the vast options in computing. I found ,via the Internet, the solution was a preferred computing option for the United Nations [2] Boeing and Nasa among many large and small private or public groups across the world.

With my Discovery , , I am happy to say in a recent visit to the Antigonish Town and County Library I found the system running as good as the day it was commissioned in 2011. This Install is the only one that I know in the world where all the computing stations of a public library work off PV Solar panels or batteries charged via PV solar panels. Thirty (30) sharing the computing capacity of Two CPU Servers saving 95 percent of the electrical power normally used in multiple seat computing setting.

My references for judgement of BAT or Best Available Technology have always been from well sourced information from Business and Governmental bodies. Procurement practices described in the forms of Press Releases,Trade Journals, Case Studies, White Papers and Scholarly articles are key to knowledge of technological and environmental subjects.

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[1] "Case Study: Antigonish Town & County Library - Efficiency Nova Scotia." https://www.efficiencyns.ca/smart-energy-business-idea/case-study-antigonish-town-county-library/. Accessed 5 Mar. 2019.

[2] "NComputing and UN to Bring 500000 Workstations to ... - Litmos." 27 May. 2009, https://www.litmos.com/blog/industry-news/ncomputing-and-un-to-bring-500000-workstations-to-developing-countries. Accessed 5 Mar. 2019.

Public or Private sector procurement behavior generally occurs for salient well researched judgements for purchasing. Published documents with a price tag have much greater evidence value then that of Free opinion on the Internet.

On my extensive research of the proponents proposal. Veolia Anox Kaldnes BAS MBBR - Moving Bed Biofilm Reactor system

In my researched judgement the choice of the Veolia Anox Kaldnes BAS Moving Bed Biofilm Reactor system by the proponents ,Dillion Consultants and Northern Pulp, is indeed the Best Available Technology or BAT for treating Northern Bleached Softwood Kraft Pulp Effluent. The Anox Kaldnes BAS MBBR system has over 700 reference installations across public and private effluent treatment facilities. Over 700 multi-million dollar installations in the timespan of 30 years is an incredible amount of sales growth especially in the realm of Public Sector Procurement with municipal waste treatment facilities. If indeed Anox Kaldnes BAS MBBR did not work, as has been promoted, it would indeed not had grown to hundreds of installations approaching 1000 installations in a relative short time of 30 years. Simple Logic and a bit of knowledge of the nature of public and private procurement patterns tells me that sales of MBBR Systems are in the Multi Millions or even Billions of dollars since 1989.

As great footnotes I have seen online where Veolia Anox Kaldnes BAS is the sewage treatment system for Pictou Landing First Nations.[3] A First Nation that I can confirm via MERC tender documents as using the Veolia Anox Kaldnes BAS Moving Bed Biofilm Reactor system is the God's Lake First Nation in the province of Manitoba[4]
Also Notable is the Town of Ladysmith British Columbia installing a Veolia Anox Kaldnes BAS Moving Bed Biofilm Reactor system in 2018 with Federal infrastructure monies. The Following is part of the notated # 4 article on that system in an ecologically contained seawater environment in which Shell Fishing is an industry of the Area. "The harbour is of great importance to us and it's a shellfish harvesting area," said director of infrastructure services, Geoff Goodall. "It's always been one of our top priorities to ensure that whatever we are doing provided the best effluent quality possible."[5]

According to the Proponents EA documents the Pulp and Paper Industry has 40 MBBR systems installed to date with Swedish pulp and paper mills being 25 percent of the purchasers. In my research of other energy efficiency and ecological positive innovations, I have found Sweden to be one of the most progressive for developing or adopting world leading technologies in the Environment and Energy Efficiency arenas. Sweden's reputation is world renowned in environmentalism .

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[3] "First Nations wastewater treatment systems in Canada: Challenges ...." 12 Apr. 2018, https://www.tandfonline.com/doi/full/10.1080/23311843.2018.1458526. Accessed 5 Mar. 2019.

[4] **"GOD'S LAKE FIRST NATION - Sewage Treatment Plant and ... - MERX." 23 Jan. 2013, http://www.merx.com/English/SUPPLIER_Menu.Asp?WCE=Show&TAB=1&PORTAL=MERX&State=7&id=260643&print=Y&src=osr&ForceLID=&HID=&hcode=jN2ttSK03W%2BMu2oHX3mq5Q%3D%3D. Accessed 7 Mar. 2019.**

[5] "PHOTOS: Ladysmith's wastewater treatment plant honoured for ...." 13 Apr. 2018, https://www.ladysmithchronicle.com/news/photos-ladysmiths-wastewater-treatment-plan-honoured-for-engineering-excellence/. Accessed 5 Mar. 2019.

The Business and Governmental culture in Sweden seems to be forward thinking risk taking with great amounts of research before execution of new technologies. A prime example recent interest of mine, in which Sweden is a leading adopter, is that of R744 or Co2 Transcritical Refrigeration systems for Ice Recreational Facilities. Sweden and Quebec are the largest install territories for R744 in Ice Arenas in the World. Over the last four years I have personally compiled one of the world's most extensive R744 spreadsheets of refrigeration in Ice Facilities thanks in part to global R744 refrigeration experts in Stockholm, Sweden.[6] [7] The Quest that lead to the CO2 ice rink discovery was a Google Search for Energy efficiency in Ice Rinks in which I found the Natural Resources Canada Comparative Study of Ice Rink Refrigeration. [8]

The Original MBBR system was piloted in Norway in 1989 for a municipal effluent treatment system. The first pulp mill installation of the Anox Kaldnes MBBR was in Norway with a 1700 m3 system for Sande Paper in 1993. The Swedish Pulp and Paper Industry was soon to follow with a Pulp Mill Pilot project for Sweden was in 1994 for the Stora Papyrus Grycksbo Mill. Capacity of that system was 560 m3 and the results were detailed in the 49th Purdue University Industrial Waste Conference in 1994[9]. Purdue Study

Of the 40 MBBR Pulp Effluent treatment systems I have found 34 are located in the European Union and these MBBS Treatment systems seem to function to exacting standards of the European Union in Climatic Zones ranging from Spain to Scandinavia. A Recent discovery, I made of a new MBBR installation in Spain, found that the European Union had partially funded the system as a Best Available Technology option. Northern Pulp's proposal of 6000 m3 of MBBR to me is very sound in light of the European Union funding of MBBR in their member countries.[10] I also base my judgement on the fact that the Proponents proposed capacity of MBBR is indeed not the largest in existence in the Pulp Industry, Papelera Sniace in Spain with a reactor volume of 10690 m3 is. Papelera Sniace's MBBR was installed in 2010 and one would assume it has been highly successful considering two more MBBR s have been installed for the Spanish Pulp and Paper industry. My compiled list of MBBRs in pulp mill operations Note the Swedish Pulp industry has installed MBBR systems for close to twenty years MBBR Spreadsheet Created

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[6] "(PDF) Carbon dioxide in ice rink refrigeration - ResearchGate." https://www.researchgate.net/publication/287392551_Carbon_dioxide_in_ice_rink_refrigeration. Accessed 5 Mar. 2019.

[7] "EKA responds to Winter Olympics HFC ice-rink use - R744.com." http://www.r744.com/articles/8131/eka_responds_to_winter_olympics_hfc_ice_rink_use. Accessed 6 Mar. 2019.

[8] "Comparative Study of Refrigeration Systems for Ice Rinks." https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/comparative-study-arenas_EN.pdf. Accessed 8 Mar. 2019.

[9] "Proceedings of the 49th Industrial Waste Conference Purdue ...." 29 Dec. 1994, https://books.google.com/books/about/Proceedings_of_the_49th_Industrial_Waste.html?id=efuyjycMAZwC.

[10] "Veolia chosen for the extension of the wastewater treatment plant at ...." https://www.veoliawatertechnologies.com/en/press-releases/veolia-chosen-extension-wastewater-treatment-plant-munksjo-s-tolosa-mill-spain. Accessed 5 Mar. 2019.

Elemental Chlorine Free Vs Total Chlorine Free Bleaching

In Regards to the former owners of the Abercrombie Mill and the Switch to Elemental Chlorine Free Bleaching. Elemental Chlorine Free Bleaching with Chlorine Dioxide has turned out to be the winner of the ECF vs Total Chlorine Free debate . My research has found that since the year 2000 Total Chlorine Free Pulp Mills have been either A) gone out of Business like the Louisiana Pacific Mill in Samoa, California[11] B). TCF Mills been converted to make limited tonnage runs on a separate TCF lines parallel to a new ECF line like the Mercer Mills in Germany or C. Total abandonment of TCF to be replaced by ECF Bleaching like was the case with the Metsä Fibre Rauma mill TCF Mill in Finland. The Metsa Fibre Rauma Mill is a very notable TCF installation as it was the First New construction dedicated TCF mill in the world. Matsa Fibre Rauma was commissioned in 1996 and that Mill did not run the normal course of an investment return of decades ,in my limited observation, as the same mill was turned into a ECF mill in 2007. [12]
No new TCF Mills have been constructed in the Northern Hemisphere that I am aware of in the new millennium or a full 18 years and the reason seems to be clear. In a 2002 press release by the British Columbia Ministry of Water, Land and Air Protection ,the Honorable MP for Vancouver Quadra,Joyce Murray overturned a previous governments impending ZERO AOX law for Pulp mills in British Columbia. A scientific panel had found no appreciable differences in Effluent qualities from TCF VS EDF Pulp Mills[13] . There are three Pulp Mills in Europe that the proponents, Northern Pulp and Dillion Consultants, are patterning their effluent treatment plans from according to their submission. Here is an example of the European Market conditions as of 2017 from one of them. [14] Quote " **Although strong positions for TCF still remain in the German speaking region of Europe, some 95% of our European customers now use ECF pulps and this is basically us adapting to current market conditions. " Marcus Hellberg , Head of Business Development and Marketing , Sodra Cell**

Effluent Treatment systems for NSBK Pulp Northern Pulp is emulating with this Project

The Mercer International Stendal ECF / TCF Mill in Arneburg, Germany[15]
The Södra Cell Värö ECF/ TCF mill in Väröbacka, Sweden [16]
THe Södra cell Mörrum Paper and Dissolving Pulp Mill, Sweden

The addition of oxygen delignification at Abercrombie Point Mill is a basic element that all TCF / Hydrogen Peroxide mills require. Oxygen Delignification, from my investigations, has been a replacement Delignification process for TCF Bleaching which was once an Ozone Delignification process. The addition of Oxygen Delignification to the EA , in my opinion,is

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[11] "Site Profile - Samoa Pulp Mill - EPA OSC Response." https://response.epa.gov/site/site_profile.aspx?site_id=8891. Accessed 5 Mar. 2019.
[12] "Metsä Fibre's Rauma pulp mill: ECF bleached softwood pulp production." https://www.metsafibre.com/en/about-us/Pages/Rauma-mill.aspx. Accessed 5 Mar. 2019.
[13] "NEW AOX STANDARD WILL PROTECT ENVIRONMENT, JOBS." 5 Jul. 2002, https://archive.news.gov.bc.ca/releases/archive/2001-2005/2002wlap0127-000522.htm. Accessed 8 Mar. 2019.
[14] "Investments mean more ECF pulp from Södra - Tissue World Magazine." http://www.tissueworldmagazine.com/latest-headlines/investments-mean-more-ecf-pulp-from-sodra/. Accessed 5 Mar. 2019.
[15] "Kraftzellstoff - Mercer Stendal." https://www.zellstoff-stendal.de/de/produkte-ressourcen/produkte/kraftzellstoff.html. Accessed 5 Mar. 2019.
[16] "Investments mean more ECF pulp from Södra - Tissue World Magazine." http://www.tissueworldmagazine.com/latest-headlines/investments-mean-more-ecf-pulp-from-sodra/. Accessed 5 Mar. 2019.

a very forward thinking choice not only from a business potential standpoint but also from cost of production and ecological standpoints. On face value Oxygen Delignification added to the Bleaching process will indeed allow fewer chemicals to be used to produce quality Kraft Pulp via elemental chlorine free bleaching. If Global Market conditions have Total Chlorine Free Pulp become a profitable commodity then Northern Pulp may have than option. The Actions and Business course of Scandinavian Pulp Producers Metsa and Sodra however point to **Total Chlorine Free Pulp Bleaching as a Sunset industry** with decreasing Kraft Pulp Market share restricted 5 percent of the Global Market. [17]

Cooling Tower refrigeration - Natural Refrigerants VS HFC

In my recently acquired knowledge of Natural Refrigerants in Ice Rinks I found troubling information on HFC refrigerants recently. Trifluoroacetic Acid has presented some elevated Aquatic Toxicity in Beijing China according to studies[18]. HFC refrigerants are easy to avoid by choosing a Natural Refrigerants which the proponents have indeed done. I inquired to the Proponent the Refrigerant to be used in the Water Cooling System for the Effluent Discharge plant. Cooling will be done with the Natural Refrigerant R718 AKA H20 or Water.
HFC refrigerants also present the problem of high Greenhouse Gas Potentials of 1450 molecules of CO2 per molecule of HFC Refrigerants being typical[19]. NH4 Aka Ammonia has a GHG potential of Zero and CO2 has a GHG potential of ONE. [20]
I have fullest confidence in Northern Pulps Effluent Treatment proposal will lessen impacts on the the Environment and also human health effects by just these few forward thinking choices I have discovered via the EA . The bypassing of HFC refrigerants for the water cooling to a Natural Refrigerant is very forward thinking on Northern Pulp's Part.

Effluent Temperatures for Mixing zone offshore in Northumberland Strait
Concerns expressed by some stakeholders about effluent temperatures coming out of the Diffusers are probably very moot considering the pathway the pipe will take including 4 kms underwater in the last stage. Water Cooling of the Cooling Towers seems very plausible to have temperatures return to background levels within the 100 meter mixing zone. [21] MY personal discoveries and knowledge of Heat Recovery, in regards to Ice Rink systems, I have seen the transfer of recovery heat from an Ice complex is limited to 1000 metres away via Heavily Installed Pipe that is typically 12 inches in total diameter.

The proponents 36 inch Diameter **Un-insulated** HDPC pipe, running through 4 kilometers of seawater to the final diffuser outlets is very likely to lose a great deal of the original Effluent Plant Heat. Coupling the Aquatic Marine distance that the pipe will travel with the transfer

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[17] "Best Available Techniques (BAT) - The European IPPC Bureau." 30 Sep. 2014, http://eippcb.jrc.ec.europa.eu/reference/BREF/PP_revised_BREF_2015.pdf. Accessed 6 Mar. 2019.
[18] "Airborne trifluoroacetic acid and its fraction from the degradation of ...." 17 Mar. 2014, https://www.ncbi.nlm.nih.gov/pubmed/24628386. Accessed 5 Mar. 2019.
[19] "Hydrofluorocarbons (HFC) | Climate & Clean Air Coalition." http://www.ccacoalition.org/fr/slcps/hydrofluorocarbons-hfc. Accessed 5 Mar. 2019.
[20] "Global warming potentials - Canada.ca." 18 Feb. 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/quantification-guidance/global-warming-potentials.html. Accessed 5 Mar. 2019.
[21] "Water as a refrigerant – sustainable and clean | efficient energy." https://efficient-energy.de/en/the-most-efficient-chiller/water-as-a-refrigerant/. Accessed 6 Mar. 2019.

over approximately 800 metres across the Northern Pulp property to the Harvey Veniot Causeway, the elevated transfer above the Middle River spillway gates on the Harvey Veniot Causeway (with airborne exposure of the 36 inch pipe) being 30 metres in length, the 1.561 metres transit of the 36 inch Effluent pipe from the Pictou West River control gates to the Pictou Town end of the Harvey Veniot Causeway would probably have a good amount of thermal loss of the Treated Effluent inside the pipe. The Distance from the Pictou Town end of the Causeway to the Rotary is about 1300 metres . From the Pictou Rotary to Caribou Harbour is over 7300 metres in Length. My casual researched observations of heat loss from District Heating Systems, with highly insulated pipe that are not made of HDPC, leads me to believe that claims by the proponents are made with high levels of validity.

The proponents have exhibited a historical pattern of using BAT or Best in Technology that in at least one case have exceeded my expectations.

2014-2015 Precipitator Replacement - An example of the Proponents wise forward choices.

One only has to examine the results of the 2014/ 2015 replacement of the Abercrombie Mills Precipitator where prior to the 2014 precipitator failure the releases of PM 2.5 were 1,291 tonnes of PM 2.5 annually were recorded in 2014 via the Federal Department of Environment and Climate Change . The result according to the Canadian Federal Department of Environment and Climate is the installation of the new precipitator has resulted in a reduction of PM2.5 to 1.6 Tonnes in 2017. [22]
Northern Pulp 2017 report
A decline in PM 2.5, on an annual basis from 2014 of 1,291 tonnes in that year to 1.6 Tonnes of PM 2.5 admitted in all of 2017 is quite an improvement.
For the 2017 emissions of 0.125 percent of the 2014 total shows the proponent seems to have the best consulting and action plans to deal with environmental and public health challenges the operation of a NBSK Kraft Pulp Mill presents . Bellow, one page 7 is the recent history Table detailing the PM 2.5 emissions from the Abercrombie Mill .

[22] "Pollution and waste management - Canada.ca." 1 Oct. 2018, https://www.canada.ca/en/services/environment/pollution-waste-management.html. Accessed 6 Mar. 2019

PM2.5 (NA - M10)

Year	On-Site Releases				Disposal(1)		Off-Site Recycling	Units
	Air	Water	Land	Total	On-Site	Off-Site(2)		
2017	1.6	-	-	1.6	-	-	-	tonnes
2016	110	-	-	110	-	-	-	tonnes
2015	823	-	-	823	-	-	-	tonnes
2014	1,291	-	-	1,291	-	-	-	tonnes
2013	734	-	-	734	-	-	-	tonnes

In Conclusion

With simple research of the elements of Northern Pulps Effluent Treatment Facility ETF I feel highly confident that the proposal will not harm the Marine ecology of the Northumberland Strait in any Tangible way. The Six Rounds of Environmental Effects Monitoring for all Pulp and Paper mills in Canada ,since 1992, have shown the trend of aquatic ecologies improving in receiving bodies of water near Pulp and Paper Mills.
A similar Paper Excellence Mill in Howe Sound British Columbia is over 100 years old and has had continuous Upgrades in Process including the addition of Oxygen Delignification into their kraft pulp production, Changing from Chlorine Gas Bleaching to Chlorine Dioxide Bleaching AKA Elemental Chlorine Free Bleaching among many upgrades the entire industry has taken. Where once Howe Sound was closed for commercial and sports fishing, partially because of effluent contents of the Howe Sound and Woodfibre mills and mining operations, today it is no longer the case. Quoted from one of Canada's newspapers of Record The Globe and Mail " The first glimmer of hope came in 1988 when Howe Sound Pulp and Paper began a $1.3-billion renewal process at Port Mellon. The project would turn what was openly recognized as an environmental disaster into one of the most modern, cleanest pulp mills in the World " Mark Hume , Globe and Mail OCTOBER 21, 2013

“ Thou Paper Excellence is not the complete history of Howe Sound it is a much better history than the Mill prior to Paper Excellence.[23]

No human activity is without impacts however the Proponents proposed ETF will be a vast improvement from Boat Harbour that will continue the huge progress made at the Abercrombie Mill over the last couple of decades. With the introduction of ECF Bleaching in 1997 the environmental impacts have clearly improved , as represented by the results of multiple year EEM studies. I am highly confident science and the history of Northern Pulps environmental investments will continue with the approval of this proposal. I first personally took notice when the Mill was converted from the use of Bunker C Oil to Natural Gas for proposes inside the plant.

Thank You Very Much

23 "Return of industry threatens renewal of Howe Sound's marine ecosystem." 21 Oct. 2013, https://www.theglobeandmail.com/news/british-columbia/return-of-industry-threatens-renewal-of-howe-sounds-marine-ecosystem/article14952818/. Accessed 8 Mar. 2019.

[23] "Return of industry threatens renewal of Howe Sound's marine ecosystem." 21 Oct. 2013, https://www.theglobeandmail.com/news/british-columbia/return-of-industry-threatens-renewal-of-howe-sounds-marine-ecosystem/article14952818/. Accessed 8 Mar. 2019.

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 10:09:04 PM

Project: replacement_effluent_treatment_facility_project Comments: I am writing in connection with the Environmental Assessment Registration Document hereafter â?oEAâ? submitted by Northern Pulp of the Replacement Effluent Treatment Facility. I have read carefully the document and its supporting documentation and am gravely concerned about many of the potential devastating impacts the proposal may have on the environment and, in particular, the Northumberland Strait ecosystem. As an initial point, I feel that the public consultation period of 30 days for a project of such complexity is woefully inadequate. The EA is thousands of pages in length, with multiple supporting documents, and covers a broad range of topics. For meaningful engagement to take place, considerable additional time should have been allowed. By way of background, I am a geoscientist, with a PhD in Geology from the University of New Brunswick, working primarily in the field of marine geoscience. My family have a cottage on Caribou Island and I have enjoyed many days of recreational boating and fishing in Caribou Harbour. As such, I am very familiar with the coastline, seabed and tidal conditions of the area of the proposed effluent outfall pipe. While I have reservations over many aspects of the project for example, the transport of the effluent through a pipeline that crosses above the water source for the Town of Pictou, I will restrict my comments here to those aspects of the EA that I have some familiarity with and specific scientific based concerns about. Specifically, these will focus on the proposal to pipe effluent to a discharge point close to Caribou Wharf. The environmental effects are dealt with in Chapter 8 of the EA with the harbour physical environment described in Section 8.11. The descriptions provided of the area around Caribou Harbour are very general relying on regional scale syntheses and existing reports that focus on existing data which in many cases are quite old see for metal concentrations in sediments on Table 8.11-1 from 1990. Any monitoring of the marine environment and assessment of the impacts particularly potential ongoing impacts should have a robust baseline dataset. The EA clearly does not have purposely acquired primary data and relies on inapplicable, insufficient or inappropriate datasets and studies. Physical Hazards Sedimentation â?" The Northumberland Strait coast of Nova Scotia is a dynamic marine coastal environment with longshore drift transporting and depositing sediments typically from West to East. This is particularly evident at the mouth of Caribou Harbour where a large sand bank occupies much of the western side of the mouth. This is clearly visible through satellite imagery for the area and is the cause for the requirement to dredge the navigation channel for the PEI ferry that departs from Caribou Wharf. The development of a significant sand bank on the lee side of Caribou Point is entirely expected where longshore drift is a dominant process and environments such as this are highly mobile sedimentary environments. This represents a burial danger for the diffusers which would impact the effectiveness of the assumed dilution of effluent in the water column. If the diffusers cease to work as designed, concentrations of effluent could exceed the CCME guidelines for Marine Aquati c Life causing fish kills. Furthermore, the process of monitoring the condition of the diffusers is greatly diminished if it becomes buried. The prospect of having to excavate sediments to ensure the diffusers function as designed risks damage and further degradation of the marine environment. This was not addressed in the EA. On a related point, the proposed effluent pipeline routing is along the western edge of the dredged navigation channel. This channel is dredged on a relatively frequent basis. The dredging operation typically takes the form of a large excavator on a barge â?" a rather imprecise procedure. The possibility of damage to the pipeline by dredging operations would seem quite high. Ice Keel - The Northumberland Strait is well known for

significant ice development and accumulation in the winter season. In a comprehensive study of ice keel data from the Northumberland Strait, Obert and Brown 2011 report average ice keel depths of 2.94 m with a maximum of 8.49 from the PEI bridge. The EA cites a NS Museum of Natural History report 1996 that states that â?o[c]oastal lagoons in the Northumberland Strait area are protected from ice scourâ?. The outfall for the effluent pipeline is located beyond the mouth of Caribou Harbour and therefore this statement would not seem to apply. Even the ice keels in the Caribou Harbour mouth region were significantly smaller than those noted above, it seems plausible that damage to the pipe could happen by ice keel scouring in the winter months. Physical Oceanography The EA is deficient in describing the physical oceanography of the local environment. Assessments of salinity, temperature and tidal currents are based on measurements and models for the entire Northumberland Strait and southern Gulf of St Lawrence. For a project whose potential effects may have such a profound influence on the marine environment of such an enclosed bay and whose effects, in large part, are determined by physical oceanographic processes, there is a striking lack of detail and analysis. The understanding of tidal currents for the area is entirely insufficient. The EA cites modelling of tidal currents from DFO in Figure 8.11-3 which covers the entire Northumberland Strait without providing any additional context or information. The semi-enclosed nature of Caribou Harbour presents a localised complexity with understanding the tidal pattern in the region. This was not addressed in the EA. The degree to which tidal mixing occurs is not addressed in any detail. The Northumberland Strait has some of the lowest tidal mixing in the Gulf of St. Lawrence Lu et al., 2001. Coupled with the localised coastal geography, it is quite possible that the current/flow regime in the area of the proposed outfall is not conducive towards effectively diluting the effluent discharge. This brings me to the numerical modelling supplied in the EA Appendix E that purports to show that the effluent becomes rapidly diluted within the water column. The stated model parameters and results are quite simply not scientifically valid and cannot, in my view, be used to support any decision making by the regulator. If decisions are to be science-based then it is important that the science being presented is credible and broadly acceptable to the scientific community. Below is a non-exhaustive list of major problems with the proposed modelling results: â?¢ The effluent concentrations are not described or defined. Different components e.g. dissolved solids, metals, organic material etc. will behave in a different manner in the water column and this was not accounted for. â?¢ The modelling results indicate that there are few isolated traces of relatively high diluted effluent after a period of 30 days see pg 350 of the EA and figures 2.5 to 2.13 of Appendix E, but effluent discharge will be continuous. If a continuous flow is assumed, it is physically impossible for there to be an isolated concentration of the effluent away from the discharge location. â?¢ The modelled ambient flow directions shown in Figure 3.1 of Appendix E show a dominant northwest direction flow. This is counter to local knowledge and the stated understanding cited in the EA itself: â?oThe current in the Northumberland Strait generally ï¬,ows in a southeasterly direction between New Brunswick and Prince Edward Island PEI Nova Scotia Museum of Natural History 1996.â? see pg 338 of the EA. â?¢ The shape of the dispersal plume from the diffuser as shown in figures 3.4 and 3.5 of Appendix E is utterly unrealistic. This suggests a numerical weakness in the model that undermines any confidence in its output. The tidal modelling and contaminant plume dispersal model is scientifically not credible and should at a minimum be subjected to rigorous peer review. The Caribou-Munroe Island Provincial Park is located less than 2 km from the proposed outfall location and the proposed effluent pipe will be within 400 m of the Provincial Park. The website for this Park currently states â?oCaribou-Munroes Island Provincial Park invites you to experience northern Nova Scotiaâ?Ts unspoiled natural beauty. Conveniently located along the Sunrise Trail just a few kilometres from the Caribou-Wood Islands Ferry Terminal, the park features secluded,well-wooded sites that offer privacy in a natural

setting.â? https://parks.novascotia.ca/content/caribou-munroes-island-hiking-trails Is the current government planning on amending this description to include that the recreational activities are located immediately adjacent to an effluent outfall? Currently reviews for this park on Trip Advisor state that the beach is lovely, the wilderness is beautiful, however, it is stinky due to the Pulp Mill https://www.tripadvisor.ca/ShowUserReviews-g154977-d2306605-r140010740-Caribou_Munroes_Island_Provincial_Park-Pictou_Nova_Scotia.html. Furthermore, it seems that without a permit from the Minister of Lands and Forestry the proposed effluent outfall should not be allowed. The effluent is, by definition, a hazardous or industrial waste. Section 24 of the Provincial Parks Act R.S., c. 367, s. 1 states: â?oNo person shall transport garbage, refuse or domestic, hazardous or industrial waste through, over or in any provincial park or deposit such material in or on a provincial park, except as may be authorized by permit issued by the Minister.â? The proposed location of the effluent outfall seems at odds with the purpose defined in Section 2 of the Provincial Parks Act. A source of contamination is not compatible with â?oproviding resident travellers and out-of-Province visitors with opportunities to discover, experience and enjoy Nova Scotias distinctive outdoor recreational and heritage resourcesâ? Section 2.1.d of the Provincial Parks Act. The Caribou-Monroes Island Provincial Park was not included as a Valued Component VC in the EA document. Given the proximity of the park to the outfall location, it should be included as a VC and have a full environmental effects assessment. Caribou Wharf is the home port of many fishers who make a living on the waters of the Northumberland Strait. Their knowledge and years of experience fishing these waters is unrivalled. Their near unanimous opposition to the proposed pipeline is telling and, in my view, should be heeded. To conclude, there is simply too much at stake to grant the approval of the project based on the EA submitted by Northern Pulp. In my view, the EA does not contain sufficient data or analysis of the marine environment in and around the region of the effluent outfall pipe. The EA has not taken into account the physical dangers to the pipe infrastructure and the potential behaviour and effect the effluent outfall will have on the marine environment. Name: Email: @gmail.com Address:

Privacy-Statement: agree

x: 64 y: 27

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 10:14:18 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 10:31:27 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Forestry and Fishing are very important sectors and have and can continue to co-exsist side by side and mills plan will put them atop of pact in regards to the environment and meeting regulatory standards. Mill should be given the time to do put in their treatment plant as all Nova Scotians will benifit

Signed by:

@hotmail.com)

From:
To: Environment Assessment Web Account
Subject: Please reject NP's replacement effluent treatment facility proposal
Date: March 8, 2019 10:59:37 PM

Hello,

I am writing to ask you to please reject Northern Pulp's effluent treatment replacement proposal on the grounds that it will cause adverse effects that significantly outweigh any potential benefits of allowing it.

If the proposal is approved, it will allow an aging facility to limp on for a few more years while posing serious potential risks to the Pictou area. If the proposal is rejected, it is likely that the mill will close. , director of communications for Paper Excellence has been quoted as saying "No pipe equals no mill" [1]. I believe this is the ideal outcome. Here are a couple reasons why:

1. The Pictou Landing First Nation people don't want it [2] - and for good reason. The existing effluent pipes have leaked several times in the past [3]. It's time to listen to them. The shameful history of environmental racism in Boat Harbour makes our whole province look bad and moving the effluent dump of an old pulp mill across land and out into beautiful waters full of sea life doesn't make it any better. It's time to get rid of the mill and put an end to that whole miserable saga.

2. Tourism. The pulp mill is a huge blight on an otherwise picturesque tourism destination in our province. Why approve an effluent pipe that is at best an environmentally risky means of allowing an outdated operation to limp on a few years longer? The loss of 300 jobs [4] is not nothing, but those people all have the potential to do other things. Tourism is one industry poised to improve if the mill closes. Real estate is another. The waterfront properties in Pictou Harbour would be worth more and the town of Pictou waterfront would be so much more enjoyable if it wasn't for the eye(and nose)sore that is the pulp mill. Pollution from the mill stinks. It stinks up the entire area surrounding Pictou Harbour. I visit my family in Pictou regularly and can attest to how bad it smells. Other people without family in town don't like to visit because it's so often smelly there. Even if the airborne pollution from the Mill had no negative impact beyond stinking and looking bad, the stink especially harms tourism (and quality of life in the Pictou area). The same would be true of the effluent that would be coming out of the pipe into the strait if the proposal is approved. There are several beaches within 2 km of the proposed pipe outlet [5], including Caribou-Munroes Island Provincial Park [6] and the beaches surrounding the Caribou Island Lighthouse [7]. Those beaches are great for swimming and watching the many curious seals and diving seabirds from, but people will think twice about swimming so close to effluent and worry what poor sea creatures might wash up and scare their kids at the beach.

For the reasons described above as well as the many environmental concerns I'm sure others have voiced to you already, I implore you to please reject the proposal and play a role in putting the pulp mill to rest.

Sources:
1. Web article: https://www.nationalobserver.com/2018/07/25/analysis/uproar-nova-scotia-over-plan-dump-pulp-effluent-northumberland-strait
2. Victim impact statement: http://canadianaboriginallaw.com/wordpress1/wp-

content/uploads/2016/02/PLFN-Victim-Impact-Statement-2016-02-221.pdf and Web articles: https://nsadvocate.org/2018/12/09/weekend-video-boat-harbour-and-the-mill/ and https://aptnnews.ca/2018/07/16/its-a-dead-zone-says-pictou-landing-elder-about-pulp-mills-effect-on-harbour/

3. Web article: https://www.thechronicleherald.ca/news/regional/fishermen-first-nation-still-oppose-pipe-plan-252614/

4. Web article: https://www.thestar.com/halifax/2019/01/31/one-more-year-needed-for-boat-harbour-effluent-plan-northern-pulp-mill-says.html

5. See map on pg 162 of the Environmental Effects Assessment Report Registration Document Section 8, https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/

6. Website: https://parks.novascotia.ca/content/caribou-munroes-island

7. Website: http://lighthousefriends.com/light.asp?ID=1006

Thank you very much,

From:
To: Environment Assessment Web Account
Cc: @juniperlaw.ca
Subject: Review of Northern Pulp NS Environmental Assessment
Date: March 8, 2019 11:00:37 PM
Attachments: Fisheries Industry Submission on NPNS ED, Mar 8, 2019 FINAL copy.pdf
Appendix A, Dr. Andrea Battison, Animal Health Perspective with a Focus on Crustaceans.pdf
Appendix B, Dr. Battison, publications.pdf
Appendix C, FOIPOP excerpts.pdf

Good evening ,

In addition to the technical review submitted earlier today by Shared Value Solutions on behalf of the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, I am attaching and additional document including three appendices as part of our review of the NPEA.

Please note, we will will be forwarding you an addendum to this submission tomorrow.

Thank you in advance,

Linda Townsend
On behalf of Fishermen's Working Group for the NPEA

CrustiPath Box 682 Charlottetown, PE C1A 7L3
Tel: 902.330.6878 Fax: 902.367.6878 www.CrustiPath.com

Review of the Environmental Assessment Registration Document Regarding Northern Pulp Nova Scotia's Proposed Replacement Effluent Treatment Facility from an Animal Health Perspective with a Focus on Crustaceans

Prepared for:

Harvester Working Group
Attn: Melanie Giffin
Prince Edward Island Fishermen's Association
420 University Ave,
Charlottetown, PE C1A 7Z5
(902) 566-4050

Prepared By:

Dr. Andrea Battison
Principal Consultant
CrustiPath

February 25, 2019

DISCLAIMER

This document entitled 'Review of the Environmental Assessment Registration Document Regarding Northern Pulp Nova Scotia's Proposed Replacement Effluent Treatment Facility from an Animal Health Perspective' with a Focus on Crustaceans was prepared by CrustiPath for the Harvester Working Group (the Client). Any reliance on this document by any third party is strictly prohibited. The material in it reflects CrustiPath's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between CrustiPath and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, CrustiPath did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that CrustiPath shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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EXECUTIVE SUMMARY

CrustiPath was engaged by the Harvester Working Group to review the January 2109 Environmental Assessment (EA) on the Northern Pulp Nova Scotia replacement effluent facility. The focus was to be on the health of the fish, crustaceans and bivalves; specific to local commercially important species including an understanding of how contaminants in the effluent may negatively affect the reproduction and growth rate. After a preliminary review of available information and given the very short timeline available, it was decided to focus the review on the changes known or potentially possible to happen to crustaceans, particularly American lobsters

Although improvements in treatment of BKME have decreased acute toxicity (mortality) to fish, effluent from pulp and paper mills continues to release bioactive substances that affect fish metabolism and reproductive performance. The identity of the responsible compound(s) remains undetermined. The roles of hormones e.g., estrogens, androgens, anti-estrogens, anti-androgens, neuroactive substances and altered nutritional effects are possibilities. There are reports of moult inhibition in crustaceans exposed to estrogenic, androgenic, anti-estrogens and anti-androgens. Five studies on American lobster (*Homarus americanus*) exposed to BKME from Abercrombie Point between 1968 and 1973 suggested: larvae were relatively resistant to BKME and adult lobster more so; no significant change in larval numbers after opening of the mill; and, that lobster movement and feeding behaviour were unchanged at low levels of BKME. The latter could also be interpreted as an inability to detect and avoid potentially deleterious BKME. These studies were limited in scope, used BKME different from that anticipated to be produced by the NPNS, and did not include sublethal toxicity or generational testing. These limitations were noted in Appendix R of the EA, but not mentioned in Section 8.12.3.3. There are few data on the sublethal effects of exposure of crustaceans to the pulp mill effluents created today e.g., elemental or total chlorine free, secondary biological treatment, particularly in marine environments.

Section 9 of the EA (Human Health Evaluation) used model studies to identify cadmium, mercury, selenium, (and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)) as chemicals of potential concern (COPC) that might accumulate in tissue of fish exposed to effluent. While the intent was to examine the fish tissue from a food safety perspective, it could also be concluded that these chemicals also represent a health risk to species in the receiving waters. With respect to crustaceans, cadmium has been shown to negatively effect moulting and growth, reproduction, and cause variation in hemolymph glucose (sugar) levels, possibly via an 'endocrine disruption' effect. Anticipated levels of these COPCs in the effluent are not provided in the EA, precluding assessment of possibility toxicity to crustaceans.

The current Environmental Effects Monitoring (EEM) program uses the caged blue mussels (*Mytilus edulis*) as a representative invertebrate for testing purposes. Bivalves are different from crustaceans in many ways. It would be desirable to know if bivalves and crustaceans respond similarly to BKME for EEM purposes.

Development of a new reef structure creating habitat for lobsters and other fish as a result of the pipe infrastructure is mentioned. Whether or not this would encourage fish to stay near the outflow in an area of maximal effluent and whether this could have a negative, neutral or positive effect on fish health is not discussed.

Given the limited, and often dated, information available regarding the potential for adverse effects on the health, in particular growth (moulting) and reproduction, of marine species of commercial interest such as the American lobster and rock crab, upon exposure to the mill effluent to be produced by the proposed facility at NPSNS, further studies (acute, sublethal, and generational) are recommended.

SCOPE OF REVIEW

The overall pertinent sections of the environmental assessment (EA) were reviewed: Section 8.12 Marine and Fish Habitat, Section 9 Human Health Evaluation, Appendix G Proposed EEM Program, Appendix H Proposed Follow Up and Monitoring Program, Appendix R Scientific Literature BKME Effects on Lobster, and the 2016 EEM report and summary documents. Literature searches on: the historical effects of BKME on finfish, bivalves and crustaceans; known or proposed mechanisms of action of BKME; effects of BKME on finfish, bivalves and crustacean since the introduction of new effluent treatment measures; and known or suspected effects on crustaceans of the chemicals of potential concern (COPC) identified in Section 9 of the EA. There is heavy reliance on the review paper by Hewitt at al in 2006 regarding the chemistry and effects of BKME. The conclusions and recommendations are based primarily on the information provided in the EA and how it relates to published information on crustaceans rather than a global review of potential health effects to marine species exposed to BKME.

CONCEPTS OF HEALTH

Animal, or human, health can be loosely defined as an absence from disease. Disease can be defined as the impairment of normal function or structure of a living organism. A more specific definition of health is provided by the World Health Organization (WHO) and states the following "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (Grad, 2002). The presence of disease be assessed by looking at changes in physiological systems e.g., respiratory, reproductive, immune, integument (skin, shell, carapace), muscular, skeletal and nervous systems, and behaviour. Testing methods can include: physical examination; changes in weight; collection of blood (or hemolymph) samples to test e.g., immune function, organ function or toxin accumulation; pathology exams at the gross or microscopic (histology) level; gene expression; and, more recently metabolomics.

Pulp Mill Effluent Effects on Finfish Health

The review paper by Hewitt et al. (Hewitt, Parrott, & McMaster, 2006), summarises the path of research of two identified responses in finfish exposed to pulp mill effluent 1) induction of detoxification enzymes (suggesting exposure to a toxin) in fish tissues, and 2) reproductive effects e.g., "smaller gonad (ovary) and egg size, increased age to maturation, decreased levels of reproductive steroid hormones, and altered expression of secondary sex characteristics". The earlier focus on absorbable organic halides (AOX) switched to bioactive substances released from the wood during pulp digestion (in kraft mills, present in black liquor and chemical recovery condensates). Of note is the study of the **AhR** (aryl hydrocarbon receptor), cytochrome **cyt p450,** P-4501A1, and **EROD** (ethoxyresorufin O-deethylase) molecules which are involved in the detoxification process.

The authors note that despite the improved quality of effluent with decreases in compounds producing acute toxicity (mortality), organochlorine discharges and AOX levels, effects persist *"…, effluents from pulp and paper mills continue to release into Canadian aquatic receiving environments bioactive substances that affect fish metabolism and reproductive performance*" (Hewitt et al., 2006). The authors also note in their conclusions that "*The bioactive substances in pulping processes appear to be derived from original pulp digestion and/or from residual lignin removal during bleaching. The identities of the responsible compounds have remained elusive, thereby impairing any evaluation of the effectiveness of secondary treatment and other process changes in the industry*".

A review in 2010 (van den Heuvel, 2010) indicated that reproductive impairment noted in fish exposed to pulp and paper effluent, although decreasing, continues and the causative agent(s) remains to be definitively identified. Exposure to hormones (estrogenic, anti-estrogen, and androgens) derived from the wood itself, neuroendocrine compounds that interfere with hormone balance, or nutritional effects are possible mechanisms under consideration. The metabolic disruption response (decreased gonad size associated with increased liver size and greater body condition) "*remains a prevalent pattern in data generated as part of Canada's federally mandated Environmental Effects Monitoring Program*" (van den Heuvel, 2010).

A long term review of effluent at a mill in New Zealand concluded that subtle effects on fish reproductive physiology, while substantially decreased, continue to be observed even with extensive efforts to improve the quality of the effluent (van den Heuvel, Slade, & Landman, 2010). The example described was that of swim-up fry being substantially shorter and lighter than fry from the reference site. This was attributed to a chronic, eight- month, exposure of the maternal fish to the test effluent, suggesting a next-generation effect.

Interestingly, Davis et al. (Davis et al., 2013), used metabolomics (the study of a set of metabolites within a cell, tissue, or organism) to demonstrate short term response of fathead minnows to short term changes in effluent levels in Lake Superior during a temporary shut down of a paper and pulp mill in the region. The effect was most pronounced in male fish… "*Thus, we demonstrate the potential utility of field-based metabolomics for performing biologically based exposure monitoring and evaluating remediation efforts occurring throughout the Great Lakes and other ecosystems*". This represents another potential way to assess fish health.

Pulp Mill Effluent Effects on Crustacean Health

The effects of BKME on crustacean physiology are not as well studied as in fish. Crustaceans have a complex endocrine (hormone) system that is responsible for regulating reproduction, growth and moulting, and metabolism as in vertebrate species. The effects of pollutants (pesticides, herbicides, effluents, heavy metals) on the physiology of these animals are not as well documented as in fish, birds and mammals. Review papers by Fingerman (Fingerman, Jackson, & Nagabhushanam, 1998) and Rodríguez (Rodríguez, Medesani, & Fingerman, 2007) concisely summarise some of these endocrine (hormone) disruptive effects and the known or suspected mechanisms in crustaceans.

Disturbance or disruption of the normal processes of reproduction and moulting were the most common effects studied. While many of these were ascribed to pesticides, xenoestrogens (synthetic or naturally occurring compounds that mimic estrogen), testosterone (an androgen), juvenoids (synthetic compounds designed to mimic the structure or effect of insect juvenile hormone; often used as insecticides) the impacts of the metals cadmium, and to a lesser extent, copper, mercury and zinc are also described (Rodríguez et al., 2007). In their concluding remarks, the authors stated "*crustacean molting can be inhibited by any one of several organic compounds (including androgenic, estrogenic, as well as antiandrogens and antiestrogens) as well by some heavy metals."* The need for further study to determine mechanisms, with an emphasis for multigenerational studies to assess long-term processes such as reproduction and growth was emphasised (Rodríguez et al., 2007).

Cadmium has been associated with moult inhibition in the crab, *Chasmagnathus granulatus* and *Daphnia magna,* and inhibition of ovarian growth in fiddler crabs (*U. pugalotor*) exposed to cadmium for two weeks (Rodríguez et al., 2007). Cadmium is suspected to inhibit moulting by inhibiting the secretion of the moulting hormone ecdysone (Rodríguez et al., 2007). Lethal concentrations (LC-50 at 96 hours) of cadmium, copper, and mercury for stage I *Homarus americanus* larvae were determined to be 78 µg/L, 48 µg/L, and 20 µg/L, respectively (Johnson & Gentile, 1979). Heavy metals can inhibit food intake by small crustaceans (Rodríguez et al., 2007). Changes (transient increases (hyperglycemia) in acute exposures, decreases in chronic exposures) in hemolymph (blood) glucose levels in response to metal exposure have been documented in crayfish and in the shrimp *Palaemon elegans* exposed to mercury, cadmium, and copper crabs (Rodríguez et al., 2007). Chronic (two week) exposure to cadmium in the crab, *Chasmagnathus granulatus* appeared to interfere with crustacean hyperglycemic hormone (CHH) – the crustacean 'stress hormone' and lowered hemolymph glucose levels.

Information on the specific effect of BKME on American lobsters is extremely scarce with all five papers found during a literature search being written before 1973 (McLeese, 1970, 1973; Scarratt, 1969; Sprague & McLeese, 1968a; Sprague JB, 1968b).

Comparisons of surface plankton tows conducted in 1966, before opening of the pulp mill at Abercrombie Point, and in 1968 after the mill had been in operation determined that the variation in total catch of 746 larvae in 1968 from 1814 larvae in 1966 was within the range of normal catch fluctuations in the Strait (Scarratt, 1969). The study concluded that "*the mill effluent was not having any immediate, direct effect on the abundance and distribution of lobster larvae in the Pictou area*." No

measurements (weight, length), gross or microscopic observations for abnormalities or adverse effects are reported.

One day old American lobster larvae and adult lobsters were exposed to a range of diluted BKME and acute toxicity evaluated (Sprague JB, 1968a). The BKME represented a mixture of material from the bleachery 'chlorination effluent', (40%), bleachery 'caustic extraction effluent' (30%) and effluent from the kraft screen room sewer (30%) and neutralised to pH 7. The authors concluded that larvae were reasonably resistant to BKME concentrations below 10% and that adults were "*even more resistant*". When comparing the responses of salmon parr (*Salmo salar* L.) and *Homarus americanus* larvae to biologically oxidised BKME, lobster larvae were described as more sensitive than parr at the one week time point, suggesting different responses by different animals to the same conditions (Sprague & McLeese, 1968b). There was no histologic examination of tissues to assess for injury, long term, sublethal, or generational effects evaluated for survivors in either study.

Adult American lobsters to exposed to 10% - 20% BKME (spillway material) in a test tank passed through the BKME-seawater boundary 98 out of 103 approaches (McLeese, 1970). Of the five initial reversals, lobsters passed through the boundary on subsequent approaches. The conclusion was that 10% - 20% BKME did not affect movement of adult lobster. A later study examined if BKME would alter the feeding response of American lobster in the presence of BKME (McLeese, 1973). It was concluded that "*exposure to low concentrations of BKME for short periods does not reduce the response of lobsters to freeze dried cod solution or, if so, to a minor extent only*". The investigator also indicated "*the possibility that long term exposure might affect the response, or that other behavior stimulated by chemoreceptors may be affected, was not tested".* An additional interpretation of these results is that failure to avoid the effluent might represent a risk to the health of the lobster if there is a component in the effluent that could generate an adverse effect in the lobster.

While these studies did investigate the effect of BKME on American lobster specifically, it is important to note that the effluent composition has changed over the past 50 years (Hewitt et al., 2006; van den Heuvel, 2010) and probably does not reflect what would be entering the receiving waters in the current proposal. The studies were relatively limited in scope and depth – essentially looking at acute toxicity data, a behaviour response, and one abundance and distribution study. These represent very limited investigations by current standards with a notable lack of sublethal, chronic exposures or examination of generation effects, assessment of growth or reproduction indices, etc.. The relevancy of the findings in these studies to the composition of the effluent, which is not clearly defined within the EA, from the proposed NPNS effluent treatment facility is uncertain.

A study of the decapod crustacean, *Pacifastacus leniusculus,* a freshwater crayfish, demonstrated induction of cytochrome p450 in response to dioxin (TCCD) exposure (injected) (Ashley, Simpson, Holdich, & Bell, 1996). The response may have involved the AhR system as noted in vertebrates. This is an interesting finding as it could mean that crustaceans have the potential to respond to BKME in a manner similar to fish. Expression of genes for cytochrome p450-form has been studied in American lobster (Tarrant, Franks, & Verslycke, 2012). This suggests that physiologic responses of American lobster could be studied at the gene expression level as in finfish.

More recently, Chamorro et al. (Chamorro et al., 2016) investigated the sublethal effects of chlorine-free kraft mill effluents using the small freshwater crustacean, *Daphnia magna* as the model species. This is a tiny, freshwater, planktonic, water flea used in studies for ecologic monitoring purposes. The study was conducted to address the concern of biologically active compounds that might remain in wastewater despite the use of chlorine-free bleaching and biological treatment of wastewater. A chronic feeding test and two standardised tests - an acute lethality test, OECD 202 (Organisation for Economic Co-operation and Development., 2004) and a chronic assay testing reproduction, OECD 211 (Organisation for Economic Co-operation and Development., 2012) were used. The latter "uses reproduction as a basic biological endpoint, but the test design allows for the measurement of other relevant variables like mortality and growth". The investigators reported mixed results with stimulatory effects on some parameters at low concentrations of effluent while reproductive effort was reduced at higher concentrations of effluent. The potential for this to be a hormetic effect, where a biphasic dose response to an environmental agent characterized by a low dose stimulation or beneficial effect and a high dose inhibitory or toxic effect was considered (Mattson, 2008).

The reproductive assay and the chronic feeding test are directly and indirectly looking at animal health and examining for sublethal effects. Further investigation as to the applicability of these tests to a marine environment and/or extrapolation of any results to larger decapods and species of commercial interest requires further investigation and is beyond the scope of the current report.

Taken together, these studies suggest the potential for impact on crustacean health by several organic compounds (androgenic, estrogenic, antiestrogenic, antiandrogenic) which have suspected roles in impaired reproductive potential in finfish exposed to BKME. Metals such as cadmium that could be present in BKME are also recognised to impact growth and reproduction in crustaceans.

COMMENTS ON SELECTED SECTIONS OF THE ENVIRONMENTAL ASSESSMENT SUBMITTED BY NPNS

Section 8.12.3.3 Characterization of Residual Effects

The report on scientific literature of BKME effects on lobster (Appendix R) summarises literature on responses of American lobster, *Homarus americanus* to BKME and related salinity, temperature and dissolved oxygen changes. The limitations and the need for further study, including sublethal testing using current BKME was indicated in the executive summary and in the report's concluding remarks as follows: "*Studies to more accurately assess the potential for impact to adult lobsters including lethality, behavior, and sublethal impacts are recommended to be carried out with current treated BKME. Completing studies of lobster larvae with today's treated BKME would allow for confirmation and better understanding of potential lethal and sublethal effects."*

These recommendations are valid and appropriate; however, do not appear in Section 8.12.3.3 (Marine and Fish Habitat. Impact Evaluation/Effects Assessment. Characterisation of Residual Effects) where much of Appendix R is referenced.

The concept of a reef effect at the site of the pipe is mentioned as a beneficial aspect of the change "from a soft-bottomed benthic community to hard-bottom community". It was also noted that "*Marine plants, which are important components of habitat for lobster and other commercially important species, will also colonize the hard substrate of in-water structures*." While it may provide new habitat, the potential to encourage animals to feed and remain close to the outflow site might have the unintended consequence of increasing the exposure of animals to the effluent. The studies by McLeese suggested that adult American lobsters would detect and consume feed in the presence of BKME of the day (McLeese, 1970, 1973). The effects on marine animal health of this behaviour are unknown and would be an area for further evaluation.

Environmental Effects Monitor (EEM) for Monitoring Stage (Appendix G)

Appendix G provides an outline of the components of an EEM program should the NPNS EA submission be approved. It states that modifications from the current EEM will be required to address the change in treatment plant and discharge structure. The current EEM uses caged bivalves (*Mytilus edulis*), blue mussels, as *"Caged bivalves provide a reasonable alternative to finfish to assess the effects of pulp and paper effluent on fish* (Environment Canada, 2010) when marine discharges are used .

The assays to be conducted on caged mussels include*: "Various morphological measurements will be made on individual mussels (shell length, shell width, shell height, whole animal weight wet (WAWW), soft tissue fresh weight, and, gonad somatic index (GSI)) in order to generate measures of key potential effect endpoints, such as reproductive effort, growth, energy storage and survival."*

As the crustaceans, American lobster and rock crab, represent two of the commercial resources identified in the EA, it would be reassuring to see evidence that the caged bivalve system is also an approved alternative for crustacean species. This information could not be found in the EA.

Proposed Follow Up and Monitoring Program (Appendix H)

"*Follow up and Monitoring will include: sublethal toxicity testing of treated effluent; phytoplankton and zooplankton community assessments; benthic invertebrate community sampling; water quality sampling; fish community and fisheries resource characterization; and fish and shellfish tissue chemistry investigations*". More detailed monitoring is proposed in the event that "*monitoring results indicate that either end-of-pipe effluent quality data or receiving environment data deviate from those predicted in the EA the potential consequences (if any) of such deviations would be investigated. In this instance, additional or modified performance monitoring components could be proposed and/or implemented, as appropriate"* or *"Alternatively, where EA-related predictions are confirmed reduced monitoring effort may be indicated".*

Tissue chemistry monitoring would include collecting tissues from potential species of interest including lobster, rock crab, scallop, blue mussel, softshell clam, oyster, and locally relevant finfish (e.g., Eel, Smelt, Gaspereau, Striped Bass, Mackerel, Atlantic Herring). *"Tissue specimens will be collected from the exposure area (i.e., the area potentially influenced by mill effluent) and up to two reference areas that are beyond the potential zone of influence of the effluent. Overall, it is envisioned that 5 to 8 replicate samples of 3 to 4 species from 2 to 3 sampling areas will be submitted for analysis of the following parameters: total phenols; total metals contents; low level mercury; and, resin and fatty acids.*

Tissue chemistry testing will generate data on the levels of these chemicals in fish tissues (presumably for use in food safety assessments) but is only an indirect assessment on the health of the fish and shellfish themselves. If the sublethal testing is limited to bivalves, it is unknown is this would adequately reflect effects on crustacean health.

Section 9.0 Human Health Evaluation (as pertains to marine health)

As part of the review of human health risks, a report by Toxikos prepared for a pulp mill deemed to have similar characteristics as NPNS was used to determine candidate chemicals of potential concern (COPC) for human health within the effluent anticipated to be produced by NPNS. The initial list had 39+ compounds listed which was reduced to four identified in Section 9.2.4.2. *"The outcome of the screening approach to identify substances that may accumulate in fish was a greatly reduced list of candidate COPCs. The final COPCs selected in the Toxikos HHRA study were: Cadmium, Mercury, Selenium, polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)".* The Toxikos report indicated that "*PCDD/F was included due to regulatory and public concerns only, as it was noted there is no technical justification to include PCDD/F in effluent from an ECF mill…*". No information on projected levels of these metals or PCDD/F were provided in the EA so it is not possible to compare them to known LC50s in American lobster larvae for cadmium, mercury, and copper.

There are studies (see Pulp Mill Effluent Effects on Crustacean Health, this report) describing adverse effects of metals, particularly cadmium, on crustacean health with respect to moulting, reproduction and the glycemic/stress response. Given these studies, and the statement in the EA that these metals could accumulate in fish tissues, these metals could be considered COPC with regards to crustacean health.

CONCLUSIONS & RECOMMENDATIONS

Taken together, these studies suggest the potential for impact on crustacean health by several organic compounds (androgenic, estrogenic, antiestrogenic, antiandrogenic) which have suspected roles in impaired reproductive potential in finfish exposed to BKME. Metals such as cadmium that could be present in BKME are also recognised to impact growth and reproduction in crustaceans.

Due to the limited and dated information available regarding the potential for adverse effects on the health of the marine species of commercial interest, in particular growth and reproduction of crustaceans such as the American lobster and rock crab, upon exposure effluent to be produced by the proposed replacement effluent treatment facility at NPNS, further studies (acute and sublethal) are recommended.

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Honourable Minister Margaret Miller
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March 8th, 2019

Dear Hon. Minister Miller:

Please find below concerns expressed by the Gulf Nova Scotia Fleet Planning Board, the PEI Fishermen's Association, the Maritime Fishermen's Union and Pictou Landing First Nation. The four groups together represent approximately 3,000 commercial fishermen who make their living in the Northumberland Strait.

Following a thorough review of Northern Pulp Nova Scotia's (NPNS) EA Registration Documents, both by us and by independent experts, we are extremely concerned with NPNS's proposal to pump effluent into the Northumberland Strait. As detailed below, as well as in the attached review by Dr. Battison and in the separately submitted expert review by SVS Ltd., NPNS's EA Registration Documents provide no assurance that marine life will not be harmed, or that our fishing industry and our way of life will not be irrevocably damaged.

We implore you to reject NPNS's proposal as presented and require NPNS to file a **thorough and rigorous Environmental Assessment Report, per subsection 13(1)(d) of the Environmental Assessment Regulations,** given the project's high risk of environmental effects. Failing this, the lack of sufficient information in NPNS's proposal on the impacts of the effluent on marine life and the health of the Northumberland Strait requires that you, at a minimum, deem the Registration Documents as insufficient and require more information, per subsection 13(1)(a) of the Environmental Assessment Regulations.

In addition to the concerns expressed below, please find attached Dr. Andrea Battison's review of the EA registration documents from an animal health perspective with a focus on crustaceans (Appendix A), along with Dr. Battison's list of publications (Appendix B). Also attached are documents obtained through FOIPOP requests and are referenced in the comments below (Appendix C). Furthermore, SVS Ltd. is submitting an expert review of the NPNS EA Registration Document under separate cover. SVS Ltd. was contracted by several fishermen's organizations to conduct an independent expert review of NPNS's new ETF proposal.

Fishing Industry's Concerns with Northern Pulp's EA Registration Document:

1. ***EA Registration Document fails to assess potential impact of effluent on crustaceans and other marine life.***

In her February 25, 2019 review (submitted separately), veterinarian Dr. Battison notes that with respect to the potential sublethal effects of exposure of crustaceans to NPNS's pulp mill effluent, NPNS relied on studies that "were limited in scope, used BKME different from that anticipated to be produced by the NPNS, and did not include sublethal toxicity or generational testing."

Additionally, Dr. Battison notes that "anticipated levels of [chemicals of potential concern] in the effluent are not provided in the EA, precluding assessment of toxicity to crustaceans…."

Dr. Battison concludes that,

> *Given the limited, and often dated, information available regarding the potential for adverse effects on the health, in particular growth (moulting) and reproduction, of marine species of commercial interest such as the American lobster and rock crab, upon exposure to the mill effluent to be produced by the proposed facility at NPNS, further studies (acute, sublethal, and generational) are recommended.*

Furthermore, the EA Registration Document fails to explain how NPNS will improve upon the Cycle 7 EEM Results regarding sublethal toxicity testing, which indicated that "there are chronic effects seen in laboratory test species at relatively low effluent concentrations…" (Appendix J, page 144).

Moreover, NPNS's own EA consultant, Dillon Consulting, recommended to NPNS in a February 14th 2018 letter that,

> *Conducting research on lobster larvae, … needs to be completed to demonstrate to regulators that these were properly considered and stakeholder concerns are being addressed as much as reasonable possible…. The level of stakeholder (commercial fishers) concern regarding lobsters necessitates the need for increased scientific understandings…. (FOIPOP 2018-07644-TIR2, page 476 – 479, attached in Appendix C, pages 1 - 4).*

Despite this recommendation from NPNS's own consultant, NPNS failed to carry out this research.

RECOMMENDATION 1: The Minister cannot accept the EA Registration Document as submitted given the effluent's potential harm to crustaceans and other marine life and given the lack of information to demonstrate whether this harm is negligible or significant.

2. ***NPNS's proposal to test effluent toxicity sometime within 24 months after the new ETF is operational (Appendix H, page 90) presents an unacceptable risk of significant harm to marine life.***

NPNS fails to indicate how it will mitigate negative impacts of the effluent on marine life that may occur before effluent testing is conducted. Given that NPNS has failed to disclose what the effluent leaving the new ETF will contain, forgoing monitoring of the effluent for up to 24 months poses an unacceptable

risk to marine life in the Strait. If effluent contains chemicals of concern that bioaccumulate in marine life, NPNS's proposed testing of the effluent may be too late to stop or mitigate the potential harm these chemicals present.

RECOMMENDATION 2: The Minister cannot accept the EA Registration Document as submitted because NPNS's proposal to test effluent toxicity sometime within 24 months after NPNS starts pumping effluent into the Northumberland Strait presents too high of an unmitigable risk to marine life and the fishing industry.

3. NPNS presented misleading statements to the public about the quality of effluent to be discharged from the proposed ETF, thereby compromising NPNS's public engagement process.

NPNS repeatedly made public statements to the effect that the effluent from the proposed ETF would be no worse than the effluent currently entering Northumberland Strait. For example:

- In a letter to the Town of Westville obtained through a FOIPOP request, NPNS's Director of Corporate Communications wrote "Northern Pulp has been releasing effluent into the Northumberland Strait for five decades. … Treated effluent that will be discharged under the proposed new design will see an even greater improvement…" (FOIPOP 2018-07644-TIR4, page 1104 – 1105, attached in Appendix C, pages 5 - 6).

- In a letter to Advocate News, November 24th 2017, NPNS's Director of Corporate Communications wrote "… Treated effluent has been discharged into the Northumberland Strait for 50 years; it is important to recognize that current effluent discharge into the region has not impacted fishing activities nor will it in the future." (FOIPOP 2018-07644-TIR5, page 1175 – 1177, attached in Appendix C, pages 7 - 9).

- In a letter to CBC reporters, November 15th 2017, NPNS's Director of Corporate Communications wrote the following response to a reporter's question "Are [the fishermen] right to be concerned?": "Treated effluent has been flowing through Boat Harbour and into the Northumberland Strait for over 50 years. The new treatment facility and diffused outfall <u>will reduce the impact on the Strait</u>. …" (FOIPOP 2018-07644-TIR5, page 1268 – 1271, attached in Appendix C, pages 10 -13) (emphasis added).

- In a letter to NPNS's EA consultant company Dillon Consulting Ltd., November 26, 2017, NPNS wrote: "… mark the existing outfall clearly on the map with a thick red line and put a sentence on the outfall page that says something like 'New outfall and diffuser located xx nautical miles from the existing outfall … We want the NB and PEI fishermen to clearly see it is there already." (FOIPOP 2018-07644-TIR5, page 1170 – 1171, attached in Appendix C, pages 14 - 15).

Moreover, NPNS's message that the new ETF will not increase impact on the Strait was echoed in Minister of Environment (as he was then) Iain Rankin's form letter sent to citizens concerned with the proposed ETF. He wrote in a January 18, 2018 letter: "… I am sure you are aware that effluent from the pulp mill has been treated by the Boat Harbour effluent treatment facility and then discharged into the

Northumberland Strait for the last 50 years. …" (FOIPOP 2018-06097-ENV, page 88, attached as Appendix C).

In stark contrast to these statement to the public through the media, internal statements within NPNS indicated that NPNS believed that the effluent from the new system would be "worse" that the effluent currently entering the Northumberland Strait. For example:

- In a letter to NPNS's EA consultant Dillon Consulting Ltd., NPNS's Technical Manager stated "Some say effluent quality will be worse than today because of all the polishing that is happening across the BH basin – and they are correct to some extent…" (FOIPOP 2018-07644-TIR4, page 1037 – 1041, attached in Appendix C, pages 17 - 20).

- In a letter to Gary Porter, senior employee with NS's Department of Transportation and Infrastructure Renewal, November 15th 2017, NPNS's Technical Manager stated "Right now mill has BH as large buffer zone, so effluent at point C is not comparable to new effluent. Need to compare to Point D or speak to difference between current point C and D. … [Consultant] KSH study that says AST [activated sludge treatment / proposed for new ETF] quality not significantly different than ASB [aerated stabilization basin, ie, Boat Harbour / current ETF]." (FOIPOP 2018-07644-TIR5, page 1274 – 1277, attached in Appendix C, pages 21 - 24).

- In a 2014 report by KSH consultants commissioned by NPNS, KSH states: "A large, natural final polishing/stabilization basin follows prior to release to the Northumberland Straight [sic]. … Point C of the effluent treatment system also benefits from the settling effect of Boat Harbour prior to Point D, so the impact on marine environments is even less pronounced." (FOIPOP 2018-07644-TIR6, page 1815 and 1825, attached in Appendix C, pages 25 - 26).

Given that NPNS acknowledged that the effluent to be released into the Northumberland Strait might be worse than they currently release into the Strait via Boat Harbour, NPNS's statements to the public that the effluent from the new ETF would be better or at least no worse are disingenuous and misleading and thereby compromised NPNS's public engagement process. There is no way to know what concerns the public may have expressed if the public had been given the full account of the relative quality of the effluent to be discharged from the proposed ETF.

RECOMMENDATION 3: The Minister cannot accept the EA Registration Document as submitted because NPNS compromised their public engagement process by providing misleading statements to the public about the relative quality of the effluent to be discharged into the Northumberland Strait from the proposed ETF.

4. NPNS has not demonstrated how the proposed ETF will accomplish the "polishing" effect on the effluent currently achieved through the 25 – 30 day settling in Boat Harbour before released into the Northumberland Strait.

The EA Registration Document notes that NPNS's effluent currently undergoes a "polishing" effect thanks to the 25 to 30 day settling period in Boat Harbour before the effluent reaches the Strait (Appendix J, page 23). However, the Document fails to describe how the proposed ETF will provide for

these same effluent quality benefits, or whether the lack of a "polishing" effect could cause significant environmental impacts.

Furthermore, the EA Registration Document (Appendix I4, page 24) also notes that the 2017 yearly average test results for TSS (Total Suspended Solids), BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) at point C were 1563, 1300 and 36,506 kg/day respectively, and that the values for these parameters at Point D were 775, 792, and 34,250 kg/day, respectively. These results indicate that TSS is 2 times larger at Point C than at Point D, that BOD is 1.6 times larger at Point C than at Point D, and that COD is 1.07 times larger at Point C than at Point D. The EA Registration Document fails to indicate how the advantages in reduced TSS, COD and BOD due to Boat Harbour will be achieved in the proposed ETF, or whether increased TSS, COD and BOD relative to Point D will have a negative and significant impact on the environment.

RECOMMENDATION 4: The Minister cannot accept the EA Registration Document as submitted because NPNS fails to demonstrate whether the lack of "polishing" effect and reductions in TSS, BOD and COD currently achieved by the settling time in Boat Harbour will cause significant environmental impacts, or whether the "polishing" and TSS, BOD and COD reduction effect will be achieved through other means in the proposed ETF.

5. NPNS fails to describe what the effluent will be composed of when it is released into the Northumberland Strait via the proposed ETF.

NPNS notes in the EA Registration Document that it rejected the possibility of discharging effluent into Pictou Harbour due to "the accumulation and increasing concentration of residual contaminants contained in the treated effluent, over time" (page 68). NPNS fails to describe what the "residual contaminants" in the treated effluent will be. It is impossible to determine the extent of harmful impacts on the environment that may occur given this lack of information.

RECOMMENDATION 5: The Minister cannot accept the EA Registration Document as submitted because NPNS fails to provide information about what potentially harmful components will be contained in the effluent.

6. NPNS failed to demonstrate that ice scour will not damage the pipeline and/or the diffusers.

The EA Registration Documents indicate that the pipeline route to Pictou Harbour was abandoned due to risk of ice scour damage (pages 47 and 70), yet the Documents fails to demonstrate that ice scour risk will be negligible at the Caribou Harbour site. Appendix E notes that "… an outfall pipe is proposed to be extended parallel to the ferry route to a deeper water location that might help avoid potential issues of ice scour" (page 9) [emphasis added].

Given that Northumberland Strait is ice-bound for a significant portion of the year, a compromised pipe and/or diffuser could result in a large amount of effluent released in an unplanned manner for a months-long duration before the problem is identified and fixed, potentially resulting in significant environmental impacts.

RECOMMENDATION 6: The Minister cannot accept the EA Registration Document as submitted because NPNS fails to provide sufficient evidence that ice scour will not compromise the integrity and function of the pipeline and the diffusers.

7. NPNS fails to explain how it will deal with its effluent between February 1, 2020 and the date by which the new ETF is operational.

The EA Registration Document indicates that the new ETF will not be operational by the January 31, 2020 deadline to close Boat Harbour (page 48). Yet, the Document fails to provide a plan for the intervening time between the closure of Boat Harbour and commencement of the new ETF. Without such a plan, the proposal lacks an air of reality. Furthermore, NPNS's plan for dealing with its effluent between February 1st 2020 and the commencement date of the new system could have significant environmental impacts; these impacts cannot be evaluated in the absence of a plan from NPNS.

RECOMMENDATION 7: The Minister cannot accept the EA Registration Document as submitted because NPNS fails to provide a plan for its effluent for the time between February 1, 2020 and the commencement of the new ETF.

8. NPNS fails to respond to Nova Scotia Environment's requirement to address all potential substances of concern, not just those outlined in the Federal Pulp and Paper Effluent Regulations.

In a letter from Nova Scotia Environment to NPNS's General Manager on June 14th 2017, NSE issued the following requirement to NPNS, at NPNS's request, with the subject line "Minimum Requirements of a Receiving Water Study":

> *… The mixing zone principle does not apply to hazardous wastes or dangerous goods. Mixing zones also do not apply to bio-accumulative or persistence [sic] substances and despite the allowance of a mixing zone, effluent shall not be acutely toxic. It should be noted that in this particular case, a receiving water study must address all potential substances of concern not limited to those outlined in the Federal Pulp & Paper Effluent Regulations.*
>
> *… In order to protect important aquatic communities … no conditions within the mixing zone will be permitted which:*
>
> *a. are acutely lethal to aquatic life;*
>
> *b. cause irreversible responses which could result in detrimental post-exposure effects;*
>
> *c. result in bioconcentration of toxic materials which are harmful to the organism or its consumer;*
>
> *d. attract organisms to the mixing zones, resulting in a prolonged exposure;*
>
> *e. create a barrier to the migration of fish or other aquatic life.*

… Mixing zones should not impinge upon … important fish spawning and/or fishing areas.

… When background water quality conditions at a proposed mixing zone site are degraded, effluent discharge requirements established must ensure, at the very least, that background water quality is not further degraded.

The Department requires enough information to ensure each of the above concerns is adequately addressed. Specifically including but not limited to:

- *information about the effluent (substances of potential concern, volumes, etc.);*
- *information about the receiving water (physical characteristics, size, upstream and downstream water quality); …*

The information provided to the Department should include one year's worth of effluent characterization data. … Water quality considerations take precedence when contaminant discharges exceed the assimilative capacity of the receiving waters, even if the discharged loadings are within the treatment technology based effluent requirements based on the guidelines, regulations or policies. Receiving-water based effluent requirements also take precedence when ambient levels of contaminants are above acceptable levels. …

All effluent discharges must not be acutely lethal. (FOIPOP 2018-07644-TIR5, page 1422 – 1424, attached in Appendix C, pages 28 - 31)

The EA Registration Document fails to respond to the requirements detailed in NSE's letter to NPNS. The Document fails to provide detailed information about the effluent, fails to demonstrate how the mixing zone will not impinge upon important fish spawning and fishing areas, and fails to provide one year's worth of effluent characterization data. Without such information, the Minister cannot make an informed decision on whether the effluent will be acutely lethal to aquatic life, cause irreversible responses which could result in detrimental post-exposure effects, or result in bioaccumulation of toxic materials, among other potential impacts.

RECOMMENDATION 8: The Minister cannot accept the EA Registration Document as submitted because NPNS fails to respond to Nova Scotia Environment's specific information requirements to be included in the Document and therefore the Minister does not have sufficient information to determine whether the project will result in significant adverse environmental impacts.

All of the above is respectfully submitted to the Nova Scotia Minister of Environment, the Honourable Margaret Miller, within the 30-day public comment period with respect to Northern Pulp Nova Scotia's proposed Effluent Treatment Facility.

Sincerely,

Prince Edward Island Fishermen's Association, President

Maritime Fishermen's Union, President

Gulf Nova Scotia Fleet Planning Board, President

Chief Andrea Paul

Andrea Paul
Pictou Landing First Nation, Chief

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 8, 2019 11:11:59 PM

Project: replacement_effluent_treatment_facility_project Comments: I have great concern regarding the replacement effluent treatment facility project. I believe, at the very least, a federal assessment is required and necessary. o Northern Pulpâ?Ts submission does not prove a lack of significant risk, and is missing critical data on many issues. o There is insufficient evidence to know exactly how broad any damage might be. The companyâ?Ts claim that damage will be â?ominimalâ? is not credible and should not be accepted. o Fisheries, tourism and outdoor recreation are important economic factors and should not be put at risk. o The United Nations Declaration on the Rights of Indigenous Peoples requires not just consultation, but consent by the local Indigenous population. Pictou Landing First Nation is opposed to this proposal. o A 30-day comment period on the companyâ?Ts 2,000-page submission is completely inadequate. o Oceans need more protection, not less. Environmental security outweighs the risk of job loss. New jobs can and will be created if necessary. Thank you, Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 54 y: 29

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 8, 2019 11:25:32 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 12:00:07 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmail.com)

From:
To: Environment Assessment Web Account
Subject: NP Proposal
Date: March 9, 2019 1:01:27 AM

Please consider a Federal Assessment . Thank you.

Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: FW: Environmental assessment of effluent treatment facilit
Date: March 9, 2019 1:16:17 AM

There must be further assessment as so much is at stake for NS and PEI and NB. We do not know the ingrediants. They will start burning contaminated sludge without a thorough study of emission concerns, the environment, the fisheries, sea life and tourism. Aka are at risk the strait can freeze so how will the warmth fro. The Pope impact lobster spawning grounds. Much further studies need to be done. Tha k you

From:
To: Environment Assessment Web Account
Subject: FW: Environmental assessment of effluent treatment facilit
Date: March 9, 2019 1:16:42 AM

There must be further assessment as so much is at stake for NS and PEI and NB. We do not know the ingrediants. They will start burning contaminated sludge without a thorough study of emission concerns, the environment, the fisheries, sea life and tourism. Aka are at risk the strait can freeze so how will the warmth fro. The Pope impact lobster spawning grounds. Much further studies need to be done. Tha k you

From: Advanced Legal Settlements
To: Environment Assessment Web Account
Subject: FW: Environmental assessment of effluent treatment facilit
Date: March 9, 2019 1:17:02 AM

There must be further assessment as so much is at stake for NS and PEI and NB. We do not know the ingrediants. They will start burning contaminated sludge without a thorough study of emission concerns, the environment, the fisheries, sea life and tourism. Aka are at risk the strait can freeze so how will the warmth fro. The Pope impact lobster spawning grounds. Much further studies need to be done. Tha k you

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 3:20:56 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

I’m encouraged by my employer Northern Pulp to invest and install the latest technology to protect well paying jobs in Pictou County. Paper Excellence is committed to continue to support Nova Scotia economy and improve their environment footprint. I have worked for mill since I was 19 and hopefully I will get to retire with my full pension that I worked hard to invest in.
Please approve EA for replacement effluent treatment facility and secure Forestry jobs in Nova Scotia.

Signed by:

@northernpulp.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 9, 2019 7:02:59 AM
Attachments: Northern Pulp"s Effluent Replacement Project EA Submission.pdf

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Sent from Mail for Windows 10

March 7, 2019

Honorable Minister Margret Miller
Environmental Assessment Branch,
Nova Scotia Environment
P.O. Box 442, Halifax, Nova Scotia
B3J 2P8

RE: Northern Pulp Nova Scotia - Environmental Assessment Registration Document-Replacement Effluent Treatment Facility

Please see the following document in response to the Environmental Assessment of Northern Pulp's Effluent Replacement Project. The following document will focus on some major concerns of the underwater portion of the proposed pipe and the site-specific characteristics of the seafloor along the proposed route. I am a commercial fisher and harvest lobster, rock crab, and herring from the waters directly surrounding the proposed pipe route and outfall location. I also have a background in structural engineering and have worked on various projects throughout the Maritimes assisting in both the structural design and geotechnical investigation of various structures. This submission will include a combination of site-specific observations and the effects it will have on the structural integrity of the pipe.

Sincerely,

1.0 SEAFLOOR CHARACTERISTICS OF PROPOSED ROUTE

1.1 Effluent Effects Rock Crab Population

Inside Caribou harbour consists mainly of shallow soft sand and mud bottom with portions of broken hard bottom. Such seafloor characteristics create a favourable environment for the rock crab population to flourish. While harvesting rock crab throughout LFA 26A fishers have observed that this inlet presents optimal conditions for juvenile and female rock crabs. If you place traps within the harbour (south/southwest of Munros Island or directly east of the ferry terminal) the majority of the harvested catch appears to consist of small juvenile crab including a high percentage of females. As you move out of the harbour along the proposed pipe route and along the shore east and west the percentage of harvestable rock crab (a rock crab of legal size) within the catch appears to significantly increase. Traps placed further offshore in deeper waters tend to have a catch rate with the majority of the catch consisting of large harvestable crabs with very few undersized crabs. Over the years all of the above has remained consistent and local fishers have concluded that the Caribou harbour acts as a breeding ground and an optimal environment for juvenile rock crab to mature before moving to deeper waters. This raises the major concern of what effect will this effluent have on these juvenile rock crab and the rock crab population as a whole? Not to mention the chain reaction that would occur throughout other species including lobster whose diet consists of a large percentage of rock crab (Fisheries & Oceans Canada, 2013).

1.2 Effects of Site Specifics on Structural Integrity of the Pipe

The marine portion of Northern Pulps pipeline design consists of approximately 4 kilometers of 36” high density polyethylene (HDPE) pipe that will be weighted with concrete ballast and placed in a 3 m trench (providing approximately 2 m of cover to the top of pipe) and will be backfilled with armour stone (Appendix F, Northern Pulp, 2019).

The pipeline location proposed by Northern Pulp presents various challenges that must be addressed to ensure the structural integrity of the pipe. As previously stated, the bottom has been observed by fishers to consist of soft sand and mud bottom with small pockets of hard bottom. With no geotechnical investigation carried out by any of Northern Pulps consultants it is unknown how deep the soft bottom continues. This raises the concern of non-uniform settlement of the soil that will be supporting the pipe. Due to the pipe being placed in a pre-dug trench during the construction phase it is likely that the pipe will experience increased installation deflections due to the trench quickly being filled in with sand due to wave and tidal action, thus creating discrepancies between design pipe elevations and as built pipe elevations. The pipe is also likely to experience increased in-service deflections over time due to the pockets of hard bottom creating a point of solid support while large portions of soft bottom allow for settlement and pipe sag. These deflections will induce increased compressive and tensile bending stresses within the pipe wall resulting in bending strains. The design code aims to limit these strains and the geometric stability of the pipe by setting ring deflection limits of 7.5%. As deflections increase beyond this point geometric stability is eventually lost and the crown of the pipe will begin to flatten and eventually

reverse leading to reverse curvature collapse of the pipe Figure 1 shows observed pipe deformation patterns that lead to failure due to increased pipe deflections (Plastic Pipe Institute, 2014).

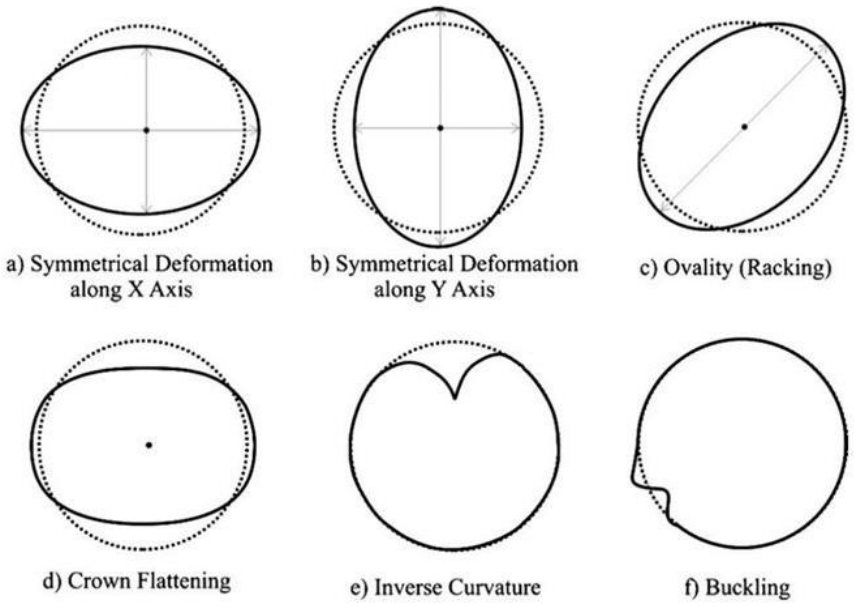

Figure 1: Observed deformations of installed HDPE pipelines (Motahari & Abolmaali, 2010)

Figure 1 is from a study published in the Journal of Transportation Engineers of the American Society of Civil Engineers (ASCE). The study included structural monitoring with video and laser surveillance of over 15,000ft (96 pipelines) of buried HDPE pipe across the USA. It was concluded that the majority of pipelines had actual deformations in excess of design code limits (Motahari & Abolmaali, 2010). This study gives great insight into the possible repercussions of not accurately modeling induced strains in buried HDPE pipes.

Due to the cyclical nature of the tidal forces and wave action these induced stresses combined with ice loads over time could present fatigue stress issues. Although HDPE pipes are extremely flexible making them well suited to bend and adhere to the seafloor, cyclical loading has the potential to cause failure if the site-specific loadings on the pipe are not properly addressed. "One of the causes for failures of HDPE pipes is fatigue which is the result of pipes being subjected to cyclic loading, such as internal pressure, weight loads or external loadings on buried pipes, which generate stress in different directions: circumferential, longitudinal and radial." (P. 600, Djebli et al., 2014). To accurately determine these site-specific loads, various data is required including accurate geotechnical site investigation with borehole results, hydrographic site surveys including bottom type/depths, potential ice scours, and site observations of ice conditions. It should be noted that none of these are present in Northern Pulp's submission.

Of all the loads the pipe will experience, ice loads present that largest risk to the structural integrity of the pipe. Potential failure of the pipe due to ice could occur from one of two mechanisms: 1) Direct impact causing a ductile failure (high amount of stress over a relatively short time), 2) Cyclical loading causing a brittle failure (stress levels lower than the mechanical strength of the

material induced repeatitly over a relatively long time) (Zhang, 2005). Brittle failure due to ice impact could occur if any of the following project tasks are neglected: complete a site survey of ice conditions, complete a hydrographic survey depicting any potential ice scours, bury pipe at an adequate distance to account for extreme ice event. Although Northern Pulp shows a pipe buried with cover of approximately 2 meters, they have not completed any of the pre-design field work required to ensure that the pipe is not at risk of failure. When determining extreme ice scouring events, it is also recommended that ice scour surveys be carried out more than once, spaced out over time to gain an accurate depiction of the ice and seafloor interaction (C-Core, 2004). Grounding models such as the one created for a tunnel project crossing the Strait of Belle Isle, Newfoundland can also be carried out to gain insight into ice activity in a given region (C-Core, 2004). The soft soil and shallow design depth of the pipe (approximately 2 meters) also poses concerns for ice and seafloor interaction. If large ice accumulation was present and gouged the seafloor to the unknown depths of the soft bottom there would be no evidence of such gouges once the ice had melted as the sand would infill the gouges within a couple tide cycles. Figure 2 and Figure 3 are a photo's taken March 4th, 2019 from the Caribou light house, the PEI ferry can be seen docked in the background.

Figure 2: Ice southeast of Caribou lighthouse along proposed pipe route (March 4th, 2019)

This photo shows extensive ice directly over the proposed pipe route. Locations where water depths are as shallow as 1 meter have ice piles of 3-4-meter heights above sea level. It is not unlikely to conclude from these photos alone that potential for ice impact at a depth of 2m below seafloor bottom in a soft bottom is a very real possibility that could lead to a ductile failure resulting in the catastrophic event of premature released effluent into the Caribou harbour. Figure 3 shows more ice further north along proposed pipe route.

Figure 3: Ice east of Caribou lighthouse along proposed pipe route (March 4th, 2019)

now retired, fished the waters surrounding the proposed pipe location for 55 years. Along with other species fished lobsters along the shores of Caribou Island. He recalls one winter when ice conditions were at their peak, one of his most lucrative lobster spots was completely wiped out by the ice. North of Black Point the bottom consisted of dense hard bottom with drastic elevation changes in the bottom including a large trench where lobsters could always be found. The following spring the rock bottom had been completely changed and the trench had been filled in.

a long-time fishermen and a commercial diver in the area for 25 years have also seen the power of the ice in the area. One spring could not seem to get his traps boarded as they were tangled on something on the bottom. When dove to retrieve them a navigational marker buoy from PEI was found drove into the rock bottom by the ice.

3.0 RECIEVEING WATER STUDY

Events that would be catastrophic to the marine ecosystems include: 1) Structural failure of the pipe causing effluent to be released prematurely of the discharge location. 2) Errors in the receiving water study including tides, water flow, mixing characteristics at discharge location, lack of consideration for climate change effects will have on mixing characteristics.

The shallow soft bottom that extends south of the Caribou lighthouse combined with Munroe's Island extruding westward creates a bottleneck effect for the water currents. This bottleneck effect is also accelerated by the water moving in from deep waters to shallow waters on a rising tide.

These physical characteristics create accelerated tides and wave action, across the proposed location. These conditions combined with a prevailing north wind can cause water to swell into the harbour and hold waters in the harbour longer on a rising tide this gives the harbour very poor flushing characteristics. If there were a failure in the pipe at a location prior to the diffusers there would be no chance of meeting the dilution standards. The same could be said about the diffuser location if there is any variability in the water/mixing properties that were used in the receiving water study. Although computer modelling can give great insight into complex problems performing thousands of iterations and time steps in the matter of seconds, the results are only as good as the variables that were entered into the model. When dealing with a project with environmental consequences as catastrophic as this, each variable of tidal data, water depths, salinity, mixing characteristics etc. must be observed and calculated in a timely manner to ensure the level of confidence of the model is extremely high.

In near field portion of the receiving water study Stantec states "No historical water quality data are available for Northumberland Strait around the CH-B location. Data from the neighbouring Pictou Road (Stantec, 2017) located about 6 km southeast were used." (Stantec, 2018). While in the far field portion of the study they simply extended the boundaries of the previous model created for the previous outfall location in the original study that was completed for Pictou Harbour (Stantec, 2017). I will not attempt to touch on the technical data within the receiving waters study as I do not have the educational background to do so. I will however pose the following questions: Has adequate field investigations been carried out to ensure the results of these models are correct? Is stating there was no historical data thus we used data from our previously studied location sufficient? Should actual water sampling have been carried out at the actual location? Is this project being fast tracked? The study concludes that "The effluent discharged at the CH-B location is predicted to be dispersed and transported predominantly with offshore currents in the northwest and southeast directions. The effluent intrusion into Caribou Harbour is predicted to be minimum." (P.27 Stantec 2018). With what level of confidence can they make this statement while some data was simply pulled from the original location of Pictou Harbour? Have they modelled the bottleneck effect that all fishermen are aware of?

4.0 CONCLUSIONS & RECOMMMENDATIONS

Due to the lack of detail presented concerning site-specific data of various elements of the project, the minister must request an environmental assessment report. The report should include a geotechnical investigation, hydrographic survey and further investigations detailing ice presence. Pipe deformation issues should be addressed and a study must be conducted to ensure that direct ice impact will not occur. A detailed tidal study should be carried out to ensure that the effluent will not intrude into Caribou harbour severely effecting the marine ecosystem.

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From:	South Shore Council of Canadians
To:	Environment Assessment Web Account
Subject:	Submission: Replacement Effluent Treatment Facility Project
Date:	March 9, 2019 8:11:45 AM

TO: Environmental Assessment Branch, Nova Scotia Environment, EA@novascotia.ca

Dear Minister Miller:

I am writing to you on behalf of the South Shore Chapter of the Council of Canadians. We are part of the national Council of Canadians, Canada's largest citizen advocacy organization. Our chapter promotes education, discussion and action on significant issues affecting our lives.

We call on the Nova Scotia government to reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project based on the following key points which have been outlined by the groups based in the communities most affected by this issue.

Northern Pulp has been unable to prove that there will not be significant risk. Their claim that damage will be 'minimal' is not good enough. We cannot allow this company to put our fisheries, tourism and outdoor recreation industries at risk.

Northern Pulp has failed to meet the requirement of consent from the local Indigenous population. Pictou Landing First Nation is opposed to this proposal.

At a time when Nova Scotia has paid lip service to a just transition to a sustainable economy, and at a time when the IPCC report issued in 2018 has warned us that we have only 11 years to curb GHG emissions, this path is foolhardy for our province to pursue. We need to take all available steps to protect our ocean and our province.

We call on the Government of Nova Scotia to reject the proposed Northern Pulp Replacement Effluent Treatment Facility Project. We fully support the closure of the effluent treatment facility in Boat Harbour on schedule.

(for South Shore Chapter of the Council of Canadians)

The Council of Canadians is Canada's largest citizen advocacy organization. Nova Scotia's South Shore Chapter promotes education, discussion and action on significant issues affecting our lives. www.facebook.com/SouthShoreCouncilofCanadians www.canadians.org

(If you no longer wish to receive emails from the South Shore Council of Canadians, please ask to be removed from our mail list.)

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 9, 2019 8:12:05 AM

Project: replacement_effluent_treatment_facility_project Comments: I support the mill workers and realize the impact the closure of the mill would have on the nova scotia economy so hopefully a federal assessment will satisfy everyone . Name: Email: Address:

Privacy-Statement: agree x: 37 y: 24

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 8:52:19 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@unifor.org)

From:
To: Environment Assessment Web Account
Subject: Re: Northern Pulp Effluent Treatment Facility
Date: March 9, 2019 9:09:55 AM
Attachments: Nova Scotia Department of Environment - Northern Pulp.pdf

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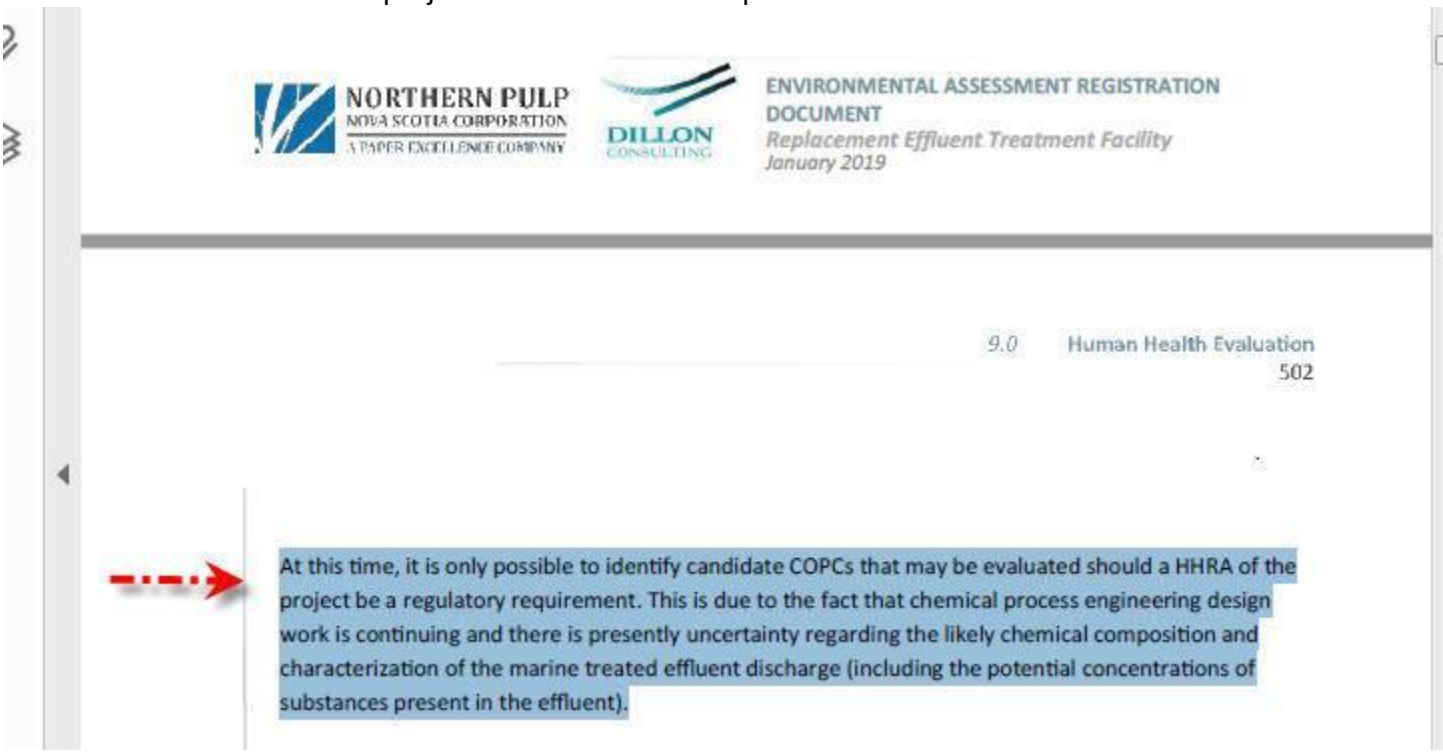
Environmental Assessment Branch, Nova Scotia Environment
P.O. Box 442,
Halifax, Nova Scotia B3J 2P8
Via E-mail at ea@novascotia.ca

RE: Northern Pulp Effluent Treatment Facility

Good morning,

I am writing to you today to express my concerns regarding the Northern Pulp Effluent Treatment Facility with special trepidation regarding the indication that effluent from this facility will be pumped via a pipeline that passes by the Town of Pictou's watershed land and then dumped into the Northumberland Straight.

I am a resident of Pictou having moved here over years ago. I have spent much of my career in the business world and one component of my work has been establishing whether the RISKS associated with a project are acceptable and assuring that if the risks are greater than the outcome, a project will not move forward. I believe in the case of a pipe being constructed to carry effluent – the chemical makeup of which is not 100% known (according to the Environmental Assessment document submitted by Northern Pulp) - creates a scenario where the risks associated with this project ARE NOT worth the potential outcome.


NORTHERN PULP
NOVA SCOTIA CORPORATION
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DILLON CONSULTING

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT
Replacement Effluent Treatment Facility
January 2019

9.0 Human Health Evaluation
502

At this time, it is only possible to identify candidate COPCs that may be evaluated should a HHRA of the project be a regulatory requirement. This is due to the fact that chemical process engineering design work is continuing and there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential concentrations of substances present in the effluent).

From my perspective let's look at some of the parties that will be impacted by this project when something does go wrong – and looking at the history of this company (as well as previous owners), something will. The fact is that at times pipes leak and sometimes break. We have

been made aware of two leaks in the current system at Northern Pulp in the past several years. The conditions where a pipeline is installed, the person(s) installing the pipeline and the actual pipe itself are all subject to the real risk of leakage and potential environmental damage.

1. **Fisheries**
   The risks associated with this project include extensive damage to the ecosystem in the Northumberland Straight. This will directly impact the livelihoods of fishermen and fisherwomen in three provinces directly (Nova Scotia, New Brunswick and Prince Edward Island). This industry is a multi-billion-dollar business which exports seafood internationally. Just imagine what would happen if this pipe went in and the effluent is harmful to the marine life. Mad cow disease took decades to recovery from and it doesn't take much imagination to see what would happen to this industry.

   We have the most pristine cold waters. In 2017 the value of our seafood exports was $2.0 billion. Infrastructure at Halifax Stanfield Airport has begun to increase with holding areas for lobster and with 3-5 air cargo shipments to China per week, as well as flights to Seoul, Korea.

   Northern Pulp constantly talks about their “spin-off” jobs. Fisheries also has “spin-off” jobs – it is another product that requires the same structure to export. Let’s not forget those.

2. **Tourism**
   The Tourism sector also brings billions into this province mainly due to our clean oceans, beautiful beaches and magnificent scenery – not to mention the friendly people. Why would we want to put this at risk? Even taking into account the number of "spin-off" jobs Northern Pulp states, the RISK is not worth it. The Tourism industry employs thousands of people in Nova Scotia and has far more economical impact than the 277 jobs at Northern Pulp. This company is part of Paper Excellence who have a horrid record on the environment internationally.

   In addition, there is the “spin-off” revenue that is brought to the many cities and towns that the tourists visit – and spend their money. Nova Scotia is "**Canada's ocean playground**". If there is an incident in the waters of the Northumberland Straight, there will be no recovery.

3. **Local Real Estate Market**
   If such a break would occur, there is also the potential for the real estate market to die completely in this area of Nova Scotia - for homes and cottages. I personally will have to consider selling both my home in Pictou and my cottage on Cape John should a decision be made to move forward on this project. If and when there is a breach in the pipe effecting either the Pictou watershed or the Northumberland Straight, this would render both properties unsaleable and that is not a risk I am willing to take. I also expect that

should this occur, the Nova Scotia government will have liability to its citizens in this case – after all these would be preventable damages.

4. **Town of Pictou residents**
   Now that the plan has been filed, the matter of the pipe and where it is planned to be constructed and where it will dump the effluent is known. There are many better qualified people who can and I am sure will speak to the chemical nature of the effluent (what is known at least) however I can speak to the fact that the pipe is to be constructed close to the watershed for the Town of Pictou. We have just come to the point of having clean water in our town, thanks for grants from both the Federal and Provincial governments as well as rate adjustments to the town residents. This has been a multi-year and multi-million-dollar project and in NO WAY should any risk be taken with regards to clean water in our town.

   The Town of Pictou heard about this via the media, like everyone else. As a major stakeholder in this situation this is unacceptable and again finds Northern Pulp not true to their word. There has also been NO information sessions on this project held in the Town of Pictou which to me is quite telling.

5. **Pictou County residents**
   There is also the consideration of the quality of air. This part of the province has suffered enough regarding this – every citizen should be able to open their windows on a nice warm day and the reality here is that we can't. This should not be the case in Nova Scotia. It has greatly affected the businesses in our town – many who have left since visitors want no part of this.

   Several local medical doctors have recently written concerning the quality of the air here (John Krawczyk, MD ; Anne Kwasnik- Krawczyk, MD; Maurice Strasfeld, MD; Gerry Farrell, MD; and Catharina Felderhof, MD). Their full letter can be found at https://nsadvocate.org/2019/03/06/letter-northern-pulp-wealth-over-health/?fbclid=IwAR3JOvaYq1ncax-lvZNPzsv3P29IFunDd-qN6I7NQxCKGXSPKzvlhmhMvVs – however here is a brief excerpt regarding the particulate matter coming into the air from the pulp mill:

   > *"In 2013 the WHO declared PM 2.5 carcinogenic to humans. Once in the air it can stay in the air for days to weeks and it can travel hundreds to thousands of miles. The new precipitator installed on the recovery boiler addresses a percentage of the PM2.5. The main boiler has no precipitator, but has scrubbers. These mechanisms require constant maintenance to operate with high efficiency. The results of the operating efficiency should be transparent and made public and tested more frequently."*

I would also refer you to an article from Dalhousie University that was published earlier this week on the cancer-causing impact of the air emissions released from Northern Pulp, which can be found at https://www.halifaxexaminer.ca/province-house/dalhousie-researcher-breaks-silence-over-pulp-mills-cancer-causing-air-emissions/?fbclid=IwAR1vhmxpQra7s5kcivyS0NC9fJRiunR2399AcW-DTdPm_WPogPFhwjwag3I

As well, in the Environmental Assessment document, Northern Pulp used the Tasmania Pulp mill for comparison for part of the Human Health Evaluation

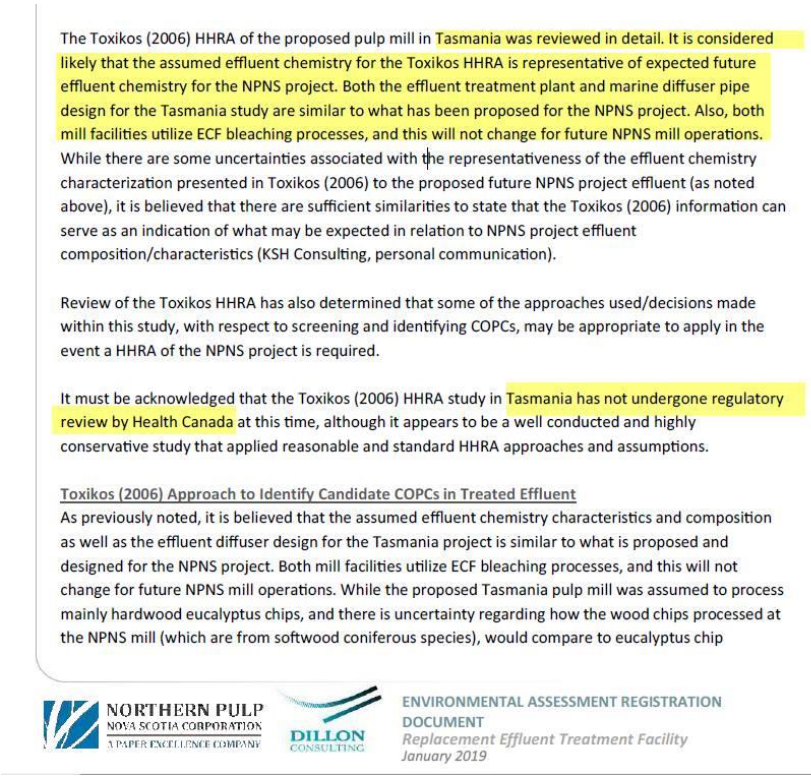
* It is important to note the Tasmania mill DID NOT open and faced many environmental challenges in court https://en.wikipedia.org/wiki/Bell_Bay_Pulp_Mill

* It also DID NOT undergo regulatory review by Health Canada

* There was no mention of their effluent facility technology

* It was using hardwood eucalyptus not softwood

From the EA:
"The Tasmania pulp mill process mainly hardwood eucalyptus chips. There is some uncertainty regarding how the wood chips processed at the NPNS mill, which are from softwood coniferous species, would compare to eucalyptus chip processing, with respect to potential effluent chemistry differences." EA. Section 9-15 page 492



The Toxikos (2006) HHRA of the proposed pulp mill in Tasmania was reviewed in detail. It is considered likely that the assumed effluent chemistry for the Toxikos HHRA is representative of expected future effluent chemistry for the NPNS project. Both the effluent treatment plant and marine diffuser pipe design for the Tasmania study are similar to what has been proposed for the NPNS project. Also, both mill facilities utilize ECF bleaching processes, and this will not change for future NPNS mill operations. While there are some uncertainties associated with the representativeness of the effluent chemistry characterization presented in Toxikos (2006) to the proposed future NPNS project effluent (as noted above), it is believed that there are sufficient similarities to state that the Toxikos (2006) information can serve as an indication of what may be expected in relation to NPNS project effluent composition/characteristics (KSH Consulting, personal communication).

Review of the Toxikos HHRA has also determined that some of the approaches used/decisions made within this study, with respect to screening and identifying COPCs, may be appropriate to apply in the event a HHRA of the NPNS project is required.

It must be acknowledged that the Toxikos (2006) HHRA study in Tasmania has not undergone regulatory review by Health Canada at this time, although it appears to be a well conducted and highly conservative study that applied reasonable and standard HHRA approaches and assumptions.

Toxikos (2006) Approach to Identify Candidate COPCs in Treated Effluent

As previously noted, it is believed that the assumed effluent chemistry characteristics and composition as well as the effluent diffuser design for the Tasmania project is similar to what is proposed and designed for the NPNS project. Both mill facilities utilize ECF bleaching processes, and this will not change for future NPNS mill operations. While the proposed Tasmania pulp mill was assumed to process mainly hardwood eucalyptus chips, and there is uncertainty regarding how the wood chips processed at the NPNS mill (which are from softwood coniferous species), would compare to eucalyptus chip

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6. **Pictou Landing First Nations**
   The Boat Harbour situation which the people of the Pictou Landing First Nations have been dealing with for over 50 years must come to an end. This is one of the worst cases of Environmental Racism to occur in our county and it is well past time for it to come to an end. On that note, I do not believe any extension should be granted to Northern Pulp. The Boat Harbour Act was legislated in 2015 for closure on Jan 31, 2020. Northern Pulp did not file its Environmental Assessment to the Province of Nova Scotia until January 31, 2019 - only one year from the legislated closure - not enough time to get approval and start purchasing and construction to meet the deadline. Their plan should have been filed well before this.

   Nova Scotia has been standing proud with regards to its dealings with our First Nations and has made some great progress in recent years. This is the time to support the Pictou Landing First Nation people. Actions speak louder than words.

Summary

It is time to protect the environment and the people of Nova Scotia. It is time to stop corporate welfare in this province. – a Northern Pulp employee who has been speaking publicly on this matter (see CBC coverage on this topic) has indicated that his employer has "deep pockets". I would suggest if the mill had wanted to continue its operation here, those deep pockets could be used to create a closed-loop process where there is zero environmental impact (or close to it). I have heard arguments all about how it doesn't exist however if Northern Pulp can source studies on mills that have never opened, then surely they can discover the science to plan and implement a closed-loop solution.

In my opinion, current government can create a **new legacy** by doing the right thing here and ending the use of Boat Harbour and ensuring that another environmental disaster does not occur in the Northumberland Straight. #nopipe #noextension

Thank you for your time and consideration of my comments and concerns.

Pictou, Nova Scotia

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 9:23:06 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Treatment Facility Proposal
Date: March 9, 2019 9:41:08 AM
Attachments: Northern Pulp's Treatment Facility.docx

Sent from my iPad

March 8, 2019

Dear Nova Scotia Minister of Environment,

I am writing to you to express my concerns with Northern Pulp's Replacement Effluent Treatment Facility. Northern Pulp's proposal of putting a pipe, pumping unknown effluents into the Northumberland Strait, certainly requires more information and answers. Any risk to our fishery, tourism and the environment is a risk not worth taking. I strongly urge you to acquire all the scientific information needed to properly assess the affects that this "unknown" effluent will have on the lobster larvae, herring spawn and human life.

The mere fact that Northern Pulp has stated in their Environmental Assessment (EA document page 489) that "the effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational" is concerning and needs further study. Pumping 62 to 90 million litres of this effluent per day into the Northumberland Strait will put our fisheries at risk. Northern Pulp has stated " the identified candidate COPC's in effluent are considered preliminary at this time", therefore, this proposal shows that there is a potential risk to the health of our beautiful Northumberland Strait. Thirty percent of Canada's fishery revenue comes from the Southern Gulf including the Northumberland Strait. The reputation of Canada's fishing industry is built on clean , pristine waters off our coastlines. A threat to this reputation is a risk to all of Canada's fishing industry. Any risk to our Strait and to the reputation of our fishing industry must be examined and studied until we know all the facts.

As a lifelong resident of Pictou I have enjoyed walking our beautiful beaches, especially Munroe's Island. The proposed pipe will be pumping unknown effluent not far from Munroe's Island which is one of Nova Scotia's unspoiled natural beauties and is a sanctuary for birds and wildlife. It is important to protect these delicate areas from environmental dangers. Tourists are drawn to Nova Scotia for its beautiful coastlines and beaches. I have sailed the Northumberland Strait fishing mackerel, lobster and have seen many whales and porpoises swimming in

our waters. Tourism is important for the economy of all Nova Scotians and this proposed pipe with its unknown dangers, effects and deadly consequences to our beautiful coastline places this important industry in jeopardy as well.

In conclusion, Northern Pulp's Replacement Treatment Facility Proposal has too many unanswered questions that will have devastating consequences for our Strait, fishing industry and all of Nova Scotia. I strongly urge you to do a full Environmental Assessment, the unknowns and risks are too many to ignore. Boat Harbour is proof of what happens when decisions are made without knowing all the risks, **when we know better, we should do better.** Do Not let our beautiful Northumberland Strait become the "new" Boat Harbour.

Sincerely,

@hotmail.com

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 9:57:04 AM

Project: replacement_effluent_treatment_facility_project Comments: As a practising Engineer in Nova Scotia, Ive made my career in analyzing, minimizing and preparing for risk. As a general rule: the more unknowns that must be accounted for, the greater the risk. We cant forget that these same scientific arguments emerging from the latest batch of consultant reports paid for by Northern Pulp created our current environmental predicament at Boat Harbour and beyond. This mill wasnt supposed to destroy Boat Harbour, but it did. The airborne toxins werent supposed to elevate cancer levels to the highest per capita in the country... but they did. However, even if all this science somehow worked out, and we all came to an agreement that dumping 90 million litres of effluent into the lobster grounds was somehow a good idea, are you going to eat the lobsters? Is anyone going to eat the lobsters, knowing whats going on here? When the foaming agents start to settle on the beaches but someone in a lab coat tells you its fine, are you going to swim in the water? Even if taking this action didnt violate federal regulation and didnt scientifically remove everything good that this town has left, the perception will. To all environmental ministers involved, I implore you to make the right decision here. Name: Email: @hotmail.com

Privacy-Statement: agree x: 39 y: 25

From:
To: Environment Assessment Web Account
Subject: Public Comment - Replacement Effluent Treatment Facility (ETF) Project for Northern Pulp
Date: March 9, 2019 10:41:49 AM
Attachments: Public Comment Effluent Treatment Northern Pulp.pdf

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Hello,

Please find attached my personal comment with respect to the Environmental Assessment application for the Replacement Effluent Treatment Facility (ETF) Project for Northern Pulp currently being reviewed.

Thank you,

March 8, 2019

Nova Scotia Environment
Environmental Assessment Branch
P.O. Box 442
Halifax, NS
B3J 2P8

Re: Replacement Effluent Treatment Facility (ETF) Project for Northern Pulp

I am a resident of the Town of Pictou who is very concerned about Northern Pulp's Environmental Assessment (EA) application. After reviewing the company's application documentation, I remain wholeheartedly opposed to the proposal because i) many aspects of the proposal are inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act,* ii) the information provided in the documentation is misleading, and iii) there is a lack of trust that, if approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations. Each of these points will be addressed separately below.

i) The proposal is inconsistent with the principles of sustainable development protected by the *Environment Act*.

The proposal is inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act*. In particular, the absence of critical information in the application documentation suggests that the precautionary principle identified in Nova Scotia Environment's Guide to the Environment Act (https://www.novascotia.ca/nse/ea/docs/EAActGuide.pdf) ought to outweigh any other consideration. According to the precautionary principle, an activity whose effects are disputed or unknown should be avoided, and therefore, the proposal ought to be rejected because:

- The final characteristics of the effluent are admittedly **unknown** by Northern Pulp and will remain **uncertain** until the new treatment system is up and running as indicated in Section 9.0 Human Health Evaluation, page 502,

  > "there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential concentrations of substances in the effluent"

- The proposal does not include lobster larvae tests or tests on herring spawning grounds, thereby indicating these effects are **unknown**. This is a particularly glaring omission

given that these tests were specifically requested by those directly affected by potential negative effects of the effluent.

- The proposal does not mention the known mercury contamination in the soil and bedrock proximal to the proposed new treatment plant and basins, nor does it acknowledge the potential for disturbing the mercury contamination during construction. (Baxter, J., The Canso Chemicals mystery: With the chemical plant long gone, why is the company still alive? And what about all that mercury pollution?, *Halifax Examiner,* March 7, 2019, https://www.halifaxexaminer.ca/province-house/the-canso-chemicals-mystery-with-the-chemical-plant-long-gone-why-is-the-company-still-alive-and-what-about-all-that-mercury-pollution/). Yet, Section 2.5.2 (p.15) of the proposal explicitly identifies that siting decisions of the treatment facility were made with consideration for sensitive environmental features and that mitigation and compensation measures were developed where avoidance was not possible.

  > "NPNS has emphasized project design and siting so that the location and configuration of the project facilities considers the above measures wherever possible so as to avoid or minimize the potential environmental effects of the project. To the extent possible, project facilities have been sited to avoid and reduce interactions with watercourses, wetlands, areas of elevated archaeological potential, and other sensitive environmental features. Where avoidance was not possible, mitigation or compensation measures have been developed as part of the EA, and will be implemented in consultation with the applicable regulatory authorities."

  It is a gross oversight that the potential disruption of mercury contamination has not been addressed in the proposal and one can conclude that, on the basis of this proposal, the potential risk of mercury disturbance that, while present, is **unknown**.
- Northern Pulp has exhibited a poor track record with their current pipe, experiencing a number of breaks and leaks in recent years. Northern Pulp's inability to effectively maintain the integrity of their equipment over time would suggest that the ability of the company to prevent environment damage from effluent pipe breaks in the future is **uncertain** at best, not in keeping with the precautionary principle, and, therefore, too risky a prospect.
- Finally, the new effluent treatment system requires burning sludge, but the proposal does not indicate additional pollution abatement equipment that will be a part of the power boiler stack to minimize environmental impacts of burning something with **unknown** characteristics. This lack of information is particularly troubling given Northern Pulp's historical problems with the power boiler pollution filtration and the limited stack testing currently required. Furthermore, while Northern Pulp has had permits for test burns of sludge in the past, those test burns offer no assurance the sludge burning with the new system would be safe since effluent processing is entirely different and the sludge will be different given that it will undergo less 'polishing'.

ii) Some of the information provided in the application is misleading.

Some of the information provided in the application is misleading, specifically with respect to the quality of effluent that will result from the new treatment facility.

- First, in the public information sessions presented by Northern Pulp in December 2017, the effluent quality promised was contingent on Northern Pulp installing an oxygen delignification system. The proposal has been revised since the plans presented in 2017, but the promise of improved effluent quality remains despite oxygen delignification not being part of this proposal. If oxygen delignification is required to achieve the predicted effluent quality as promised, why is it not included in the proposal? And, if the proposal is assessed at face value and approved based upon predicted effluent quality dependent upon oxygen delignification, but oxygen delignification is not proposed, can the facility proceed and have poorer quality effluent as a result?
- Second, Northern Pulp's promise of improved effluent quality is misleading based upon the company's own admission in internal communication. Despite publicly claiming the effluent will be better, internal documents acquired by environmental lawyer Jamie Simpson acknowledge that it will, in fact, be worse due to losing the 'polishing' time that Boat Harbour affords. (Jamie Simpson's interview with CBC Information Morning can be accessed here: https://www.cbc.ca/listen/shows/information-morning-ns/segment/15672343)
- The two points above refer to promises by Northern Pulp that effluent quality will be improved. Yet, as previously indicated, by the company's own admission, the actual characteristics of marine effluent are unknown. Therefore, it is challenging to understand how a promise of improved effluent quality can be made, if the effluent characteristics are uncertain.
- In addition, Emma Hoffman, the author of one study cited by Northern Pulp in their EA proposal has recently responded to the interpretation of their work within the EA document and have explicitly stated that Northern Pulp has misrepresented its scientific contribution, thereby raising concern about the representation of other studies included in the proposal (Pannozzo, L., Dalhousie researcher breaks silence over pulp mill's cancer-causing air emissions, *Halifax Examiner*, March 7, 2019, https://www.halifaxexaminer.ca/province-house/dalhousie-researcher-breaks-silence-over-pulp-mills-cancer-causing-air-emissions/).

iii) There is a lack of trust that, if the project is approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations.

- Lastly, there is a lack of trust that Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations or adequately monitor the terms and conditions of this environmental assessment, should it be approved. The provincial Auditor General has identified this specific issue as a concern as recently as 2017 where his November 2017 report clearly stated that "Nova Scotia Environment is not monitoring terms and conditions attached to approved projects", (Report of the Auditor General to the Nova Scotia House of Assembly, November 1, 2017, p. 45; https://oag-ns.ca/sites/default/files/publications/FullNov2017_1.pdf). And, using history as a guide,

NSE has demonstrated numerous challenges with effectively monitoring Northern Pulp and enforcing the regulations it has imposed as highlighted below.

- Nova Scotia Environment (NSE) has the responsibility of creating and enforcing the rules for Northern Pulp's current effluent pipe, yet there have been at least three pipeline leaks in recent years (2008, 2014 and 2018). And, despite increasing efforts by the regulator to improve pipeline monitoring by the company in response to the recent pipe breaks, those efforts did not result in preventing future leaks.
- The current monitoring and enforcement model employed by Nova Scotia Environment (NSE) requires companies self-report problems and breaches. More than a decade ago, in 2008, a review of NSE by the Office of the Auditor General identified this as an area of concern and recommended that,

> "The Division should establish procedures to obtain objective evidence to validate the accuracy of monitoring reports received from approval holders". (Recommendation 3.2, https://oag-ns.ca/sites/default/files/publications/2008%20-%20Feb%20-%20Ch%2003%20-%20Environment%20and%20Labour%20-%20Env%20Mon%20and%20Compliance.pdf)

Yet, the 2017 Report to of the Auditor General to the House of Assembly (https://oag-ns.ca/sites/default/files/publications/FullNov2017_1.pdf) notes that this recommendation had not yet been addressed. As a result of failing to implement a solution per the Auditor General's decade-old recommendation, NSE has proven to have lessened awareness of certain problems and have been unable to minimize what could be preventable environmental damage. Some examples that illustrate NSE's limited objective oversight with respect to Northern Pulp include the following:

- Northern Pulp had problems with their power boiler scrubber identified to them by a consultant in 2006, but NSE did not become aware of the situation until 2008. Had NSE been relying on objective oversight, the problem could have been identified much sooner rather than obliviously allowing the company to continue operations.
- Subsequently, NSE issued an industrial approval in 2011 despite the company failing to address their air pollution problems. The Minister of the Environment stated that NSE was unaware of the ongoing air pollution issues when the 2011 Industrial Approval was issued despite evidence to the contrary provided by NSE to the environmental group Clean the Mill (CBC News, Northern Pulp air quality monitors years behind schedule, October 7, 2014, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-air-quality-monitors-years-behind-schedule-1.2789892). It was not until 2012 that NSE finally issued a directive to the company to address the problem. This example illustrates a lack of communication within NSE, further reinforces the need for objective information to be used in decision making within the Department in order to prevent damage from environmental regulation violations and further justifies the decreased public trust in NSE's ability to protect the environment.

- When the effluent pipe broke in 2014, NSE grossly underestimated the volume of effluent lost at be 4 to 5 million liters ((CBC News, Northern Pulp charged with releasing effluent into fish habitat, October 14, 2015, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-spill-charge-1.3270154). However, the actual volume released turned out to be 47 million liters which was only revealed in court proceedings after a federal investigation (Withers, P., Northern Pulp fined $225K for 'toxic' effluent pipe leak, CBC News, March 23, 2016, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-mill-effluent-leak-fine-1.3504203). NSE has no way to independently monitor the current pipe or that proposed in this EA application not does it have the ability to validate the information reported by the company. As a result, NSE must rely on the face value of information provided by the company, a situation that has proved problematic in the past.
- Despite Northern Pulp's 2015 Industrial Approval requiring the company 'operate and maintain real time flow monitoring equipment ... designed to immediately notify the approval holder in the event of a total loss of flow or a reduction of flow below normal operating conditions', it was a member of the public that identified and reported the most recent pipe leak in October 2018. (Brimicombe, H., Northern Pulp line springs another leak, *The Advocate*, http://pictouadvocate.com/2018/10/24/northern-pulp-line-springs-another-leak/).

- Where Northern Pulp's information has proved inaccurate in the case of the 2014 pipe break, was missing in the case of the malfunctioning power boiler scrubber between 2006 through 2008, and the public needed to report the pipe break case of 2018, it seems unrealistic to think that NSE has the capacity to effectively monitor a new pipe and proactively limit environmental risks.
- Over the years, NSE has issued multiple directives to Northern Pulp to correct air emissions violations. Yet, these directives were ineffective at generating an immediate solution. Instead, Northern Pulp was given excessive timelines (often years) to correct problems. If a problem occurs with the proposed pipe or at the proposed new on-site treatment facility, problems need to be able to be identified and addressed immediately not with the excessive timelines we have become accustomed under the current monitoring and enforcement model. There is no amount of time that would be acceptable to fix problems that risk damaging the Town of Pictou's watershed or the commercial fishery.

In summary, I remain wholeheartedly opposed to Northern Pulp's effluent treatment proposal. Several aspects of the proposal are inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act.* The information provided in the proposal documentation is misleading. And, finally, there is a lack of trust that, if approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations.

Sincerely,

From:	
To:	Environment Assessment Web Account
Cc:	
Subject:	Response to Northern Pulp"s Environmental Assessment
Date:	March 9, 2019 10:48:02 AM
Attachments:	Response to Northern Pulp"s Environmental Assessment.pdf

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Dear Minister Miller,

Please find my response attached.

Yours truly,

Signed in Agreement,

BY EMAIL: ea@novascotia.ca

8 March 2019

To: The Honourable Margaret Miller, Minister of Environment

Re: Response to Northern Pulp's Environmental Assessment

Dear Minister Miller,

I am writing to submit comments on Northern Pulp's Proposed Replacement Effluent Treatment Facility Project.

I am retired from the Canadian Forces having done a tour to Camp Mirage and another to Afghanistan returned home to Pictou While there I was exposed to burning of toxic garbage, and the stench from a poo pond. In the summer of 2014, there were many days that we couldn't see the children playing in the park across the street due to the toxic smog that was hanging over the Town of Pictou. I was appalled that the Province of NS was allowing the same toxicity to happen in Nova Scotia that had happened in Afghanistan. It was clear at that time that Northern Pulp didn't care about those being exposed to the toxins, Pictou County or the Province and it took public pressure and our taxpayer money to force Northern Pulp to fix the problem.

At that time, I was oblivious of Boat Harbour and the environmental racist disaster that was in my backyard. Late in 2017 I read a book by Joan Baxter that clearly explained the problems with the pulp mill across Pictou Harbour. I was once again appalled that in Canada a company could try to block the release of this book. I was quickly losing respect for the owners of Northern Pulp. When I learned that my Provincial Government signed agreements stating that we are responsible for the effluent, in fact the Province owns the responsibility for the effluent and Boat Harbour. I asked myself how can the Province, the Department of Environment be involved in any decision for a proposed replacement to the effluent treatment plant, when in fact it will be their plant, paid for by taxpayer dollars? This is a blatant conflict of interest.

I next asked myself how the Nova Scotia Department of Environment could decide on effluent going into the Northumberland Strait when it does not just affect Nova Scotia, it affects PEI and New Brunswick.

So, you are in a conflict of interest making a decision for 3 provinces, sounds like Afghanistan to me but this is Nova Scotia, this is Canada. I asked myself how this can be happening.

Then I looked at the proposed plan to dispose of the effluent, going overland, across the Pictou watershed, to Caribou Harbour. Now, Northern Pulp would have me believe that this effluent won't affect our fish, our wildlife or our beaches but I find that very difficult to believe. Nothing lives in Boat Harbour, even treated effluent is so hot it has a kill zone. So, I wondered to myself, if they think we are all stupid. Does the Province, do you think we are stupid enough to accept another Boat Harbour, we will be surrounded by toxic chemicals, we will be at risk of their pipes, which periodically break and spill effluent, polluting our Pictou watershed and our water.

I didn't come back from serving my country, to be exposed to toxins on all sides and I will tell you right now you might as well wipe Pictou off the map, pay off all the residents, pay off all the fishermen because we will have no future in Pictou County if you allow this pipe to flow into Caribou Harbour. This is not Afghanistan where a government can do whatever it wants to its citizens, this is a democracy. Conflicts of interest, blatant greasing of palms are illegal, as well as immoral. The Nova Scotia Department of Environment should not be making this decision, this decision should be assessed by the Federal Department of Fisheries and the Federal Government.

My understanding is that within the Act, the Minister must make their decision on factors set out in the Environment Act. You must decide if the project will cause adverse effects or significant environmental effects and if so, can they be mitigated. Well, I say:

1. Any death of fish and lobster spawn is an adverse effect and any loss will be significant to the billion-dollar lobster fishery in PEI, NS and New Brunswick and can't be reversed or mitigated. Boat Harbour proves this, you might as well pave it over it is so full of dioxins, ferons, and mercury it will be decades before it is habitable. I would not consider Boat Harbour closure, and cleanup mitigating the effects. Is this the plan for the Northumberland Strait and Caribou Harbour, and the Pictou Watershed, pollute it for 10 years and then do another cleanup costing us, the taxpayers, millions of dollars. How do you mitigate the loss of quality of life, loss of tourism and loss to the billion-dollar lobster fishery? In my opinion, you can't. And once again how can you make a decision that affects 3 provinces?
2. A spill in the Pictou watershed is an adverse effect, we don't salt in the watershed, no pollution is allowed in the watershed, once there is a spill there will be no way to repair our watershed. This is an adverse effect that has happened many times over the 50 years the pulp mill has been in existence and it is very probable that this will happen in the Pictou watershed. The First Nations have been drinking bottled water for decades, would you consider this mitigating the effects? I would not. It is unacceptable to run this pipe over the Pictou watershed and it is once again apparent that Northern Pipe does not care about the citizens of Pictou or Pictou County by considering this an acceptable plan.

In closing, I would like to state that environmentally Northern Pulp has poisoned our air, our water, and our lands in Pictou County. We suffer higher rates of unusual cancer, lung issues, etc. Tourists smell the stench and leave, affecting tourism operators and offshoot businesses. For 50 years these effects have not been mitigated, they are significant environmentally, personal health, and enjoyment of Pictou and Pictou County. It is time for the Nova Scotia Department of Environment to take to task Northern Pulp

and not accept a pipe going into any waters, overland or otherwise. A closed loop system is the only solution to Northern Pipe remaining in Pictou County. I hope you are not another member of the old boys club that failed to look out for people who elect them, and failed to protect sustainable and viable local industries such as in-shore fishing and tourism while supporting unsustainable and polluting industries such as pulp and paper which harms the environment, and treats this province like we are a third world country. This is not Afghanistan, I exhort you to stand firm and move forward environmentally and not backward, there can be no pipe in Northumberland Strait/Caribou Harbour and Boat Harbour must close.

Yours truly,

Signed in agreement,

Postscript:

, have contacted the Department of Environment by phone, many times and left messages never to have any calls returned. I look forward to your reply to this letter.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 11:07:00 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulps"s Replacement Effluent Treatment Facility Project
Date: March 9, 2019 11:24:59 AM
Attachments: Miller ltr EA.pdf

March 9th, 2019
Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442 Halifax, NS,
B3J 2P8
Submitted via email: ea@novascotia.ca

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

Dear Minister Miller,

I have been active working with a number of groups over the past few years on the critical environmental problems surrounding offshore drilling including its dire effect on marine mammals, the risks to our seafood and tourism industries, and above all the industry-captive nature of our offshore regulatory regime, notably the CNSOPB. What does this have to do with Northern Pulp's proposed Effluent Treatment Facility? Everything. The problems and effects are the same.

The way we treat our oceans, plastic dumping, chemical dumping, our continued reliance on fossil fuels in the face of spiraling temperatures and the coming climate change cataclysm, all these things are fundamentally related to the Northern Pulp proposal.

I have read their submission in detail and find their treatment of facts both cavalier and unrealistic.

For example, their proposed Activated Sludge Treatment system can't be fool proof as they argue. Considering the mill's appalling history of dissembling and extorting financial support from successive provincial governments, their track record is as polluted as the effluent they propose to spew into the Northumberland Strait. Note the blurred lines between the regulated and the regulator including retired politicians now working on the corporate side, not to mention their proposed "new" system's reliance on a power boiler with a dismal emissions record.

Despite the best intentions of your Staff, to have a provincial EA executed by a government in the case of the Pictou mill so beholden and prey to political influence is totally unacceptable.

I do not envy your responsibility to make a decision in this case, and urge you to contribute to finding a real solution to the problem, not some rushed and cursory proposal from a dilatory proponent with zero skin in Nova Scotian's long term game. In my opinion, we should show Paper Excellence the door and start encouraging the re-design of our forestry industry per the Lahey Report, and adopt a Green Jobs approach to re-tooling Nova Scotia's paper manufacturing industry. Trying to retrofit a decrepit 50 year-old mill is clearly a poor choice for Nova Scotia's future.

Thank you for the opportunity to express my opinions.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 11:36:28 AM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@unifor5555.ca)

From:
To: Environment Assessment Web Account
Cc: @juniperlaw.ca
Subject: Re: Review of Northern Pulp NS Environmental Assessment
Date: March 9, 2019 11:48:17 AM
Attachments: Working group submission - marine perspective (v2).pdf

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Hello ,
Further to my email yesterday, I am submitting our final document for our EA response. Please see attached document entitled, "Working Group Submission - Marine Perspective". You should now have in your possession the following documents from the Fishermen's Working Group.

1. Technical Review Submitted by Shared Valued Solutions on behalf of Fishermen's Working Group
2. Fisheries Industry Submission on NPNS ED
3. Appendix A. Dr. Andrea Battison, Animal Health Perspective with a Focus on Crustaceans
4. Appendix B, Dr. Battison's publications List
5. Appendix C, FOIPOP Excerpts
6. Working Group Submission - Marine Perspective

If you could acknowledge receipt of the above listed documents, it would be greatly appreciated.

Sincerely,

On behalf of the Fishermen's Working Group for the NPEA

On Fri, Mar 8, 2019 at 10:59 PM Linda Townsend <northumberlandfishermen@gmail.com> wrote:

> Good evening
> In addition to the technical review submitted earlier today by Shared Value Solutions on behalf of the Gulf Nova Scotia Fleet Planning Board, and their Fishermen's Working Group for the Northern Pulp Environmental Assessment, I am attaching and additional document including three appendices as part of our review of the NPEA.
> Please note, we will will be forwarding you an addendum to this submission tomorrow.
>
> Thank you in advance,
>
> On behalf of Fishermen's Working Group for the NPEA

Gulf Nova Scotia Fleet Planning Board
44 River John Rd.
River John, NS , B0K 1N0

Pictou Landing First Nation
6533 Pictou Landing Road
Site 6 Box 55, RR#2
NS, B0K 1X0

PEI Fishermen's Association
420 University Avenue, Suite 102
Charlottetown, PE C1A 7Z5

Maritime Fishermen's Union
408 rue Main St.
Shediac, NB, Canada, E4P 2G1

March 8th, 2019

Dear Hon. Minister Miller:

Please find below concerns expressed by the Gulf Nova Scotia Fleet Planning Board, the PEI Fishermen's Association, the Maritime Fishermen's Union and Pictou Landing First Nation. The four groups together represent approximately 3000 commercial fishing licenses including 215 communal commercial licenses held by 18 Aboriginal organizations

There are numerous commercially important species in the Northumberland Strait including but not limited to lobster, rock crab, Atlantic halibut, tuna, mackerel, herring and American eel. The Strait is considered somewhat of a closed system with a delicately balanced ecosystem based on a complex food web. The fishing associations are in a perfect position to examine Northern Pulp Nova Scotia's (NPNS) EA Registration Documents from the marine perspective because of their extensive knowledge of each species and their interaction with each other. This knowledge comes directly from harvester experience coupled with the organization's involvement in stock assessments, collaborative research with DFO, and numerous advisory groups.

Armed with this knowledge the fishing organizations are extremely concerned with the lack of solid evidence in NPNS's proposal that this effluent will not alter the ecosystem in the Northumberland Strait. An alteration of the ecosystem could be due to a change in water chemistry, sedimentation, or negative health effects on marine life.

The organizations feel strongly that this environmental assessment, submitted by Northern Pulp, is insufficient and it should have a more rigorous assessment. This needs to include field work and research from an ecosystem perspective with consideration given to the climate change currently being documented in the Gulf of St. Lawrence.

We are asking you to reject Northern Pulp's proposal as presented and require NPNS to file a thorough and rigorous Environmental Assessment Report.

It is important to point out that a request for a more rigorous federal assessment does not set a precedent for changes to other pulp mill treatment plants to go through a federal assessment. The current pulp and paper effluent regulations were developed in 1992 and are currently under review so this project is a unique case while regulations are being updated.

Background information:

The mean water flow in the Northumberland Strait is west to east and the residence time is weeks to months but this varies with seasons, storms, etc. (AMEC Earth & Environment 2007). There are also 2 gyres (figures 1 and 2) located at each end of the Northumberland Strait (Fisheries and Oceans Canada 2005) affecting the residence time. These gyres have the

capability to retain and redistribute particles, being larvae or toxins (AMEC Earth & Environment 2007). These are important to understand when considering different life stages of a species because it corresponds directly with larval drift and settlement.

It is noted in the American Lobster, *Homarus americanus*, stock status in the southern Gulf of St. Lawrence: LFA 23, 24, 25, 26a and 26b report (DFO 2013) that recent models show that the Northumberland Strait is basically a secluded system based on larval recruitment compared to the rest of the southern Gulf of St. Lawrence.

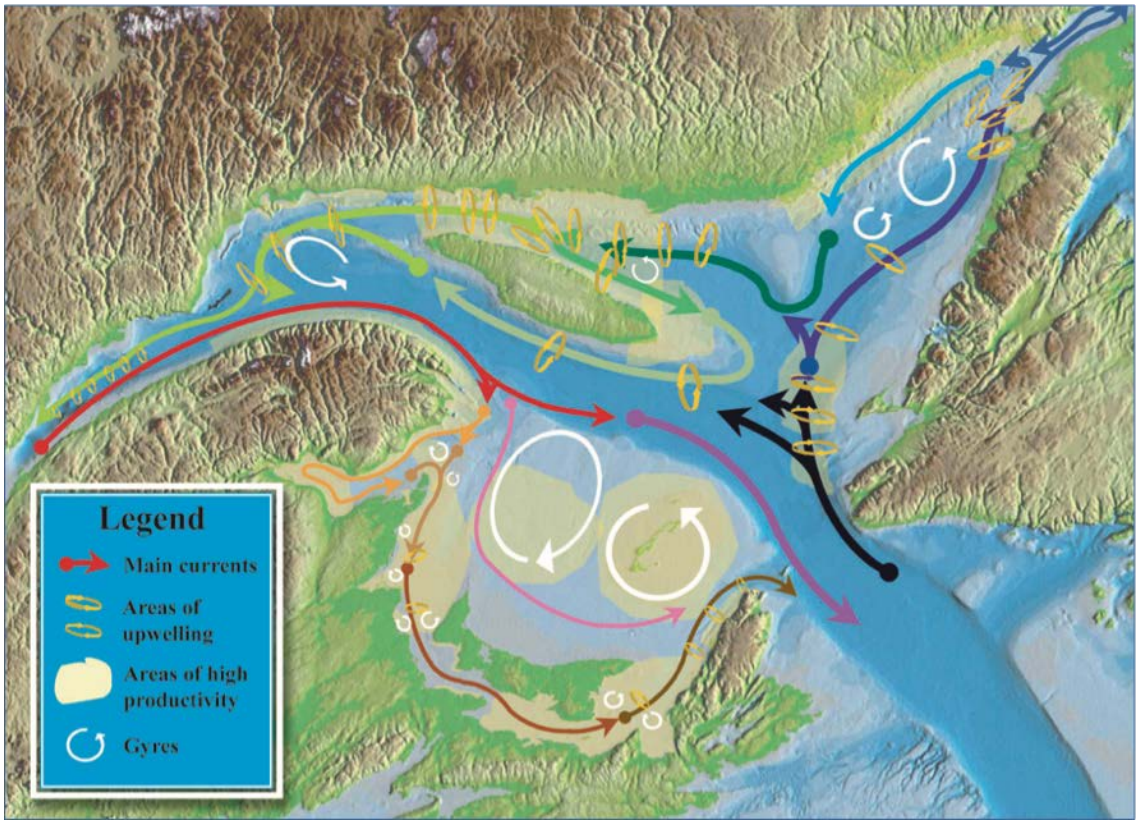

Figure 1: Currents, gyres, upwelling and areas of high productivity in the Gulf of St. Lawerence (DFO 2005).

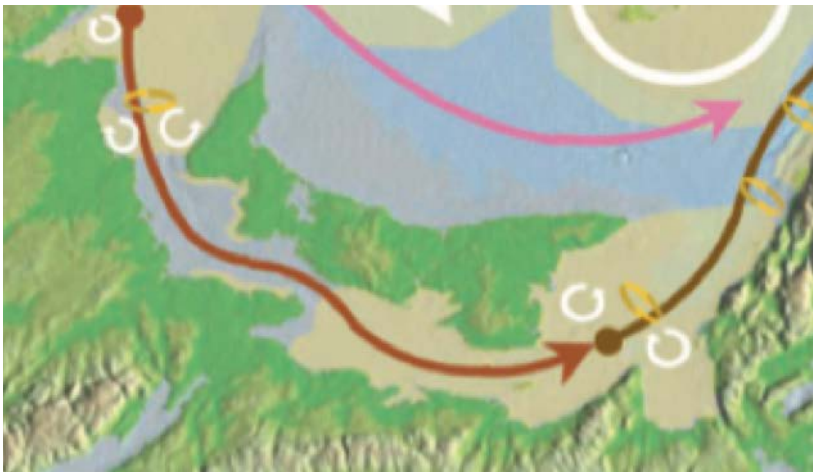

Figure 2: Section of the map from figure 5 zoomed in on the Northumberland Strait.

To give this some context, we can look at lobster larval transport in the Gulf. Based on the previous description above one can assume that anything entering the Northumberland Strait will drift toward the east, up along the Western side of Cape Breton to the Cabot Strait, and out of the Gulf, but the description leaves out the timeline of this taking place. In 2010 Joël Chassé and Robert J. Miller published “Lobster larval transport in the Southern Gulf of St. Lawrence”.

They broke down the Southern gulf to 25 larval source-sink areas (Figure 3) to look at the distribution between the time the eggs are released to the time the larvae settle. When the eggs are released they are reliant on the current for transport and only have the capability to swim to the bottom and seek out suitable habitat at stage 4 which occurs approximately 3-12 weeks after release from the abdomen. During the 3- 12 weeks the prior to settlement the larvae’s destination is a result of the direction of the current. Chassé and Miller (2010) showed that the larvae released in Pictou (area 21) actually seeds areas 23, 24, 22, 20, 18 and 19 (Figure 3). Seeding in areas 18 and 19 are to a lesser degree but still shows a distribution from east to west, exemplifying the weak current present in the Northumberland Strait. These models were run for the larval and post-larval season, June 1st to September 30th, over a 10-year period. This shows lobster larvae are retained in the Northumberland Strait for up to 120 days while a product of the current and some actually end up west of where they were released rather than east; completely contradicting the description our harvester working group is being given by Northern Pulp and their consultants. This model showed that particular circumstances result in east to west currents lasting days to weeks (Hanson and Comeau 2017).

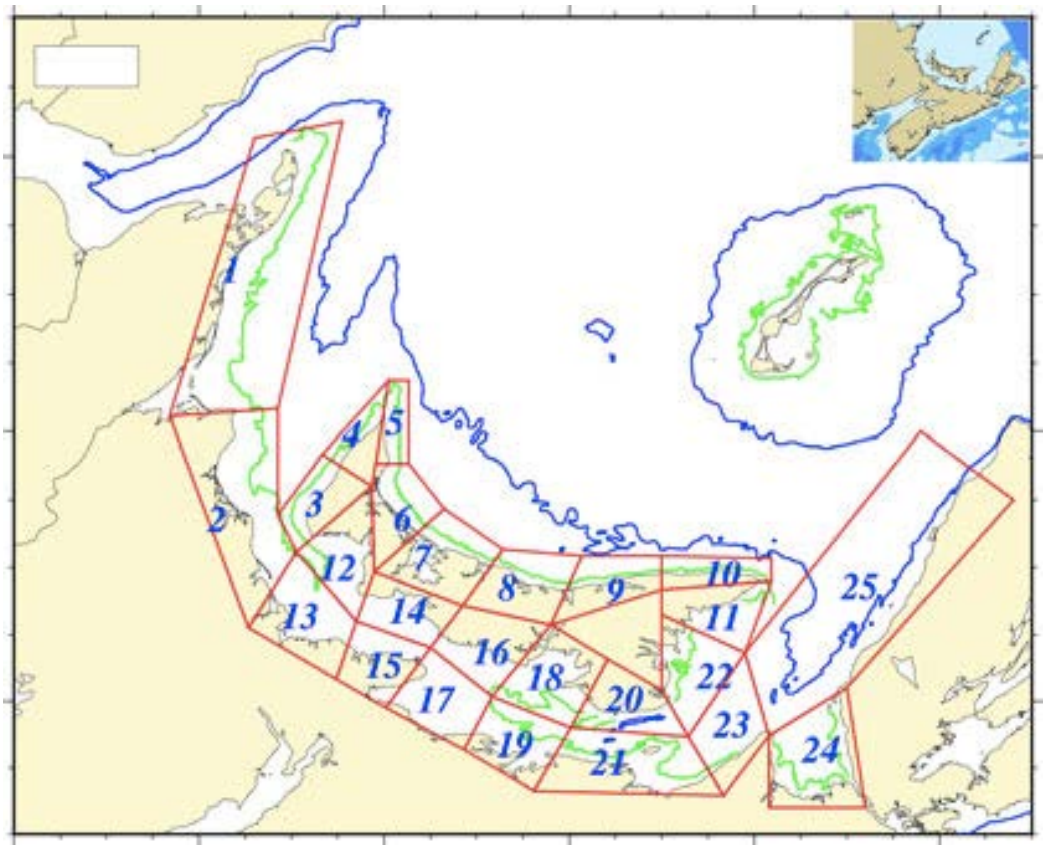

Figure 3: The 25 larval source-sink areas set up by Chassé and Miller, 2010 to analyze larval drift in the Southern Gulf of St. Lawrence.

This also shows the relationship that exists between the provinces in relation to the lobster fishery. Abundance in one area is not a product of the adults in the same area, but rather the adults in other areas and the currents that move the larvae through the Northumberland Strait and the Gulf of St. Lawrence.

Figure 4 showed a full year averaged currents in the Gulf of St. Lawrence and is represented by arrows, the darker and longer the arrows the stronger the current. It is apparent that the movement in the Northumberland Strait is greatly reduced compared to other areas within the Gulf of St. Lawrence further emphasizing the lack of circulation in the Northumberland Strait.

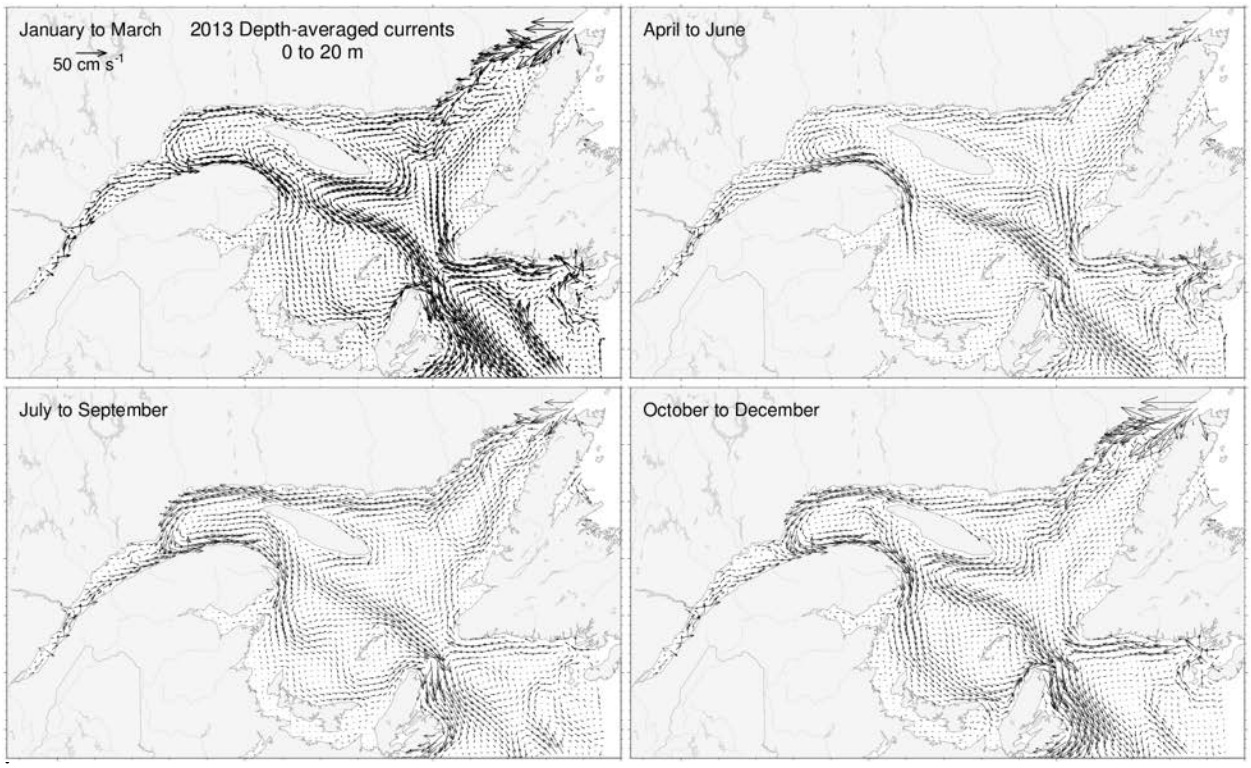

Figure 4: Depth-averaged currents from 0 to 20 m for each three-month period of 2013. (Galbraith et al. 2013)

The Gulf of St. Lawrence has been identified as an area of rapid coastal deoxygenation by Claret, M. et. al (2018). Their analysis shows increased surface water temperature, increased salinity and decreased oxygen saturation. Changes to any of these variables in isolation can cause stress on important commercial species, changes to all three has the potential for synergistic effects and should not be overlooked. The addition of hot, fresh water to the Northumberland Strait for an extended period should not be so easily passed by in this environmental assessment.

Specific Concerns from the Fishing Industry with Northern Pulp's EA Registration Document:

Issue 1: "The description of existing conditions for the harbour physical environment, water quality, and sediment quality in the Northumberland Strait, Caribou Harbour, and Pictou Harbour is based on the results of previous research and existing scientific literature and environmental assessments; no field work was conducted as part of this EA Registration." Pg. 337

Recommendation 1: A project of this magnitude warrants sufficient field work to be completed. The fact that there was NO field work adds to the gap in knowledge on this topic. Further studies should be carried out to confirm harbour physical environment, current water quality and sediment quality as a baseline for the future.

Issue 2: "Average sea surface temperature in May to December in the Northumberland Strait (1986-2012) are shown in table" (Pg. 338). The discussion around sea surface temperature draws attention to the changing ocean temperatures as a result of climate change. The Gulf of St. Lawrence has been identified as an area of rapid coastal deoxygenation by Claret, M. et. al (2018). Their analysis shows increased surface water temperature, increased salinity and decreased oxygen saturation. Changes to any of these variables in isolation can cause stress on important commercial species, changes to all three has the potential for synergistic effects and should not be overlooked. The addition of hot, fresh water to the Northumberland Strait for an extended period should not be so easily passed by in this environmental assessment.

Recommendation 2a: This data is not up to date but it is available. Care should have been taken to include up to date information. This represents a gap in scientific data.

Recommendation 2b: Fisheries in the Northumberland Strait take place throughout the entire water column. Surface, mid-water and bottom water therefore bottom water analysis is required. This is a gap in scientific data that is essential to understanding the changes that will take place going forward.

Issue 3: "This section provides an overview of water quality sampling in Pictou Harbour in 1990, 1995 and 1998 (Dalziel et al. 1993; JWEL 1996; ENSR 1999). Pictou Harbour was used as a proxy for Caribou Harbour with respect to water quality, in the absence of available water quality data for Caribou Harbour.**"** (Pg. 343).

As laid out in the opening sections of this document, proper water quality is extremely important to every species inhabiting the Northumberland Strait. Parameters have shifted over the years due to numerous stressors on the ocean, the Northumberland Strait is not an exception to this change.

Recommendation 3: Relying on data that is 30 years old is unacceptable considering the simplicity of completing these tests. This project focuses on releasing effluent into a highly productive section of the marine environment and the care should have been taken to collect all appropriate data.

Issue 4: "The main commercial, recreational and aboriginal fisheries are for lobster, sea scallop, herring and rock crab among other lesser species fished" (Pg. 356).
"Commercially important species with potential to occur in the Marine LAA include rock crab, lobster, sea scallop, herring, mackerel, and tuna" (Pg. 366).

Yes, these are some of the commercial, recreational and aboriginal fisheries that take place in the Northumberland Strait, but Northern Pulp failed to mention: mackerel, bluefin tuna, Atlantic halibut, soft shell crab, American eel, gaspereau, and silver sides.

In terms of those with potential to occur in the Marine LAA, any of these species listed have the potential to occur in the LAA, it is not restricted to rock crab, lobster, sea scallop, herring, mackerel and tuna.

A full and complete environmental assessment would take in to consideration every species fished commercially in the area to look at sensitivities of those fish to changes in water quality and negative health effects of contaminants. In this environmental assessment all species fished are not even listed, and none are researched to the extent they should be. A few examples of species missed and important information about them are below.

Atlantic Halibut are known to frequent the area and it seems that this is an area of interest during the summer/fall feeding period for them (personal communication with Dr. Arnault LeBris, 2019). Industry has played a large part in collecting data in collaboration with academia. Together we've pinpointed spawning areas through tagging studies and this is also how we know they are directly in the vicinity of the proposed pipe. This tagging study generated tracks or movements of each fish tagged. Figure 5 shows one halibut's approximate location in late June of 2015, which is directly overlapping the location of the outfall. Their normal temperature range in the summer and fall is 1°C and 15°C (Murphy, et al. 2017).

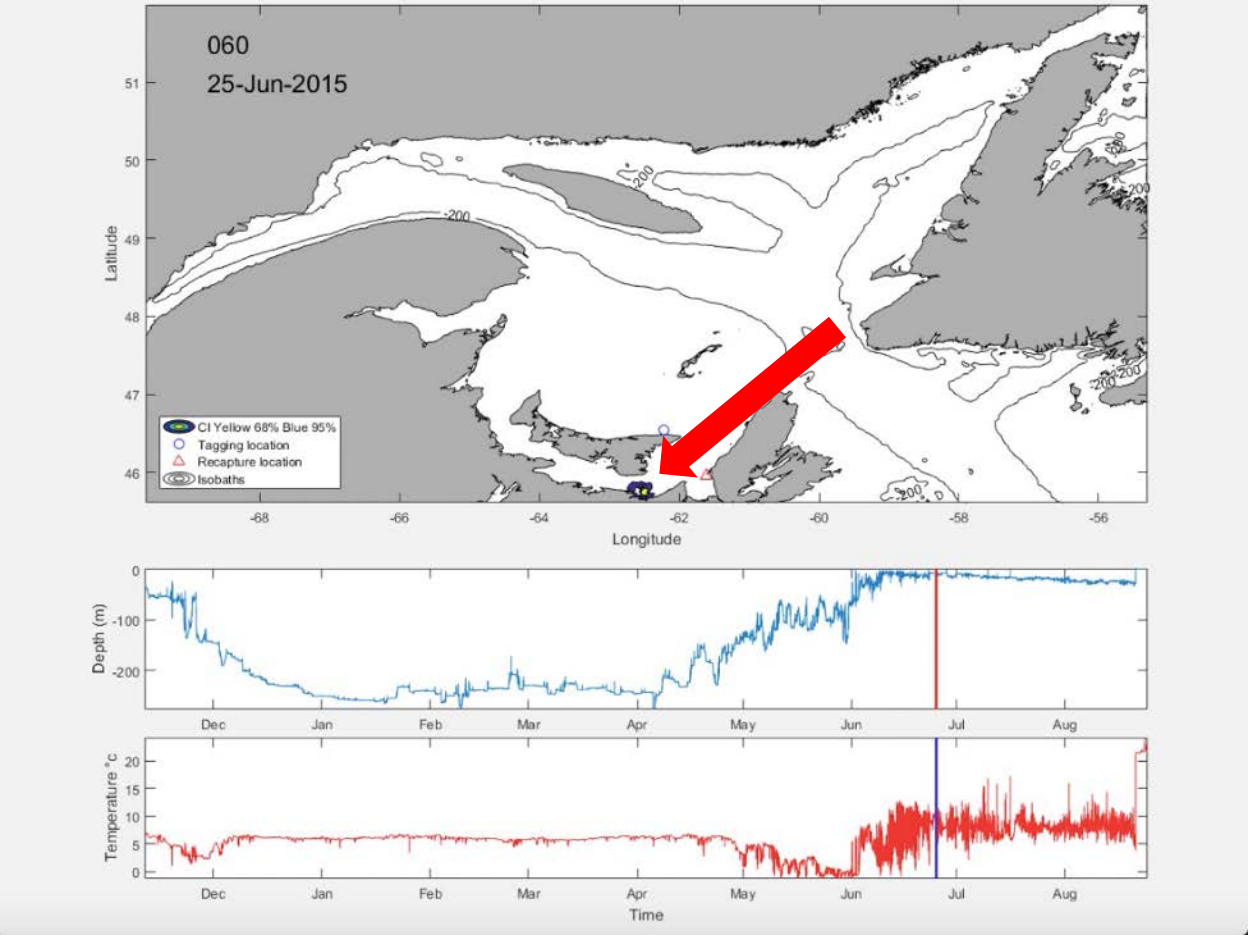

Figure 5: Location of a tagged Atlantic Halibut in late June 2015. (Arnault LeBris, Personal communication).

Recommendation 4: A complete list of species fished should have been composed with research on their tolerance ranges, sensitivities and how different contaminants in the effluent could negatively affect that species. Each species has a different mechanism for expelling toxins from their body so comparing one species to another does not work in the majority of cases.

Issue 5: Herring is caught along the shoreline of New Brunswick and Nova Scotia in the Northumberland Strait, including the Pictou area (Figure 8.12-6). There may be overlap with herring fishing and the location of the marine outfall. Concern has also been raised about the effects of the marine effluent pipeline on herring spawning as well as juvenile lobster (PEI Standing Committee on Agriculture and Fisheries 2018); however, the main fisheries in the LAA are for scallop and rock crab. Nevertheless, herring stocks are currently of concern to DFO, and attempts are being made to manage this fishery to avoid becoming at risk in the area (PEI Standing Committee on Agriculture and Fisheries 2018). Herring spawn between August and October in the southern Gulf of St. Lawrence and DFO has identified fall spawning grounds for herring in the eastern Northumberland Strait (DFO 2018) (Figure 8.12-7). (Pgs. 366-367)

This portion of the EA states that concern has been raised about the effects of the effluent on herring spawn, **however, the main fisheries in the LAA are for scallop and rock crab**. The DFO are making attempts to manage this fishery to rebuild the stock. There is NO mention of what Northern Pulp is doing

to mitigate the risk to herring spawn. Northern Pulp did not do any field or lab work on this possible interaction. This is another gap in data.

On February 20th and 21st, the Gulf small pelagic advisory met in Moncton. This advisory consists of DFO management and science, industry representatives and First Nation Communities. The advisory reviewed the current stock assessment, discussed landings and reviewed the draft of the rebuilding plan. In the management issues of the rebuilding plan the DFO state:

"Climate change and other human impacts on the ecosystem: the physical and biological shifts climate change brings, along with more direct human impacts … are modifying marine ecosystems in many ways, which often cannot be effectively monitored and quantified. Since herring are spawning in shallow coastal areas, these populations may be impacted by these changes" (Figure 6).

This clearly shows concern from the DFO regarding possible issues involved in rebuilding this stock.

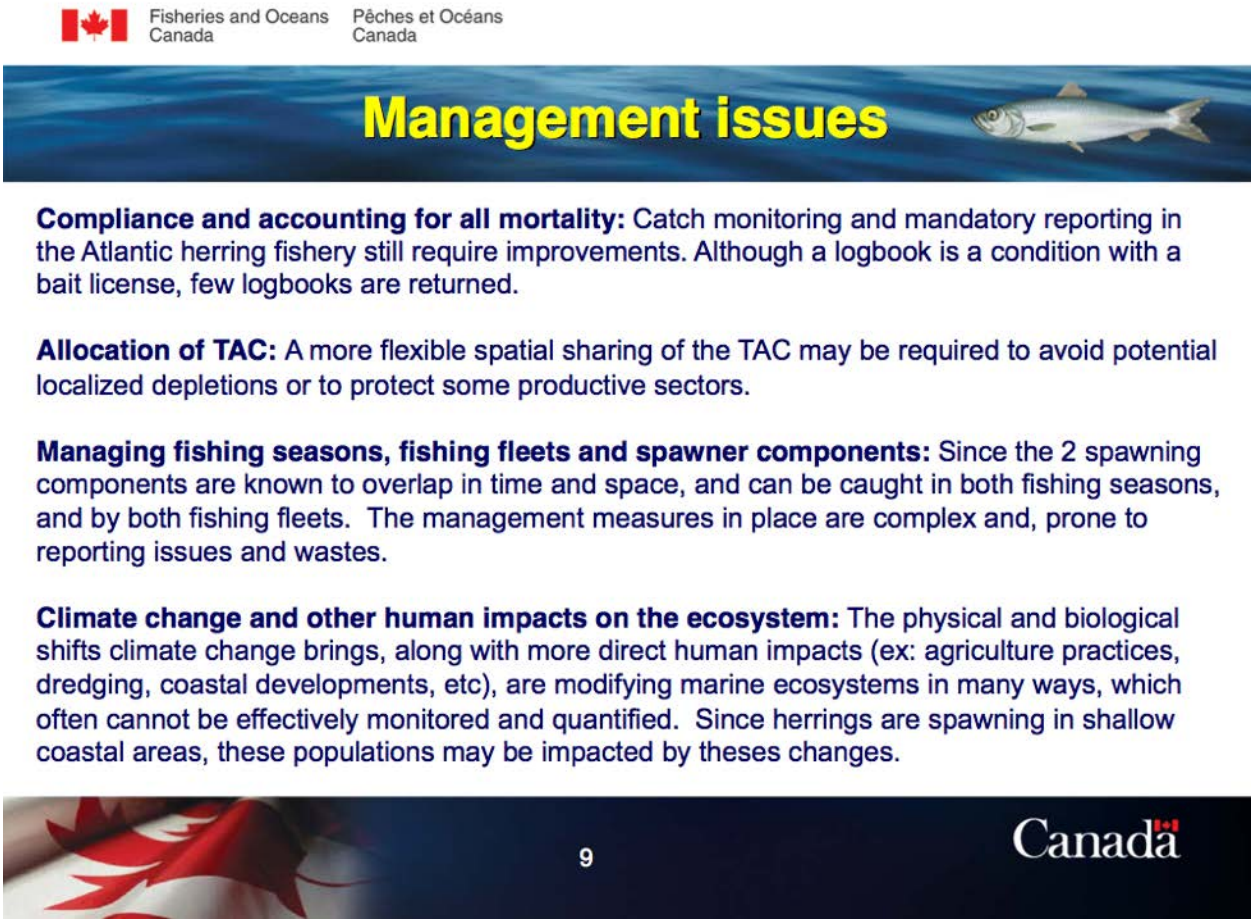

Figure 6: information on management issues from DFO's Herring Rebuilding Plan draft presented at the Small Pelagics Advisory meeting.

Recommendation 5: Proper research needs to be completed to understand possible sub-lethal effects of the effluent on herring spawn. Currently, the fall spawning stock is in the critical zone and the spring spawning stock is in the cautious zone (DFO, 2018) and a rebuilding plan is being developed to ensure the regrowth of the stock. The need for more research is obvious to assist in the rebuilding plan.

Issue 6: "Mackerel is also caught along the coast near the LAA, although most fishing occurs in the central and western portions of the Northumberland Strait (Figure 8.12-8)" (pg. 367).

This is the only comment about mackerel in the environmental assessment and it shows a lack of robust analysis. There is only a mention of fishing, no mention of life stages or their occurrence in the LAA. We know that the only spawning area in Canada is the Southern Gulf of St. Lawrence and that the egg survey has been slowly increasing since 2012 (DFO, 2017). We also know, based on those egg surveys that mackerel eggs are present in the East end of the Northumberland Strait (Figure 7).

Currently, this stock is in the critical zone but changes to management have allowed for a small increase in the last few years. For the past two years the DFO, industry and First Nations have been working together on a rebuilding plan.

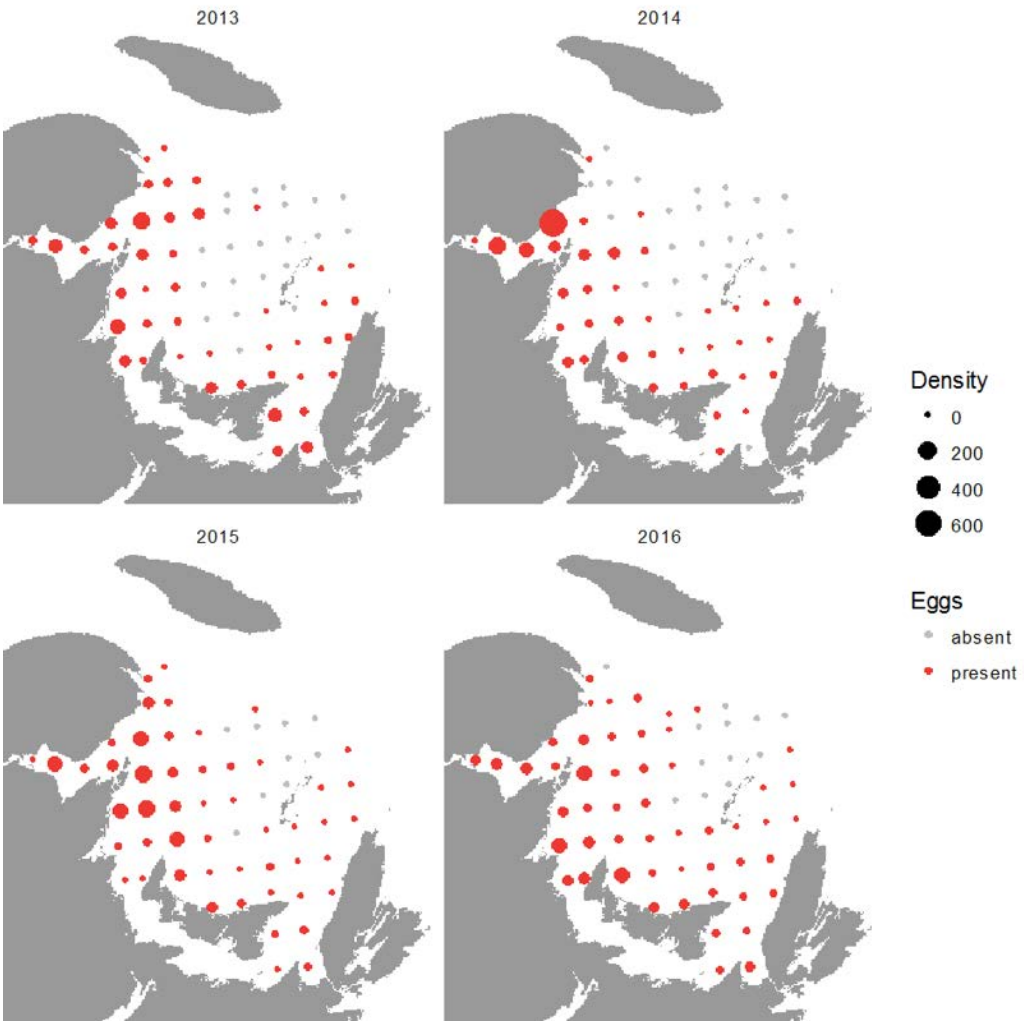

Figure 7:Distribution of mackerel egg (stages 1 and 5) densities (n/m2) measured in surveys in the southern Gulf of St. Lawrence from 2013 to 2016 (DFO, 2017)

Recommendation 6: Proper research needs to be completed to understand possible sub-lethal effects of the effluent on mackerel eggs. Currently, the stock is in the critical zone (DFO, 2017) and a rebuilding plan is being developed to ensure the regrowth of the stock. The need for more research is required to assist in the rebuilding plan and ensure all eco-system aspects are understood to give the stock biomass a chance to rebuild. This is clearly a gap in the environmental assessment data provided by Northern Pulp.

Issue 7: White Hake "This species was determined to have a high probability of being caught during DFO
research vessel trawl surveys in the eastern section of the Northumberland Strait, including the LAA (Rondeau et al. 2016)" (Pg. 381)

It is also noted on the same page, "The main reason for the decline of this species was overfishing in the late 1980s and early 1990s (COSEWIC 2013)."

This species may not currently be listed under SARA, but the DFO is currently undergoing consultation with the public regarding listing the Southern Gulf of St. Lawrence population under SARA as

endangered (Figure 8). Comment period ends on May 6th for this consultation. There is ample concern that is this species is listed and is known to be caught in the LAA what are the next steps?

White Hake stick to temperatures of 4°C to 10°C. The population normally migrates inshore in summer, and then to deeper waters during winter (DFO 2019).

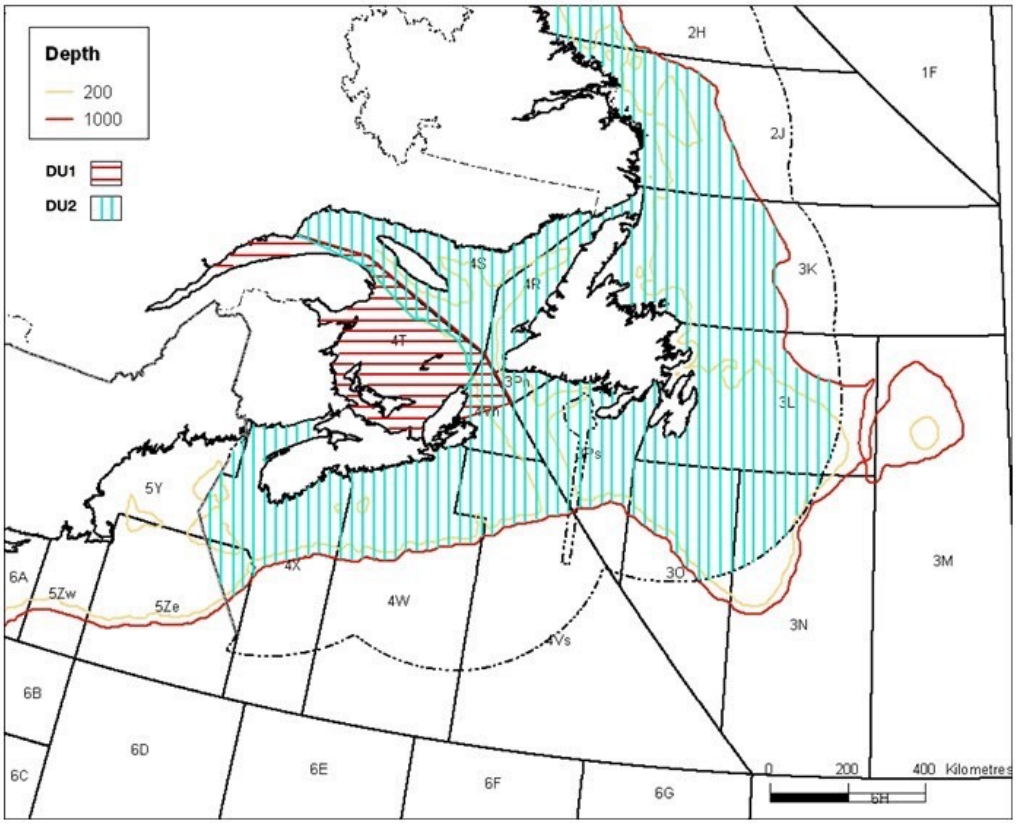

Figure 8: Differentiation between the two designated stocks of white hake, red horizontal lines show distribution of the Southern population (DFO. 2019)

Recommendation 7: The moment there is a SARA listed species in question in an environmental assessment it is supposed to trigger a federal assessment. The recommendation in this case is that Northern Pulp respect this process and request a federal assessment due to the fact that the federal government is currently seeking consultation on listing white hake as endangered under SARA. There is an enormous amount of time and energy spent on trying to rebuild stocks such as this one. Although Northern Pulp consultants laid the blame on the fisheries for the decline the truth is it was only a portion of the problem and fishing effort has nothing to do with the rebuilding struggles as DFO explains here:

"The main threat to White Hake in the sGSL is from an increase in natural mortality. Predation by Grey Seals is considered to be a major cause of this natural mortality. Over the past 3 generations (27 years), adult abundance declined by 91%. Levels of fishing removals that were sustainable in the 1970s and early 1980s became unsustainable when non-fishing

mortality increased in the late 1980s. No directed fishing for White Hake has been allowed in the sGSL since 1995."

This species is naturally struggling to rebuild and no work was done to determine how the effluent will affect the already stressed species.

Issue 8: Atlantic Sturgeon – "Table 8.12-6: Marine Fish Species at Risk and Species of Conservation Concern with Potential to Occur in the LAA." This table lists American eel, American plaice, Atlantic bluefin tuna, Atlantic cod, Atlantic salmon, Lumpfish, Porbeagle, Spiny dogfish, Striped bass, and White hake but it does NOT list Atlantic Sturgeon.

There are 2 species of Atlantic Sturgeon in Canada and both are listed as threatened by COSEWIC. There was an Atlantic Sturgeon caught off Pictou Island in 2018 as bycatch (personal communication, fall 2018). It was returned healthy and swimming to the ocean.

Recommendation 8: This is another instance of a lack of comprehensive research done by Northern Pulp on a very lucrative and productive marine eco-system. More research required.

Issue 9: Potential Environmental Effect "Routine effluent discharge from the effluent outfall diffuser will cause a project-related change in water quality. The treated effluent will contain the following water quality parameters of concern: absorbable organic halides (AOX), total nitrogen (TN), total phosphorus (TP), colour, biochemical oxygen demand (BOD), total suspended solids (TSS), dissolved oxygen (DO), pH, and water temperature. Potential effects could result from:

- an increase in temperature, nutrients (nitrogen and phosphorus), and/or TSS;
- a change in colour, chemical and BOD, DO, and/or pH; and/or
- a reduction in salinity from the discharge of relatively freshwater effluent into the Northumberland Strait.

The discharge of effluent containing elevated levels of TSS could also cause a change in sediment quality near the diffuser due to settlement of suspended sediment," (Pg. 347)

This paragraph amplifies industry concern. As mentioned above, with the few species discussed, a change to any of these parameters can have detrimental effects on the fishery and this paragraph states in black and white that potential effects could result from any of them.

Increased TSS coincides with a change to the habitat and possible suffocation of benthic species.

Recommendation 9: Time should have been dedicated to understanding each species upper and lower limits for their environment as well as upper and lower limits for toxins specific to Pulp and Paper Effluent. The Pulp and Paper Effluent Regulations only monitor a few levels and are not stringent enough. This is based on the fact that Environment and Climate Change Canada are currently reviewing the regulations to make them more stringent and include other contaminants. A review and research should be done to understand how changing water quality coupled with toxins could affect each species inhabiting the area.

Issue 10: "Modelling results indicate that there are few traces of relatively high diluted effluent after a period of 30 days" (Pg. 350)

This is part of the accumulation the industry is concerned with. This plant is not going to run for 30 days and then stop this pipe will dump effluent into the Northumberland Strait 24 hours a day, 7 days a week potentially for years to come. Those few traces will add up overtime, remaining in the Northumberland Strait.

It is also key to remember that a model is a prediction, it is not exact. A scientific model is defined by Encyclopedia Britannica as: "the generation of a physical, conceptual, or mathematical representation of a real phenomenon that is difficult to observe directly. Scientific models are used to explain and predict the behaviour of real objects or systems and are used in a variety of scientific disciplines, ranging
from physics and chemistry to ecology and the Earth sciences. Although modeling is a central component of modern science, scientific models at best are approximations of the objects and systems that they represent—they are not exact replicas."

Recommendation 10: The industry is interested in a better understanding of the long-term effects of the effluent. As stated in the early pages of this report fishing has existed for hundreds of years and with healthy oceans the stocks will continue for hundreds more. More work should have been done to look at the effluent remaining in the Northumberland Strait for the long term. This would also take into account the changing climate (increasing temperature, salinity and decreasing oxygen saturation).

Issue 11: "A significant adverse residual environmental effect on marine fish and fish habitat is one where project related activities:

- Cause a significant decline in abundance or change in distribution of a marine fish population within the Northumberland Strait such that natural recruitment may not re-establish the population to its original level within one generation"

"No field work was conducted as part of this EA registration" (Pg. 358)

One generation means very different timelines for each species. This could be 2 years for a species like mackerel, 5-7 years for a species like lobster or 12 years for an Atlantic Bluefin tuna. In any case too much damage could be done to a population during that timeline to be acceptable to the industry. If there is damage to larval lobster and it is not understood or mitigated until it reaches size at maturity there will be 5-7 year classes following that initial one that will also be negatively impacted.

Recommendation 11: Again, this is a gap in the data. More research should have been done to better understand each species with a mitigation plan in place for each with a timeline based on their generation timelines.

Issue 12: "Figure 8.12-5 presents scallop catch weights from 2010-2014 in the Northumberland Strait where there is an overlap of the route of the pipeline and at the outfall location. Since 2014, a Scallop Buffer Zone in Scallop Fishing Area (SFA) 24, discussed further in Section 8.12.2.7, prevents scallop fishing in this area, except potentially at the location of the outfall" (Pg. 366).

The above paragraph is basically the only mention of sea scallops in Northern Pulp's environmental assessment. They are a species fished directly in and around the LAA, but only get the same attention as species apparently not fished in the area (according to Northern Pulp's consultants). Sea scallops will normally grow when they are between 8°C and 18°C, ideal temperature for growth is 13.5°C. Ideal salinity is between 30 to 32 ppt but they can tolerate salinities as low as 25 ppt. Sea scallops, although a bivalve are still an animal and are prone to being stressed in environments outside of their normal ranges, in this case they get stressed between 20°C and 23°C and mortality will occur at temperatures of 23.5°C and greater. The Southern Gulf of St. Lawrence has experience mass die offs in the past. (DFO, 2011)

Temperatures will not reach background levels until 100 m from the outfall site and the proposed effluent release will be 26°C in the winter and 37°C in the summer. This is much higher then mortality causing temperatures for the sea scallop.

Figure 9 shows locations of fishing effort in 2009. Although this effort is outdated fishing takes place on scallop beds so the concentrated effort would still be around the same areas as seen in 2009. The purpose of this map is to point out that a large portion of the fishery takes place in the vicinity of the proposed outfall location and therefore there are numerous sea scallop beds in the location susceptible to increased water temperatures.

For more information on collaborative research between the fishing organizations, the DFO and academia please see Appendix A.

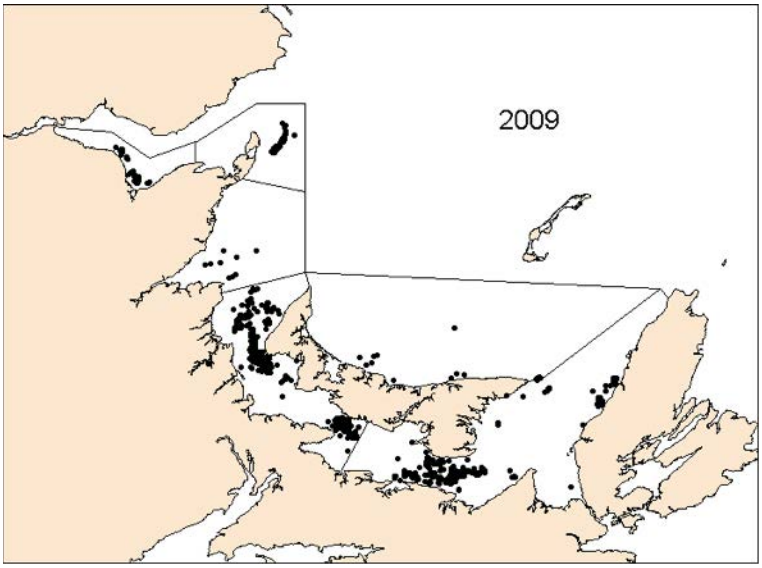

Figure 9:Map of fishing effort positions reported in the 2009 fish harvesters' logbook (DFO. 2011)

Recommendation 12: The information provided proves the susceptibility of sea scallops to temperature and that they inhabit the area near the proposed outfall location. This justifies the completion of detailed field work and trials in the area prior to the release of the proposed effluent to ensure there will be no negative effects on the sea scallops.

Issue 13: "NO field work was conducted as part of this EA registration for marine mammals, sea turtles and marine birds. In particular, this section relies substantially on the EIA registration for the PEI-NB Cable interconnection upgrade project" Pg. 395

Recommendation 13: A project of this magnitude warrants sufficient field work to be completed. The fact that there was NO field work adds to the gap in knowledge on this topic. Further studies should be carried out to confirm frequency of marine mammals in the area.

Issue 14: "NARW are not known to occur in the vicinity of the LAA and no historical observations of this SAR have been recorded in the Northumberland Strait, according to data obtained from DFO (2017) and OBIS (2018)." Pg. 400

"As noted in Sec?on 8.13.2.1, several North Atlan?c right whales were killed by vessel collisions and fishing gear entanglement in the Gulf of St. Lawrence (outside of the Northumberland Strait) during the

summer of 2017. However, this SAR is not known to occur in the Northumberland Strait and is therefore unlikely to be at increased risk of injury or mortality from vessel strikes or entanglement from the project." Pg. 420

Recommendation 14: If all documentation is reviewed it is clear that NARW have been reported in the Northumberland Strait in the past, most recently in 2015 when a female and her calf were spotted in St. George's Bay (Fig. 6).

There are currently strict management measures in place to prevent interactions between fishing and North Atlantic Right Whales. These management measures include flexibility outside of the designated dynamic zones. The management measures outside of the dynamic zone are on a case by case basis. A sighting of one whale may be handled different than a sighting of 3 whales together and different again for a sighting of a mom and calf.

Considering there is at least one reported sighting in the Northumberland Strait, it should be noted that there is an increased risk of injury or mortality from vessel strikes or entanglement from the project.

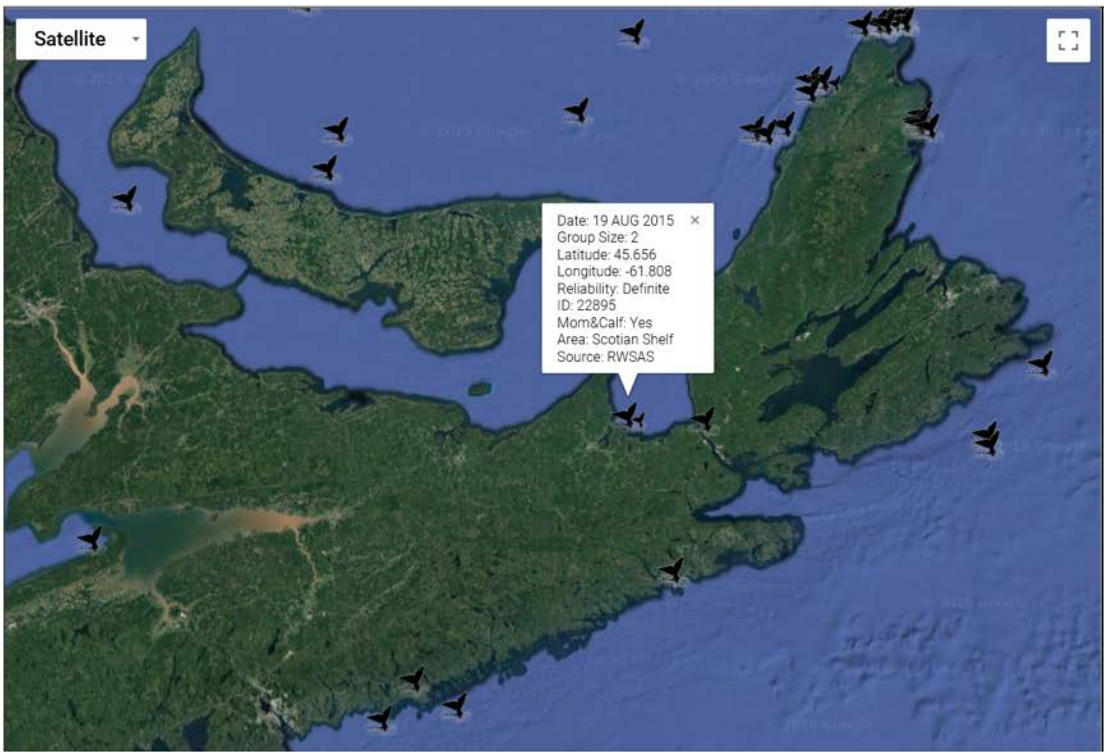

Figure 10: Sighting of North Atlantic Right Whale in the Northumberland Strait in 2015 along with calf (https://www.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html)

Issue 15: "A significant adverse residual environmental effect on the socio-economic environment is one where project-related activities directly interfere with the use of the land or water such that their intended use is no longer possible" (Pg. 431)

This is significance defined by Northern Pulp and/or it's consultants. The lobster fishing season lasts 2 months, a total of 61 days (minus Sundays as they do not fish on Sunday). This

leave a little over 50 fishing days. A loss of 5 or more of these fishing days is significant to the harvesters. This loss could be due to construction interference, negatively affected water quality driving the species off fishing grounds or sound from marine blasting driving the species away.

Recommendation 15: The definition of significant needs to be changed in this case (and others). What is defined as significant to Northern Pulp and/or their consultants is not an agreed level of significance to the harvesters in the area. If Norther Pulp would have completed proper consultation through this process the harvesters could have explained this.

Issue 16: "NPNS has attempted to engage commercial and PLFN fish harvesters to obtain fisheries data in the area of the marine outfall, but there was little interest from the fish harvesters to partcipate or provide any data (see Sec**?**on 6 Public, Regulatory and Indigenous Engagement)." (Pg. 366)

This comment is concerning to the Harvester working group because they did engage in discussion surrounding fishing grounds. It was made clear to Northern Pulp that if there was water there was fishing. Harvesters do maintain their tradition grounds, but they consistently explore other areas outside of their traditional areas. As biomasses evolve so do the traditional grounds they are found on. Lobster stocks are currently on the rise, so they are being found in areas they not have been found previously.

Recommendation 16: Each species cannot be pinpointed to specific locations within the Northumberland Strait. Again, they do have traditional habitat and areas they are commonly found, but individuals are not restricted to these areas only. The capability of each species to move throughout the Northumberland Strait must be considered and accounted for.

Issue 17: "While the majority of the commercial fishery for rock crab occurs in the central and western portions of the Northumberland Strait, there are areas in the eastern portion where rock crab is harvested, including Caribou Harbour where there is overlap with the proposed marine route of the effluent pipeline (Figure 8.12-3)." (Pg. 366)

Rock crab is another species of extreme importance in the Northumberland Strait, both for its commercial value, and it's position in the food chain. According to the DFO 2013 CSAS on *Homarus americanus* (American Lobster) which represents the most recent full CSAS, "Lobster is largely carnivorous and decapods were the principal prey (57% to 84% of prey biomass), with rock crab being the single most important component of the diet (45% to 78%). About 70% of the rock crab consumed by lobster represented fresh prey (muscle or gills attached) and the remainder consisted of old carapaces."

A decline in the rock crab biomass could also be detrimental to the lobster biomass

Recommendation 17: On numerous occasions in discussions with Northern Pulp the harvester working group recommended understanding the Northumberland Strait as an eco-system not on an individual species by species bases. This has not been accomplished in the environmental assessment submitted by Dillon Consulting on behalf of Northern Pulp.

Issue 18: "Lobster is caught throughout the central and eastern portions of the Northumberland Strait and there is overlap with the proposed route of the effluent pipeline and the location of the marine outfall (Figure 8.12-4)." (Pg. 366)

The Gulf of St. Lawrence (GSL) American lobster is the most valuable in the region, with 33,000 mt of lobster worth $445 million landed in 2016 (DFO 2016), and abundance indices still increasing

throughout the Gulf (DFO 2016, DFO 2016, DFO 2016, DFO 2016). The value of American lobster is never mentioned throughout the environmental assessment submission. The fact that the biomass is increasing is mentioned, but the reasons for the increase are not mentioned. The harvesters in the Gulf region have been working for years toward voluntary management changes to help increase the biomass. These include but are not limited to increased carapace size, returning window females (all females within a certain size range) back to the water, escape mechanisms, returning berried females, etc. Below you will see a comparison between 2012 management measures (figure 11) and 2018 management measure (figure 12) to demonstrate the efforts harvesters make to ensure a sustainable fishery.

Table 1. Key management measures in the lobster fishery in the southern Gulf of St. Lawrence that were in effect in 2012.

	Lobster Fishing Area (LFA) and subarea										
	23				24	25	26A			26B	
	23A	23B	23C	23D			26A1	26A2	26A3	North	South
Fishing season	May 1 to June 30				May 1 to June 30	Aug. 13 to Oct. 14	May 1 to June 30[1]			May 2 to June 30	May 1 to June 30
Number of licences											
Category A Category B	636 33				635 1	708 6	703 5			223 3	
Number of traps per licence	300				300	250 (PEI 240)	280 (PEI 273)	275	250	250	
Number of traps per line	na	na	3 (portion)		na	na	6 (part of PEI) 5 Gulf NS	6	2	5	na
Maximum size entrance (mm diameter)	152				na	152	na	152	na	152	na
Minimum legal carapace size (mm)	75	75	72	71	71	71	71	73	76	81	79
Female size restriction (mm)[2]	115-129				115-129	>= 114	115-129			na	

[1] Fishing season for the portion of LFA26A from Point Prim to Victoria was May 7 to July 8, 2012
[2] Female size restriction refers to size of females which must be released, in addition to the minimum legal size and the restriction on berried females

Figure 11: table take from the lobster stock assessment in 2013 reviewing the 2012 management measures (DFO 2013)

Major Lobster Management Measures in 2018
Mesures majeures de gestion en 2018

Lobster Fishing Area	Minimum carapace (mm)	Window /maximum size females	Maximum number of traps	Minimum number of traps per line*	Maximum hoop size (mm)	Escape mechanism / Mécanisme d'échappement	
						Length between 127 mm and less than 254 mm	Length equal to or greater than 254 mm
Zone de pêche de homard	Taille minimale de carapace (mm)	Fenêtre / taille maximale femelle (mm)	Nombre maximal de casiers	Nombre minimal de casiers par ligne	Taille maximale du cerceau	Longueur entre 127 mm et moins de 254 mm	Longueur de 254 mm et plus
23A	**77**	115-129	300	s/o / n/a	152	44 mm	43 mm
23B	**77**	115-129	300	s/o / n/a	152		
23C	**77**	115-129	300	Portion de/of 23C 3 casiers / 3 traps	152		
23D	**77**	115-129	300	Portion de/of 23D 3 casiers / 3 traps	152		
24[1]	**73**	**115**	300	**6 traps per line**	s/o n/a	42 mm	41 mm
25	**77**	115	240- PEI / Î.-P.-E. 250- NB / N.-B. 225- NS / N.É.	s/o / n/a	152	44 mm	43 mm
26A-1	**73** 74 (2020)	115-129	280 GN.-É. 272 Î.-P.-E.	Portion de/of 26A1 (GNS/GN.-É.) : 5 casiers / 5 traps Portion de/of 26A1 (PEI/Î.-P.-É.) : 6 casiers / 6 traps	s/o / n/a	42 mm	41 mm
26A-2	76	115-129	255 & 275	6 casiers / 6 traps	152	43 mm	42 mm
26A-3	76	115-129	250	2 casiers / 2 traps	s/o / n/a		
26B south/sud	**81.7** 82.5 (2019)	s/o n/a	250	s/o / n/a	s/o / n/a	44 mm	44 mm
26B north/nord	82.5	s/o n/a	250	5 casiers / 5 traps	152		

Figure 12: table of the 2018 management measures presented by DFO at the Southern Gulf Advisory meeting in Moncton in December 2018.

There is a high exploitation rate in the lobster fishery leaving the fishery dependent on strong larval recruits (DFO 2013). This is the reason the harvesters protect egg bearing females and it is also partially the reason for increasing the carapace size in some regions, larger females result in more eggs in the water and the guarantee every female will spawn at least once (rather than 50%) prior to being harvested.

It should also be noted that conditions like water temperature can impact the distribution of lobster and and their catches (DFO 2013). This is extremely important to the fishers in the area of the outfall considering the temperature being released will be well above the average for the given time of year (27 degrees Celsius in the winter and 36 degrees Celsius in the summer).

Recommendation 18: In Appendix R of Northern Pulp's environmental assessment it is recommended that more research be completed on the effect of the effluent on lobster in each life stage, although this was omitted from the executive summary written for the environmental assessment. Considering the effort harvesters contribute to understanding the eco-system they rely on and the changes the harvesters are implementing, voluntarily, to ensure they maintain a sustainable fishery in the future the same efforts should be made by Northern Pulp to ensure a sustainable fishery. At this point there has been no field trials, no lab test; absolutely zero work completed by Northern Pulp to prove to harvesters that they

will not be jeopardizing all the hard work going in to protect their lobster fishery. Considering lobster in the Gulf were worth $445 million in 2016, this warrants real science to be completed, not just literature searches based on 40 year old research.

Issue 19: "Scallop Buffer Zones SFA 22 and 24 are part of a system of Scallop Buffer Zones in SFA 21, 22, and 24 that covers a total area of 5,835 km^2 (DFO 2017). Scallop Buffer Zones were established to protect juvenile American lobster as they are known to contain lobster nursery habitat (DFO 2017). Scallop Buffer Zone SFA 22 is in the western Northumberland Strait, approximately 85 km to the west of the marine PFA. Scallop Buffer Zone SFA 24 is in the eastern Northumberland Strait and the effluent pipeline will cross through the Scallop Buffer Zone SFA 24 close to shore (Figure 8.12-10) in Caribou Harbour near Jessies Cove. The location of the outfall is outside this buffer zone" (page 384).

Figure 13 was shared in section 8.12.2.7 of the NPNS's environmental assessment. This image is inaccurate. According to Variation Order GVO-2017-087 (DFO 2017), "A one (1) nautical mile buffer zone will be closed until further notice from the nearest point of land in the counties of Cumberland, Colchester, Pictou and Antigonish and one (1) nautical mile from the nearest point of land around Pictou Island, situated in the Northumberland Strait." The outfall location would be within the scallop buffer zone is the zone was shown in his entirety. These scallop buffer zones are considered marine refuges by DFO and count toward the Marine Protected Area goal of 10% protection of coastal waters in Canada by 2020.

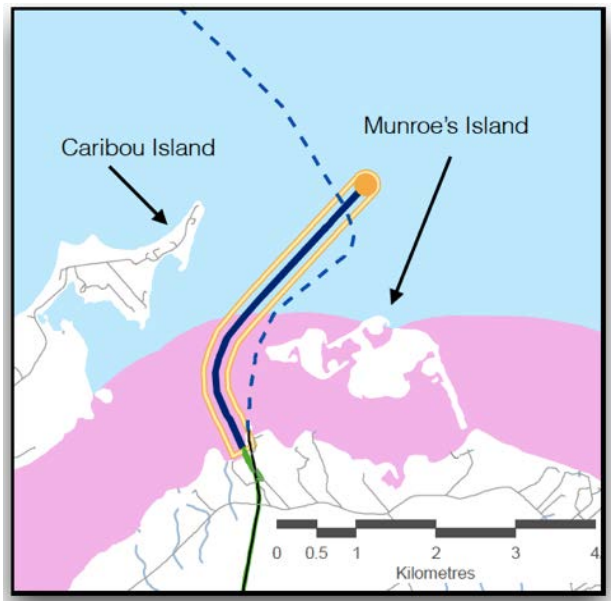

Figure 13: Outfall location and scallop buffer zone as shown, inaccurately, by Northern pulp in the Environmental Assessment

Recommendation 19: Ideally there would be no change or alteration to the scallop buffer zone. It is in place to protect juvenile lobster habitat and that protection zone should be honored.

Sincerely

Prince Edward Island Fishermen's Association, President

Maritime Fishermen's Union, President

Gulf Nova Scotia Fleet Planning Board, President

Andrea Paul
Pictou Landing First Nation, Chief

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APPENDIX A. Ongoing Research Efforts by Industry

This section is designed to show the effort being made by the industry associations to improve the health of the oceans and eco-systems. It is not enough to maintain the current status of the ocean. The majority of current harvesters come from a long line of harvesters and the outlook for the future of the industry remains the same. Soon, the children of current harvesters will take over gear with visions of their own children doing the same.

It is not enough to consider the effects of the effluent on the ocean environment in one month or one year. Fishing has been going on for hundreds of years and should continue for 100 more. To ensure this is possible industry groups now work directly with the Department of Fisheries and Oceans (DFO) to come up with new management plans, help DFO collected required data for stock assessments and various research and help develop rebuilding plans for stocks. Below are a few of the projects industry works on with DFO to improve the health of our oceans:

Halibut Longline survey – Collaborative research with DFO. Collected data from this study feeds the Atlantic Halibut Stock Assessment.

Scallop survey – Collaborative research with DFO. This project is being completed to gain insight into changes seen in the scallops physiology.

Lobster/crab study – Rock crab is an integral part of the lobster's diet, unfortunately we don't know enough about the current rock crab biomass to ensure there will continue to be enough food for the lobster as their population grows. The project titled: "Effects of exploitation patterns and fluctuations in lobster (*Homarus americanus*) and rock crab (*Cancer irroratus*) abundances on lobster diet and condition in the Gulf of St. Lawrence; is the predator-prey interaction at risk?"; has been drafted and we are currently exploring funding opportunities to move forward. The project, if we are successful with funding, will be a collaboration between the Prince Edward Island Fishermen's Association, DFO and the Province of PEI.

Bio-collectors – This is a study that has been ongoing in the Gulf region for 10 years now and is a collaboration between the Prince Edward Island Fishermen's Association, DFO and the Province of PEI. This project gives us a look at the number of lobster settling in sites around Prince Edward Island at stage 4 to gather information on trends of higher or lower settlement annually. The hope of this project is to find a correlation between lobster settlement and lobster landings in the future. The collectors also provide an opportunity to collect data on some other species as well, including rock crab, mud crab, cunner and other fish species.

Lobster Node – This is an industry lead, pan-Atlantic group bringing DFO, industry and acedemia together to try to answer questions from the industry, specifically on lobster.

Bait Alternatives – foraging fish are normally used as bait in the lobster industry. These stocks are declining and fishers are, pre-emptively, looking for other sources of bait while they sit on working groups to come up with a plan to rebuild the stocks.

Temperature Probes in the Northumberland Strait – This is at the request of harvesters who are seeing bottom water temperature changes in the Northumberland Strait and they are curious if certain species will vacate the vicinity due to unsuitable habitat. This will be monitoring 10 locations in the Northumberland Strait for 6 months a year.

Acoustic Herring and variable mesh nets – Collaborative with DFO. This has been ongoing for many years to better understand the biomass of herring. The data is used to feed the stock assessment.

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s EA proposal
Date: March 9, 2019 11:55:19 AM
Attachments: Response to NP ETF proposal0001.pdf

Please see my attached written comments in response to Northern Pulp's proposal for a new effluent treatment facility. My comments consist of a letter (9 pages) and attachments (16 pages).

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Dear Sir or Madam:

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

I am writing to comment on Northern Pulp's proposed Replacement Effluent Treatment Facility Project.

I am a life long resident of Pictou County and have many ties to the Northumberland Strait. For over 40 years, my family has owned a cottage along the Northumberland Strait. I have spent each summer walking the beaches and swimming the waters. I have worked in Pictou as a lawyer for over 25 years and am a volunteer member of several boards and organizations in the area, including the Northumberland Fisheries Museum and Heritage Association, which is dedicated both to the preservation of fishing history and the celebration of the fishing culture. I am married to a commercial fisherman who fishes the waters of the strait, like many generations of his family who came before him. Involvement in the commercial fishery is a family commitment that is shared by our children and shapes our lives on a day to day basis. Like so many people in Pictou County and beyond, the Northumberland Strait is beloved by me and my family and is the cornerstone of our economic prosperity, social enjoyment and mental well being. The risk that Northern Pulp's proposed Effluent Treatment Facility Project poses to the Northumberland Strait and all who rely on it is simply too great for the Minister to grant approval.

Regulation 12 of the Nova Scotia *Environment Act* sets out the factors the Minister must consider when making her decision:

> 12 All of the following information shall be considered by the Minister in formulating a decision under subsection 34(1) of the Act:
>
> (a) the location of the proposed undertaking and the nature and sensitivity of the surrounding area;

(b) the size, scope and complexity of the proposed undertaking;

(c) concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking;

(d) steps taken by the proponent to address environmental concerns expressed by the public and aboriginal people;

(da) whether environmental baseline information submitted under subclause 9(1A)(b)(x) for the undertaking is sufficient for predicting adverse effects or environmental effects related to the undertaking;

(e) potential and known adverse effects or environmental effects of the proposed undertaking, including identifying any effects on species at risk, species of conservation concern and their habitats;

(f) project schedules where applicable;

(g) planned or existing land use in the area of the undertaking;

(h) other undertakings in the area;

(ha) whether compliance with licences, certificates, permits, approvals or other documents of authorization required by law will mitigate the environmental effects;

(i) such other information as the Minister may require.

Regulation 13(1)(e) made pursuant to the *Environment Act* states that one of the decisions of the Minister upon registration of a Class 1 undertaking may be as follows:

> "that a review of the information indicates that there is a likelihood that the undertaking will cause adverse effects or significant environmental effects which are unacceptable and the undertaking is rejected."

Section 34 (1) of the Nova Scotia *Environment Act* states that the Minister shall make one of six listed determinations upon the registration and review of an undertaking. I submit that, based on the factors listed in Regulation 12 set out above, it is appropriate that the Minister reject the undertaking as per section 34(1)(f) "because of the likelihood that it will cause adverse effects or environmental effects that cannot be mitigated."

ERRORS, MISREPRESENTATIONS, CONCERNS

In my review of Northern Pulp's proposed Replacement Effluent Treatment Facility (ETF) Project, I identified many errors, misrepresentations, and concerns. These are as follows:

1. Definitions: Commencing at Page xxiii, there are a number of words that are defined for the purposes of the proposal. Not all of the definitions used are the same as the definitions of the same terms used in relevant legislation, including the following definitions (emphasis are mine):

(a) **Contaminant** is defined in the *Environment Act* as: "contaminant" means, unless otherwise defined in the regulations, a substance that causes or may cause an adverse effect;

Contaminant is defined in the ETF proposal as: "A biological, chemical, physical or radiological substance that becomes harmful for humans or living organisms, when accidentally or deliberately introduced to air, water, soil or food."

(b) **Deleterious** substance is defined in the *Fisheries Act* as: deleterious substance means

> (a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or
> (b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water,
> and without limiting the generality of the foregoing includes
> (c) any substance or class of substances prescribed pursuant to paragraph (2)(a),
> (d) any water that contains any substance or class of substances in a quantity or concentration that is equal to or in excess of a quantity or concentration prescribed in respect of that substance or class of substances pursuant to paragraph (2)(b), and
> (e) any water that has been subjected to a treatment, process or change prescribed pursuant to paragraph (2)(c); (substance nocive)"

Deleterious substance is defined in the ETF proposal as: "A substance that is dangerous and harmful."

(c) **Mitigate** is defined in the *Environment Act Regulations* as: "mitigate" means, with respect to an undertaking, to eliminate, reduce, or control the adverse effects or the significant environmental effects of an undertaking, and may include restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means;

Mitigation is defined in the ETF proposal as: "With respect to a project, refers to the elimination, reduction or control of the adverse environmental effects of the project and includes restitution for any damage to the environment caused by such effects through

replacement, restoration, compensation or any other means."

(d) **Significant** is defined in the *Environment Act Regulations* as: "significant" means, with respect to an environmental effect, an adverse effect that occurs or could occur as a result of any of the following:

(i) the magnitude of the effect,
(ii) the geographic extent of the effect,
(iii) the duration of the effect,
(iv) the frequency of the effect,
(v) the degree of reversibility of the effect,
(vi) the possibility of occurrence of the effect;

Significance is defined in the ETF proposal as: "A defined threshold of acceptability. The significance of adverse environmental effects is determined by a combination of scientific data, regulated thresholds, standards, social values and professional judgment. For example, the ecological context of a project may be determinant of whether likely adverse effects are significant."

It is noted that the term "**adverse effect**" is not defined in the ETF proposal. It is defined in the *Environment Act* as " an effect that impairs or damages the environment or changes the environment in a manner that negatively affects aspects of human health".

Also noteworthy is the definition of the term "**reach**" in the ETF proposal. It is defined as, "In the context of this project, a reach is a section of watercourse of defined length (usually 100 m) in which fish and fish habitat surveys are completed, and water quality measurements are taken." The term "reach" is not defined in the *Environment Act*, regulations or other applicable legislation.

Because the ETF proposal uses definitions which are different than those set out in the relevant legislation, when the proposal reaches a conclusion or makes a statement, the standards for that conclusion or statement may not be what is set out in the legislation. The conclusion or statement may satisfy the definition the ETF chooses to apply, but it may not satisfy the standard set out in the actual legislation.

Also of concern is the definition of "**change in water quality**" found on page 346 of the ETF proposal, which states, "For the purposes of this assessment, a change in water quality refers to any alteration to pH, dissolved oxygen (DO), temperature, total suspended solids (TSS) or contaminants in the water column." The definition does not include such things as AOX, BOD, COD or colour.

The definition of "**change in marine fish population**" set out in the proposal is also of concern. On page 384, a change in marine fish population is said to "include any physical injury or mortality on fish attributable to the project, and any destruction or alteration of habitat from disturbance of the marine environment." It is not clear whether this definition includes such things as bio-accumulation and any other effect or change to fish.

2. The ETF proposal states that the temperature of the treated effluent will reach ambient termperatures within 2 meters of the diffuser and therefore will comply with CCME Guidelines for temperature . This is a misrepresentation of the CCME Guidelines (Canadian Water Quality Guidelines for the Protection of Aquatic Life - see attached), which state, "Human activities should not cause changes in ambient temperature of marine and estuarine waters to exceed +/- 1degree Celsius at any time, location, or depth."

3. On page 123 of the proposal, it is stated that, "Dioxins and furans in NPNS's effluent have virtually been eliminated since the conversion to chlorine dioxide bleaching in 1998. NPNS has never exceeded the limits as per the Pulp and Page Mill Effluent Chlorinated Dioxins and Furans Regulations. In fact, dioxins and furans testing for the last 5 years has consistently shown that all of the compounds required to be tested under the regulations have not been detected in NPNS' effluent (non-dedect)." This statement runs contrary to the test results of samples taken June 11, 2014 from NPNS' effluent leak. The test results are published on NSE's website and attached hereto. The test results appear to reveal that there were exceedences of dioxins and furans beyond what is permitted under the Pulp and Paper Effluent Regulations.

4. On page 433 of the proposal, the physical land use in the vicinity of the land-based portion of the effluent pipeline route is set out. There are a number of land uses missing from this list, including single family homes and cottages in the area between the causeway and Division Road, and near the ferry wharf. Also in the vicinity of the ferry wharf and missing from the list are the Caribou fishing wharf, the fishing wharf at North Nova Seafoods, the North Nova Seafoods fish plant, and the Pictou Island ferry. At the fishing wharves, the uses extend beyond the tying up of fishing vessels. At the wharves is where fish buyers set up their buying stations for various fisheries and store bait and catches. It is where fishers work on their vessels and gear. Fishers use water from the Northumberland Strait to wash down their vessels and hydrate and store their catches. The wharves are used by recreational boaters, barges and tugs and those seeking shelter from storms or rough seas. The proposal puts all of these uses at risk.

The ferry service between Caribou, Nova Scotia, and Wood Islands, Prince Edward Island, is a vital link between the two provinces. Any infrastructure or impediment to the use or expansion of the ferry wharf at Caribou should not be permitted. The proposal does not set out details as to the specific location of the proposed effluent pipe. Insufficient details are provided to determine whether the proposed pipe will impact the ferry service now or in the future. The attached article from CBC dated May 5, 2017 confirms that changes to the ferry service are being contemplated.

5. The proposal claims that "operation of the outfall will not interact with use of community beaches in the surrounding area." (see page 440). This statement appears to contradict the results of the Stantec Final Caribou Discharge Receiving Water Study found in Appendix E1 which shows effluent concentrations washed ashore in various areas. For example, Figures 2.7 and 2.9 shows effluent on the beach at Munro's Island which is a popular provincial park. Figure 2.11 shows effluent on a beach at Caribou Island which is enjoyed by many locals, cottagers and tourists. I suggest that the presence of effluent in any form on any beach or shoreline will interact

with the use of community beaches.

6. On page 505 of the proposal, it is stated that "Stantec (2019) also reported that ambient air monitoring data for 2015, 2016 and 2017 showed no exceedances of the applicable Nova Scotia regulatory AQC for the air contaminants monitored under the NPNS approval to operate." This does not appear to be a true statement. Attached is Source Emission Test Results for Winter 2015 and Summer 2015. Both tests were conducted by Stantec and the results were found on NSE's website. The test results show exceedances for both the recovery boiler and the power boiler as outlined in the company's industrial approval.

7. The proposal claims that "the loss of vegetation and associated bird habitat within the pipeline footprint area along the road shoulder (if it occurs) will be consistent with existing road maintenance activities along Highway 106 and thus, will not result in any additional loss of bird habitat." (see page 561). This statement fails to consider the habitat of the double breasted and great cormorant which are located along the Harvey A. Veniot Causeway. Their habitat will be destroyed with the construction of the pipeline, and will not likely recover.

8. The proponent's public consultation was not adequate. I attended the open houses in New Glasgow and Pictou Landing which were both held prior to the new route of the pipe to Caribou Harbour being announced. The open houses were conducted on the basis of the pipe going into Pictou Harbour. No open houses were conducted following the announcement of the new route to Caribou, even though Dillon Consulting Limited promised me in two letters that they would hold additional open houses. Dillon also promised me in the same correspondence that they would release studies to the public as they became available. Very few studies were released to the public prior to the registration of the proposal. The correspondence from Dillon are included with Ecojustice's submission to the proposal on behalf of Friends of the Northumberland Strait.

The open houses were crowded, loud, and not conducive to conversation, asking questions or obtaining information. They did not allow for meaningful discussion and it was difficult to engage the proponents. They did not have any means of taking notes of my concerns for future reference, consideration or documenting purposes.

The information provided at the open houses, in a subsequent mail out and advertisements represented that the project would include an oxygen delignification system which would improve the quality of the effluent. This system does not appear to be included in the proposal. There was no consultation by the proponent with the public following the announcement of the new route or the elimination of the oxygen delignification system from the project.

9. I am concerned that the environmental assessment is proceeding on the basis of a Class 1 environmental assessment which limits the time the pubic has to respond to the proposal. The proposal is almost 1700 pages long and takes a lot of time to read, analyse and reply. Because of the short length of time provided, I submit that the pubic consultation is not meaningful or as fulsome as it could otherwise be. This raises significant public policy concerns which are exacerbated by the lack of input the public will have to the additional information and studies the proponent has stated it will file at a later date. Pubic review and input is vitally important to the EA process but the public is not being this opportunity.

Missing Information

Aside from the many studies yet to be completed, the proposal is missing several pieces of information, as follows:

(a) The proposal states that the proponent's "Toxicity Prevention and Remediation Plan" will be used. This plan was not included in the proposal, and as such, it is not possible to determine whether it is complete or effective. Any reference to this plan and its use to mitigate or address any issue should not be considered.

(b) Page 28 of the proposal refers to a brochure attached to Appendix D. No such brochure is attached.

(c) Page 349 and 351 makes reference to "occurring in a context of previous disturbance". There is no information provided as to what the previous disturbances refers to.

(d) Page 460 sets out 10 known ship wrecks in the vicinity of the marine PFA/LAA. Attached is a list of 17 ship wrecks which I found after searching the Marine Heritage Database if the Maritime Museum of the Atlantic which is the same database the proponent claimed to have used.

(e) There appears to be information missing from Table 11.1-1 (page 535) as not all VEC's set out in section 8 of the proposal are summarized.

(f) Appendix Q (Bird Data) sets out data collected for the month of December only. As such, any data from migratory birds who left the area by December is not captured.

(g) The proposal fails to disclose that the location of the new on-site ETF will be located adjacent to Canso Chemicals which is a former chemical plant that has known deposits of mercury on its property. The proposal does not address the potential interaction that the presence of mercury will have on the construction and operation of the ETF and the environment.

(h) Although the proponent appears to imply that the lack of cooperation from fishers is the reason for the deficiencies in the proposal's information relating to commercial fishery in the area, it must be noted that area fishery information is contained in the most recent Environmental Effects Monitoring Study (EEM), which is attached as Appendix J of the proposal. The Receiving Waters Study completed by Stantec (attached as Appendix E2 of the proposal) sets out less information on the area fishery than the EEM study which was prepared prior to the Receiving Water Study. Also, during the open houses I attended in both New Glasgow and Pictou Landing hosted by the proponent as part of this environmental assessment process, I personally witnessed fishers and others drawing on a map the location of the fishery and explaining in detail the location of the area fishery to the proponent. The proponent appears to have disregarded this information as it has not been included in the proposal.

(i) A provision in the sign off sheet contained in the Receiving Water Study found in Appendix E3 of the proposal limits the usefulness of the study. The provision states, "The material in it [the Receiving Water Study] reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client." Unless the contract between Stantec and KSH (the Client) is disclosed, it is not possible to understand the effect that the "scope, schedule and other limitations" imposed in the contract may have had on the results of the Receiving Water Study. As such, the Receiving Water Study ought not to be relied upon in the review of the proposal.

(j) On page 336 of the proposal, the marine local assessment area (LAA) is said to consist of a corridor approximately 300 m wide, including an area of 300 m encircling the outfall. There is no explanation as to how this area was determined or developed. It appears to be an arbitrary area with no basis for its existence.

CONCLUSION

This proposal was submitted prematurely without proper study or consideration for the environment and the adverse effects of the proposal on the Northumberland Strait. On page 12 of the proposal, the proponent admits that "due to EA Registration submission timing, the study period did not facilitate full biological field assessments for the current proposed transmission pipeline corridor", and "...it was not possible to conduct field work in the new pipeline corridor or marine environment in order to inform this EA Registration." The time constraints were created and were self imposed by the proponent. They could have chosen to complete the required studies and then file the proposal. Failure by the proponent to do so, and acceptance by the minister of this tactic if the proposal is approved, sets a very dangerous precedent for future EA registrations. It would convey the message that EA registrations do not need to be complete at the time of registration. Instead, a proponent can file an incomplete EA, receive approval, and then complete important studies. These studies would be filed without public review and input which would eliminate a vital component of an EA. This is not acceptable and is against public policy and violates procedural fairness.

I suggest that the proposal ought not to have been accepted for registration because it was not complete. Regulations 9(1A) made pursuant to the *Environment Act* states that the proponent must submit, "environmental baseline information". This was not included in the proposal.

To protect the integrity of the EA process in Nova Scotia, this proposal must be rejected. The proponent must start the process from the beginning once it has gathered the required environmental baseline information and all studies required to properly review it's proposal. The precautionary principle, set out in section 2(b)(ii) of the Environment Act, ought to be followed. It states,

> "(ii) the precautionary principle will be used in decision making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation."

The environmental effects which would occur as a result of the proposal cannot be mitigated.

The proposal suggests that fishers can be compensated and therefore mitigation will be served. Money cannot address the harm that this project will bring because there is more than monetary or commercial issues at play. Money cannot compensate for the loss of a beloved beach or shoreline. Money cannot compensate for the loss of peace and enjoyment of a day on the strait with family and friends. Money cannot compensate future generations of fishers who want to fish the pristine waters of the strait. Money cannot compensate a rural community who is dependent on the strait for its economic prosperity, social well being and mental health.

This project must be rejeted because of the likelihood that it will cause adverse effects or environmental effects that cannot be mitigated.

Yours truly,

Canadian Water Quality Guidelines for the Protection of Aquatic Life

TEMPERATURE
(Marine)

Water temperature, along with salinity, is one of the most important physical factors affecting marine and estuarine organisms. Temperature affects almost every physical property of seawater. The ionization constant, surface tension, and latent heat of vaporization decrease in a near-linear fashion as temperature is raised. The compressibility, viscosity, and specific heat of water all decrease nonlinearly with increasing temperature. Vapour pressure and thermal conductivity, the speed of sound in seawater, its electrical conductivity, and osmotic pressure, however, increase in magnitude as temperature increases. The solubility of gases, such as nitrogen, hydrogen, carbon dioxide, and oxygen, in contrast, all decrease as water temperatures rise (Cox 1965; Houston 1982).

Temperatures in the Canadian Pacific and Atlantic coastal and estuarine waters vary considerably depending on location, depth, freshwater inputs, extent of ice formation, upwellings, and currents (Dera 1992). For both coasts there is a pronounced seasonal variability in nearshore surface temperatures. Temperature measurements along the Canadian Atlantic coast have shown that winter water temperatures often range between -2 and 6°C, while summer temperatures vary between 7 and 18°C (Petrie and Jordon 1993). In the Straits of Georgia and Juan de Fuca, along the Canadian Pacific coast, winter temperatures between 5 and 8°C have been measured, while summer temperatures have been between 12 and 15°C (Thomson 1981). These general water temperature ranges are often exceeded in localized areas, such as certain fjords in British Columbia (e.g., Pendrell or Hotham Sound), where summer stratification has caused surface temperatures to exceed 20°C (Valiela 1979; Thomson 1981). Temperatures in the Arctic Ocean also exhibit geographical, seasonal, and annual variations, but fluctuations are smaller than those experienced in the Pacific or Atlantic Canadian coastal waters. In areas with drifting ice, surface waters usually remain at about -1.8°C, year-round. In the summer, ice-free areas may reach temperatures that rise several degrees above 0°C (Heimdal 1989). In northern Baffin Bay, average monthly temperatures over a 2-year period changed only marginally from a low of -1.53°C to a high of 0.19°C (Ross 1991). Ice and water transport patterns, winter air temperatures, and freshwater inputs can contribute to considerable local variability in recorded Arctic marine water temperatures (Drinkwater 1986; Prinsenberg 1986; Hopky et al. 1990).

Most of the human activities that affect the temperatures of marine and estuarine waters in Canada are associated with the release of waste heat. The major sources of these inputs include the processes of the chemical, petrochemical, and pulp and paper industries; municipal sewage; and thermal generating stations (Swiss 1984). Thermal generating stations account for over 75% of the total heat discharged into the marine environment. For example, the six thermal stations in Nova Scotia have been observed to raise the temperature of their effluent between 6.1 and 14.4°C over natural levels (Swiss 1984).

Other disturbances of aquatic temperature regimes may be related to the physical alteration of a water body. For instance, such processes as river diversions, water withdrawals from coastal areas, retaining walls in estuaries, large jetties, breakwaters, and causeways in coastal areas may significantly alter water temperatures. The construction of a tidal barrage in the upper regions of the Bay of Fundy, for example, increased the local tidal range and resulted in an overall lowering of the area's surface sea temperatures (Greenberg 1984).

Biological Effects

Summary

Temperature affects many chemical and biological processes. Chemical equilibrium constants, solubilities, and the rates of chemical reactions are temperature-dependent (Whitehouse 1984). Most marine and estuarine organisms are poikilotherms (i.e., cannot regulate their internal temperatures). As a result, biological processes, such as photosynthetic and respiration rates, spawning, uptake of toxic substances, and behavioural patterns of organisms, are all responsive to changes in temperature (Strickland 1965; Houston 1982; Aiken and Waddy 1990).

Kinne (1963) conducted a comprehensive review of the effects of water temperature on marine and brackish water animals. The results of this review indicated that biological processes may be greatly affected by water temperature fluctuations, gradients, ranges, and averages, as well as by the frequency and intensity of changes, duration of patterns, and accumulated heat units. Most marine and estuarine species, or populations within species, have characteristic tolerable temperature ranges

that include specific high and low lethal temperatures. Eurythermal species, i.e., species that can tolerate wide ranges of temperatures, are characteristic of aquatic environments with fluctuating temperatures. Stenothermal species, i.e., species that can only exist in a narrow range of temperatures, are characteristic of environments with near-constant temperatures. Gradual water temperature changes are usually better tolerated by all species than sudden changes (Kinne 1963).

Many marine and estuarine organisms can adjust to alterations in ambient water temperatures through an array of biological responses. This process, termed acclimation, can include behavioural, morphological, physiological, or biochemical responses. The length, frequency, and severity of exposure, as well as thermal history, are all-important determinants of an individual organism's response to temperature changes (Fry 1971; Hochachka and Somero 1971; Thompson and Newell 1985).

Potential effects of extremely low water temperatures on aquatic organisms include insufficient integration of nervous and metabolic processes, insufficient rates of energy liberation, changes in water and mineral balance, increase in osmoconcentration resulting from extracelluar freezing followed by the dehydration of cells, liquefaction of cortical protoplasm, and gelation of the cell interior (Kinne 1963). Many species of marine fish have body fluids with lower osmotic pressure than seawater, causing such species to freeze at temperatures above the freezing point of seawater. Most species of marine fish avoid freezing by either avoiding ice-laden seawater and/or by increasing the osmotic concentration of their blood (DeVries 1971).

The effects of extremely high temperatures include insufficient supply of oxygen, failures in process integration, desiccation (intertidal organisms), enzyme inactivation, change in lipid state, increase in protoplasmic viscosity, increase in cell membrane permeability, protein denaturation, and release of toxic substances from damaged cells. Death can result from exposure to either extremely high or extremely low water temperatures (Kinne 1963).

Water temperature changes that are not lethal can produce a wide variety of significant sublethal effects. For example, temperature changes can significantly affect photosynthesis; respiration; susceptibility to disease; osmoregulation; uptake of pollutants; susceptibility to the toxic effects of pollutants; various behavioural patterns, including physical activity, reproduction, feeding, growth, migration, distribution, intra- and inter-specific competition, predator–prey relationships, community composition, and parasite–host relationships; and many other biological processes (Kinne 1963). Selected examples of some water temperature effects in marine and estuarine ecosystems follow. Wherever possible, examples dealing with Canadian marine or estuarine systems were selected.

Specific Effects

Lüning and Freshwater (1988) studied the water temperature tolerance (-1.5–30°C) of marine algae (49 species) and seagrass (two species) near Vancouver Island. All species studied showed high levels of cold tolerance, with all surviving at 0°C and only six species dying at -1.5°C. Heat tolerance was much more variable; most subtidal species showed survival limits lower than 20°C; intertidal species survived at higher ranges of 20–28°C. Only one species, the seagrass *Zostera marina*, survived at 30°C. The authors characterized the northeast Pacific seaweeds as "cold-stenothermal", indicating a narrow range of temperature tolerance at the low end of the range of global marine temperatures.

Different organisms will exhibit different productivity levels at a given water temperature range. In Newfoundland coastal waters, Pomeroy and Deibel (1986) measured low levels of bacterial growth and respiration during the spring phytoplankton bloom, when surface temperatures were -1–2°C. It was suggested that in very cold environments, low bacterial activity (i.e., decomposition) during a period of high primary production could result in greater food availability for herbivores, thereby enhancing secondary production. Temperature-related control of bacterial activity may therefore be important in influencing production at higher trophic levels (Pomeroy and Deibel 1986; Pomeroy et al. 1991).

Water temperature plays a limiting role on the feeding and recruitment success of fish and crustacean larvae. The eggs of the walleye pollock *(Theragra chalcogramma)* in the Bering Sea generally hatch at temperatures ranging between 3 and 6°C, and the larvae feed on copepod nauplii. It was found that the larvae reared at 5.5°C were more successful at capturing copepod nauplii when the prey was at low concentrations, than the larval fish cohorts reared at 3°C. Conversely, larvae hatching at 5°C required 8% more calories than those hatching at 3°C (Paul 1983 and references therein). Paul and Nunes (1983) reported that northern pink shrimp larvae *(Pandalus borealis)* that hatched during a warm year (i.e., at 6°C) required 63% more calories to meet their metabolic requirements than larvae of the same weight that hatched in a cooler year (i.e., at 3°C). If this increased metabolic requirement were to exceed their ability to find and ingest food, the survival of that year's recruits could be compromised.

Increasing water temperature generally causes increases in the respiratory rates of aquatic animals and vascular and nonvascular plants (Kinne 1963; Dawson 1966). Beyond a given temperature, thermal stress is induced (Kinne 1963; Paul and Nunes 1983; Paul 1986; Paul et al. 1988). As respiratory rates increase, so do the organism's metabolic energy needs (feeding or photosynthesis). This relationship has important implications for the overall productivity and survival of marine and estuarine organisms that thrive in habitats with varying temperature regimes. Commercially important pacific fish species were investigated for their metabolic oxygen requirement. In the linear portion of the oxygen consumption-temperature relationship, the nonfeeding metabolic requirement increased by 11%, 7–12%, 9%, and 18% per °C for Pacific cod, Atlantic cod, saffron cod, and juvenile walleye pollock, respectively (Paul 1986; Paul et al. 1988, 1990, and references therein).

Water temperature may also affect the reproductive capacity of marine organisms. Tanasichuk and Ware (1987) found that for Pacific herring the mean sea temperature in overwintering habitats during the three months before spawning (December to March) best accounted for variations in size-specific fecundity. The range in mean monthly sea surface temperature during the three months before spawning for the five years studied was 5.6–8.1°C. This range is relatively narrow, considering that the data purposely included one year that was very strongly influenced by an El Niño episode, and that herring came from seven sites extending close to 700 km along a north–south axis (Tanasichuk and Ware 1987).

All the relationships previously described demonstrate that relatively small changes in the extent and timing of temperature phenomena in high-latitude coastal waters can significantly alter biological processes.

Temperature and Toxic Substances

In general, the sensitivity of aquatic organisms to toxic substances increases with increasing water temperature (Cairns et al. 1975). The interactions between temperature and toxicity, however, are very complex because temperature generally affects the chemistry and availability of toxic substances, the survival and function of organisms, and the responses of organisms to toxicants. In water, ammonia exists in two forms, a non-ionic species (NH_3) and an ionic species (NH_4^+). The toxicity of ammonia to aquatic organisms is largely determined by the concentration of the non-ionic species, which is partly temperature dependent. A decrease in temperature will lead to an increase in the proportion of NH_3 in water (Whitfield 1974; Miller et al. 1990).

Some criteria or guideline documents state different maximum or average toxicant concentrations allowed or recommended for different temperatures. The British Columbia ambient water quality criteria for ammonia for the protection of marine life (Nordin 1992, adopted from USEPA 1989) give maximum and average concentrations of total ammonia nitrogen that vary with water temperature.

According to Voyer and Modica (1990), insufficient data exist to permit the development of relationships between either water temperature or salinity and the toxicity of heavy metals in marine water. However, the authors also stated that evidence is available that indicates that survival, bioconcentration, and sublethal effects of pollutants on estuarine organisms are often related to ambient salinity and temperature conditions. Generally, as water temperature increases, the rate of metabolic processes increases, resulting in enhanced uptake and toxicity of metals to marine and estuarine organisms (Phillips 1976; Waldichuk 1985; McLusky et al. 1986; Voyer and Modica 1990).

Interim Guideline

Human activities should not cause changes in ambient temperature of marine and estuarine waters to exceed ±1°C at any time, location, or depth. The natural temperature cycle characteristic of the site should not be altered in amplitude or frequency by human activities. The maximum rate of any human-induced temperature change should not exceed 0.5°C per hour (CCME 1996).

Rationale

Many biological processes that occur in marine and estuarine waters are sensitive to temperature changes. The interim guideline of ±1°C for induced temperature change is recommended to ensure that adverse effects on these processes are minimized. The variability of coastal and estuarine waters is such that this temperature alteration is probably a minor proportion of the total variability to which organisms are exposed in these environments. Furthermore, the recommended rate of temperature change of 0.5°C per hour, which is adopted from the Alaskan guideline for temperature (BNA 1986; State of Alaska 1989), should reduce the impact of sudden induced temperature changes on the Canadian marine environment.

Site-specific diurnal, seasonal, and annual water temperature regimes are intended to be maintained through the recommendations of the interim temperature guideline. In recognition of this intention, a clause, adapted from the USEPA (1986) and Alaskan (BNA 1986; State of Alaska 1989) guidelines, which calls for the preservation of the amplitude and frequency of ambient temperature cycles, has been included as part of the Canadian interim temperature guideline.

It is recognized that, in implementing the recommended interim guideline for temperature, allowance may be made for the existence of mixing zones. Definitions of mixing zones are generally site-specific and consider the requirements of the jurisdiction or jurisdictions responsible for a particular activity.

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Excerpt from Publication No. 1299; ISBN 1-896997-34-1

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Northern Pulp Effluent Leak NSE test results - samples taken June 11, 2014

The following test data was taken on June 11, 2014, after an effluent leak at Northern Pulp. The wetlands were the most affected by the leak, and the evidence shows that materials likely did not reach Melmerby Beach and other points downstream from where the leak occurred **Definitions:** pg is picogram (one trillionth of a gram); ug is microgram (one millionth of a gram), and mg is milligram. ND = not detected. Dioxins and Furans (below the blue line) were compared to federal pulp and paper effluent regulations (PPER). Exceedances to the operating approval (blue) will be dealt with in accordance with the department's compliance model. It should be noted that despite BOD and TSS exceeding approval limits, results of toxicity testing determined the exceedances were non toxic. Dioxins and Furans were compared to PPER exceedences (red) and fall under the jurisdiction of Environment Canada.

Parameter	SW2 - Wetland at Indian Cross Point	SW3 - East River at point of release	SW1 - Melmerby Beach	Approval Requirement	SW2- Wetland at Indian Cross Point	SW3 - East River at point of release
Biochemical Oxygen Demand (BOD)	88 mg/L	3.1 mg/L	ND	3960 kg/day	7920 kg/day*	279 kg/day*
Total Suspended Solids (TSS)	82 mg/L	65 mg/L	4.4 mg/L	4100 kg/day	7380 kg/day*	5850 kg/day*
pH	7	7.7	7.68	6 to 9		
Acute Toxicity	PASS	Lab error**	Lab error**	PASS		
Dioxins & Furans				PPER***		
2,3,7,8 - TCDD	ND	ND	ND			
1,2,3,7,8 - P_5CDD	ND	ND	ND			
1,2,3,4,7,8-H_6CDD	ND	ND	ND			
1,2,3,6,7,8-H_6CDD	ND	ND	ND			
1,2,3,7,8,9-H_6CDD	ND	ND	ND			
1,2,3,4,6,7,8-H_7CDD	17.5 pg/L	1.69 pg/L	ND			
OCDD	304 pg/L	21.0 pg/L	3.93 pg/L			
TCDD	ND	ND	ND			
P_5CDD	ND	ND	ND			
H_6CDD	6.37 pg/L	ND	ND			
H_7CDD	43.8 pg/L	3.32 pg/L	ND			

Nova Scotia Environment

July 24, 2014

2,3,7,8-TCDF	ND	ND	ND			
Parameter	SW2 - Wetland at Indian Cross Point	SW3 - East River at point of release	SW1 - Melmerby Beach	Approval Requirement	SW2- Wetland at Indian Cross Point	SW3 - East River at point of release
Dioxins & Furans				PPER		
1,2,3,7,8-P_5CDF	ND	ND	ND			
1,2,3,4,7,8-H_6CDF	ND	ND	ND			
1,2,3,6,7,8-H_6CDF	ND	ND	ND			
2,3,4,6,7,8-H_6CDF	ND	ND	ND			
1,2,3,7,8,9-H_6CDF	ND	ND	ND			
1,2,3,4,6,7,8-H_7CDF	ND	ND	ND			
1,2,3,4,7,8,9-H_7CDF	ND	ND	ND			
TCDF	ND	ND	ND			
P_5CDF	ND	ND	ND			
H_6CDF	ND	ND	ND			
H_7CDF	3.58 pg/L	ND	ND			

*Calculated based on 90,000 cubic metres per day flow

**Lab used fresh water rather than marine species for testing. Samples had passed the acceptable hold period by time the lab discovered the error, however based on the fact samples at SW2 have higher concentrations of effluent than those at SW1 or SW3, it can be concluded that the effluent would have a reduced impact once diluted.

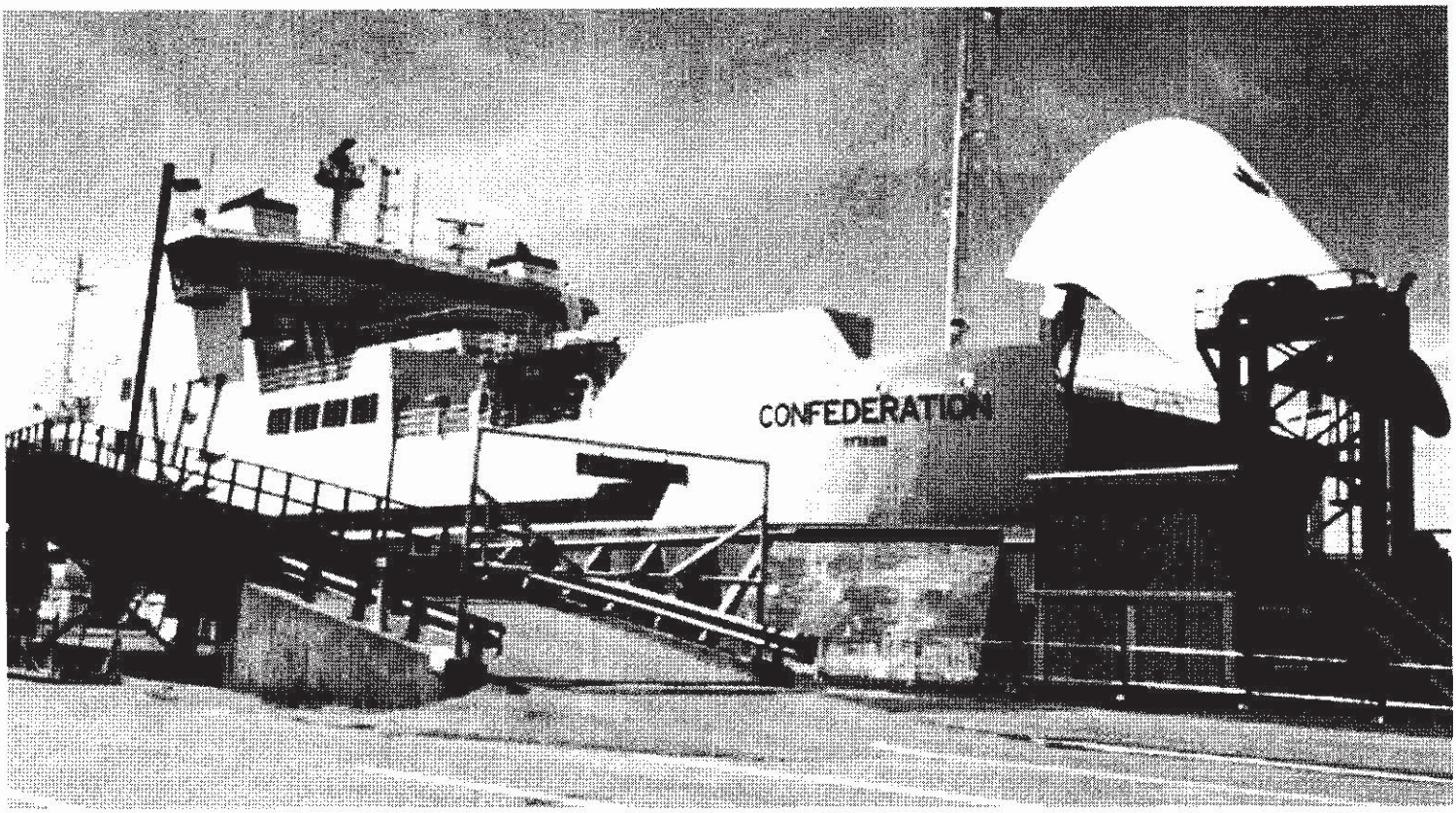
***PPER - Federal Pulp and Paper Effluent Regulations require dioxins and furans to be non-detectable. This is enforced by Environment Canada.

CBC

New ferries, new operators, part of proposed revamp of Maritime ferries

Proposal would see operator-owned ferries on the water

Kevin Yarr · CBC News · Posted: May 05, 2017 7:11 AM AT | Last Updated: May 5, 2017



The Confederation was left alone to serve the Northumberland Strait, offering limited sailings for most of last season. (Julia Cook/CBC)

A federal government proposal could see new operators for three ferry services in the Maritimes, new ferries, and big changes to the way the services operate.

The government made the announcement at the community centre in Belfast, in eastern P.E.I., Friday morning.

The affected services connect

- Wood Islands, P.E.I., and Caribou, N.S.
- Souris, P.E.I., and Îles de la Madeleine, Que.
- Digby, N.S., and Saint John, N.B.

"I am very pleased that the Government of Canada is seeking to move towards long-term contracts to provide stability and certainty in the communities of eastern Prince Edward Island, which in turn will stimulate our economy," said Cardigan MP Lawrence MacAulay in a news release.

MacAulay said the proposal opens up the contract process in a way it has never been before.

Northumberland Ferries, the current operators of the P.E.I. — Nova Scotia service, welcomed the announcement of a strong, long-term commitment in a news release sent out after the announcement.

"We are pleased, for our customers, our employees, and the communities we serve, that the Government of Canada is making a strong and long-term commitment to the Wood Islands/Caribou and Saint John/Digby ferry services," said Chairman and CEO Mark MacDonald in a statement.

New operating structure proposed

Before that announcement, in the early morning hours of Friday, the government posted a request for information from industry that outlined its plans.

Ottawa is looking to move away from the current model where it owns the ferries and leases them to the companies that operate the services. The proposal is for the operating companies to own the ferries and sign a long-term contract — perhaps as long as 20 years — to provide the service.

Long-term contracts will provide economic stability, says P.E.I. MP Lawrence MacAulay (Adrian Wyld/Canadian Press)

The proposal is currently at a request for information stage, with the government seeking feedback from companies.

As it stands, the government plan would see at least of three of the four ferries on the three routes replaced within the next three years. Ottawa is offering up the *MV Fundy Rose*, which service the Saint John – Digby route. Purchased in 2015 for $44.6 million, the *Fundy Rose* was built in 2000.

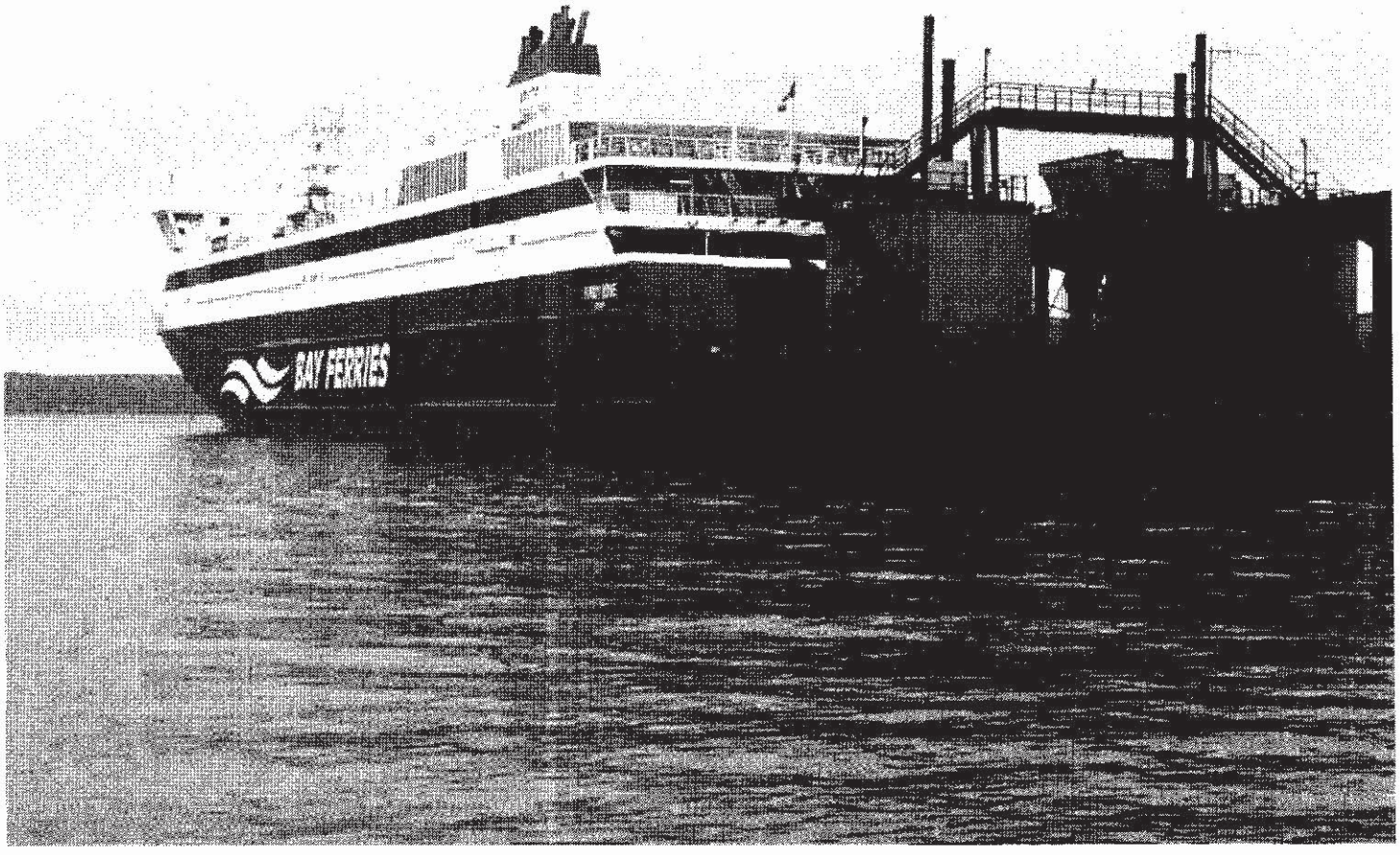
- **Fundy Rose ferry between Saint John and Digby unveiled**

The government says it is interested in leasing out the other ferries for a transition period of up to three years. Those ferries are

- *MV Confederation*: Built in 1992, serving the P.E.I.- N.S. route.
- *MV Holiday Island*: Built in 1971, serving the P.E.I.- N.S. route.
- *MV Madeleine*: Built in 1981, serving the Souris Îles de la Madeleine route.

Vessels new to the routes would be no more than 10 years old.

The most recent federal budget included $278 million over five years for the service, about $18 million more than the previous funding agreement. In August Prime Minister Justin Trudeau said his government was committed to supplying the ferry service.



Ottawa is offering up the MV Fundy Rose as an option for the Digby - Saint John route with the new contract. (Roger Cosman/CBC News)

The government will hold an industry day for discussions on the proposals in Gatineau, Que., on June 2, and is scheduling one-on-one meetings with companies between July 10 and 21. It is accepting comments on the proposals until July 31.

Last summer the aging ferries connecting the Island and Nova Scotia struggled to stay on the water. The *Holiday Island* was in dry dock most of the season, leaving the *Confederation* alone to serve the route through the busy July-August season.

- **MORE P.E.I. NEWS | 'Our child shouldn't have laid there': Mother waits hours on roadside with dead son**
- **MORE P.E.I. NEWS | Online voting not ready for federal, provincial election: officials**

With files from Island Morning

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Northern Pulp Nova Scotia mill, in Abercrombie, Pictou County
Source Emission Test Results for Winter 2015

The table below provides an overview of the results of the stack testing (source of the emissions) conducted on the Northern Pulp mill. The testing was conducted by Stantec Consulting Ltd., during the week of March 9, 2015.

Stack tests were taken at two locations: recovery boiler and power boiler

At the time of testing, stack emissions on the recovery boiler were 833 mg/Rm3, which is well above the stack emission limit of 375 mg/Rm3 as outlined in the company's industrial approval with the province. Emission levels for particulate on the power boiler were 155 mg/Rm3, which is above the approval limit of 150 mg/Rm3.

Legend:	
	does not meet limit
	meets limit
	unknown

	Stack Emission Limits		**Source Emission Testing Results**	
POINT SOURCE	**AIR CONTAMINANT**		**AIR CONTAMINANT**	
	PARTICULATE	**TOTAL REDUCED SULPHUR (TRS)**	**PARTICULATE**	**TOTAL REDUCED SULPHUR (TRS)**
Recovery Boiler	375 mg/Rm^3	15 ppm dv (any 4 hour rolling average)	833 mg/Rm^3	Not Tested (not required in Source Testing Section of the Approval)
Power Boiler	150 mg/Rm^3	n/a	155 mg/Rm3	Not Tested (not required in Source Testing Section of the Approval)
REFERENCE SAMPLING METHOD	Environment Canada's EPS 1/RM/8	US EPA Method 16/16A/16B	Environment Canada's EPS 1/RM/8	US EPA Method 16/16A/16B

mg -	milligrams
Rm^3 -	reference cubic meter (ie. The volume of gas at 25 degrees celsius (°C) and 101.3 kilopascals (Kpa) corrected to 11% Oxygen)
ppm dv -	parts per million dry volume
kg -	kilograms
adubmt -	reference production rate in air dried unbleached metric tonnes

Northern Pulp Nova Scotia mill, in Abercrombie, Pictou County
Source Emission Test Results for Summer 2015

The table below provides an overview of the results of the stack testing (source of the emissions) conducted on the Northern Pulp mill. The testing was conducted by Stantec Consulting Ltd., during the period of September 15-18, 2015.

Stack tests were taken at two locations: recovery boiler and the power boiler.

At the time of testing, emissions of particulate matter from the recovery boiler was 3.9 mg/Rm3, which is well below the stack emission limit of 77 mg/Rm3 as outlined in the company's 2015 industrial approval. Results for the power boiler were 190 mg/Rm3 which is above the emission limit of 150mg/Rm3.

Legend:	does not meet limit
	meets limit
	unknown

	Stack Emission Limits		Source Emission Testing Results	
POINT SOURCE	**AIR CONTAMINANT**		**AIR CONTAMINANT**	
	PARTICULATE	**TOTAL REDUCED SULPHUR (TRS)**	**PARTICULATE**	**TOTAL REDUCED SULPHUR (TRS)**
Recovery Boiler	77 mg/Rm^3	15 ppm dv (any 4 hour rolling average)	3.9 mg/Rm^3	
Lime Kiln	0.50 kg/adubmt	20 ppm dv (any 4 hour rolling average)	Not Tested (not required in this round of Source Testing under the Approval)	Not Tested (not required in this round of Source Testing under the Approval)

Smelt Dissolving Tank	0.50 kg/adubmt	n/a	Not Tested (not required in this round of Source Testing under the Approval)	Not Tested (not required in this round of Source Testing under the Approval)
Power Boiler	150 mg/Rm^3	n/a		
High Level Roof Vent	n/a	n/a		Not Tested (not required in this round of Source Testing under the Approval)
REFERENCE SAMPLING METHOD	Environment Canada's EPS 1/RM/8	US EPA Method 16/16A/16B	Environment Canada's EPS 1/RM/8	US EPA Method 16/16A/16B

mg -	milligrams
Rm^3 -	reference cubic meter (ie. The volume of gas at 25 degrees celsius (°C) and 101.3 kilopascals (kpa) corrected to 11% Oxygen)
ppm dv -	parts per million dry volume
kg -	kilograms
adubmt -	reference production rate in air dried unbleached metric tonnes

Marine Heritage Database

Results 1 to 18 of 18 from your search: carib

Vessel Name	Date of Wreck	Event	Location of Wreck
Belle - 1875	1875-07-01	Foundered	Pictou Island, between Caribou Island and
Bounty - 1887	1887-12-20	Stranded	Caribou Island
Cape Breton - 1887	1887-11-07	Foundered	Caribou Island
Ellen - 1875	1875-11-20	Stranded	Caribou Harbour, entrance
Emelie - 1885	1885-04-11	Wrecked	Caribou Island
Emma - 1870	1870-06-09	Stranded	Caribou Point
Harriet - 1868	1868-10-17	Stranded	Caribou Island
Hilda - 1886	1886-05-09	Stranded	Little Caribou Entrance
Maggie - 1883	1883-11-17	Stranded	Caribou, off
Mary Hart - 1875	1875-10-24	Stranded	Caribou Island Shoal, Pictou Harbour
Ocean - 1875	1875-09-01	Stranded	Caribou Island
Nancy - 1879	1879-10-19	Stranded	Caribou Island
Nightengale - 1868	1868-11-21	Stranded	Caribou Island
Shannon - 1868	1868-10-17	Stranded	Caribou Island
Speed - 1878	1878-12-22	Stranded	Cariboo Cove, Gut of Canso
Trimmer - 1939	1939-05-24	Wrecked	Caribou River
Union - 1910	1910-07-20	Stranded	Caribou Head
Zaidee - 1896	1896-11-01	Stranded	Toney River, near Caribou

enter a search

select a search field
Vessel Name ▼ Search

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 12:40:19 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 9, 2019 12:40:24 PM
Attachments: letter - dad.docx

Hello,

Attached is a letter concerning Northern Pulp.

Thank you.

Dear Minister Miller,

I am writing to you regarding Northern Pulps Replacement Effluent Treatment Facility Project.

My name is and I live just outside on Pictou, Nova Scotia, in the small community of . I have lived in this area for all of my years. I am a commercial fishing license holder, for years fishing out of Toney River, Nova Scotia, and also fished in the area long before purchasing my own license. The threat of this new project impacts me and my family a great deal. Not only am I employed in the commercial fishery, but my father is also a commercial license holder and my brother, and son are both currently employed in the fishery. My family has been fishing in this area for many years and have depended on the Northumberland Strait for an income, but it is also a key to our way of life and culture. My family is not the only one with this sort of bloodline dependency and history with the fishery and the Strait. My community is full of people who depend on the Strait for survival. The Northumberland Strait is more then just a body of water, it is our life.

I wish to raise a couple points of concern with the project.

First, as a fisherman I am concerned, that the proposed effluent pipe will be a detriment to the local fisheries, including that of lobster, rock crab and herring. The proposed outfall location is premium breeding grounds for all of these fisheries, and are of grave importance to the local area, as well as the entire economy of Nova Scotia. I feel as though there should be a greater deal of importance placed on protecting these fisheries. The science provided in Northern Pulps proposal is outdated, being conducted in the 1960's. Our industry is under constant pressure to evolve and become more sustainable and improve our fishing methods as well as our conservancy methods. How can a large corporation, who is not even Canadian owned, come in and attempt to infiltrate our waters, and not be subject to more severe outside pressures to ensure that what they are doing is not only scientifically acceptable but also morally right. Just because they claim that the effluent technically passes whatever loose requirements imposed by the federal pulp and paper mill guidlines, does not mean that is morally right to be pumping anything into the ocean. All levels of government have been claiming that we need to protect the ocean, that we need to cut down on pollution and begin to care for our environment because we won't have it forever. How can someone say this but then consider pumping effluent full of toxins into the ocean. The Government can't have it both ways and are going to have to step up to the plate. Is big industry more important than the health and well being on not only the Environment and ecosystem of the Northumberland Strait, but as well as the health and well being of the people that live there. Nova Scotia is considered Canada's ocean playground, and that's for good reason, the province is surround by the ocean. But what happens if Northern Pulp wants to start pumping their effluent into that playground? No ones going to want to play there anymore.

A separate point I would like to bring up is the monitoring of the pipe and its wellbeing. My main point being that how will the pipe be monitored? They claim that the accidental release of effluent can occur. There is an example of this in the fall of 2018 when a ruptured pipe was

discovered by a passerby in the Pictou Landing First Nations area. How can Northern Pulp claim to monitor their systems when a pipe rupture was undetected on land, let alone if the pipe was buried in the sea floor. I feel as though this risk needs to be better assessed because the potential for effluent to leak throughout the pipeline is very high. This applies for both the sections, land and ocean. This can pose problems for the fisheries and the marine ecosystem in the marine environment, but just as big a problem on land as the pipe is running right through the town of Pictou's water shed. I am sure the residents of Pictou do not want any effluent in their drinking water. Risking these aspects seem to be a very great risk that Northern Pulp is willing to take. I feel as though if the effluent leaking and entering the environment is seen as a problem, why is the idea of pumping it into the Northumberland Strait seen as an acceptable means of disposing of effluent in the first place?

Finally, this entire process, with the timelines put forth in the entire process, is once big farce. Northern pulp has had 5 years, to put together this large report on the entire project. That's fine. Where I draw the problem is that we as a concerned public, have only a fraction of that time, to formulate any concerns and put them forth to the government. In fact, the time line for concerns is only 30 days. This to me is a gross miscalculation. It is a hardly fair that the public has so little time to critique and raise concerns on a project that could potentially have a lasting and detrimental impact on the entire Northumberland Strait region, including that in neighboring provinces of New Brunswick and Prince Edward Island. This raises an aside to my main point. That being that why is the Government of Nova Scotia the one to make the decision when the Northumberland Strait is a body of water the impacts three separate provinces. As a fisherman, everything I do is monitored and controlled by the federally department of fisheries and oceans. They control everything in the fishery, as a federal body. So why does this decision that has the potential to impact everything mentioned above, being made by a provincial government? This does not seem right. Especially when you take into consideration that the Government of Nova Scotia has funded the planning and design of this project, and as well has helped the Pulp Mill with monetary funding and aiding them over the years with extended boat harbor leases or example, so that they can continue their environmental racism uninterrupted. All this seems to lead to the conclusion the that Government of Nova Scotia is unable to make this decision with a clear and concise conscience and therefore should defer and have the choice put into the hands of the Federal Government so that a more thorough investigation and assessment can take place so that everything is out in the open and there will be no more secrets and fear in the community. Because right now there is fear and division. And all this could be fixed by the Government if they aid on the side of caution, and don't give into the Mill once again. Don't let them have their way anymore. This project should be a Federal issue. No more romance between Northern Pulp and the Provincial Government.

Restating the three reasons that I oppose this project,

1) Lack of sufficient research regarding the Fisheries
2) Lack of monitoring and potential disastrous leaks
3) An underhanded process that only helps Northern Pulp and the overlooking of the Nova Scotian Government that this is a Federal issue

These points are a handful of reasons that I believe this project should be handed over to the Federal Environment Minister. This entire project should be subject to extreme scrutiny and not be taken lightly. A decision that impacts three separate provinces and millions of people should have to be approved by simply a few days' worth of thinking and processing. I plead that the Federal Government be involved, and the that the Northumberland Strait be taken care of and not be put at risk.

Thank you

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Northern Pulp Environmental Assessment Application
Date: March 9, 2019 12:43:23 PM
Attachments: Northern Pulp submission.docx

Attached is my response to the above EA

March 9, 2019
To: NS Department of Environment
Re: Northern Pulp Environmental Assessment
Attn: Hon. Margaret Miller
Dear Minister Miller,

I am writing in response to Northern Pulp's proposed Replacement Effluent Treatment Facility Project.
I have been a resident of the Town of Pictou I am retired from a career working in Recreation, Health Promotion, Tourism and Community Development at the municipal (Town of Pictou) and provincial (Government of NS) and the Northwest Territories in both Iqaluit and Yellowknife.
Throughout my career I have been dedicated to promoting and protecting natural spaces and parks for the enjoyment of citizens and for the sustainability of the environment for future generations. On a personal level I have been involved in the construction of trails in NS and I am an avid outdoor enthusiast specifically hiking and kayaking.
Whether it be in my career or personal life I have experienced numerous negative impacts as a result of the Northern Pulp operation at Abercrombie Point. To name a few:

- Decreased visitor numbers and cancellations of bookings by customers to our tourism sites/attractions/special events as a result of the putrid odour and smog coming from the mill.

- The inability to enjoy our own property and outdoors in general in the Town of Pictou and surrounding area again as a circumstance of the stench and smog emanating from the mill.

- Personal danger and harm; my wife and I had an experience kayaking at the mouth of Pictou Harbour when we had to put our kayaks ashore due to the blinding effect of the smog and the level of the toxicity burning our eyes. Not the type of experience anyone would expect when experiencing Canada's Ocean Playground.

The proposed effluent treatment facility does not rectify these concerns and in fact only serves to compound them and add additional threats to our environment and personal health. I am specifically concerned about the following:

A. Town of Pictou Watershed

As a citizen of the Town of Pictou I have long awaited improvement to the water quality in our community. A new water treatment facility was put into operation in 2018. The proposed route for effluent pipe is through and in proximity of the Towns protected watershed area. The Mill has had numerous breaks in the pipeline line which currently dumps the effluent into Boat Harbour. There is no confidence that Northern Pulp can prevent future spills nor put into place sufficient monitoring to detect spills and take action quick enough to prevent poisoning of the Town's water supply. Typically, past behaviour is an accurate indicator of future behaviour, that has certainly been the case with Northern Pulp and I suggest that this risk is not acceptable given their past record of spills. I should also note that the Town Water Shed feeds private well systems of residents living in the Municipality of Pictou County. A pipe carrying toxic waste through a watershed area is not acceptable.

B. Air Quality

Northern Pulp proposes to burn the sludge captured the newly prosed treatment process in their boilers. The levels of toxicity and odour will be worse.
I am not sure what the appropriate word is, perhaps "ironic", better yet "absurd" that the Town of Pictou has a Fireplace By-law passed in 2012 which in part deals with levels of smoke deemed to be acceptable, or not. An exerpt from the by-law is included below:
TOWN OF PICTOU
OUTDOOR FIRE BY-LAW
BE IT RESOLVED that this By-law, known as the Outdoor Fire By-law for the Town of Pictou be enacted effective this 30th day of May, 2012;
j. "Nuisance" means the causing of any smoke or other emission from any fire permitted or allowed under this By-law, or otherwise, that adversely affects the reasonable enjoyment by other persons of their property;

Surely, if this basic standard was applied to the fire, in this case, smoke from Northern Pulp stacks it would be classified a nuisance and shut down. The current standards for air quality in my opinion as a person who lives in this are is not acceptable. It is not fair or reasonable to expect any person, by any standard, to endure this poor air quality. Imagine this level of toxicity, smog and stench in any other jurisdiction in NS. For example, on the Halifax waterfront, it would not be acceptable there and Pictou residents and visitors should not be expected to endure it any longer.
The Town of Pictou uses the Ringelmann Visual Chart to assess compliance to the by-law and fines can be levied if smoke is rated at Ringelmann level 1 or 20% opacity which smoke emitted from Northern Pulp does not meet frequently on days of high humidity in our community, thereby removing our ability to enjoy the most basic air quality standards. The accompanying odour on these days is by any reasonable standard unbearable and not in sync with today's norms, especially in an era when most workplaces and communities are enforcing, for example, no scent policies and programs.

3. No Public Confidence

The public is again being asked to believe the science and engineering for the new treatment facility. In their matrix table " E.1.1-1 Summary of Significance of Project related Residual Environmental Effects " the mill claims that there is absolutely No Significant expected impact on all of the environmental areas they are required to address. The public has no confidence in this corporate claim especially based on past history of effluent pipe spills, non-compliance to air quality standards and the like.

4. Dredging and Federal Regulations

On page 56 of the EA document Northern Pulp makes a very cursory reference to necessary approvals for the dredging required to put the pipe in the Northumberland Strait. It is not satisfactory that Northern Pulp be considered for EA approval at a provincial level when they have not submitted their dredging plan for approval for by the Federal Government. There are a number of Federal regulations which impact on dredging permits including but not restricted to: Fisheries Act, Navigation Protection Act, and the Canadian Environment Assessment Act. Northern Pulp should be required to pass these approvals for dredging prior to consideration for approval by the NS Dept. of Environment. In particular, as in the case with dredging in the St. Lawrence Seaway which was subject to the aforementioned Federal Regulations, Northern Pulp has no way of ensuring that toxins, contaminants present from past industrial activities in the Ferry Terminal area at Caribou would not be disturbed as a result of the pipe installation.

In conclusion I ask the Minister to reject Northern Pulp's request for EA approval for a number of reasons as stated above as well as the following:

- The time permitted to review their 1700 page application is not fair.
- Northern Pulp made changes to the proposed pipe route and did not hold additional public consultations to present the rationale for this change and to seek input from the public and stakeholder groups.
- They make a number of claims throughout the report where "they don't expect" any harm to be done. This is does not demonstrate confidence in their own ability to implement a safe and reliable project.
- Northern Pulp should be required to submit to a more thorough environmental assessment through the Canadian Environmental Assessment Agency due to the complex nature of their proposal, anticipated harm to the environment, the local economy, and quality of life of residents who live in proximity to the mill.
- It does not make sense that regardless of the treatment process proposed that we would put the same substance that has gone into Boat Harbour and that will cost at least 200 million dollars to mitigate, into another body of water.

Respectfully submitted,

From:
To: Environment Assessment Web Account
Subject: Northern Pulp
Date: March 9, 2019 12:44:08 PM
Attachments: Letter grampy.docx

Hello,

Attached is a letter from My Grandfather regarding Northern Pulp.

Thank you

Dear Minister Miller,

I am writing to you regarding Northern Pulps Replacement Effluent Treatment Facility Project.

My name is . I live in Toney River, Nova Scotia. I have been a commercial fisherman in the Pictou area for 40 years now, and have both my sons employed in the fishery, one of whom is a captain, and the other that I employ. I also have a grandson employed in the Fisheries. So, to say that the Northumberland Strait and the local fishing industries is not gravely important to my family would be a substantial understatement. Fishing has been a way of life in our family for many years, since before I was born, and will continue well into the future, so long as we protect the Northumberland Strait and all the resources that live in it. This is why I write to you today, to demonstrate my objection and involvement with the project. I want to express concern for my children, their children and my family's future well being and wish to make sure that they are taken care of ad their way of life is not jeopardized in the future.

I wish to raise three points of concern with the project.

First, as a fisherman I am concerned, that the proposed effluent pipe will be a detriment to the local fisheries, including that of lobster, rock crab and herring. The proposed outfall location is premium breeding grounds for all of these fisheries, and are of grave importance to the local area, as well as the entire economy of Nova Scotia. I feel as though there should be a greater deal of importance placed on protecting these fisheries. The science provided in Northern Pulps proposal is outdated, being conducted in the 1960's. Our industry is under constant pressure to evolve and become more sustainable and improve our fishing methods as well as our conservancy methods. How can a large corporation, who is not even Canadian owned, come in and attempt to infiltrate our waters, and not be subject to more severe outside pressures to ensure that what they are doing is not only scientifically acceptable but also morally right. Just because they claim that the effluent technically passes whatever loose requirements imposed by the5555, does not mean that is morally right to be pumping anything into the ocean. All levels of government have been claiming that we need to protect the ocean, that we need to cut down on pollution and begin to care for our environment because we won't have it forever. How can someone say this but then consider pumping effluent full of toxins into the ocean. The Government can't have it both ways and are going to have to step up to the plate. Is big industry more important than the health and well being on not only the Environment and ecosystem of the Northumberland Strait, but as well as the health and well being of the people that live there. Nova Scotia is considered Canada's ocean playground, and that's for good reason, the province is surround by the ocean. But what happens if Northern Pulp wants to start pumping their effluent into that playground? No ones going to want to play there anymore.

A separate point I would like to bring up is the monitoring of the pipe and its wellbeing. My main point being that how will the pipe be monitored? They claim that the accidental release of effluent can occur. There is an example of this in the fall of 2018 when a ruptured pipe was

discovered by a passerby in the Pictou Landing First Nations area. How can Northern Pulp claim to monitor their systems when a pipe rupture was undetected on land, let alone if the pipe was buried in the sea floor. I feel as though this risk needs to be better assessed because the potential for effluent to leak throughout the pipeline is very high. This applies for both the sections, land and ocean. This can pose problems for the fisheries and the marine ecosystem in the marine environment, but just as big a problem on land as the pipe is running right through the town of Pictou's water shed. I am sure the residents of Pictou do not want any effluent in their drinking water. Risking these aspects seem to be a very great risk that Northern Pulp is willing to take. I feel as though if the effluent leaking and entering the environment is seen as a problem, why is the idea of pumping it into the Northumberland Strait seen as an acceptable means of disposing of effluent in the first place?

Finally, this entire process, with the timelines put forth in the entire process, is once big farce. Northern pulp has had 5 years, to put together this large report on the entire project. That's fine. Where I draw the problem is that we as a concerned public, have only a fraction of that time, to formulate any concerns and put them forth to the government. In fact, the time line for concerns is only 30 days. This to me is a gross miscalculation. It is a hardly fair that the public has so little time to critique and raise concerns on a project that could potentially have a lasting and detrimental impact on the entire Northumberland Strait region, including that in neighboring provinces of New Brunswick and Prince Edward Island. This raises an aside to my main point. That being that why is the Government of Nova Scotia the one to make the decision when the Northumberland Strait is a body of water the impacts three separate provinces. As a fisherman, everything I do is monitored and controlled by the federally department of fisheries and oceans. They control everything in the fishery, as a federal body. So why does this decision that has the potential to impact everything mentioned above, being made by a provincial government? This does not seem right. Especially when you take into consideration that the Government of Nova Scotia has funded the planning and design of this project, and as well has helped the Pulp Mill with monetary funding and aiding them over the years with extended boat harbor leases or example, so that they can continue their environmental racism uninterrupted. All this seems to lead to the conclusion the that Government of Nova Scotia is unable to make this decision with a clear and concise conscience and therefore should defer and have the choice put into the hands of the Federal Government so that a more thorough investigation and assessment can take place so that everything is out in the open and there will be no more secrets and fear in the community. Because right now there is fear and division. And all this could be fixed by the Government if they aid on the side of caution, and don't give into the Mill once again. Don't let them have their way anymore. This project should be a Federal issue. No more romance between Northern Pulp and the Provincial Government.

Restating the three reasons that I oppose this project,

1) Lack of sufficient research regarding the Fisheries
2) Lack of monitoring and potential disastrous leaks
3) An underhanded process that only helps Northern Pulp and the overlooking of the Nova Scotian Government that this is a Federal issue

These points are a handful of reasons that I believe this project should be handed over to the Federal Environment Minister. This entire project should be subject to extreme scrutiny and not be taken lightly. A decision that impacts three separate provinces and millions of people should have to be approved by simply a few days' worth of thinking and processing. I plead that the Federal Government be involved, and the that the Northumberland Strait be taken care of and not be put at risk.

Thank you

From:
To: Environment Assessment Web Account
Subject: Northern Pulp ETF Project Concern
Date: March 9, 2019 12:46:55 PM

Dear Honourable Minister Miller:

I am writing in response to Northern Pulp's environmental assessment for their new effluent treatment facility that would discharge up to 85 million litres daily of treated pulp effluent daily and into the Northumberland Strait.

Our family has had cottages on Moodie Cove since the early 1900's, long before the mill compromised air quality and before its effluent hugged the shoreline along Lighthouse Beach. My deep appreciation for the Northumberland Strait's beauty and clear water is what keeps our family coming back.

As a police officer with 30 years of experience, the history of Northern Pulp's parent companies is of particular concern to me. Northern Pulp is owned by Paper Excellence a subsidiary of Indonesian conglomerate, Sinar Mas. Sinar Mas is owned by the Widjaya family, one of the wealthiest families in Indonesia. Their businesses are responsible for deforestation of the Indonesian rainforest; contributing to hazardous level of smog in Singapore and Malaysia; defaulting on a $14 billion loan; greenwashing their companies; and bribing government officials.

As Northern Pulp wraps up 50 years of deceit and environmental racism with Pictou Landing First Nation, they say they are ready to start a new and improved environmental legacy in Nova Scotia. Sinar Mas does not have their own country's best interests at heart. How are we to believe that their environmental practices in Nova Scotia will ever be any better. Below are a number of examples of questionable practices and concerns by Sinar Mas, parent company of Northern Pulp.

1. Asia Pulp and Paper makes Corporate Criminal List top 10

https://globalexchange.org/2018/11/23/ten-top-corporate-criminals-of-2018

In 2018 Asia Pulp and Paper was listed in the top ten of corporate offenders on the Global Exchange list. Global exchange is an international human rights organization dedicated to promoting social, economic and environmental justice around the world. Each year it releases its top corporate criminal list too highlight some of the world's corporate worst-of-the-worst on issues like violations of human rights and workers' rights, environmental destruction, war profiteering, and tax evasion and other white-collar corporate crime, just to name a few.

Asia Pulp and Paper made Global Exchange's 2018 "10 Top Corporate Criminal" list for continued destruction of the Indonesian rainforest and peatlands and attempting to "greenwash" its image for the global market

2. Executives with Sinar Mas arrested in Bribery scandal in Indonesia

An October 2018 article in Mongabay (detahttps://news.mongabay.com/2018/10/palm-oil-executives-arrested-in-bribery-scandal-in-indonesia/ils the arrest) details the arrest of three Sinar Mas executives *after an employee was caught bribing politicians to kill an inquiry into water pollution and plantation licenses in Borneo*. Two of the executives were employed with a palm oil company which falls under Sinar Mas and according to the Mongabay article was located *near Lake Sembuluh in Seruyan district, in the Bornean province of Central Kalimantan. The lake is ringed by oil palm plantations and mills and has become severely polluted, with residents complaining of itchy skin after swimming in its waters and the collapse of fish stocks.*

PT Binasawit Abadi Pratama, was a smaller company the executives worked for operating near the lake.

A tip was received by investigators about *a planned meeting in Jakarta between Binasawit representatives and provincial legislators, during which the bribery was supposed to take place.* Further investigation revealed that there were problems with Binasawit permits and that *Sinar Mas wanted to pay off the legislators not only to kill the inquiry into water pollution but also to tell the media that Binasawit's permits were in order.* At the conclusion of the investigation two executives from Sinar Mas were charged.

3. Greenpeace Slams AP&P over links to Deforestation

https://www.greenpeace.org/usa/news/greenpeace-slams-app-sinar-mas-links-deforestation-ends-engagement-company/

An article by Greenpeace International in May of 2018 calls out Asia Pulp and Paper (AP&P) over its deforestation practices in Asia and indicated that Greenpeace has ended all engagement with the company. Through *mapping analysis by Greenpeace International* it has been revealed that *almost 8,000 ha of forest and peatland has been cleared since 2013 in two concessions which are, through ownership, linked to APP and its parent company the Sinar Mas Group.* Greenpeace has put *these allegations to APP/Sinar Mas. The group failed to provide a credible response or to take meaningful action. As a result, Greenpeace has ended all further engagement with APP/Sinar Mas.*

In 2013 APP had adopted a Forestry Conservation Policy (FCP) and had *committed to end forest clearance within its own and suppliers' concessions, protect remaining forests in these areas, improve management of peatland and work with communities to resolve social conflicts.* Greenpeace had been advising and inputting into the FCP, however when it was able to show the deforestation of nearly 8000 hectares through satellite imagery and company deeds, it ended its relationship with APP stating that *this new evidence tells us that APP/Sinar Mas is not genuinely serious about stopping deforestation in Indonesia.* Greenpeace further called upon customers of APP to demand they end their deforestation practices and that if *APP and the Sinar Mas Group do not immediately comply, then all customers should cancel contracts and walk away.*

4. Behind-the-scenes ties and significant influence over wood suppliers linked to fires and deforestation in Indonesia.

https://www.seattletimes.com/business/ap-exclusive-pulp-giants-makeover-obscures-supplier-ties/

According to an AP exclusive published in the Seattle Times, December 19, 2017, Sinar Mas, known by its international trade name, Asia Pulp and Paper, one of the world's largest paper producers was attempting to "Greenwash" its image for the global market. In the article it states that Asia Pulp and Paper (APP) *has insisted in company publications, public events and to the media that most of the companies that supply it with wood are "independent," not owned by it or in other ways affiliated with it.* The AP reviewed over 1000 pages of company records and determined that 10 individuals owned these "independent' wood suppliers, and *that six are employees of the Sinar Mas group and two are former employees, one with links to the Widjaja family, which owns Sinar Mas. Several work in the finance department of Sinar Mas Forestry.* According to the article, Sinar Mas had pledged in 2013 to stop deforestation however the investigation found that *a company owned by two employees of Sinar Mas Forestry has been cutting down tropical forest on the island of Borneo since 2014.*

The AP was able to find that 27 so called independent wood suppliers had links to Sinar Mas even though the company had told the outside world that they were independent. They were able to identify some by *matching biographical details in the documents, including birth dates, to information in social media profiles, news reports, forestry industry documents and other sources.*

The article goes on to describe that on top of its pledge to stop deforestation in 2013, that Siiar Mas made another *pledge to gain prior and informed consent of local communities for new plantations,* but in spite of this, *Sinar Mas is pressing ahead with plans to turn 66,000 hectares (163,000 acres) of state land in the Bangka Belitung island chain off Sumatra into industrial forestry plantations despite substantial opposition from locals. The move puts the company on a collision course with villages that farm on the land and*

which some 100,000 people call home.

5. Defaulted on $14 billion worth of bonds and loans in 2001

In the mid-1990s Asia Pulp and Paper (APP) embarked on an aggressive expansion strategy to turn their pulp and paper operations into a global player. Billions of dollars were required to fund the intended expansion. According to the Bulls and Bears Blog, t*he company commenced a global drive for funds and managed to issue* billions *of dollars' worth of bonds starting 1994, with the help of the eager Wall Street investment banks, and a story that sold with investors: an emerging market blue-chip, with competitive advantage in fast-growing Indonesian hardwood, and operating in low-cost Indonesia while collecting revenue in dependable US currency.* (http://stocktaleslot.blogspot.com/2005/11/asia-pulp-paper-debt-default.html.

Several years later, after a down turn in global paper prices , APP were unable to meet their debt payments on bonds , loans and trade payables and according to Wikipedia, *in 2001, Asia Pulp & Paper (APP), the subsidiary of Sinar Mas Group, called a standstill on $14 billion worth of bonds and loans and stopped repaying its debt, including interest payments, in what is still the largest default to foreign investors in Asian market history.* This included *about US$6.7 billion of dollar notes, the biggest missed bond obligation by an Asian company to date,* (The Strait Times, Published Apr 28, 2015, https://www.straitstimes.com/business/worst-asian-default-forgiven-as-indonesia-billionaire-sells-debt).

The consequences for the Widjaya family were limited and as the ultimate owners of APP*, there was no forced pledging of their personal assets, nor any injection of assets to prop up the company for debt restructuring. The family and their associates were still left as the operational managers after the whole debacle. (Bulls and Bears Blog)*. The Widjaya family was also the owner of Bank Internasional Indonesia, *before it was taken over and bailed out by the government in 2001 because it was unable to force Sinar Mas and other borrowers to repay their debts,* and that, *more than half of the bank's loans were made to Sinar Mas companies, violating rules on inter-group lending.* (Bloomburg Billionaire Index, Overview Eka Widjaya)

The Widjaya family business went on to recover from this debt default and expanded their properties in Indonesia, Singapore and China and according to the Bloomburg Billionaires Idex , Eka Widjaya , the founder of the family business was listed in 2017 with a net worth of $ 8.1 Billion.

Minister Miller, our natural resources deserve better than Sinar Mas. Nova Scotia deserves better. Pictou County deserves better. I am asking you to reject Northern Pulp's EA proposal. Their EA does not prove that their project will not cause adverse effects to the environment, and given their parent company's history of deceit and environmental destruction, there is no evidence to show that Northern Pulp has any intention of starting an improved environmental legacy here in Nova Scotia.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Treatment Facility Project Concern
Date: March 9, 2019 1:03:39 PM

Dear Honourable Minister Miller:

I am writing in response to Northern Pulp's environmental assessment for their new effluent treatment facility that would discharge upwards of 85 million litres of treated pulp effluent daily into the delicate ecosystem of the Northumberland Strait.

My husband and I have a cottage on Moodie Cove, Pictou Landing. As recreational water enthusiasts, we have spent our summers exploring the Strait and observing its diverse marine life. The Caribou Harbour area is one of our favourite areas to explore. We travel from the Pictou Landing Marina, make our way around the PEI Ferry markers and anchor off Munroe's Island. Here we will walk the beaches, swim and snorkel. While snorkelling, we have noticed the Caribou area is rich in marine life and is home to large populations of juvenile fish and crustaceans.

Concern: Northern Pulp's Community Liaison Committee - Lack of Transparency

While there are countless data gaps and inaccuracies in Northern Pulp's Environmental Assessment related to potential harmful environmental effects of the Project, I would like to focus on one concern with respect to public consultation, specifically Northern Pulp's Community Liaison Committee.

Northern Pulp provides the following description of their Community Liaison Committee (CLC) in their EA.

"NPNS has an existing Community Liaison Committee (CLC). The CLC serves as a formal consultation process with certain local stakeholders in compliance with NPNS' Industrial Approval to operate. The CLC serves a very important role in providing advice and facilitating two-way communication. The CLC members represent themselves as members of their community and provide their own personal perspective to the committee. They also provide constructive input on how the company may better address and respond to the community needs and concerns. The CLC meets at a minimum twice annually, in Spring and Fall, as well as convening on an as-needed basis. The CLC includes representatives from Pictou Landing First Nation, the communities of Abercrombie, Pictou Landing Moodie Cove and Pictou, NPNS staff, and NPNS executives."

In the Socio-Economic Impact section of the NPEA, under *8.14.6 Follow-up and Monitoring [operation and maintenance phase]*, Northern Pulp states: *The existing Community Liaison Committee will continue to serve the very important role in providing advice and facilitating two-way communication between the local*

community and NPNS.

And also under the Socio-Economic section, under 8.15.3.3 Characterization of Residual Environmental Effects, the NPEA states: *The existing CLC will continue to provide two-way communication between NPNS and the surrounding communities.*

Northern Pulp's CLC meeting minutes (sample: http://northernpulp.ca/assets/Uploads/NPNS-CLC-June-2018-summary-notes-FW.pdf)) indicate there is a representative from Moodie Cove on the CLC, however no name is provided for that committee member nor any of the other committee members.

As mentioned above, our cottage is on Moodie Cove, along with 20 other cottages that are accessed by three private roads. There are no permanent residents on Moodie Cove. . I contacted an executive member of the association for our road, , to ask if he knew who the representative was for Moodie Cove on Northern Pulp's CLC. was unaware there was a representative and called Northern Pulp on behalf of our association to find an answer.

received a call back from Northern Pulp's Technical Manager. indicated that the CLC members are anonymous and that if we wanted to present any of our views or questions to the committee, it would have to be through her.

In Nova Scotia Environment's *Guide for the Formation and Operation of a Community Liaison Committee (*https://novascotia.ca/nse/issues/docs/Community_Liaison_Committee_Guideline.pdf*)*, it states the purpose of a CLC is: *To represent community interest by providing an avenue for the mutual exchange of information between the proponent and the community with respect to any existing or potential environmental effects of the project plan and activities.*

The Guide also details the following mandate and responsibilities by the proponent and CLC members:

Section	Description	Issue/Concern
The mandate	*A forum whereby the residents can bring any issues of public*	The only residents who can bring their issues forward, are the ones sitting on the CLC, therefore Northern Pulp's CLC fails to represent the concerns of their communities.

	concern related to proponent's activities to the attention of the facility operators.	
Proponents Responsibility	*Notice of the CLC formation and members must be made known to the residents of the affected area by the proponent."*	Northern Pulp's members have remained confidential making it impossible for residents to bring their concerns forward to the CLC.
Proponents Responsibility	*The proponent should ensure that the views of the CLC are made available to the public in an appropriate manner.*	Minutes from CLC meetings made available to the public are vague and provide no detail on input from CLC members (sample: http://northernpulp.ca/assets/Uploads/NPNS-CLC-June-2018-summary-notes-FW.pdf)
CLC Members' Responsibility	D*iscussing community views, issues and concerns with respect to the project plan and activities.*	It is impossible for CLC members to adequately express the views of the community when the community is unaware of who to express their views to (CLC members).

In summary, Northern Pulp's Community Liaison Committee fails to facilitate any genuine or meaningful two-way communication between the local community and Northern Pulp. The CLC also fails to effectively represent the concerns and opinions of the surrounding community. It is my understanding that Northern Pulp's CLC structure has been brought to the attention of Nova Scotia Environment in the past,

and that NSE has accepted this poor level of functioning.

Not only did Northern Pulp fail to hold a second set of public consultation sessions to inform the community on changes to their proposed ETF and the new Caribou outfall location, but they are now suggesting their CLC committee will be a primary tool in mitigating environmental effects from the construction and operation of this new facility to the socio-economic environment. (section 8.14 - Socio-economics Environment, 8.14.4.2 - Mitigation).

As the Minister of Environment, you are obligated to *'consider steps taken by the proponent to address environmental concerns expressed by the public'* when making your decision. Northern Pulp has not done an adequate job informing the public and collecting concerns, and therefore cannot properly address them. As well, Northern Pulp does not have the proper infrastructure in place to address any public concerns during the construction and operation phases of the project.

Based on the above outlined concerns, combined with the extensive data gaps in the NPEA, I am requesting that you reject Northern Pulp's proposal. Northern Pulp has failed to demonstrate that their project will not cause adverse effects to the environment that can be mitigated.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: Comment on Northern Pulp pipeline plan
Date: March 9, 2019 1:19:01 PM

Hi folks,

My name is and I work at the Ecology Action Centre I grew up in Pictou County, and know the waterways of the Northumberland Strait, in particular Merigomish Harbour, very well.

Thanks for the opportunity to provide feedback on the Northern Pulp effluent treatment plant and pipeline proposal.

As a kid, I remember walking across the Pictou causeway with my parents, holding a sign protesting the use of Boat Harbour as an effluent dumping ground. My father, , was Citizens Against Pollution, a community group formed to raise awareness of the negative health effects of the pulp mill on the residents of Pictou County.

This effluent treatment plan is a bad idea. A pipeline into the Northumberland Strait will negatively affect the livelihoods of fisherfolk and Indigenous communities moreso than any other group of people, and for that reason alone it should be abandoned.

However, there are many other reasons the pipeline plan should be aborted, including:

- The plan will increase the scale of the environmental damage from one county in Nova Scotia to to the waterways of all three Maritime provinces.

- The track record of Northern Pulp shows that a leak or some failure of the effluent treatment infrastructure is more than likely, and that such a failure could go unnoticed for too long.

- The legacy of disrespect and abuse of the Pictou Landing First Nation will be continued if this pipeline is installed.

- That the government of Nova Scotia acts as both the regulator and the funder of the treatment facility shows that they are not in a position to make clear-headed decisions about it. A federal Environmental Assessment is entirely appropriate here.

The pulp mill in Abercrombie is old and out of date, and it will eventually close. As the government of Nova Scotia, you have the opportunity to prepare for that inevitability by retraining workers and increasing environmental standards so that the forestry and the fishing industries can cooperate.

Or, you can continue to throw good money after bad, shifting the burden of cleaning up the Northumberland Strait, rebuilding the economy of the Town of Pictou, and repairing the relationship with the Pictou Landing First Nation onto the next generation, all while degrading a special part of the world in the process.

30 years from now, will my children still be speaking truth to power on this issue?

Please choose wisely.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: Replacement Effluent Treatment Facility Project comments
Date: March 9, 2019 1:29:16 PM
Attachments: Northern Pulp Environmental Assessment Comments.pdf

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Good afternoon,

Please find attached my comments on the proposed Replacement Effluent Treatment Facility Project submitted by Northern Pulp.

If you have any questions or comments for me, please do not hesitate to get in touch by email at @unb.ca, or by phone

Sincerely,

March 7, 2019

To whom it may concern at the Environmental Assessment Branch of Nova Scotia Environment,

I write you today to voice my concerns over the replacement effluent treatment plan proposed by Northern Pulp. While I moved to New Brunswick last summer, I was born and raised in Nova Scotia, and have been an active member of the angling community along the rivers and saltwater that flow from the Northumberland Strait . I have also been a member of the Atlantic Salmon Federation For the danger posed to Atlantic salmon and other vulnerable species, I ask you to delay any decision about this proposal until there has been adequate time for risk assessment and public consultation.

As I am sure you are aware, Atlantic salmon are listed as a species at risk by COSEWIC. The population of Atlantic salmon in North America has been in steady decline for decades. Since 1995, the population of one sea-winter (1SW) salmon has fallen by about 56% as compared to the population measured between 1971 and 1985[1]. As is referenced by Northern Pulp on p.379 of their proposal, two of the most critical influences in the decline of Atlantic salmon are climate change, and changes to ecosystems and habitat. Atlantic salmon are very sensitive to changes in temperature[2] and water quality. The proposal lists potential operational effects on marine fish species on p.385. The list includes the change in temperature as a result of effluent discharge, but does not elaborate on the extent of the effects this could have on Atlantic salmon or any other species for that matter. Furthermore, there are no mitigation measures listed for this temperature increase. On p.389, they say that the temperature of the water will be within 0.1 degree Celsius of the background temperature at the end of the 100m mixing zone. I find it challenging to believe that a continuous discharge of 62 to 90 million litres of effluent daily would not have a more profound effect on the temperature of a much larger area in the Northumberland Strait over the the course of several decades (Northern Pulp has been vague about the potential lifespan of this project once complete in their Project Schedule on p.81). Organizations like the Margaree Salmon Association, the Atlantic Salmon Federation, and the Miramichi Salmon Association have invested a substantial amount of time and money into conservation efforts for the shared goal of protecting this vulnerable species. Additionally, the angling industry for Atlantic salmon in Atlantic Canada is a driver of local economies and tourism dollars, with $166 million in spending on the industry in 2010[3]. Based on the changes to the habitat and water quality for Atlantic Salmon that would result from the proposed project, I think it is inevitable that the species would suffer. To damage this resource is conservationally

and financially counterintuitive. Due to this potential for harm, I ask that you delay your decision on the matter until a complete risk assessment to the species can be completed.

While the issue of conservation of Atlantic salmon is one that is very important to myself and several others personally, my points above only address the potential concerns for this one species. There are countless other species that will certainly be impacted should this project be allowed to proceed. The health of many of these other species is depended on by local commercial fishermen for their livelihoods. I urge you to consider the magnitude of the impact on fish habitat and health before allowing this project to continue.

Sincerely,

References

1 Fisheries and Oceans Canada, 2018 http://www.dfo-mpo.gc.ca/reports-rapports/regs/wildsalmon-atl-saumonsauvage-eng.htm

2 Fisheries and Oceans Canada, Temperature threshold to define management strategies for Atlantic salmon (salmo salar) fisheries under environmentally stressful conditions, 2012, p. 4, http://www.dfo-mpo.gc.ca/Library/346488.pdf

3 Gardner Pinfold, Economic Value of Wild Atlantic Salmon, prepared for the Atlantic Salmon Federation, September 2011, p. V

From:	@ns.sympatico.ca
To:	Environment Assessment Web Account
Subject:	Northern Pulp proposal
Date:	March 9, 2019 1:47:43 PM
Attachments:	Response to NP EA - 001.pdf

I attach my written comments (4 pages) to Northern Pulp's proposal to pipe effluent into the Northumberland Strait.

March 9, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, Nova Scotia B3J 2P8
Fax: (902) 424-6925

Via e-mail at ea@novascotia.ca
and fax 1-902-424-6925

Dear Sir or Madam:

RE: Northern Pulp's Replacement Effluent Treatment Facility Project

I am a commercial fisher and a resident of Pictou County. I grew up in Caribou very near the Caribou ferry terminal. My father and many other family members were commercial fishers in Caribou. I fished in the industry since the 1970's, starting when . Following attendance at university, I was drawn back home by the Northumberland Strait. I have owned my own fishing enterprise I fish rock crab, herring and scallops out of Caribou. I fish lobster in another area. I have a large financial investment in the fishing industry. The health of the Northumberland Strait is vital to my retirement and my future. My son has recently started fishing with me and a clean and sustainable Northumberland Strait is essential for him to have a future in the fishing industry.

As fishers, we invest a lot of time, energy and money to maintain the sustainability of the fishing industry. We regulate ourselves by proposing and agreeing to such things as catch limits, buffer zones, reduced efforts, and modified nets and traps. The EA proposal will harm the Northumberland Strait, our fishery, and our future.

There are many errors and missing information in the proposal, as follows:

1. The proposal did not consider the behaviour of herring. Herring gather in the deep waters of the ferry channel and other deep water areas to get away from predators. They come out of the deep waters at night to spawn on the shallow banks in the adjacent areas. If fresh, hot water containing who knows what is pumped into their deep water hiding zone, the herring will not go there and will have no where to hide. I believe this will have irreversible effects on the herring species in the area, and their spawn.

2. Tuna are in the area of the outfall. While fishing herring last year, I saw approximately 6 tuna charter vessels at one time in the area outside Caribou Harbour. Last year, tuna washed ashore in

Caribou Island and Simpsons Beach (part of Caribou - Munros Island provincial park).

3. Contrary to what is showing in Figure 8.12-3 of the proposal, rock crab is fished all over the proposed effected area. The rock crab fishing area we call "Africa" because of its shape, runs from Caribou Island, Pictou Island to about Arisaig. The footprint of the pipe runs through a vital rock crab nursery where juvenile crab are spawned and grow to maturity.

4. As fishers, we are required to maintain a log book while fishing rock crab, herring, scallops and lobster. Although we fish these species in a very large area throughout a day of fishing, we are required to record our fishing location just once per day. As such, our logs do not accurately reflect the expansive areas where we fish. For example, in one day, a fisher may leave Caribou Harbour and travel to Charlottetown Harbour and fish everywhere in between. In the fishery log, if a fisher records fishing in Charlottetown Harbour, the fishing effort in all other areas is not reflected.

5. Fishing of some sort is conducted everywhere in the Northumberland Strait. It is fair to say there is no area of the strait that is not fished. Fishing areas for a certain species may vary from year to year. Therefore, using data of fishing areas from 2001, for example, as was used in the proposal, may not accurately reflect the fishing area in 2018 for that same species. Fish move and follow food sources. Piping of effluent will be detrimental to phytoplankton and zooplankton which are the food source for fish and mammals and are building blocks for all ocean creatures.

6. Some fishing bottoms also may change over time, or from year to year, due to storms or man made causes. I have fished lobster in Wallace since 1993. The construction of the fixed link between New Brunswick and Prince Edward Island took place between 1993 and 1997. The building of the fixed link brought great changes to the lobster fishery in my area - huge decline in lobster catches and changes to the sea floor. I witnessed a change in the water which went from clear to very muddy everyday. I lost a large area of my fishing bottom due to sedimentation. What was once a rocky floor was covered by mud or silt. When I pulled my lobster traps, they were covered with a fine muddy film. The film also covered the bait on my traps which hindered their ability to attract lobster, caused the bait to rot, and attracted sand fleas which ate the bait. I suspect that the silt interfered with the lobster's respiratory and other functions as they were covered with the muddy film as well.

The lobster fishery in that area is only very recently starting to recover. I notice less silt in my traps and the water is becoming clearer. Things are going back to where they were when I first bought my lobster licence in 1993 before the start of the fixed link construction. My catches are finally returning to what they were before the construction. The value of fishing enterprises was greatly reduced in this area for the last 20 years or so, and they are now just recovering to be on par with fishing areas not effected by the fixed link. I did not receive any compensation for my economic loss or the damage to the environment. I don't want that to happen again.

7. The scallop information in Figure 8.12-5 is not accurate. In the scallop logs fishers must complete, there is no place to enter fishing location for every area where scallops are fished. There is no way to determine where scallops are caught in the strait. This figure also shows

scallop catches in areas where there is a buffer zone and therefore no scallop fishing in that area. This proves that the figure is not accurate and should not be relied on. It should also be noted that recreational scallop divers dive for scallops in the area behind Munros Island, and in the area around the outfall location. They are permitted to dive for scallops within the 1 mile buffer zone, but they don't keep logs or report where they have fished.

8. Figure 8.12-6 is also not accurate. The map does not show the herring nursery which is in the area of the outfall. Also, there is herring fishing all around Pictou Island and not just as indicated. We also fish for herring in the area of the proposed outfall location. Herring is a fixed gear fishery. We use anchors on each end of our herring nets. The pipe and proposed no anchor zone will significantly interfere with our herring fishery. It is not possible for us to simply go somewhere else to fish if the fish are located in the area of the outfall or the no anchor zone and not anywhere else. The herring pack consists of a large group of boats all fishing for herring at once - possibly 200 boats in the same close area at one time. The pack is so large that sometimes the PEI ferry steers out of its normal route to avoid us.

9. Figure 8.12-8 is also not accurate. There are mackerel around Pictou Island and Caribou Island and in area of the outfall. There is mackerel in Caribou channel and Pictou channel, and around every wharf. There are many people who fish mackerel from all the wharves in the area, including Caribou. They also fish for bass, smelts, capelin and other fish from the wharves. This is an important healthy food source for many people in our area and part of our tradition and culture and must be protected.

Mackerel like going along the edge of the channel because it is deep, and they are hunting the bait fish which is also in the channel. They tend to swim back and forth from deep to shallow water.

10. The scallop buffer zone is not accurately depicted in Figure 8.12-10. The scallop buffer zone extends all around Munros Island and Caribou Island. The buffer zone is 1 mile from any point of land, which includes all islands.

11. It is not appropriate or accurate to use the characteristics of Pictou Harbour as a proxy for those of Caribou Harbour. Caribou Harbour is closed except for a narrow opening. It does not flush well. There is more flushing in Pictou Harbour and 3 large rivers flow into it. My father, who grew up in the area, used to tell stories of his grandparents walking cattle from Caribou Island to Munros Island (which in the past, was also known as Doctor's Island) at low tide. This shows how narrow and shallow that area is. The ferry channel is artificial and was created when the ferry services started, and is maintained only through periodic dredging.

12. The wharves at Caribou Harbour are used for more than tying up vessels. We sell our catches to the public and commercial buyers at the wharf. During herring season, for example, fish buyers set up buying stations where we off load our catches. Buyers who use the vacuum system to remove herring from the boats, pump water from the harbour onto the vessel in order to suck up the herring. It is like a wet vac.

During lobster season, the buyers tie large numbers of lobster in floats in Caribou Harbour until they are transported for processing. Floats are large containers which allow for water to flow in and out to keep the lobster alive. Will this water be contaminated by effluent thus making the fish toxic?

We use water from the strait to keep our catch alive during the day. I am concerned that I will inadvertently use effluent water on my fish which could cause contamination. How will I know the difference between water that contains toxic effluent and water that does not? I also use that water to wash my fishing boat and gear as I enter the channel at the end of my day. I don't want to use effluent to clean my boat and gear. What effect will this have on my heath and my equipment?

There is a lack of information provided in this proposal and large gaps in terms of the effect on the environment and ecosystem of the Northumberland Strait. Much of the information that is provided is not accurate and there are a lot of discrepancies. This makes me question the credibility of the entire proposal. The proposal must be rejected. Nova Scotia is supposed to be Canada's ocean playground. We don't want it to become Canada's ocean dump. Northern Pulp should give in, give up and get out.

Concerned fisher,

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Effluent Pipe
Date: March 9, 2019 1:58:59 PM

Dear Environment Minister Margaret Miller,

I am writing to you about my concern with Northern Pulp's plans for an effluent discharge pipe in the Northumberland Strait. I am a resident of Pictou County, I have grown up walking the beaches, swimming in the waters and fishing in the waters of the Northumberland Strait. The idea that Northern Pulp wants to use, what I think of as my backyard, as a dumping ground for their waste is unfathomable.

We are living in a time where every action on the environment has dire consequences. The ramifications of those consequences will be felt for generations to come. One example that is ailing the Earth's ocean's right now is hypoxia zones. Hypoxia zones are areas in the ocean that do not have enough oxygen in them to support aquatic life. Sea animals that are able, avoid these areas, those that cannot may suffocate and die. That is why these areas are also known as dead zones. If Northern Pulp is allowed to put their pipe in the Northumberland Strait it will create a dead zone.

I was able to attend the open house presentation hosted by Northern Pulp back in December of 2017. an engineer and the principal consultant for process and environment with KSH Solutions was also in attendance. He was fielding many questions from the concerned populace. One of the questions I happened to ask was, will the effluent cause a dead zone? His answer was Yes. My next question was how big would this dead zone be? His answer was that they did not know. This area that people recreationally fish, boat, swim and commercially fish in would be dead, how far reaching that could be is unknown. That is a frightful thought.

Table E.1.1-1 (Summary of Project Related Residual Environmental Effects) in Northern Pulp's EA shows that there is no significant residual environmental effect on harbour water quality, marine fish or marine fish habitat. I disagree with their findings as I would define a dead zone as a seriously significant environmental effect. This is an issue that is not covered well in Northern Pulp's EA and requires more thorough investigation. I believe as Environment minister you need to request an Environmental Assessment Report.

On Nov 7, 2016 the Federal Government launched the Oceans Protection Plan. It notes that Canada has the world's longest coastline and the Ocean is one of our most important resources. Should we not follow along with that mantra and do our part to protect our oceans, our resources. Planet Earth is a place of finite resources and capabilities to rehabilitate itself. Please do the right thing as environment minister and protect the environment.

Sincerely,

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 1:59:12 PM

Project: replacement_effluent_treatment_facility_project Comments: I am absolutely appalled that the Nova Scotia government is even considering Northern Pulps proposal to pipe its toxic effluent. Is 50 years of evidence not sufficient for any one with half a brain to understand that we are poisoning ourselves, our fisheries, and our forests for this irresponsible and criminal? corporation? Are politicians too ignorant, corrupt, or indifferent to do the right thing? Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 44 y: 17

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 2:11:30 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@ns.sympatico.ca)

From:
To: Environment Assessment Web Account; Minister, Env
Subject: Fwd: Northern Pulp Effluent Treatment Facility Replacement Provincial EA, Dispute !
Date: March 9, 2019 2:19:11 PM

---------- Forwarded message ---------
From: @lobsterpei.ca>
Date: Sat, Mar 9, 2019, 12:17 AM
Subject: Northern Pulp Effluent Treatment Facility Replacement Provincial EA, Dispute !
To: @gmail.com>

Dear Minister Margaret Miller,

My name is from Belfast PEI.

I am writing today with extreme concern over the proposed application for Northern Pulp to pump 70 - 90 000 000 liters of effluent a day into the Northumberland Strait.

There are so many aspects to this file that it could take days to explain but to put it short, Northern Pulp wants the fishing industry in NS, PEI and NB to take 100% of the risk on whether this effluent will affect lobster, lobster larvae, Herring, mackerel, rock crab and tuna stocks.

We know that the government of the day in the mid 60s along with Scott Paper told Pictou Landing First Nations that the water /effluent going into Boat Harbour would be clean and that it would not affect fish or habitat in that estuary. Within a week, all fish were floating on the surface dead, and now 52 years later Boat Harbour is a toxic waste dump that looks like something from a science fiction movie. It is disgraceful and the PLFN and the residents of Pictou have lived with this far too long. I applaud your govt for sticking to the 2020 deadline to shut Boat Harbour down.

Boat Harbour has been catching the dioxins, furons, cloride, Clorine Dioxide, mercury and other toxic metals for 52 years. It gives the effluent 30 days to cool while the toxic chemicals settle out. The new proposed process would see the effluent treated for hours, then solids ,chemicals ,toxins, and all be pumped directly onto Prime lobster, crab, Herring, mackeral and tuna habitat and fishing grounds.

Northern Pulp does NOT know the make up of the chemicals that will be in the effluent, they told us that. I asked in a meeting in New Glasgow, the fall of 2017 with Northern Pulp and 350 fishers, where the studies are that prove that this new proposed effluent will not harm lobster larvae ?? All their high priced lawyers and consultants at the meeting just looked at each other then admitted publicly that they did not study that at all,,,, "but don't worry, it will be fine". Can you imagine? The whole basis of our industry is larvae and they didn't even test it !!!!!

The water proposed to be dumped is fresh water and is significantly hotter than the receiving water, and we know scientifically that warm fresh water itself will kill lobster larvae, let alone the toxic soup and solids that will be pumped out with it. Salinity and temperature affect lobsters a lot. Ask SW Nova lobster buyers that hold lobsters in out door pounds what happens to lobsters if it rains hard. Also, we keep thermometers in our Lobster traps in 4 or 5 different locations throughout the season, if the temperature changes more than 2 degrees up or down it affects how they trap. I have seen them hide for days till the temperature stabilizes. The proposed effluent is over 20 degrees hotter than the receiving water. They will not stay in the area. That doesn't even factor in the chemicals and solids. The solids will be laced with chemical, fish are curious, anything with a different smell or taste they assume is food. Little would they know they would be poisoning themselves.

Then we asked Northern Pulp about ice cover and how it affects dilution and mixing ?? Again, they didn't know and did not think about that.... Or test it .

We told them at the same meeting that there was not enough water depth in Pictou Harbour to run the pipe, because the ice would crush it. They said no it will be fine. Well after 3 different survey crews at work in 2018 they all concluded that Pictou Harbour is too shallow, the pipe would get crushed by ice.

This company Paper Excellence Has 5 other pulp mills in Canada, 2 of them, Meadow Lake Saskatchewan and Chetwin BC have closed looped effluent treatment facilities that recycle their effluent. I proposed this technology as a solution for the Pictou Mill but Northern Pulp did not want to talk about it, " cost being the factor"..... Our environment is just as important as Western Canada's environment is !!!!

They said, that during the Kraft process using Clorine dioxide for bleaching (like at the Pictou Mill now) if used in a closed loop, it will destroy (eat through) the piping system. So I said let me get this straight, your effluent will eat through metal pipes, but NOT hurt baby lobsters suspended in it ??? Nothing but silence.....

They would need to change the process to peroxide bleaching for a closed looped system so that the pipes would not be ruined. But Northern Pulp is not interested investing the required dollars to change the plant.

The NS Government finds themselves in a spider Web of conflicts of interest on this file that the public are just finding out about now.

Some of he glaring ones are, because of the 1995 endemnity agreement, the province of NS have to pay for the future cleanup of Boat Harbour, the construction of the New Treatment Facility and outfall, they are paying for the environmental report of the new treatment facility for Northern Pulp, they have to pay for any shut down time for the mill if closed before 2030 and they want to consider a class one in house provincial environmental assessment, that can be signed off by themselves.....

The Premier of NS of the day mid 1990s is now the Chair of the Board for Northern Pulp,

and the lawyer that wrote the endemnity agreement in 1995 is a deputy Minister under Premier MacNeil now.

So how can we POSSIBLY get a fair, transparent, detailed environmental assessment from a fast tracked provincial class 1 ?? This project affects 3 provinces and the proposed site is in Federal jurisdiction waters. DFO, Transport Canada, and Environment Canada need to be involved to protect our Industry. The Federal Government is changing the Oceans Act and the Canada's Ocean Protection Plan, and they like to wave the environmental flag around the world. Marine Protected Areas are a big topic right now across Canada. This very location that Northern Pulp has picked for the outfall pipe, is a "Marine Refuge" officially designated by DFO, Meaning it is Prime fishing grounds and is protected, it is part of the MPA process. How could it be used as an Industrial toxic dump zone ?? Seriously?? 90 000 000 liters a day of unknown effluent with 4 tonnes of solids mixed in ??? Dumped on a Marine Refuge. !!!!

Let's talk about what we know for a fact, Stantec has been involved for years with Northern Pulp and have done air quality reports and most recently completed a 129 page receiving water study.

This report does not say what is in the effluent under the new proposed treatment facility outfall, heavy metals, solids, chemicals etc , or like I mentioned earlier, how it would affect lobster larvae, adult lobster, Herring spawn, mackerel spawn, crab larvae, or their habitat..... Or how ice cover like we have "right now" would affect mixing and dilution. There are NO reassurances and fewer guarantees.

The reason I raise this point is because Stantec was heavily involved in the environmental impact report and engineering of the Confederation Bridge. They gave it the All Clear, despite a team of scientists including David Suzuki that said there were 1200 possible environmental affects. David Suzuki said to build the bridge in the Northumberland Strait would be "monumental stupidity". And it is built directly on the biggest earth quake fault in the Northumberland Strait....

Well hind site is 20/20 and we know now who was right.

I was fishing with my father at the time, and prior to the bridge ,catches off of Point Prim 45kms east of the Bridge were 20 -30 000lbs per spring season. As soon as construction started in Oct 1993, the following spring there was a major decrease in catch, and by 1997 when the bridge was finished catches had dropped to 5000lbs of lobster for an entire season. After 4 years catches came up to 10 000 lbs, then slowly rebounded to 15000lbs but it took 18 years to get over 18000lbs and now 22 years later the catches finally came back to previous levels.

However, over 40 % of the Lobster Fishers on PEI from Wood Islands to Victoria in the spring were forced out of business due to catches being so low for so long. Also the fall season from Victoria to Egmont Bay saw similar results. NB and NS coasts 60kms on either side of the Bridge faced the same fate.

Fishers had to sell their licenses to Fishers in Beach Point east, and to West Point west, to get far enough away from the Bridge where the affects were not as drastic. The Federal govt came up with a buy back program 7 years ago as well to buy back some of the older fishers, once it realized the extent of the damage that was done. But the money paid for the few licenses that they bought was a fraction of the value of a license today.

The Biggest noticeable change was the silt in water column, we used to be able to see the ocean floor in 20' of water. From 1994 - 2006 we could not see 3' into the water due to silt. This affected the lobster, Herring, mackerel, tuna and scallops as well. After 2006 it slowly started to clear again and now it is like before. However, we hardly would see barnacles on buoys and never on traps. Now the buoys are covered a half inch thick with them and the traps as well. We have to use paint scrapers to get them off.

Another change was the increase in tidal currents. They built the bridge directly on the

narrowest part of the Strait, 44 piers, which created a venturee affect increasing the tide by 30%. Before the bridge our buoys would sit on top of the water and never pull below the surface. From 1996 on, since the Piers were placed, the currents now pull the buoys completely under water out of site. We had to add 4 fathoms of extra buoy line to our Lobster and crab gear in order to retrieve it.

The increased silt drove lobsters to the North side of PEI, we know this because the same amount that the catches in LFA 25 and LFA 26A were down, LFA 24 increased the same amount.

Another affect was the introduction of foreign invasive species like tunicates (5 different types) and green crabs. All 6 of these species were never here before and are not native to the Gulf of Saint Lawrence. We found out they arrived attached to the hull and in the bilge water of the HLV Svanen, the Dutch built, world's largest ocean Crane brought here to place the bridge sections.

The tunicates devastated the mussel industry on PEI, (Canada's largest mussel source) and drastically affected the oyster industry. Green crabs also targeted oysters and both them and tunicates are still a huge problem today costing these industries tens of millions of dollars to combat them every year.

All of these things actually happened in real time, despite "Stantec" and others stating that the fishery would not be affected and not to worry.....

The PEI government since 1996 have had a lobster index program and a Sea Sampling data base. Every year, spring and fall, provincial government Biologist come out onboard 5 times throughout the season in 60 harbours around PEI to measure every lobster that comes aboard, undersize, berried females, window females, legals etc etc. The boats involved in the program, which I am one, record their catches and window females every day in a logbook. Now we have 23 years of lobster science on PEI, DFO ( ) admits that PEI has the best, most accurate lobster science in the world. If you have any questions on the data or the program, call PEI Lobster Biologist Robert MacMillan or at RJMACMILLAN@gov.pe.ca

We are Very Very concerned about the unknowns on this proposed new treatment facility/effluent for Northern Pulp. Their track record in Pictou and around the world with their parent company Paper Excellence has a dismal reputation. It seems they will do near anything for profit. Our industry is too valuable, and you as a Minister have an obligation to make sure that things are done right. The work is not done,,,,,,and the 1700 page proposal does not answer the real questions that our industry needs answered.

Northern Pulp knew 4 years ago that the deadline was 2020. "They" decided to do nothing for 3 years, now they are pressuring you to make a rushed last minute decision.

The 1200 environmental affects of the Bridge were "risk managed" and or "mitigated" away. Some fishers in Borden PEI and Murray's Corner NB got a one time compensation check of $10 000. Meanwhile they were forced out of business, and the fishers from Egmont Bay, Summerside, Nine Mile Creek, Point Prim, Pinette and Wood Islands got nothing. ....

The compensation package was a complete disgrace. But one thing it did do was taught us a valuable lesson that will never happen again.

If Northern Pulp and the NS Govt are so confident in the information they have now, then it won't be a problem to have a 10 billion dollar compensation plan insurance policy in place.

Like I said before, 100% of the risk is on us right now, and that is NOT an option.

The more transparent and thorough way to handle this would be for you as Minister to reject this current proposal ,and to call for a full indepth , Federal Environmental Assessment with CEAA. This will serve to protect your office and Ministry as well from 100% of the Liability if things go wrong. Noone wants their legacy to be a devastated natural resource.

In December 2017, Environment Canada officially listed "Kraft Pulp Mill Effluent" as a

"Toxic Substance".....

The lobster Industry in the Maritimes was worth 2.4 Billion dollars in 2018, and has been over 2 Billion a year for many years. A big portion of this Industry Is in the Northumberland Strait. We know from Giro studies that the water in the Pictou Area " Giros" (stays in the area) for 5-6 weeks and up to 12 weeks in certain conditions. Lobster larvae float in the top 3' of the water column for 6-8 weeks every summer. This concentration of toxic effluent and it's affects have not been factored in.

The Marketing of " Canadian" Lobster as a whole could also be affected. Remember the "one" Mad Cow from Alberta, how it devastated the Beef Industry across Canada for a decade. The full costs are still not known today but it's in the 10s of Billions. It's only the last few years that that Industry has recovered.

Only court orders have forced this company and previous owners of the Mill to pay fines for repeated effluent spills, contamination and repeated air stack test failures.

We Need your help Minister Miller ! Please reject this current Northern Pulp treatment facility /effluent discharge proposal and call for a Full, detailed, transparent and thorough Federal Environmental Assessment through CEAA, so that all of the required data can be found and tests completed.

I thank you for your time, and consideration.

Yours Truly

From:
To: Environment Assessment Web Account
Subject: Pulp Mill Concerns
Date: March 9, 2019 2:20:07 PM

Dear Environmental Minister Miller

I am writing to express my concerns about Northern Pulp's plans and I implore you to reject their proposal, or at the very least, order an environmental assessment report. The decision of whether or not the mill's continued operation will have adverse effects to human health and cause unmitigated environmental damage is a no brainer. If you look at the fact that the mill's presence is proven to cause cancer in the inhabitants of the area, it seems that it is quite clear that the continued operation will no doubt have adverse effects to human health. This quote from the Halifax examiner says it all really: "Dalhousie University researcher has come forward to defend her 2017 ambient air quality study about cancer-causing air emissions detected near the Northern Pulp mill after finding that her study was "misrepresented" in the mill's recently registered Environmental Assessment [EA] for its proposed effluent treatment facility." Whether or not the law recognizes a person's right to a clean and safe environment, logic and compassion for other humans should tell us that people should not have to live with a corporation moving in next door and harming their health. It is also ridiculous to think that merely closing boat harbour is in any way ending the environmental racism that is the mill. The fact that one of their most valuable resources was allowed to be destroyed by Northern Pulp is criminal, and if you are trying to do right by them, obviously you cannot allow the culprit to continue to poison their air!

They are dumping their effluent straight into the ocean. Why must we say more? This is supposed to be Canada's ocean playground for god sake. When you have local fishermen who are telling you that this is a terrible idea, that should be taken seriously. These people work every day out on the strait, and they are the industry that defines Nova Scotia. They don't sell Nova Scotian craft paper at the airport do they?

Sincerely yours,

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 2:38:08 PM

Project: replacement_effluent_treatment_facility_project Comments: The Honorable Margaret Miller Environmental Assessment Branch Nova Scotia Environment P.O. Box 442 Halifax, NS, B3J 2P8 Dear Minister Margaret Miller, The purpose of this correspondence is to ensure that the â?oReplacement Effluent Treatment Facility ETF Projectâ? submitted by Northern Pulp Nova Scotia Corporation NPNS, is subject to a full panel Federal Environmental Assessment EA. Â I am writing you this letter today as a Nova Scotia Taxpayer, a proud and long-time resident of Pictou County, a First-Generation Fisherman and a soon-to-be father. The feeling of making your living on the water, watching the sun rise and set each day, working hard in hopes of being rewarded so that you can support your growing family â?" there is no better feeling. As a Fisherman of Lobster Fishing Area 26A LFA 26A, the proposed effluent discharge pipe will dump millions of litres of effluent, every 24 hours, within the grounds upon which I fish. This effluent will also carry approximately 945 kg of solids into the Northumberland Strait each day that were not previously reaching the strait. This not only puts my livelihood at risk, but also hundreds of others who rely on the catches in LFA 26A. According to Northern Pulp, the probability of this treated effluent negatively impacting the fishery is highly unlikely. Based on similar promises made to the first nations and the environmental disaster that became Boat Harbour, it is my belief that Northern Pulp cannot be trusted. Allowing a pipe to pump millions of litres of effluent directly into the strait without confidently knowing the environmental impacts, tourism fishing industry impacts - should NOT be a risk this government is willing to take.
worked their entire careers at the mill â?" they both died of cancer.
. While I am not solely blaming this on the mill, studies have shown that Pictou County has the highest rates of cancer incidence in Nova Scotia. These same studies discuss the pollutants entering the air, from the mill, as being the likely cause. Not only is Northern Pulp a risk to the marine environment, but also to the health of the thousands of residents of Pictou County. In light of the fact that their practices have been questionable for 60 years, they should be subjected to the highest level of federal environmental assessment. It is my belief that it is your mandate to protect the environment from unreasonable human activity, and to protect humans from unacceptable environmental risk.Â With that in mind, I am asking you to please ensure that Northern Pulpâ?Ts â?oReplacement Effluent Treatment Facility ETF Projectâ? is subject to a full Federal Environmental review. Thank you. Name: Email: @gmail.com

: Privacy-Statement: agree x: 55 y: 23

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 3:25:59 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@unifor.org)

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 3:35:29 PM

Project: replacement_effluent_treatment_facility_project Comments: Allow northern pulp to build the new facility and continue running to keep people working Name:
Email: @hotmail.com Address:

Privacy-

Statement: agree x: 56 y: 17

From:
To: Environment Assessment Web Account
Subject: Public Comment - NPNS Waste Treatment Plan
Date: March 9, 2019 3:39:17 PM

March 8, 2019

Nova Scotia Environment
Environmental Assessment Branch
P.O. Box 442
Halifax, NS
B3J 2P8

Re: Replacement Effluent Treatment Facility (ETF) Project for Northern Pulp

I am a resident of the Town of Pictou who is very concerned about Northern Pulp's Environmental Assessment (EA) application. After reviewing the company's application documentation, I remain wholeheartedly opposed to the proposal because i) many aspects of the proposal are inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act,* ii) the information provided in the documentation is misleading, and iii) there is a lack of trust that, if approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations. Each of these points will be addressed separately below.

i) The proposal is inconsistent with the principles of sustainable development protected by the *Environment Act.*

The proposal is inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act*. In particular, the absence of critical information in the application documentation suggests that the precautionary principle identified in Nova Scotia Environment's Guide to the Environment Act (https://www.novascotia.ca/nse/ea/docs/EAActGuide.pdf) ought to outweigh any other consideration. According to the precautionary principle, an activity whose effects are disputed or unknown should be avoided, and therefore, the proposal ought to be rejected because:
• The final characteristics of the effluent are admittedly **unknown** by Northern Pulp and will remain **uncertain** until the new treatment system is up and running as indicated in Section 9.0 Human Health Evaluation, page 502,
"there is presently uncertainty regarding the likely chemical composition and characterization of the marine treated effluent discharge (including the potential concentrations of substances in the effluent"
• The proposal does not include lobster larvae tests or tests on herring spawning grounds, thereby indicating these effects are **unknown**. This is a particularly glaring omission given that these tests were specifically requested by those directly affected by potential negative effects of the effluent.

• The proposal does not mention the known mercury contamination in the soil and bedrock proximal to the proposed new treatment plant and basins, nor does it acknowledge the potential for disturbing the mercury contamination during construction. (Baxter, J., The Canso Chemicals mystery: With the chemical plant long gone, why is the company still alive? And what about all that mercury pollution?, *Halifax Examiner*, March 7, 2019, https://www.halifaxexaminer.ca/province-house/the-canso-chemicals-mystery-with-the-chemical-plant-long-gone-why-is-the-company-still-alive-and-what-about-all-that-mercury-pollution/). Yet, Section 2.5.2 (p.15) of the proposal explicitly identifies that siting decisions of the treatment facility were made with consideration for sensitive environmental features and that mitigation and compensation measures were developed where avoidance was not possible. "NPNS has emphasized project design and siting so that the location and configuration of the project facilities considers the above measures wherever possible so as to avoid or minimize the potential environmental effects of the project. To the extent possible, project facilities have been sited to avoid and reduce interactions with watercourses, wetlands, areas of elevated archaeological potential, and other sensitive environmental features. Where avoidance was not possible, mitigation or compensation measures have been developed as part of the EA, and will be implemented in consultation with the applicable regulatory authorities."
It is a gross oversight that the potential disruption of mercury contamination has not been addressed in the proposal and one can conclude that, on the basis of this proposal, the potential risk of mercury disturbance that, while present, is **unknown**.
• Northern Pulp has exhibited a poor track record with their current pipe, experiencing a number of breaks and leaks in recent years. Northern Pulp's inability to effectively maintain the integrity of their equipment over time would suggest that the ability of the company to prevent environment damage from effluent pipe breaks in the future is **uncertain** at best, not in keeping with the precautionary principle, and, therefore, too risky a prospect.
• Finally, the new effluent treatment system requires burning sludge, but the proposal does not indicate additional pollution abatement equipment that will be a part of the power boiler stack to minimize environmental impacts of burning something with **unknown** characteristics. This lack of information is particularly troubling given Northern Pulp's historical problems with the power boiler pollution filtration and the limited stack testing currently required. Furthermore, while Northern Pulp has had permits for test burns of sludge in the past, those test burns offer no assurance the sludge burning with the new system would be safe since effluent processing is entirely different and the sludge will be different given that it will undergo less 'polishing'.

ii) <u>Some of the information provided in the application is misleading.</u>
Some of the information provided in the application is misleading, specifically with respect to the quality of effluent that will result from the new treatment facility.
• First, in the public information sessions presented by Northern Pulp in December 2017, the effluent quality promised was contingent on Northern Pulp installing an oxygen delignification system. The proposal has been revised since the plans presented in 2017, but the promise of improved effluent quality remains despite oxygen delignification not being part of this proposal. If oxygen delignification is required to achieve the predicted effluent quality as promised, why is it not included in the proposal? And, if the proposal is assessed at face value and approved based upon predicted effluent quality dependent upon oxygen delignification, but oxygen delignification is not proposed, can the facility proceed and have poorer quality effluent as a result?
• Second, Northern Pulp's promise of improved effluent quality is misleading based upon the company's own admission in internal communication. Despite publicly claiming the effluent will be better, internal documents acquired by environmental lawyer Jamie Simpson acknowledge that it will, in fact, be worse due to losing the 'polishing' time that Boat Harbour

affords. (Jamie Simpson's interview with CBC Information Morning can be accessed here: https://www.cbc.ca/listen/shows/information-morning-ns/segment/15672343)
• The two points above refer to promises by Northern Pulp that effluent quality will be improved. Yet, as previously indicated, by the company's own admission, the actual characteristics of marine effluent are unknown. Therefore, it is challenging to understand how a promise of improved effluent quality can be made, if the effluent characteristics are uncertain.
• In addition, the author of one study cited by Northern Pulp in their EA proposal has recently responded to the interpretation of their work within the EA document and have explicitly stated that Northern Pulp has misrepresented its scientific contribution, thereby raising concern about the representation of other studies included in the proposal (Pannozzo, L., Dalhousie researcher breaks silence over pulp mill's cancer-causing air emissions, *Halifax Examiner*, March 7, 2019, https://www.halifaxexaminer.ca/province-house/dalhousie-researcher-breaks-silence-over-pulp-mills-cancer-causing-air-emissions/).

iii) There is a lack of trust that, if the project is approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations.

• Lastly, there is a lack of trust that Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations or adequately monitor the terms and conditions of this environmental assessment, should it be approved. The provincial Auditor General has identified this specific issue as a concern as recently as 2017 where his November 2017 report clearly stated that "Nova Scotia Environment is not monitoring terms and conditions attached to approved projects", (Report of the Auditor General to the Nova Scotia House of Assembly, November 1, 2017, p. 45; https://oag-ns.ca/sites/default/files/publications/FullNov2017_1.pdf). And, using history as a guide, NSE has demonstrated numerous challenges with effectively monitoring Northern Pulp and enforcing the regulations it has imposed as highlighted below.
• Nova Scotia Environment (NSE) has the responsibility of creating and enforcing the rules for Northern Pulp's current effluent pipe, yet there have been at least three pipeline leaks in recent years (2008, 2014 and 2018). And, despite increasing efforts by the regulator to improve pipeline monitoring by the company in response to the recent pipe breaks, those efforts did not result in preventing future leaks.
• The current monitoring and enforcement model employed by Nova Scotia Environment (NSE) requires companies self-report problems and breaches. More than a decade ago, in 2008, a review of NSE by the Office of the Auditor General identified this as an area of concern and recommended that,
"The Division should establish procedures to obtain objective evidence to validate the accuracy of monitoring reports received from approval holders". (Recommendation 3.2, https://oag-ns.ca/sites/default/files/publications/2008%20-%20Feb%20-%20Ch%2003%20-%20Environment%20and%20Labour%20-%20Env%20Mon%20and%20Compliance.pdf)
Yet, the 2017 Report to of the Auditor General to the House of Assembly (https://oag-ns.ca/sites/default/files/publications/FullNov2017_1.pdf) notes that this recommendation had not yet been addressed. As a result of failing to implement a solution per the Auditor General's decade-old recommendation, NSE has proven to have lessened awareness of certain problems and have been unable to minimize what could be preventable environmental damage. Some examples that illustrate NSE's limited objective oversight with respect to Northern Pulp include the following:
o Northern Pulp had problems with their power boiler scrubber identified to them by a consultant in 2006, but NSE did not become aware of the situation until 2008. Had NSE been

relying on objective oversight, the problem could have been identified much sooner rather than obliviously allowing the company to continue operations.
o Subsequently, NSE issued an industrial approval in 2011 despite the company failing to address their air pollution problems. The Minister of the Environment stated that NSE was unaware of the ongoing air pollution issues when the 2011 Industrial Approval was issued despite evidence to the contrary provided by NSE to the environmental group Clean the Mill (CBC News, Northern Pulp air quality monitors years behind schedule, October 7, 2014, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-air-quality-monitors-years-behind-schedule-1.2789892). It was not until 2012 that NSE finally issued a directive to the company to address the problem. This example illustrates a lack of communication within NSE, further reinforces the need for objective information to be used in decision making within the Department in order to prevent damage from environmental regulation violations and further justifies the decreased public trust in NSE's ability to protect the environment.
o When the effluent pipe broke in 2014, NSE grossly underestimated the volume of effluent lost at be 4 to 5 million liters ((CBC News, Northern Pulp charged with releasing effluent into fish habitat, October 14, 2015, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-spill-charge-1.3270154). However, the actual volume released turned out to be 47 million liters which was only revealed in court proceedings after a federal investigation (Withers, P., Northern Pulp fined $225K for 'toxic' effluent pipe leak, CBC News, March 23, 2016, https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-mill-effluent-leak-fine-1.3504203). NSE has no way to independently monitor the current pipe or that proposed in this EA application not does it have the ability to validate the information reported by the company. As a result, NSE must rely on the face value of information provided by the company, a situation that has proved problematic in the past.
o Despite Northern Pulp's 2015 Industrial Approval requiring the company 'operate and maintain real time flow monitoring equipment ... designed to immediately notify the approval holder in the event of a total loss of flow or a reduction of flow below normal operating conditions', it was a member of the public that identified and reported the most recent pipe leak in October 2018. (Brimicombe, H., Northern Pulp line springs another leak, *The Advocate*, http://pictouadvocate.com/2018/10/24/northern-pulp-line-springs-another-leak/).
• Where Northern Pulp's information has proved inaccurate in the case of the 2014 pipe break, was missing in the case of the malfunctioning power boiler scrubber between 2006 through 2008, and the public needed to report the pipe break case of 2018, it seems unrealistic to think that NSE has the capacity to effectively monitor a new pipe and proactively limit environmental risks.
• Over the years, NSE has issued multiple directives to Northern Pulp to correct air emissions violations. Yet, these directives were ineffective at generating an immediate solution. Instead, Northern Pulp was given excessive timelines (often years) to correct problems. If a problem occurs with the proposed pipe or at the proposed new on-site treatment facility, problems need to be able to be identified and addressed immediately not with the excessive timelines we have become accustomed under the current monitoring and enforcement model. There is no amount of time that would be acceptable to fix problems that risk damaging the Town of Pictou's watershed or the commercial fishery.
In summary, I remain wholeheartedly opposed to Northern Pulp's effluent treatment proposal. Several aspects of the proposal are inconsistent with the principles of sustainable development that are supposed to be protected with the *Environment Act*. The information provided in the proposal documentation is misleading. And, finally, there is a lack of trust that, if approved, Nova Scotia Environment has the capacity to monitor and enforce compliance with regulations.

Sincerely,

Sent from my iPhone

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Environmental Assessment
Date: March 9, 2019 3:42:51 PM

March 9, 2019

Environmental Assessment Branch

Nova Scotia Environment

PO Box 442

Halifax NS B3J 2P8

EA@novascotia.ca

RE: Response to Northern Pulp Nova Scotia

Replacement Effluent Treatment Facility

In response to the proposal from Northern Pulp to pipe effluent into the Northumberland Strait I have several concerns regarding the lack of information provided in this document.

I am not a scientist or engineer, I am a concerned resident who has lived with air emissions that have exceeded the conditions of the IA over the course of that last several years. I have lived through two recent pipe ruptures which have allowed untreated toxic waste to foul the land and water. Both pipe breaks were discovered by individuals while out walking. One resulted in a fine and the investigation is still ongoing regarding the latest spill/breach.

The lack of information regarding what will be discharged is most concerning. As Paper Excellence operates a number of bleached kraft mills throughout the world this information should be readily available and should have been included in this proposal. To state they won't know what will be going into the Northumberland Strait until the system is operational is highly questionable.

What is different in this proposal, submitted by this same mill, from two previously proposals

(1990's)regarding piping effluent into the Northumberland Strait which were rejected?

Why is the technology/system presented in this proposal from a mill operation that was never built, rather than one that is operational?

Currently the effluent flowing into Boat Harbour is released into the Northumberland Strait after treatment and 'polishing' for 25 to 30 days. The new system will release effluent into the Northumberland Strait in a matter of hours at a rate of 70-90 million liters of hot liquid and 945 kg of solids every twenty four hours.

There is a great deal of technical theory, not proof in this proposal that there will be no ill effects to the receiving waters (Northumberland Strait) similar to information presented when Boat Harbour was built. Once the effluent was discharged into Boat Harbour every living thing was dead within days and created an environmental disaster that will never be free of toxins even after a multimillion dollar 'clean up'. The receiving waters (over 300 acres) of Boat Harbour contains heavy metals, mercury, zinc, chromium, cadmium, lead, nickel, arsenic, aluminum and vanadium. I cannot trust this same fate will not happen to the Northumberland Strait.

I also have grave concerns regarding the burning of toxic solid waste in an antiquated boiler without constant monitoring. Northern Pulp has an extensive record of noncompliance to their IA conditions when it comes to air emission.

Northern Pulp has presented a proposal that has very little actual fact based information and a great deal of speculation or theory.

I am concerned for the thousands of fisheries related jobs that will be put in jeopardy if an effluent discharge pipe is permitted in the Northumberland Strait. I am concerned the marine environment and ecosystem will be destroyed as well as our tourism industry. But most of all I am concerned with the health and wellbeing of everyone living in Pictou County.

There is far too much at risk to allow this proposal to be approved and I respectfully suggest this proposal should be rejected as presented.

Respectfully Submitted

@ns.sympatico.ca

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 9, 2019 3:45:23 PM

Project: replacement_effluent_treatment_facility_project Comments: Hello I would like to see northern pulp have a chance to build there treatment plant and operate it. Iâ?Tm an employee for northern pulp and am raiseing a young family in rural Nova Scotia. My wife is a nurse practitioner in Pictou and if northern pulp is forced to shutdown it will force myself and my family to relocate to another province where we can both secure stable work. Thank Name: Email: Address: : Privacy-Statement: agree x: 61 y: 22

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 3:49:24 PM

Project: replacement_effluent_treatment_facility_project Comments: Yes this project should get approved, if we look around Nova Scotia itâ?Ts clear to see that the province is turning into a retirement community and less industry is looking to set up shop in our province,There is no reason why the fishing industry and pulp/forestry industries cannot both be sustained here in Nova Scotia as they have for the last 50 plus years, there is more than enough science to support the fact that this effluent treatment plant will look after any concerns around environmental upsets as this type of plant is in place in many other places in North America. Name: Email: @hotmail.com Address:

Privacy-Statement: agree x: 35 y: 28

From:
To: Environment Assessment Web Account
Subject: [PROBABLE-SPAM] Northern Pulp Pipeline Objection
Date: March 9, 2019 4:14:31 PM
Attachments: image002.png

To whom it may concern.

I object to the approval of a new pipeline for Northern Pulp (Paper Excellence) for the following reasons:

Northern Pulp has not honestly submitted the all the information available to them.

Namely,

Internal emails that received through a FOIPOP request show that Dillon consultants raised the issue of heavy metals, such as mercury, and of dioxins and furans in the effluent. In January 2018, Dillon sent a list of questions to Northern Pulp, KSH Consulting, and TIR, saying it needed information on the "percentage of dioxins and furans in the final effluent going into the straight [sic] daily."

In February 2018, Dillon again wrote to Northern Pulp reminding the technical manager of the need to acknowledge these substances, noting that:

… questions have arisen regarding the content of metals in the discharge. Based on available data …[redacted] will review potential metals or other effluent components levels in the context of potential marine environmental risk …

And:

We believed [sic] that an understanding of effluent characteristics regarding metals, dioxins and furans will be necessary.

Also, the new pipeline necessitates the burning of solid waste through their already inefficient burner systems creating further air pollution. The current air pollution according to a Delhousie study is already a significant health hazard to the general population in the area.

Please read the following article,

Dalhousie researcher breaks silence over

pulp mill's cancer-causing air emissions

MARCH 7, 2019 BY LINDA PANNOZZO6 COMMENTS

Share this story

Dalhousie University researcher Emma Hoffman has come forward to defend her 2017 ambient air quality study about cancer-causing air emissions detected near the Northern Pulp mill after finding that her study was "misrepresented" in the mill's recently registered Environmental Assessment [EA] for its proposed effluent treatment facility. [1]

In Part 3 of the "Dirty Dealing" series, I reported that a study by Hoffman and five other Dalhousie University researchers revealed that air levels of three of the seven volatile organic compounds (VOCs) assessed near the Northern Pulp mill exceeded cancer risk thresholds.

Over an eight-year period (2006-2013), 1,3-butadiene, benzene, and carbon tetrachloride were found to routinely exceed US Environmental Protection Agency (EPA) cancer-risk levels, which refer to the probability of contracting cancer if exposed to a concentration of a substance every day over the course of a 70-year lifetime.

According to the public and peer-reviewed study published in *Environmental Science and Pollution Research* — one of the few on record about airborne VOCs in rural Canada — many VOCs are either known or suspected of having direct toxic effects on humans, ranging from carcinogenic to neurotoxic and that "combinations of air toxics may have additive or synergistic adverse health effects." By analyzing the available data, the study authors were able to show that the Abercrombie pulp mill (currently Northern Pulp) was a likely source of the contaminants.

At the time, I contacted both Emma Hoffman and Tony Walker, two of the lead researchers, to ask about their work but neither were able to speak to me. They both cited "ongoing consultations" with the Boat Harbour Remediation Project. Hoffman said she was unable to speak "due to the sensitivity of the subject matter." Both are members of the Boat Harbour Environmental Advisory Management Committee (BHEAC), which was formed in 2016 after the governing Liberals set in law the January 2020 closure of Boat Harbour as Northern Pulp's waste lagoon. At the time, the provincial department of Transportation and Infrastructure Renewal handed over the responsibility for the remediation of Boat Harbour to Nova Scotia Lands Inc., a crown corporation, which is now the proponent of the project.

Minutes obtained from the BHEAC meetings dating back to 2016 indicated at the time that the consultants, including Hoffman, were instructed to avoid speaking publicly since the subject matter was "sensitive… until [the] strategy is finalized."

Emma Hoffman, from her Linkedin page.

But Hoffman, who is still involved with separate Nova Scotia Lands-funded studies, has decided to speak publicly now, given that the ambient air study was not funded by the province. She also said she wanted to "defend" the study "due to the misrepresentation put forth by [Northern Pulp's] Environmental Assessment of the scientific contributions it

provides."

Hoffman's full statement provided to me in response to Northern Pulp's EA can be found here**.** Her supervisors and study co-authors, Dr. Judith Guernsey and Dr. Tony Walker also contributed to her statement. [2]

Northern Pulp says Hoffman's study is flawed

The Northern Pulp EA says that the limitations of the study make it impossible to point definitively at the pulp mill as being the source of the VOC emissions. It says that while the seven VOCs referenced in Hoffman's 2017 study "may be emitted in small amounts in stack and fugitive emissions at the NPNS mill…a number of other point and mobile local sources also emit these substances within the local airshed."

In response Hoffman, Guernsey, and Walker say that the study was a "pilot" and "was not intended to provide causal evidence to implicate the mill as the sole source of the VOCs. Nevertheless, the study was able to show a very plausible association.

By analyzing publicly accessible emissions data from a provincially operated National Air Pollution Surveillance (NAPS) monitoring site located in Granton, southwest of the mill and combining this with local meteorological conditions at Caribou Point, Hoffman and her colleagues were able to show a positive correlation with wind direction and the Granton NAPS site's ambient VOC concentrations in relation to the location of the pulp mill. In other words, when the prevailing winds were blowing from the mill toward the Granton air monitor, the VOC concentrations typically went up for all of the compounds assessed, except carbon tetrachloride, suggesting that the mill is likely a contributor to the increased concentrations. "The largest point source emitter northeast of the Granton NAPS site is likely the mill," she says, but "the origin(s) of the VOCs are inconclusive."

Northern Pulp's EA also stated that the study did not attempt to rule out the contributions of other potential sources. But Hoffman, Guernsey, and Walker say this "is clearly not a true statement," and that the study did not disregard other potential sources of VOC emissions. The study openly acknowledged and discussed in detail the other potential local emission sources in the area, including a coal-fired generating station in Trenton and a tire manufacturing facility. The study even provided a map indicating these other potential sources relative to the Granton NAPS site.

Study Findings Warrant Further Investigation, says Hoffman and co-authors

Northern Pulp's EA states that "When other study uncertainties are considered… there is no current air quality issue with the seven targeted VOCs in the Pictou area." Hoffman and her colleagues say this statement is "misleading."

They say that despite some of the study limitations — including a limited number of air sampling sites in relation to the mill and the short duration of the study — the fact that VOCs routinely exceeded EPA air toxics-associated cancer risk thresholds, regardless of whether the mill contributed to these VOC levels, should not be ignored. "Absence of evidence is not necessarily evidence of absence," they say. "The limitations caused by sparse data does not necessarily mean there is no problem with air emissions in this community and there is no justification for [Northern Pulp's] erroneous conclusion."

Instead of more ambient air data, particularly in areas where there is higher residential exposure to the mill's toxic emissions, there appears now to be less. In 2015 Environment and Climate Change Canada (ECCC) decided to decommission the Granton NAPS site, the only one in Pictou County that measured VOCs.

According to the Nova Scotia Department of Environment, the Granton site was decommissioned after the feds analyzed 10 years of data and determined that the average annual levels of VOCs picked up by the monitor were "below or comparable to average levels" over time, elsewhere in Canada.

But air monitors are stationary devices meant to measure contaminants in outdoor (ambient) air. When they are located properly, like in Halifax where there is a relatively steady pollution source (cars), they can indicate levels of pollutants, like smog, quite accurately. But not so when it comes to "point sources," like the mill. One of the limitations with accurately measuring ambient point source contaminants is there is often a lot of variability.

When there were northeast prevailing winds blowing from the mill toward the Granton NAPS site, higher concentrations of VOCs were typically captured. But when the wind was blowing in another direction, it wasn't. So the high levels — the ones that routinely exceeded the cancer-risk thresholds, with the exception of carbon tetrachloride, reported by the Dalhousie researchers — were averaged down by the lower concentrations when the wind was blowing in other directions. That doesn't necessarily mean there were lower VOC concentrations in the surrounding community; it means that VOCs were likely blowing where they could not be captured by the Granton NAPS site.

The study also found that the prevailing winds (southwest) that blow toward the town of Pictou dominate during the summer months, when "people are more vulnerable to ambient air pollution exposure." In fact, because of Pictou's geography, air toxics from across the Eastern Seaboard of the United States converge with the local emission sources, including the mill, and as a result higher VOC concentrations are expected in Pictou in the summer.

The study authors point out that given Pictou's considerably larger population base, compared to the rural area of Granton, there is a need for "installing and maintaining additional strategically placed NAPS sites," to more accurately represent levels of air toxics where there is higher residential exposure.

Hoffman and her colleagues say that decommissioning the air monitor left an "information vacuum" and "only emphasizes the need for more research on these questions."

What is the cancer risk?

Northern Pulp's EA points to the study's use of USEPA cancer risk levels, which are expressed as 1-in-1 million, saying that the study authors should have adjusted the values to 1 in 100,000, in keeping with "current public health policy in Nova Scotia and most other provinces." Northern Pulp argues that this "correction would alter the conclusions of the study substantially," and that the exceedances would have been "negligible."

This will take a few steps to unpack.

First, Hoffman and her colleagues say this criticism is not relevant “given that Health Canada has no formal standards for air toxic emissions.” Many agencies and provinces use an increased chance of 1-in-1 million for expressing cancer risk.

Since there are no air toxics standards in Canada, the study authors turned to the US and the Environmental Protection Agency’s National Air Toxics Assessment (NATA), which calculates concentration and risk estimates from a single year’s emissions data. [3]

The NATA risk estimates assume a person breathes these emissions each year over a lifetime (or approximately 70 years), and establishes an air concentration value when excess cancer is observed. Hoffman, Guernsey, and Walker say the US NATA process is based on a 2005 scientific risk assessment process that established the cancer risk levels to which they compared the ECCC data. [4]

To illustrate, let’s take benzene as an example. The International Agency for Research on Cancer (IARC) has classified benzene as a Group 1 agent, which means it is “known” as being carcinogenic to humans. According to Carex Canada, a national carcinogen surveillance program that was established in 2007, there is no safe exposure level for benzene.

Hoffman’s study used the US EPA estimate that if an individual were to continuously breathe the air containing benzene at an average of 0.13 $\mu g/m^3$ over his or her lifetime (roughly 70 years), that person would have no more than one-in-a-million increased chance of developing cancer as a direct result of breathing benzene. If the exposure level goes up, so does the risk.

So, if the numbers for benzene, say, were adjusted to one-in-100,000, as Northern Pulp suggested, this would effectively increase the value ten-fold from 0.13 $\mu g/m^3$ to 1.3 $\mu g/m^3$ — meaning that if an individual were to continuously breathe air containing 1.3 $\mu g/m^3$ for a lifetime that person would have no more than one-in-100,000 increased chance of developing cancer.

But increasing benzene’s threshold concentration, as Northern Pulp suggests, does two things.

First, it does exactly what Northern Pulp said it would do: expressing cancer-risk levels as one-in-100,000 means that benzene concentrations detected at the Granton NAPS site would have been close to negligible.

But Hoffman and her colleagues point out it also does something else: It effectively increases the allowed ambient air concentration for benzene, a chemical for which there is no safe exposure. Therefore, the threshold is “less protective” of human health, they say.

In defence of the study, Hoffman, Guersey, and Walker also noted that it met all the quality control standards of *Environmental Science and Pollution Research*, the internationally-recognized, environmental science peer-reviewed journal in which it was published.

Boat Harbour could be adding to the problem

Northern Pulp’s EA also states that the seven VOCs cited in the ambient air study “are not

known (based on literature review) to be associated with pulp and paper mill activities and air emissions to any significant extent."

However, the study notes that the mill's own self-reported data show otherwise. National Pollutant Release Inventory (NPRI) data showed that in 2012 the company emitted 143 tonnes of VOCs from its stacks. In addition, an estimated 3.2 tonnes of benzene were released to the air from a stack higher than 50 metres, and 0.02 tonnes were released within 50 metres of the ground.

Hoffman, Guernsey, and Walker tell me that what's also worrying is that benzene can combine with chlorinated hydrocarbons associated with the Kraft bleaching process to form a range of toxic compounds which can become airborne. The study points out that although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not officially reported to have been released by Northern Pulp, these toxic VOCs "may become airborne through evaporation from pulp and paper wastewater." [5]

In other words, Boat Harbour — the mill's current effluent lagoon — could also be contributing to ambient concentrations of VOCs.

Despite a long history of non-compliance with regards to air emissions at the mill, and without providing any evidence of its own, Northern Pulp's EA simply concludes that when it comes to the seven targeted VOCs in the Pictou County area, "there is no current air quality issue."

It's a statement that rings hollow given that the company has failed repeatedly and spectacularly when it comes to pollution emission tests.

For instance, in 2014 the mill reported the release of 1,290 tonnes of fine particulate matter — the equivalent of 13 Irving pulp mills in one location. A lot of the excess particulate pollution at the time was blamed on a faulty electrostatic precipitator (ESP) in the recovery boiler — which was replaced in 2015 — but this still didn't address the issue of combustion gases, including VOCs. While all of the stacks at the mill would emit the cancer-causing substances, most would be coming from the recovery boiler, where the "black liquor" — the waste from the Kraft process — is burned to recover the sodium and sulphides, dispose of the unwanted dissolved wood components, and generate steam. ESP units are not designed to remove combustion gases. To do that you need properly functioning scrubbers, but the 50-year old scrubber in the recovery boiler is well past its best-before date and can't handle the high levels of pulp production now common at the mill.

Add to all this the fact that issues with the power boiler, first noted to be problematic in 2006, have never been addressed. Particulate matter emissions have been exceeded from that aging stack on numerous occasions, which is particularly disconcerting when we consider that the mill is planning on using it for a key part of its proposed effluent treatment plan: the "dewatered sludge" that would be a product of the activated sludge treatment process it proposes will be "burned along with bark in the mill's power boiler, which reduces or eliminates the problem of landfilling," according to the mill.

Not knowing what chemicals will be in the sludge, coupled with a glaring lack of properly functioning pollution-abatement equipment in the stack that will be burning it, could spell much worse air quality for local residents.

I ask Hoffman what she thinks about burning the sludge in the power boiler. While she concedes that she doesn't have "experience" with this matter, or "the knowledge of how these emissions produced by incineration would be mitigated or controlled for," she doesn't think it's a good idea.

Incineration of the sludge could result in emissions of "compounds of concern," such as heavy metals and other VOCs, she says, and "there are no standards in Nova Scotia to apply against these emissions." She notes that there are studies that investigate the re-cycling of pulp and paper mill sludge, but doesn't know if such practices would be "feasible" at Northern Pulp.

According to Hoffman, the intent of the ambient air study was to increase awareness and encourage government to "adopt more stringent air quality regulations and monitoring programs to ensure health of all citizens is safeguarded and prioritized."

In addition to the ambient air study, Hoffman was lead author on another 2015 study that highlighted the environmental impacts and lack of compliance at the mill. While Hoffman's work as a researcher with Dalhousie's School for Resource and Environmental Studies has specialized in investigating industrial pollution impacts on human and environmental health, it has been particularly focused on the reality of living near a pulp and paper mill and that's because for Hoffman, the mill is personal. She is from Pictou and says she has "a vested interest in issues surrounding local industry."

The abstract to the 2015 study concluded that, "After decades of local pollution impacts and lack of environmental compliance, corporate social responsibility initiatives need implementing for the mill to maintain a social license to operate."

That expiration date appears to be fast approaching.

Linda Pannozzo is an award-winning freelance journalist and author of two books: *The Devil and the Deep Blue Sea* (2013) and *About Canada: The Environment* (2016).

Notes:

1. A critique of the Hoffman et al. (2017) ambient air quality study can be found on pp. 504-505 of Northern Pulp's Environmental Assessment Registration Document.
2. Hoffman's supervisors from the School for Resource and Environmental Studies — Dr. Judith Guernsey in the Department of Health and Epidemiology and Dr. Tony Walker — contributed to her statement and responses to my questions.
3. Furthermore, at the federal level there are no legally binding guidelines for air pollution, only voluntary guidelines. The *Canadian Environmental Protection Act* (CEPA) outlines national air objectives and emissions standards for certain industries, but nothing is legally enforced, unlike the US, UK, and the EU, where national air quality standards do have legal teeth.
4. According to the US EPA Health Effects Fact Sheets, cancer risk when it comes to hazardous air pollutants is "the inhalation unit risk for a chemical, which is the increased probability of a person developing cancer from breathing air containing a specified concentration of the chemical for a lifetime. The inhalation unit risk is derived using mathematical models that assume a non-threshold approach; i.e., there

is some risk of cancer occurring at any level of exposure…The risk-based concentrations corresponding to a one-in-a-million, one-in-a-hundred thousand, and one-in-ten thousand excess risk attributed to exposure to the chemical are presented. This means that EPA has estimated that, if an individual were to breathe air containing these concentrations of the chemical over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million, one-in-a-hundred thousand, or one-in-ten thousand increased chance of developing cancer as a direct result of breathing air containing the chemical."

5. In Hoffman et al. (2017) the reference provided is: Soskolne CL, Sieswerda LE (2010) Cancer risk associated with pulp and paper mills: a review of occupational and community epidemiology. Chronic Dis Can 29:86–100.

Finally.
The intended path of the pipeline goes over the water table that feeds Pictou town, If this pipe is ruptured by fair means or foul, the effects to the community would be significant. It could be that land shift or tree roots may rupture the pipe or perhaps more sinister, the strength of feeling against this project may attract more militant action. I believe that it would be implausible to maintain security of this facility.

Sincerely

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 4:23:49 PM

Project: replacement_effluent_treatment_facility_project Comments: Dear Mr., Mrs. I moved here in New Glasgow, Pictou County, come work at Northern Pulp and I brought my family with me. We bought a house and become members of the community. My kids were born here and they are now in school. I am expecting the government to work with the owner to complete the new effluent treatment plant and finally close the Boat Harbour saga once for all. The price to pay to lose one of the biggest employer in Nova Scotia is too high to quantify without talking about the collapse of the forestry if the mill goes down. I personally experienced a mill closure in my hometown 15 years ago and I do not wish that on anyone. The rural Nova Scotia needs young families and not only retired people. The new ETF will have the best technology available to treat the effluent and I am expecting a fair and objective review of Northern Pulp application based on proven science and not only on people personal opinions. This province need to attract new employers but a lso need to work with the existing ones to build a long and prosperous future. Lets build a better future for our younger people to have a chance to stay at home and have good paying jobs in the private sector. Best regards, Mechanical engineer Name: Email:

Privacy-Statement:

agree x: 42 y: 16

From: @rogers.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 4:36:47 PM

Project: replacement_effluent_treatment_facility_project Comments: Re Replacement Effluent Treatment Facility Project I am currently a resident of Ottawa, but my family roots go back 200 years in Pictou County and I have a small house there that I return to every summer. You will have received many comments from many people, and many of these comments will go into extensive detail about the science and engineering involved. There will have been interpretations that support NP and interpretations that oppose that position. I wont attempt to argue technical details. I will simply argue that the level of risk is far too high to allow this project to go ahead. There is far too much uncertainty involved given all thats at stake for the fisheries, for tourism, for relations with First Nations, and for the quality of life for all residents of the area. First, it would be extremely irresponsible to allow NPs project to go ahead when there is no consensus on the science. Northern Pulps track record for honesty, for transparency, is a very poor one and it stretches back several decades. During those decades, while they claimed otherwise, their effluent has been poisoning parts of Pictou County. It is difficult, in fact it is impossible, to believe their current claims that this new process will have no negative environmental impact. There are many concerned citizens and scientists who are familiar with the technical details and are adamantly opposed to this proposal. Im sure you have heard from many of them and those concerns must not be brushed aside in order to gamble recklessly on this project. Second, given the complexity of the science and engineering involved in this project, the situation is made even more difficult when the project is only undergoing a Class One assessment rather than the more thorough Class Two or federal assessment. This fast-tracked process raises doubts and alarms rather than encouraging a sense that the consequences are being evaluated with all the careful attention to fine-grained detail that the project requires. Again, the risk of allowing this to go ahead without the greater certainty that a full scale assessment might provide, and thus allowing the fifty years of toxicity to continue, would be reckless and unacceptable. Third, approval of the project is only part of the issue. NP will apparently require at least a year delay of the January 2020 Boat Harbour deadline in order to complete the project and the toxic effluent would presumably continue to flow during that time. The current environmental assessment should thus include consideration of this environmental fact as well since the two are completely interdependent. This part of the project has absolutely nothing to do with risk or uncertainty. Its toxicity is a matter of public record, its effect has been nothing short of disastrous, and it constitutes one of the major examples of environmental racism in Canada. It is unthinkable that this could be approved and permitted. Yet that is precisely what NPs plan entails. There has been far too much damage already and the risk going forward is far too great. Fifty years is enough. Just say no! Name: Email: @rogers.com Address:

Privacy-Statement: agree x: 48 y: 24

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Environmental Assessment
Date: March 9, 2019 4:57:36 PM

Hello,
I own a property in Pictou County - Braeshore to be precise and I grew up with that pulp mill across the harbour. It seemed like people coped with the situation because it brought jobs to our diminishing part of the province. But after more than 50 years and living with chronic illness and life threatening diseases like cancer, people have run out of patience for a government that appears to be in a conflict of interest with this whole situation. My request is a simple - we need to have a federal environmental assessment completed. The logic points to this as the next step in this process. It is the right thing to do and wouldn't you say that now is the time for the Government of Nova Scotia to finally do what is fair and just for the citizens of Pictou County and its precious environment?

Sincerely,

Sent from my iPhone

From: @eastlink.ca
To: Environment Assessment Web Account
Subject: Public Response to Department of Environment - Northern Pulp Replacement Effluent Treatment Facility Project
Date: March 9, 2019 5:27:46 PM
Attachments: Letter to Margaret Miller Northern Pulp Replacement Effluent Treatment Facility Project.FINAL.pdf

Honourable Margaret Miller

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

March 9, 2019

Hon Minister Miller,

I am writing in response to the proposal submitted to the Department of Environment regarding the Northern Pulp Replacement Effluent Treatment Facility Project.

My name is I am a resident living in Pictou except for 3.5 years as a resident of Iqaluit and Yellowknife. I come from a fishing family including past and present and today my brothers' fish in the Northumberland Strait for lobster, crab, herring, and scallops. I spent my summers as a youth at Caribou Island and now spend summers at my husband's family cottage at Waterside.

I served as a Town of Pictou citizen representative on the Town of Pictou Ramsay Report Committee The Town of Pictou Organization Study was competed by Richard G. Ramsay Management Consultants Inc. to address the Town of Pictou's fiscal situation and develop a strategy toward a number of areas including residential, business development in the town of Pictou, increased quality and deliver of water services including our watershed and improved Town services and support to tourism, culture and community organizations.

Source: http://pictouproud.com/Portals/18/documents/20.ramsayfinal.pdf

My submission to you will include three topic areas:

1. The watershed for the Town of Pictou and surrounding community of Caribou
2. The proposed burning of sludge at the Northern Pulp site
3. The impact of the effluent dumped into the Northumberland Strait.

First of all I have to say the one month timeline for the public to respond has been a challenging one. I did my best to study this document. It has been a number of emails and follow-up with others for interpretations.

I also believe that the Department of Environment has an enormous task to respond to Northern Pulps Replacement Effluent Treatment Facility Project by March 29. I wish you and your staff

the best in sorting through what is a deep read and with tangled information, vague outcomes, contingency risks, and what I see no contingency plans to address those risks.

Focus 1: The watershed for the Town of Pictou and surrounding community of Caribou

Part of the Town of Pictou Ramsay Report Committee objective was to provide a plan toward improved drinking water services and risk management as it relates to water quality for Town of Pictou residents. Most recently a new water treatment plant was completed and opened in October 2018.

A document prepared for the Province of Nova Scotia, Department of Environment by the Caribou Source Water Protection Committee Members can be found online at https://www.townofpictou.ca/assets/PDFs/Water/Pictou-SWPP-Update-October-2017.pdf

This document states in its introduction that: *"**Water is a provincial resource and regulated by Nova Scotia Environment (NSE) under the Environment Act**. All Municipalities are required to obtain an approval from NSE to withdraw from water sources (i.e. groundwater and surface water) in Nova Scotia. The Town of Pictou (Town) holds water withdrawal approvals for both the Caribou and Pictou well fields and an **Approval to Operate** (Approval) for their water treatment and water distribution system from NSE under the Activities Designation Regulation. **The Approval details the operational conditions for the Town to ensure compliance with the Environment Act.** Included are provisions for the Town to develop a source water protection plan (SWPP)."*

This introduction clearly states that our drinking water source is regulated by the Nova Scotia Environment (NSE) under the Environment Act and that Approval to Operate for our water treatment and water distribution system. It goes on to state that: *"In 2002, Nova Scotia Environment (NSE) introduced its Drinking Water Strategy to ensure clean drinking water for all Nova Scotians. The main goal of a Water Utility is **to provide safe, clean drinking water to its customers**. **Protecting the quality and quantity of the source water is a top priority for utilities as one-step in the multiple barrier strategy developed for the protection of drinking water quality in Nova Scotia***." I interpret this to be the Department of Environment's responsibility and role to Nova Scotia citizens and communities.

The Town of Pictou who is in the business of providing services to its residents and businesses and the Municipality of Pictou County whose residents have private wells in that watershed, all must follow the guidelines/rules outline in the Pictou / Caribou Source Water Protection Plan.

The risks to water quality were identified as transportation, residential development, waste disposal, agriculture, **industrial development**, and recreation and environmental.

The procedures for development of the Pictou / Caribou Source Water Protection Plan are:
1) Form a Source Water Protection Advisory Committee (Committee);
2) Delineate a Source Water Protection Area Boundary;
3) **Identify Potential Contaminants and Assess Risk;**
4) Develop a Source Water Protection Management Plan; and

5) Develop a Monitoring Program to Evaluate the Effectiveness of a Plan.

I will focus on **#3 Identify Potential Contaminants and Assess Risk;**

Almost every activity on the land has the potential to affect the quality of water in a community. The Town of Pictou focuses on the following to protect its watershed:

Acquisition of Land: "*The acquisition of land by the Town gives direct ownership and control of portions of the source water area to the Town. This allows for a high level of protection of a source area due to direct control over the activities that can take place there."(Page 19)*

Best Management Practices (BMP's): "*These standardized and widely accepted practices for activities and products are the most* ***practical and effective means of preventing or reducing contaminants from reaching source water.*** *BMP's have been developed for most activities, which occur in a well field. They can be applied to various aspects of residential development, including septic system and oil tank installation and maintenance, and construction activities. Most aspects of agriculture have operating BMP's in place through a variety of regulatory and market driven processes. Many of these practices are specifically designed to manage specific activities, which may affect water quality. BMP's are also in place for many industrial products, services, and activities related to motorized recreation and transportation.) (Page 19)* For an effluent pipe to go through this watershed and with only one break in that pipe and it will happen, the province of Nova Scotia will have Boat Harbour #2 happen again.

The Town of Pictou recently opened its own $5.8 water treatment plant, which includes a state-of-the-art system that will eliminate the town's ongoing brown water issues, caused by high levels of magnesium and iron, for many years.

The treated effluent pipe is proposed to go through our watershed to Caribou Harbour. How will we know the precautions are being enforced based on the years of cracked pipes and effluent spills with the most and the most recent spill on Oct. 21, 2018? What will happen when that pipeline has a break? There will be a break at some point in this lifespan. This happens in every building, machinery and industry.

Northern Pulp has a failed history of this happening at last date October 21, 2018 only found by local residents, not NP staff or equipment. We have yet to receive a statement from the Province of Nova Scotia releasing three key pieces of information including: 1.the size or cause of the leak in October 2018, 2.the composition of the effluent that leaked and 3.why the pipe break went initially undetected by the pulp and paper firm owned by Paper Excellence. This is very troubling.

With our history, how will we ever trust the water coming out of our taps with the lack of transparency and accountability with effluent in an expanded watershed? Effluent coming through our facets will not have a taste. It is when it shows up in skin conditions, on-going health issues and diagnoses of cancer then it will be noticed and that is too late. There are families, individuals, business that will be impacted. Our water source for drinking, bathing, recreation, restaurants, tourism and basic living services such as food (including our local grocery store Sobeys) cannot operate without a daily, safe water resource. We will be living in a comparison

to on the poem of –The Rime of the Ancient Mariner" by the English poet Samuel Taylor Coleridge of –water, water everywhere and not a drop to drink," only our salt water will be our toxic, effluent watershed.

Do we want a Pictou, Nova Scotia version of Walkerton? With this effluent going through our watershed we will get it. *"The situation in Walkerton, Ontario, in May 2000 is nothing less than a human tragedy. The outbreak of E.coli, which killed seven residents and left 2,300 people sick, was shocking and frightening for the people in the area. For six long months the town's 5,000 residents had to rely on bottled water and the treating of tap water with bleach, with many going to homes of friends and relatives in neighbouring communities to bathe. Six months after the tragedy unfolded, the town still suffered under boil water advisory." Even after the water was declared safe to drink in December of 2000, many people still felt uncomfortable using what comes out of the tap. Their trust and belief in the water system is seriously eroded. The Walkerton tragedy is a serious reminder of what many Canadians take for granted – the value of clean and safe drinking water."*

Source: https://www.peelregion.ca/pw/waterstory/pdf/activities/case-study.pdf

Focus 2: The proposed burning of sludge at the Northern Pulp site

The proposal states: *Emissions during construction are generally related to the generation of dust from earth moving activities and unpaved temporary access roads, and routine combustion gas emissions from construction equipment. Equipment used for construction will generally consist of dump trucks, excavators, wheeled loaders, bulldozers, and other mobile equipment, similar to what may be seen on many other commercial or industrial construction sites. Control measures, such as use of water sprays on roads during dry periods or other dust suppression techniques, will be used as required to reduce the fugitive dust, and routine inspection and maintenance of construction equipment as well as the implementation of a no-idling policy will reduce exhaust fumes. Waste wood may be mulched and spread on access roads. The burning of waste brush/slash material or grubbings will not be permitted. (*Page 85- 5.0 Project Description- DILLON CONSULTING LIMITED)

Sludge Management System

Waste process sludge from primary and secondary treatment (clarifiers) will be sent to a single sludge holding tank located within the AST building….Burning sludge in this manner reduces the potential for methane emissions from the ETF process and partially displaces the use of fossil fuel that would otherwise be burned in the power boilers for energy production. (Page 81- 5.0 Project Description- DILLON CONSULTING LIMITED)

"The "dewatering process" of the sludge from the treatment facility will work well, and there is no need to worry about burning it in the mill's power boiler, even though that boiler has already caused many emissions problems." https://www.halifaxexaminer.ca/province-house/northern-pulps-environmental-documents-missing-mercury-a-pulp-mill-that-never-was-and-oodles-of-contradictions/

Additional information in a link from the above article as reported by the CBC - Northern Pulp flunks air emission tests — again Paul Withers · CBC News · Posted: Sep 19, 2017 6:30 AM AT | Last Updated: September 19, 2017 https://www.cbc.ca/news/canada/nova-scotia/northern-pulp-air-emission-tests-fails-again-1.4295686

"This is the third year in a row emissions from the power boiler at the Northern Pulp mill exceeded the limits set down by the Environment Department. In June, tests recorded particulate emissions of 224 milligrams per reference cubic metre. The boiler permit allows 150 mg/Rm3."

The proposal has toxic sludge being burned on site in a power boiler that is inconsistent with proper disposal of waste.

In the Town of Pictou, we have a Town of Pictou Outdoor Fire By-law that states:

No person shall have an Outdoor Fire except in an Acceptable Fire Pit, Outdoor Furnace, or for which a Fire Permit has been obtained from the Fire Chief, Fire Inspector or his Designate in accordance with Schedule A herein, and in accordance with conditions as follows:

a. no materials, articles or substances shall be burned excepting Seasoned Firewood or charcoal;

b. an Acceptable Fire Pit shall be located in excess of twenty-five (25) feet from any Building, flammable structure, combustible material or property line;

c. notwithstanding 5 (b), a Chimenea may be operated on a wooden deck provided:

i. it is positioned on a CSA approved fire-proof pad that extends at least eighteen (18) inches from where the door is located and eight (8) inches on all other sides;

ii. it is seven (7) feet from the house and three (3) feet from any wooden surface that is not appropriately screened with a CSA approved fire-proof material;

iii. the operation of a Chimenea meets any standards detailed in the operating instructions accompanying the device;

This means we cannot have a fire pit in our back yard unless it meets the bylaw standards of the Town of Pictou. Yet we will be allowed to breathe in toxic waste from a pulp mill across the harbour. Isn't it ironic?

Source: https://www.townofpictou.ca/assets/PDFs/Town-Hall/By-Laws/Outdoor-Fire-By-law-Approved.pdf

Focus 3: The impact of the effluent dumped into the Northumberland Strait.

In the document, ***Canada's Challenges and Opportunities to Address Contaminants in Wastewater Supporting Document 2, Wastewater Treatment Practice and Regulations in Canada and Other Jurisdictions*** – Environment Canada, March 2018, it states on **page 8**, under the header: **1.2 Regulatory structure for wastewater treatment,** the following states:

*–**The primary federal tool to control the wastewater releases is the Fisheries Act**. Within the Fisheries Act, Environment and Climate Change Canada (ECCC) administers the key pollution prevention provisions (subsections 36 (3) to (6)), which **prohibit the deposit of deleterious substances in water frequented by fish, unless authorized by regulations (Environment and Climate Change Canada, 2017a). A deleterious substance may be any substance that degrades or alters water quality such that it could be harmful to fish, fish habitat, or the use of fish by people**. Under the pollution prevention provisions, ECCC administers and **enforces several regulations, such as those governing effluents from pulp and paper mills, metal mining operations, and municipal wastewater.** The Wastewater Systems Effluent Regulations (WSER; SOR/2012-139) establish baseline municipal effluent quality standards for suspended solids (SS), carbonaceous biochemical oxygen-demanding material (CBOD), total residual chlorine, and un-ionized ammonia (NH3), as outlined in Table 1.1. These regulations impose minimum standards for municipal effluent quality nationwide, and are intended to be achievable through secondary wastewater treatment or equivalent."*

This continues with the following information on page 9*: "In addition to the Fisheries Act, the Canadian Environmental Protection Act (CEPA) is also used to prevent and manage risks posed by toxic and harmful substance. This legal framework may contribute to improved wastewater effluents by controlling substances that are otherwise difficult to treat (CCME, 2009). Under CEPA, owners or operators of wastewater treatment facilities that meet reporting requirements are required to report discharges to the National Pollutant Release Inventory (NPRI), which is a publicly accessible inventory of pollutant releases. NPRI tracks releases of several substances associated with municipal wastewater, such as ammonia, chlorine, metals, phosphorus, and greenhouse gases. However, reporting to the NPRI is only mandatory for facilities in which employees work a total of ≥20,000 hours during the calendar year, thresholds for specific substances are met, or total discharges exceed 10 000 m3 /day (Environment and Climate Change Canada Change, 2016). Because only about 200 WWTPs (out of ~3500) across Canada meet these requirements (Holeton et al., 2011), the contaminant releases shown in this database represent only a subset of the total contaminant loads released into the environment from wastewater treatment facilities."*

The Northern Pulp proposal states: *The group also visited two NBSK pulp mills that operate Veolia BAS™ treatment systems (Södra Cell Värö mill in Väröbacka, Sweden and the Södra Cell Mörrum mill in Mörrum, Sweden) in May 2018. Both of these mills successfully manage the BAS™ treatment system to meet applicable regulations and have ocean discharges for their treated effluent. These visits confirmed that the proposed Veolia BAS™ treatment system will provide the required treatment needs for NPNS to meet current and an anticipated future regulations."* (Page 64 - 4.0 Project Justification and Alternatives Considered - - DILLON CONSULTING LIMITED)

–There is an increased project risk due to lack of reliability in disposal: weather conditions, vehicle maintenance/problems, and appropriate staffing redundancy to accommodate volume of discharge. There will be a significant increase in truck traffic, which will increase noise and potentially the risk to public safety." (page 67- DILLON CONSULTING LIMITED).

The report goes on to state: "*Use of a pipeline increases the reliability of disposal as it is not as subject to weather conditions and staffing as trucking. Additional infrastructure may be necessary, including additional pumping and length of pipe, which includes risks of potential failure. NPNS may be required to purchase/lease additional land to construct a pipeline. Additional approvals and studies will be necessary*." (page 67- DILLON CONSULTING LIMITED).

If I read this correctly, then piping effluent through a watershed into a final drop off into prime fishing grounds and for ocean currents to carry it out into the large mass of Northumberland Strait is a better plan? Let's look at some of the materials that will be in that effluent.

The method that's used at Northern Pulp will create chlorinated pollutants such as chloroform, dioxins and furans and other contaminates released include, heavy metals such as mercury, zinc, cadmium chromium, along with organics, alkyl phenols and oxygen depleting nutrients. I will address two of the nine pollutants stated above from this article:

Source: Report shows heavy metals in pulp mill effluent, Cape Breton Post, Published: Nov 07, 2014 at midnight, Updated: Oct 02, 2017 at 11:27 a.m. https://www.capebretonpost.com/news/local/report-shows-heavy-metals-in-pulp-mill-effluent-7486/

Mercury in the food chain:

Source: NORTHERN PULP'S ENVIRONMENTAL DOCUMENTS: MISSING MERCURY, A PULP MILL THAT NEVER WAS, AND OODLES OF CONTRADICTIONS - MARCH 5, 2019 BY JOAN BAXTERhttps://www.halifaxexaminer.ca/province-house/northern-pulps-environmental-documents-missing-mercury-a-pulp-mill-that-never-was-and-oodles-of-contradictions/?fbclid=IwAR1O3kOUAvSC5KFq-pHKBJYEpk1dwa2olmkWOoITHpaaFEDCkH8BYaE-b6o#Missing%20answers,%20missing%20mercury

Source: https://www.canada.ca/en/environment-climate-change/services/pollutants/mercury-environment/health-concerns/food-chain.html

Mercury in the Food Chain: The Government of Canada website states in its introduction to mercury in the food chain that, *–Almost all mercury compounds are toxic and can be dangerous at very low levels in both aquatic and terrestrial ecosystems. Because mercury is a persistent substance, it can build up, or bioaccumulate, in living organisms, inflicting increasing levels of harm on higher order species such as predatory fish and fish eating birds and mammals through a process known as "biomagnification"... "In the environment, particularly lakes, waterways and wetlands, mercury can be converted to a highly toxic, organic compound called methylmercury through biogeochemical interactions. Methylmercury, which is absorbed into the body about six times more easily than inorganic mercury, can migrate through cells which normally form a*

barrier to toxins. It can cross the blood-brain and placental barriers, allowing it to react directly with brain and fetal cells."

"The most important pathway for mercury bioaccumulation is through the food chain, as illustrated in the figure below. In the water, plants and small organisms like plankton take up mercury through passive surface absorption or through food intake. For "autotrophic" organisms (which do not eat other organisms), passive absorption is the only route of exposure. The amount of mercury that results in these species from even a lifetime of passive absorption is not generally harmful to the organism. On the other hand, heterotrophic organisms (animals which eat other life forms) may be exposed to dangerous concentrations via a second route. Methylmercury biomagnifies through the food chain as predators eat other organisms and absorb the contaminants that their food sources contained. Over time, an individual who consumes plants or prey contaminated with methylmercury will acquire levels greater than in either its habitat or its food. ***As a result, top predators acquire greater body burdens of mercury than the fish they consume."*** **The top predator is "We", the human consumer.**

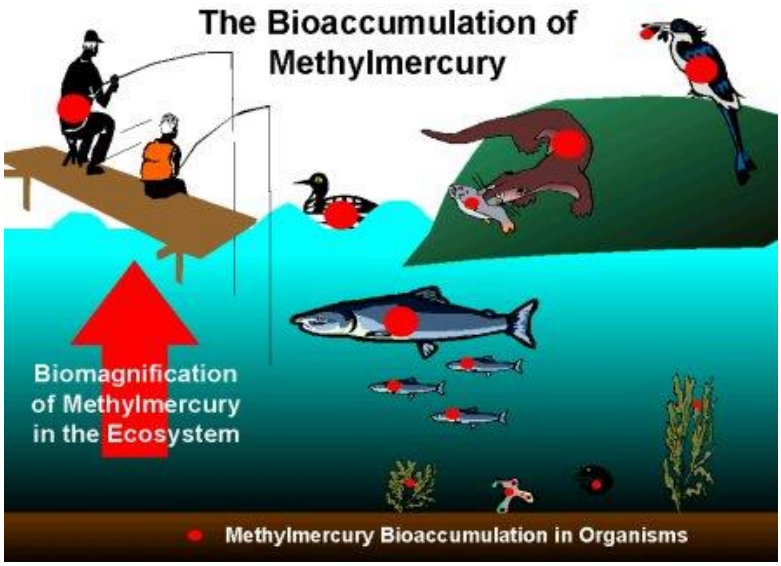

Photo Source: https://www.canada.ca/en/environment-climate-change/services/pollutants/mercury-environment/health-concerns/food-chain.html

Zinc in the Food Chain:

Source: https://www.lenntech.com/periodic/elements/zn.htm

~~-~~Water is polluted with zinc, due to the presence of large quantities of zinc in the wastewater of industrial plants. This wastewater is not purified satisfactory. One of the consequences is that rivers are depositing zinc-polluted sludge on their banks. Zinc may also increase the acidity of waters.

"Some fish can accumulate zinc in their bodies, when they live in zinc-contaminated waterways. When zinc enters the bodies of these fish it is able to ***bio magnify up the food chain***." As we

humans are many times the final customer on the food chain, zinc impacts our health by, *"Very high levels of zinc can damage the pancreas and disturb the protein metabolism, and cause arteriosclerosis. Extensive exposure to zinc chloride can cause respiratory disorders…Zinc can be a danger to unborn and newborn children. When their mothers have absorbed large concentrations of zinc the children may be exposed to it through blood or milk of their mothers."* **Source:** https://www.lenntech.com/periodic/elements/zn.htm

"Industrial sources or toxic waste sites may cause the zinc amounts in drinking water to reach levels that can cause health problems." **Source:** https://www.lenntech.com/periodic/elements/zn.htm

Other Sources:

- http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=71EF4032-1&offset=2&toc=show
- https://www.ccme.ca/files/Resources/supporting_scientific_documents/Zinc%20CWQG%20SCD.pdf
- https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/alaska/sw/cpa/Documents/L2010CadmiumLR122010.pdf
- https://novascotia.ca/fish/commercial-fisheries/industry-overview/
- http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/comm/atl-arc/lobster-homard-en.html
- http://www.assembly.pe.ca/sittings/2018spring/transcripts/17_2018-19-10-transcript.pdf
- http://employmentjourney.com/industries/fisheries/
- http://cwn-rce.ca/wp-content/uploads/projects/other-files/Canadas-Challenges-and-Opportunities-to-Address-Contaminants-in-Wastewater/CWN-Report-on-Contaminants-in-WW-Supporting-Doc-2.pdf
- http://cwn-rce.ca/report/canadas-challenges-and-opportunities-to-address-contaminants-in-wastewater/
- https://nsadvocate.org/2019/01/24/matt-dort-on-northern-pulp-effluents-and-the-northumberland-strait-its-about-more-than-meeting-flawed-regulations/

Northern Pulp on under the Human Health Evaluation starting on page 489 states, *"Public and regulatory concerns regarding the potential human health effects of project emissions and treated effluent discharges have been raised throughout the project development period, and it is likely that such health-related concerns will continue to be raised during NSE's EA review process.*

The project has two main sources of emissions/discharges that may result in potential human exposure to project-associated chemicals:

• ***The marine treated effluent diffuser; and,***

• ***Air emissions from the replacement ETF and existing NPNS mill due to future planned co-combustion of sludge with hog fuel in the mill power boiler.***

At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) ***will not be known with certainty until the project is operational."***

"Will not be known with certainty until the project is operational?" This is totally unacceptable. We the citizens in direct path of air emissions made up on sludge with hog fuel

are to wait until the gases come across the harbour at us and we are diagnosed with cancer that we will find out at that time the new process burning sludge is not good for us?

The government is putting itself in a precarious position to even think of allowing industry to act this out in 2020.

One more point:

On page 34 in the Executive Summary submitted by DILLON CONSULTING in Table E.1.1-1: Summary of the Significance of Project-Related Residual Environmental Effects, the abbreviation of NS = No Significant Residual Environmental Effect Predicted is assigned for each Valued Environmental Component (VEC) with sub headers of Project Phase Accidents (Malfunctions, and Unplanned Events), Project Overall, Construction, Operation and Maintenance.

How can a project of this magnitude to be completed and up and running by January 31, 2020 not have at least a minimal of two of the following risks?

S = Significant Residual Environmental Effect Predicted.

L = Residual Environmental Effect is Likely to Occur.

U = Residual Environmental Effect is Unlikely to Occur.

P = Positive Residual Environmental Effect Predicted.

And where in this report is a contingency plan? This proposal is best case scenario with worst case results for those of us in its path.

There is just no way can this project be trusted by any of us who will be directly impacted by this project. There is just no trust with this company.

My Recommendation

I urge the Hon. Margaret Miller to reject the Northern Pulp Replacement Effluent Treatment Facility Project. Everything I wrote on the last 10 pages state why this project must be cancelled for the sake of drinking water, health of residents, health of our food supply, economic health and for all of us Northern Nova Scotia, Prince Edward Island and New Brunswick. The risks as I outline are significant adverse effects that cannot be mitigated.

This proposal in its presented format will forever impact the drinking water for the Town of Pictou and Municipality of Pictou County residents in this area. This proposal will forever impact the fishing industry in this region and beyond. This proposal and the results will come with more health issues, respiratory illnesses and cancer rates in addition to a spoiled reputation of Canada's Ocean Playground. This proposal will impact our province, the province of Prince Edward Island and New Brunswick. It took only one mad cow to stop an industry in its tracks.

This is not an ~~"if~~" statement. This is a ~~"w~~hen" statement. History will repeat itself.

There is a Plan B for Nova Scotia, including the forestry industry. Today there has never been such a demand for wood and its products. There is a very bright future ahead for the forestry

industry that is different from ripping under age trees from the ground and mincing them into pulp for paper and toilet paper. We just change our natural resource, grow hemp for those products and follow the Leahy Report.

We need to address climate change and work toward meeting those targets. We must reduce our environmental impact with more sustainable industries and a 2020+ vision.

As a taxpayer of this province, I will be paying for the decisions that will be made over the next month for many years. I want to pay taxes on a Plan B that gives us a healthier province and a bottom line positive impact to our economy, forestry, fishing, tourism, business communities, and for all residents in this community and beyond. We just need to get to work on Plan B.

Thank you

Email: @eastlink.ca

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 5:33:47 PM

Project: replacement_effluent_treatment_facility_project Comments: The future of our air and water are of the utmost importance. It is far more important than profits for an already wealthy foreign conglomerate. The wealthy family who owns a litany of companies, including Paper Excellence parent company of Northern Pulp has been convicted of illegal logging in China, Cambodia, and Indonesia. Why should we trust them? I can guarantee they dont care at all for the future of Nova Scotias forests or people. I have no faith or trust in Northern Pulp after decades of lying and spewing their noxious chemicals into my hometowns air. I do not support the pipeline into the Northumberland Strait. I am strongly opposed to high temperature waters which I believe will also be polluted with chemicals entering the strait. I am certain that the impact on the ecology of the area near the outfall, and further removed, will be significant. Rising temperatures in ocean waters are already a serious concern with climate change. The last thing we need to do is further contribute to the temperature rise. I understand there is concern for jobs, especially in rural Nova Scotia. However, NS Governments most recent tweet March 9, 2019 states that the unemployment rate is at its lowest since modern surveys began in 1976. It is also time for our rural economies and forestry industry to diversify. With some effort and innovation, I think there are great potential opportunities in both industries. Whatever happens, it is extremely important that the province keeps their promise and closes Boat Harbour by January 2020. Name: Email: @gmail.com

Privacy-Statement: agree x: 62 y: 21

From:
To: Environment Assessment Web Account; minister.enviornment@novascotia.ca
Subject: Northern Pulp's Replacement Effluent Treatment Facility Project
Date: March 9, 2019 5:35:26 PM

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ea@novascotia.ca

minister.environment@novascotia.ca

Dear Minister Miller,

I respectfully request that you reject Northern Pulp's effluent treatment replacement proposal on the grounds that it will have a greatly negative impact on an already fragile ecosystem- the Northumberland Straight.

I grew up in Pictou and still clearly remember when the mill began operation. I was 11 years old, gagging at the rotten egg stench as I walked to school with my friends. We all wondered when we could breathe fresh air again. I remember being told that I would soon get used to the smell, that it meant jobs for Pictou County, that it was stinky but safe. I remember when we were no longer able to take the little ferry to Pictou Landing to swim off the pier with the indigenous children, or at any of our usual beaches, because the water had become "contaminated". My family would only swim or fish in waters outside of
Pictou Harbour after that.

After high school I moved to Halifax for study, became a Registered Nurse and worked in health care . As I worked and learned about the determinants of health I came to realize the risks posed by environmental pollution. Safe water, clean air and healthy workplaces are vital for healthy communities. It became obvious then that the health of the populations of Pictou, Pictou Landing First Nation and much of Pictou County were being sacrificed for some jobs at a massively polluting pulp mill.

Many in my large extended family reside throughout the Pictou County and I still spend considerable time there. I shop, eat out and attend entertainment events in Pictou. The Capital of Pictou County, it is a town steeped in a rich cultural heritage as the birthplace of New Scotland. Each summer folks from throughout the county, the province and beyond gather to celebrate the labours of local fishermen at the Pictou Lobster Carnival. The deCoste Performing Arts Centre hosts cultural and musical events throughout the year and is a tourism hub for visitors arriving by car and by boat at the nearby marina. I sometimes sail in the deep waters of Pictou Harbour out to Pictou Island. I camp at the local provincial park, Caribou-Monroe's Island, and take leisurely walks around that unspoilt natural preserve. I visit and stay near the Caribou Island Lighthouse, and walk on the mudflats at low tide. I swim and kayak along that shore and share the unique tranquility with shorebirds and seals. I wish more people could have the opportunity to share and respect the beauty and peacefulness of the Northumberland Straight.

I believe the tourism industry in Pictou County has great potential, but the smelly polluting eyesore directly across the harbour from downtown Pictou is definitely a detractor. Visitors are often put off by the site and/or smell and choose to spend time and have their meals elsewhere. The locals hope for change.

I am keenly aware that Northern Pulp provides employment opportunities to this community, but at what cost now and in the future? I understand the necessity of jobs to the survival of a community. Two of my brothers worked at the mill; the elder as an engineer in the and the younger as a tradesman in the The elder, now in his late , worked there when the mill was newish and well maintained. The younger worked there through new management, shortcuts in maintenance, and an ever increasing demand to produce more regardless of the capacity the mill was designed to manage.
My father, brother, and other relatives were/ still do make a living from fishing lobster and other seafood off the coast of Pictou County. These jobs provide food and income, and are also part of the culture and heritage of Nova Scotia.

Based on Northern Pulp's well documented track record I do not believe they are good corporate citizens. The preservation of this area is not their priority, but rather their own profit for investors abroad. I am very concerned about the current plan for the effluent pipe. I share in the fear that Pictou's watershed area will be placed at risk from pipe leakages and that the coastal waters around Pictou County will become devoid of marine life, unsafe for human recreation, and a vital fishing industry will be lost.

I stand with the First Nations peoples of Pictou Landing in opposing this plan and agree that many years of environmental racism must end.

I encourage you to stand for the preservation of a heathy environment in and around Pictou County, for the people and for the aquatic life.

Sincerely,

Sent from my iPad

From:
To: Environment Assessment Web Account
Subject: , My Addition to my Northern Pulp"s Proposed Effluent Treatment Facility submission on March 6th
Date: March 9, 2019 5:39:56 PM
Attachments: outfall comparison, depths, ice, scallop buffer Zone.pdf

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Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442

Email: EA@novascotia.ca

Dear Ms. Miller:

Re: Northern Pulp Nova Scotia - Environmental Assessment Registration Document- Replacement Effluent Treatment Facility

In Addition to my Submission on March 6th, I would like to add this comparison of the Northern Pulp Mill that is proposing to build an AST system to a mill in British Columbia that is using an AST system and show the major difference in their receiving waters. I have also added in the attached document the scollop buffer zone that the fishermen must abide by within their conditions for scollop fishing. This shows the difference in how Northern Pulp shows the buffer zone in their EA versus how DFO has set it in according to the Fisheries Act. Also in the document is a image of the present day ice report showing the gulfs ice conditions and how the ice affects the strait.

After looking through my document, I hope you understand why there are many issues of great concern to me in Northern Pulps EA submission. These issues need more review and information to insure the heath and safety for both the people of Nova Scotia and the Northumberland Strait to which we fish and share with surrounding Provinces. I am asking that you, as Minister for Nova Scotia Environment, order an Environmental Assessment Report of Northern Pulp's proposed effluent treatment facility.

Thank You

Lobster Fisher,

g@hotmail.com

Outfall Comparison of Crofton, BC Mill & Northern Pulp

Depths of Proposed NP Outfall Location

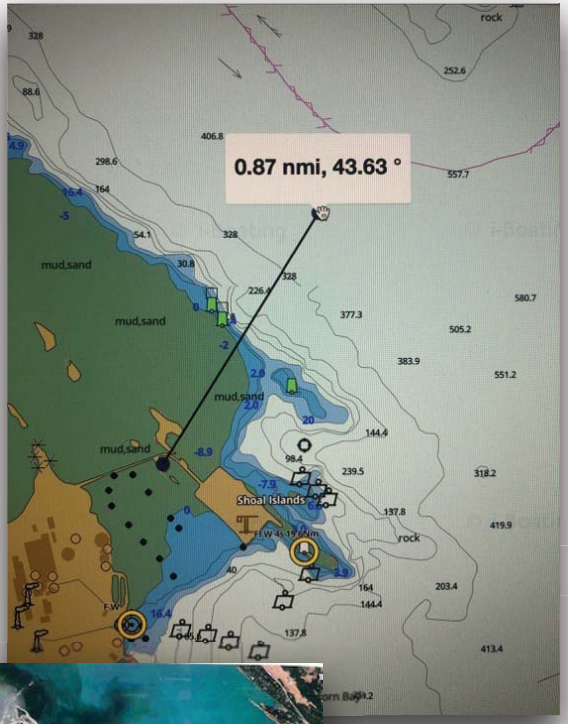
Ice Chart of Northumberland Strait

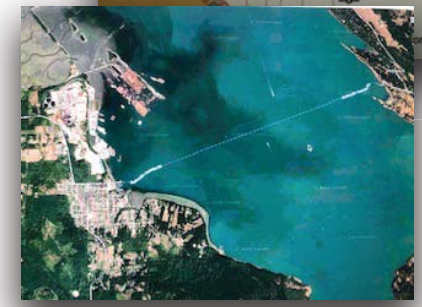
Outfall and pipeline fall within Scallop Buffer Zone

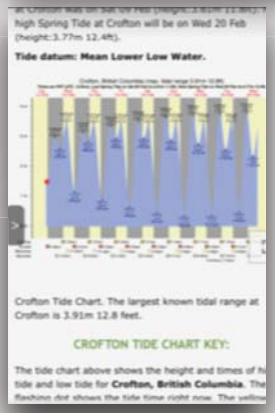
Threats to Gulf of St. Lawrence

March 9, 2019

Catalyst Paper Outfall
Crofton, British Columbia

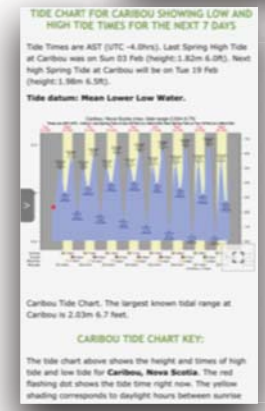






Water depth: 400-500 feet
Distance from Shore: 1.96 nautical miles
Tidal Range: 12.8 feet (Feb 12/19)

Northern Pulp
Proposed Outfall



Water depth: 67 feet
Distance from Shore: 1.84 nautical miles
Tidal Range: 6.7 feet (Feb 12/19)

sources: gpnauticalcharts.com; tideforecast.com; https://sites.google.com/dillon.ca/northernpulpetf/frequently-asked-questions

Water depths surrounding proposed pipe location & outfall

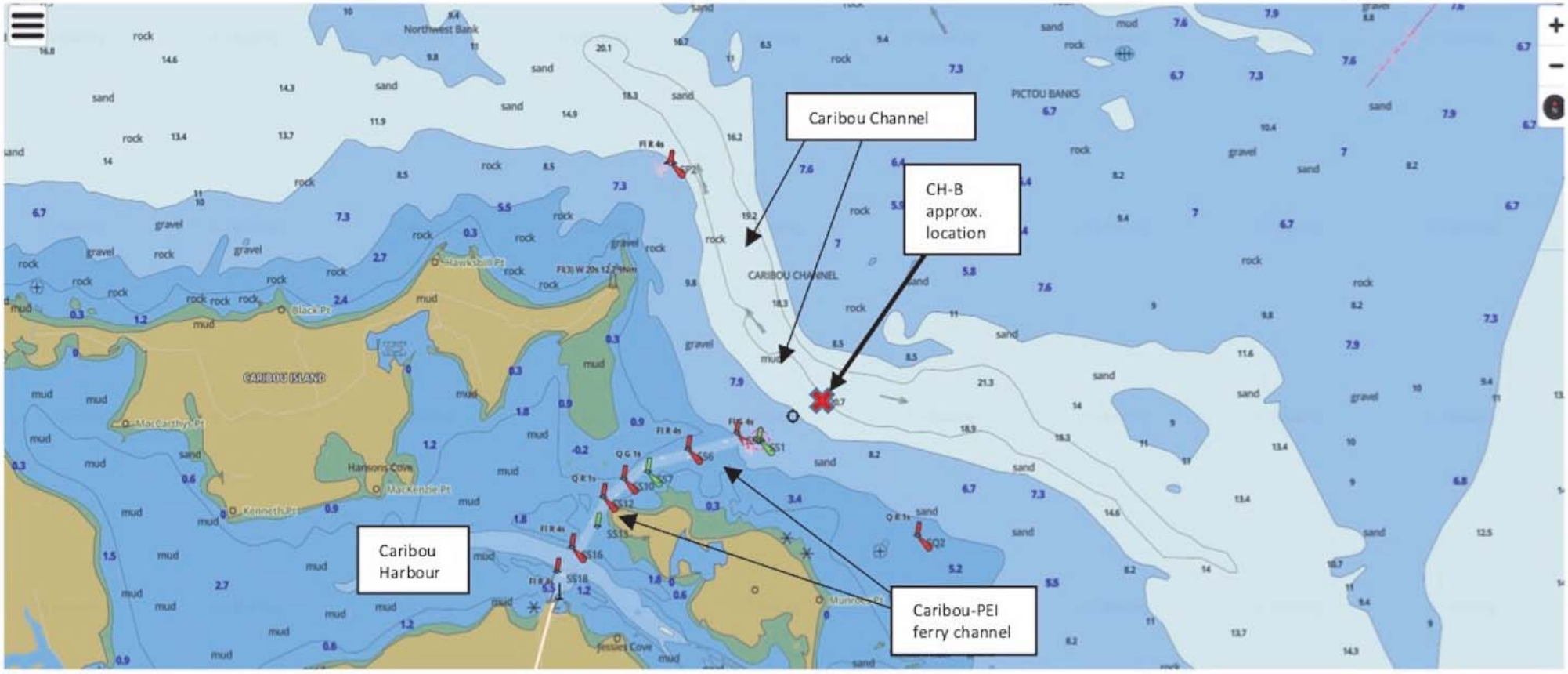


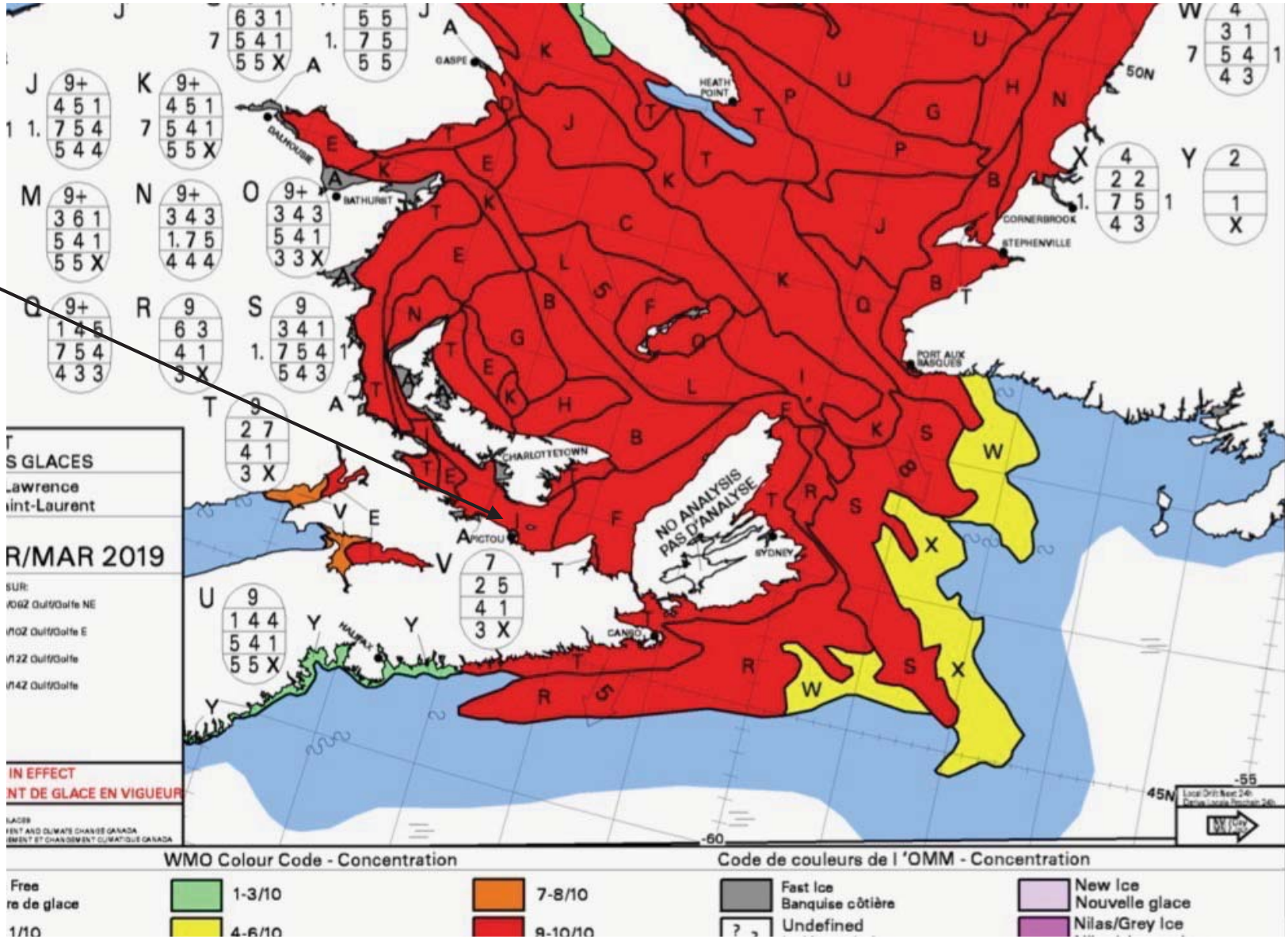
Chart of Caribou Channel and surrounding area

Northern Pulp's proposed outfall at point CH-B in the Caribou Channel is to be placed in a relatively small area with a depth of 20 metres. As this chart illustrates, the area becomes significantly shallower within a short distance. Depths are more typically between <1 to < 8 metres in most of the surrounding Caribou Harbour and Pictou Banks area.

https://gpsnauticalcharts.com/main/ca/ca4483_1-caribou-harbour-nautical-chart.html

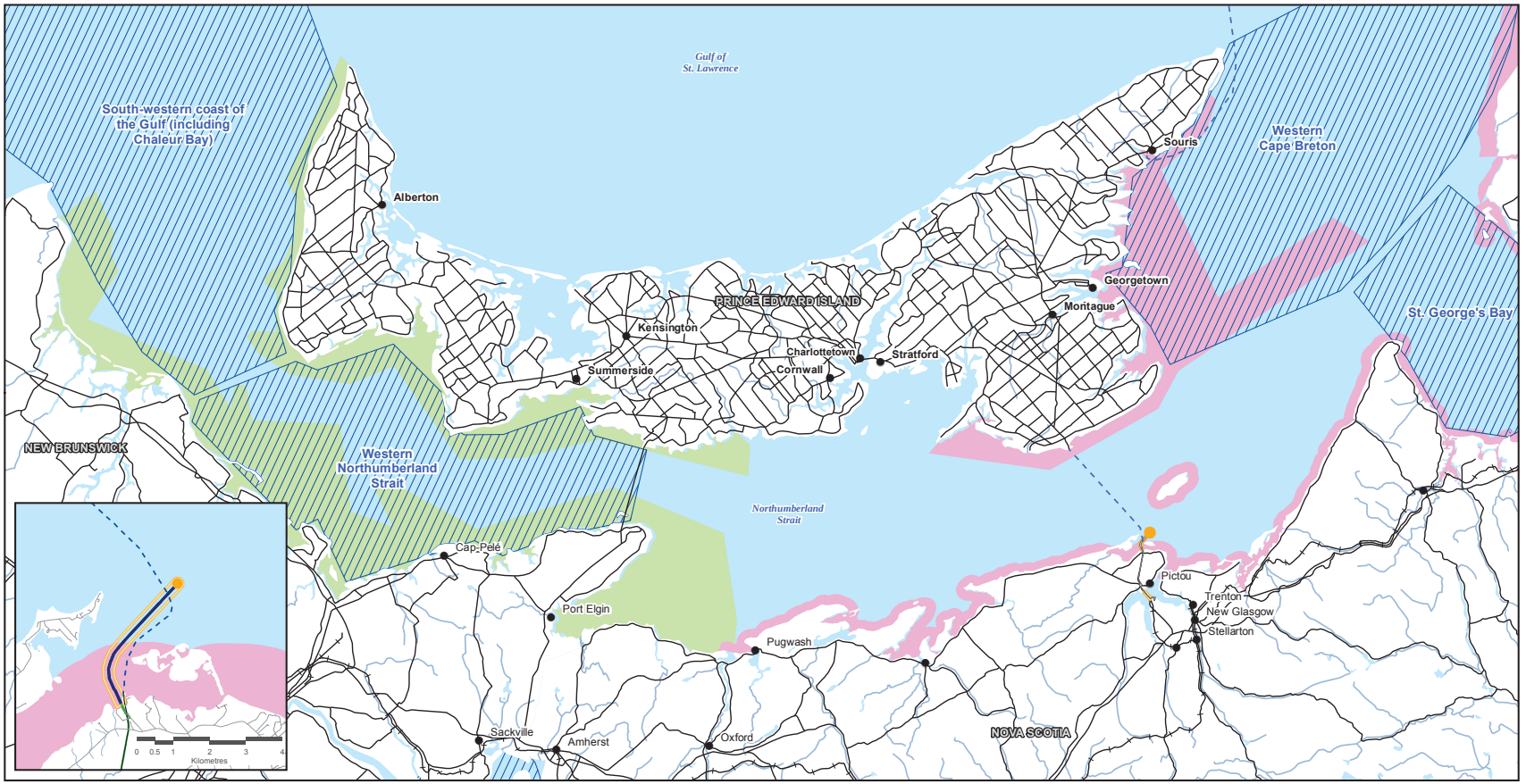
Ice Chart of Gulf of St Lawrence and Northumberland Strait: 03/09/19

Approximate Effluent Pipe Location & Outfall



https://ice-glaces.ec.gc.ca/prods/WIS28CT/20190219180000_WIS28CT_0010461191.pdf

Scallop Buffer Zones as depicted in Northern Pulp's EA



8.12.2.7 special areas 382

Scallop Buffer Zones SFA 22 and 24 are part of a system of Scallop Buffer Zones in SFA 21, 22, and 24 that covers a total area of 5,835 km^2 (DFO 2017). **Scallop Buffer Zones were established to protect juvenile American lobster as they are known to contain lobster nursery habitat** (DFO 2017). Scallop Buffer Zone SFA 22 is in the western Northumberland Strait, approximately 85 km to the west of the marine PFA. Scallop Buffer Zone SFA 24 is in the eastern Northumberland Strait and the effluent pipeline will cross through the Scallop Buffer Zone SFA 24 close to shore (**Figure 8.12-10**) in Caribou Harbour near Jessies Cove. The location of the outfall is outside this buffer zone.

Outfall and pipeline fall within Scallop Buffer Zone which protects juvenile lobster habitat

In the text accompanying image 8.12.2.7, special areas 382, which includes this inset map, Northern Pulp states, “The location of the outfall is outside this [scallop] buffer zone.”

The scallop buffer zone for this area is defined in Fishing Season Conditions 2018 Document DFO-0000471625. Scallop Condition 7 reads**:**

> *No person shall fish for scallops in that portion of scallop fishing area 24 in those waters adjacent to the Province of Nova Scotia within one [1] nautical mile from the nearest point of land in the counties of Cumberland, Colchester, Pictou, including Pictou Island in the Northumberland Strait, and Antigonish.*

The map provided by Northern Pulp does not include the scallop buffer zone around Munroe’s Island and Caribou Island (the white shorelines that are missing pink outlines.) This is clear on the inset map. The omission of the buffer zones in these areas makes it appear that the outfall location (orange dot) is farther from the buffer zone than it actually is.[1]

Measuring one nautical mile (1.852 km) from every point of land in the area, as defined in Scallop Condition 7, **the proposed outfall location would fall within the buffer zone, not outside it as Northern Pulp states**. Although Northern Pulp has not provided precise lat-long co-ordinates for the outfall, its location on Northern Pulp's map and the description that it is situated in one of the few deep areas would place it within the scallop buffer zone.

Northern Pulp also states “the effluent pipeline will cross through the scallop buffer zone SFA 24 close to shore.”

The distance from shore that the effluent pipeline would cross through the scallop buffer zone as represented on Northern Pulp’s map is 1.85 kilometers (1 nautical mile.) Because the term “close to shore” is vague, it is important to note the actual distance is almost 2 kilometers.

However, an accurate representation of the scallop buffer zone would show that **the entire 4.1km pipeline would run through the scallop buffer zone.**

In the list of marine refuges, Fisheries and Oceans Canada describes the conservation objective for Scallop Buffer Zones (SFA 21, 22, 24) as "to protect juvenile lobster habitat."[2]

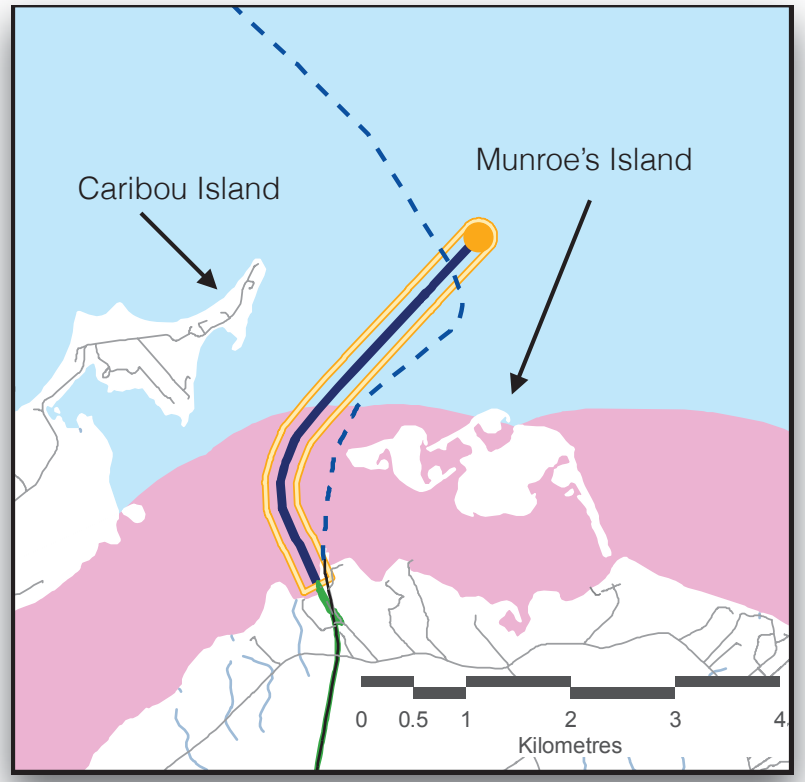
They further state:
"The following ecological components of interest are conserved through the prohibitions.
Species of regional importance: juvenile American lobster

- **Why it is important**: American lobster is a commercially important species.

Habitat that is important to biodiversity conservation: American lobster nursery habitat

- **Why it is important**: American lobster nursery habitat is important for the life-cycle of the species.

In addition to prohibition on scallop dragging, the section on prohibitions also notes:
"No other human activities that take place in this area are incompatible with the conservation of the ecological components of interest.”



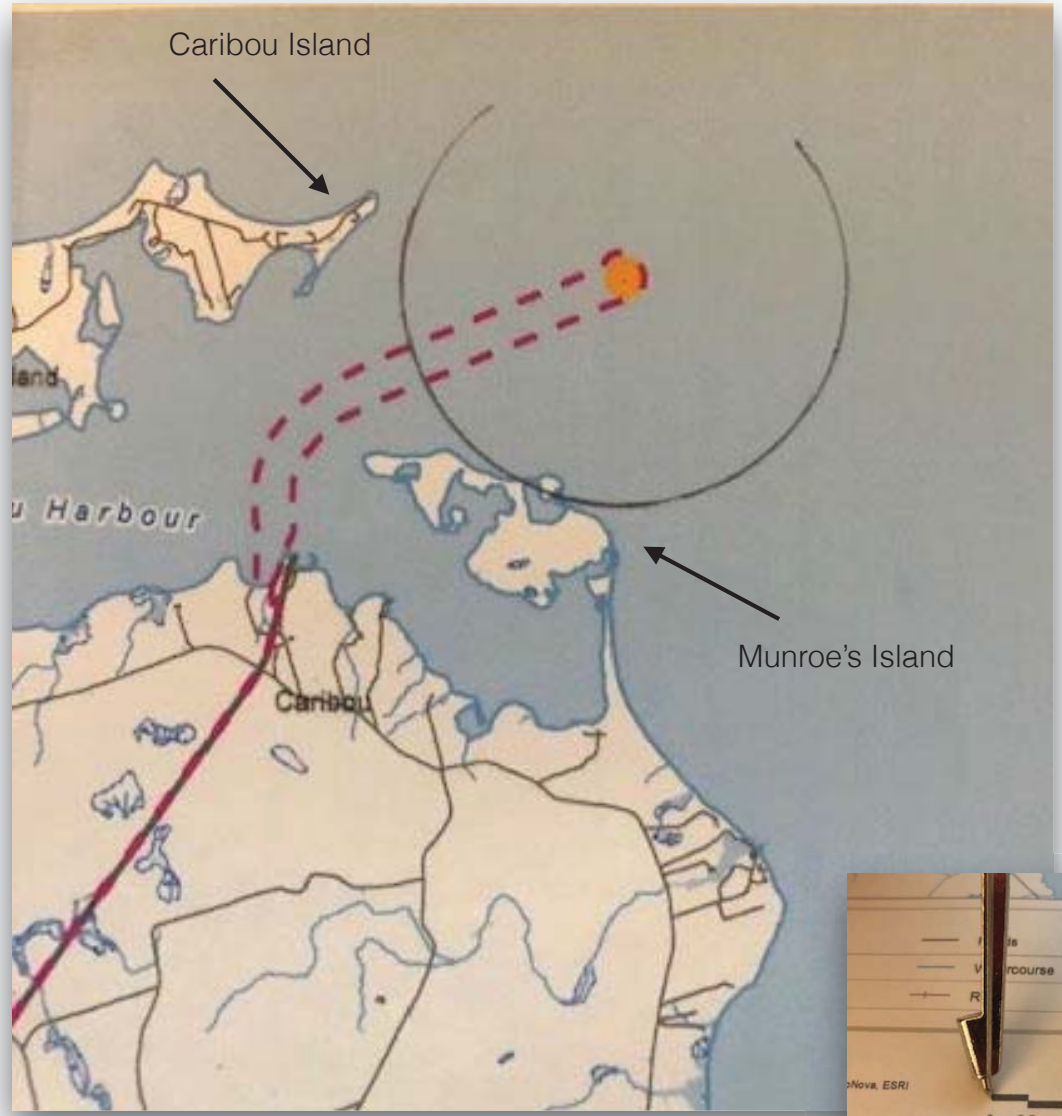
The Environmental Context for the scallop buffer zone notes, "**These closures offer protection to other important species and habitats** in the southern Gulf of St. Lawrence. For example, SFA 22 contains the last remaining area in which the winter skate (a population under the endangered designation by COSEWIC) is found during the summer. It also includes a unique population of lady crab (suspected to be endemic to the region), and the rock crab (an important prey for several species and a commercial species).”

We note that fishers in the Caribou area are aware that the immediate area of the proposed outfall and surrounding areas contain a population of rock crab and juvenile rock crab.

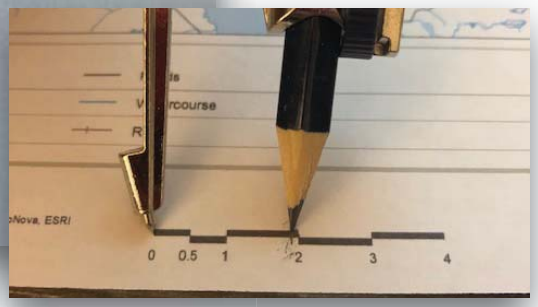
[1] We have spoken to DFO. They confirm that the conditions of the license are the conditions enforced under the Fisheries Act. DFO recognizes that there are errors on the on-line map and they are in the process of making corrections.

[2] http://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/sfa-zpp-eng.html

Northern Pulp proposed outfall with Scallop Buffer Zone

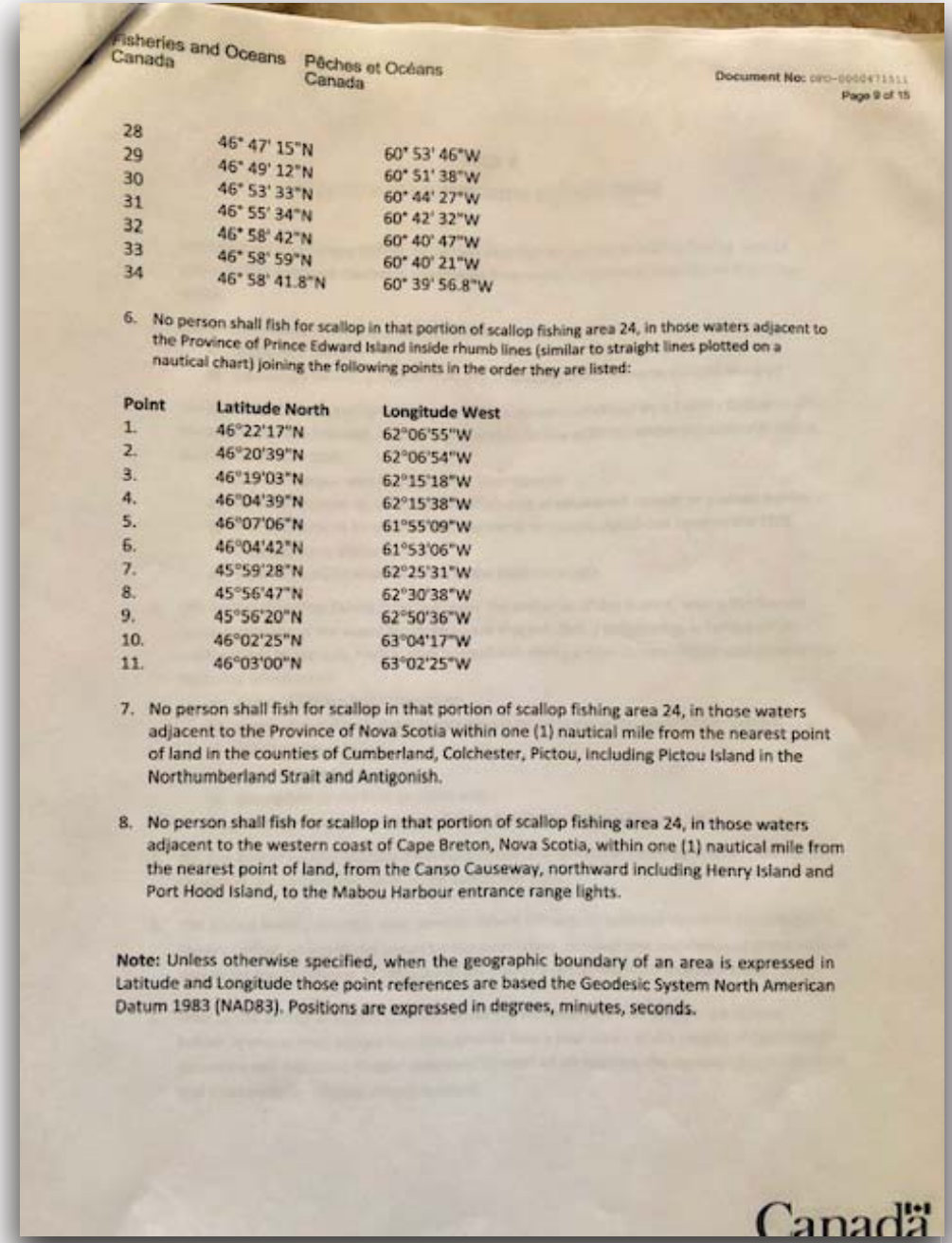


Measuring one nautical mile (1.852 km) from every point of land in the area, as defined in Scallop Condition 7, the proposed outfall location would fall within the buffer zone, not outside it as Northern Pulp states. Although Northern Pulp has not provided precise lat-long co-ordinates for the outfall, its location on Northern Pulp's map and the description that it is situated in one of the few deep areas would place it within the scallop buffer zone.



1.852 km = 1 nautical mile

DFO Scallop Buffer Zone Regulations/Coordinates



Fisheries and Oceans Canada | Pêches et Océans Canada

Document No: DFO-0000471511

Page 9 of 15

28		
29	46° 47' 15"N	60° 53' 46"W
30	46° 49' 12"N	60° 51' 38"W
31	46° 53' 33"N	60° 44' 27"W
32	46° 55' 34"N	60° 42' 32"W
33	46° 58' 42"N	60° 40' 47"W
34	46° 58' 59"N	60° 40' 21"W
	46° 58' 41.8"N	60° 39' 56.8"W

6. No person shall fish for scallop in that portion of scallop fishing area 24, in those waters adjacent to the Province of Prince Edward Island inside rhumb lines (similar to straight lines plotted on a nautical chart) joining the following points in the order they are listed:

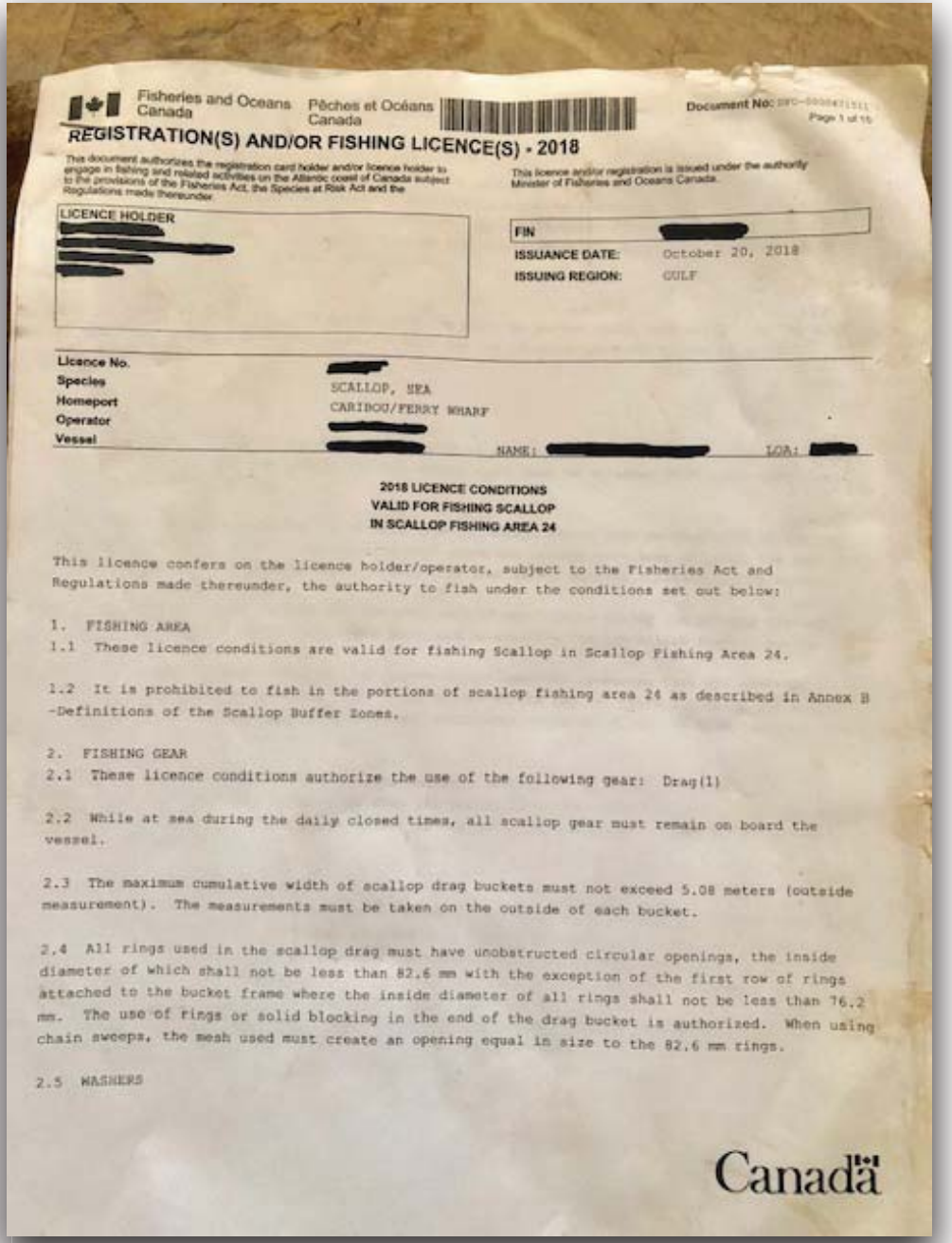
Point	Latitude North	Longitude West
1.	46°22'17"N	62°06'55"W
2.	46°20'39"N	62°06'54"W
3.	46°19'03"N	62°15'18"W
4.	46°04'39"N	62°15'38"W
5.	46°07'06"N	61°55'09"W
6.	46°04'42"N	61°53'06"W
7.	45°59'28"N	62°25'31"W
8.	45°56'47"N	62°30'38"W
9.	45°56'20"N	62°50'36"W
10.	46°02'25"N	63°04'17"W
11.	46°03'00"N	63°02'25"W

7. No person shall fish for scallop in that portion of scallop fishing area 24, in those waters adjacent to the Province of Nova Scotia within one (1) nautical mile from the nearest point of land in the counties of Cumberland, Colchester, Pictou, including Pictou Island in the Northumberland Strait and Antigonish.

8. No person shall fish for scallop in that portion of scallop fishing area 24, in those waters adjacent to the western coast of Cape Breton, Nova Scotia, within one (1) nautical mile from the nearest point of land, from the Canso Causeway, northward including Henry Island and Port Hood Island, to the Mabou Harbour entrance range lights.

Note: Unless otherwise specified, when the geographic boundary of an area is expressed in Latitude and Longitude those point references are based the Geodesic System North American Datum 1983 (NAD83). Positions are expressed in degrees, minutes, seconds.

Canada



Fisheries and Oceans Canada | Pêches et Océans Canada

Document No: DFO-0000471511

Page 1 of 15

REGISTRATION(S) AND/OR FISHING LICENCE(S) - 2018

This document authorizes the registration card holder and/or licence holder to engage in fishing and related activities on the Atlantic coast of Canada subject to the provisions of the Fisheries Act, the Species at Risk Act and the Regulations made thereunder.

This licence and/or registration is issued under the authority Minister of Fisheries and Oceans Canada.

LICENCE HOLDER

[redacted]

FIN [redacted]

ISSUANCE DATE: October 20, 2018

ISSUING REGION: GULF

Licence No. [redacted]

Species SCALLOP, SEA

Homeport CARIBOU/FERRY WHARF

Operator [redacted]

Vessel [redacted] NAME: [redacted] LOA: [redacted]

2018 LICENCE CONDITIONS
VALID FOR FISHING SCALLOP
IN SCALLOP FISHING AREA 24

This licence confers on the licence holder/operator, subject to the Fisheries Act and Regulations made thereunder, the authority to fish under the conditions set out below:

1. FISHING AREA

1.1 These licence conditions are valid for fishing Scallop in Scallop Fishing Area 24.

1.2 It is prohibited to fish in the portions of scallop fishing area 24 as described in Annex B -Definitions of the Scallop Buffer Zones.

2. FISHING GEAR

2.1 These licence conditions authorize the use of the following gear: Drag(1)

2.2 While at sea during the daily closed times, all scallop gear must remain on board the vessel.

2.3 The maximum cumulative width of scallop drag buckets must not exceed 5.08 meters (outside measurement). The measurements must be taken on the outside of each bucket.

2.4 All rings used in the scallop drag must have unobstructed circular openings, the inside diameter of which shall not be less than 82.6 mm with the exception of the first row of rings attached to the bucket frame where the inside diameter of all rings shall not be less than 76.2 mm. The use of rings or solid blocking in the end of the drag bucket is authorized. When using chain sweeps, the mesh used must create an opening equal in size to the 82.6 mm rings.

2.5 WASHERS

Canada

Warmer Water Poses Threat to Gulf of St. Lawrence

TELEGRAPH JOURNAL

Warmer waters pose threat to province's seafood stocks

JACOB LORINC TIMES & TRANSCRIPT

Sept. 28, 2018

A University of Washington study shows the Gulf of St. Lawrence is losing oxygen faster than almost anywhere else in the world's oceans, threatening a range of species vital to the Maritime economy.

Published last week, the study found the decline to be directly connected to climate change, as increased carbon dioxide from urbanization and industry seeps into ocean currents and flows into freshwater regions.

Study leader Mariona Claret said water from the Gulf Stream, which flows northwards along the eastern coast of North America, is filtering into the St. Lawrence Seaway as the Labrador Current – which flows southwards toward the Maritime region and typically blocks the entrance of gulf stream waters – weakens.

In turn, temperatures rise in deep-water areas of the Gulf of St. Lawrence, producing a decline in oxygen levels.

"The change is being amplified in this area because now what's happening is that the Gulf Stream is blocking the Labrador currer from transporting oxygen-rich waters toward the Grand Banks," Claret explains."Warmer water then enters the Gulf which lowers the oxygen level."

Katja Fennel, a professor of oceanography at Dalhousie Universit says the lower oxygen levels are unsuitable for species such as Atlantic wolffish, Atlantic salmon, Atlantic cod, and snow crabs, who dwell in lower levels of the gulf.

"Some species are better at withstanding lower oxygen levels tha others," she says. "But if these oxygen levels continue, Atlantic co for example, will not be able to thrive because of oxygen levels."

Some of these species are crucial to New Brunswick fisheries. According to Fisheries and Oceans Canada, snow crab, is the second-most valuable commercial fishery in Atlantic Canada.

"The crabs are also the least resistant to low oxygen levels, though, which poses a problem for them in areas of the gulf," sa Fennel.

She notes that changing oxygen levels may lead snow crabs to migrate to other areas in the gulf, forcing commercial fishing zon to be redrawn.

"It could have an impact for fishing, yes, but it's difficult to say where they would relocate and how that would be accommodate for fishing," Fennel says.

Fennel says snow crab numbers dipped in 2012 as a result of warming temperatures, but notes that the changes in temperatu won't always be consistent.

"There's a lot of variability in the ocean, so some years oxygen wi be low and some years it will be high. But we do know that, on average, the levels are declining, which in time-scales of three to four decades will pose problems for the fish."

Declining oxygen levels in the gulf have been monitored for years Fisheries and Oceans Canada has tracked rising temperatures in the St. Lawrence area since 1920, and began following oxygen levels in 1960.

In 2005, the department reported that oxygen levels declined dramatically, but could not specify the cause.

"What we show is that much of this change is related to climate change, and is associated with the carbon emissions that are released into the atmosphere," says Claret.

"This is happening now," says Fennel. "I can't tell you whether it's going to be in five or seven years when something really bad happens, but we're talking about within our lifetime."

source: Atlantic Salmon Federation website

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 9, 2019 5:45:06 PM
Attachments: EA Letter.docx

Good afternoon,

Attached is my letter requesting Minister Miller to reject Northern Pulp's Replacement Effluent Treatment Facility Project.

Thank you,

March 9th, 2019

The Hon. Margaret Miller
Minister of Environment

Minister Miller:

I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project.

My name is I grew up in the small community of Caribou River on the Sunrise Trail along the beautiful Northumberland Strait.

I am the daughter of a third-generation fisherman, and great granddaughter of , a former Pictou County councilor, Pictou Landing resident and land owner. My great grandfather's property near Boat Harbour was expropriated by the Nova Scotia government for use by Scott Paper Company in the 1960s.

I am currently residing in Amherst, and work seasonally for Tourism Nova Scotia as a travel counsellor at the Visitor Information Centre at the Nova Scotia/New Brunswick border.

I wrote an original thesis, titled, "Voices of the North Shore: The Lobster Fishery of Pictou County."

I am requesting that you reject this proposal by Northern Pulp based on the fact that there is simply not enough evidence to prove there will not be irreparable adverse and environmental effects. I also do not believe that this EA process has been fair. Northern Pulp did not hold public consultations on the Caribou Harbour effluent pipe outfall site plan, as they previously had with their initial Pictou Harbour effluent pipe outfall site plan. It is also unfair to expect the general public to be able to sift through and comprehend thousands of pages of documents and appendices that were included in Northern Pulp's Environmental Assessment Registration Document in a thirty-day period. In the event that you do not reject this proposal, I ask that you require an Environmental Assessment Report, or defer the proposal to the CEAA for federal review.

I work on the frontlines of the 2.7 billion-dollar tourism industry in Nova Scotia, and it is my job to help our visitors make informed decisions about where to visit in our beautiful province. Having grown up on the Sunrise Trail, I always suggest it as a scenic alternative to the TransCanada Highway, especially for those travelling towards Cape Breton Island. Visitors can experience the sweeping seaside farmland, lush forests, small fishing communities, and the well renowned sandy beaches and warm swimming waters of the Northumberland Strait along this secondary route. If Northern Pulp is permitted to place an effluent pipeline in Caribou Harbour, near one of the most popular provincial park campgrounds and beaches along the Northumberland Shore, any detrimental effects from the effluent would be felt immediately by tourism operators all along the Northumberland Strait. Visitors already comment on the 'stink'

that hangs over the Town of Pictou from Northern Pulp, and it would be difficult to confidently tell visitors that it is safe to swim in the waters of the Northumberland Strait with the lack of information that has been given about the makeup of the effluent. Northern Pulp's Environmental Assessment Document states, "At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentration) will not be known with certainty until the project is operational."[1] This is unacceptable. Allowing a pulp mill to potentially dump effluent in to a body of water without knowing the composition of said effluent is outrageous and wholly irresponsible, on the part of the mill as well as the provincial and federal governments. If Nova Scotia's tourism industry suffers as a result of this project, it will falter and generate less revenue for the province. As an industry that is striving for $4 billion in revenue by 2024, tourism, and the province, cannot afford to support this project.

The pipeline also has the potential to cause mass devastation, not only to lobsters, but to other species within the environment as well. Pelagic species of fish and bivalves (such as mussels, scallops and oysters) would be contaminated or killed off by the effluent, or from the extreme temperature of the effluent, as noted in Table 5.2-1 found on page 46 of Northern Pulp's Environmental Assessment Registration Document .[2] The study, "Detecting p53 family proteins in haemocytic leukemia cells of Mytilus edulis from Pictou Harbour, Nova Scotia, Canada," by S. St-Jean et al. from 2005, provides a detailed study on the impact of the environment on blue mussels in fourteen various sampling sites chosen in the Pictou Harbour and harbour mouth. The researchers found that each set of healthy mussels placed in all fourteen sites developed leukemia cells and contained various other carcinogens.[3]

I would also like to note that in Appendix O-R, "A Summary of the Scientific Literature Related to the Effect of Bleached Kraft Mill Effluent on the American Lobster (Homarus americanus)," prepared for Dillon Consulting Ltd. by of Mount Allison University, focuses on lobster exposure studies completed in the 1960s. Clark notes, "However, due to the range of individual lobster susceptibility, and the considerable change in chemical composition of today's treated BKME, it is recommended that lethality testing, along with additional exposure tests, be completed with today's treated BKME to determine the impact that treated BKME will have on American lobsters."[4] I would also like to draw attention to the fact that had included documents by in his references. However, he omitted one document by , titled, "Bleached kraft mill effluent near Pictou, N.S. and its effect on the marine flora

[1] Dillon Consulting Ltd., *Environmental Assessment Registration Document: Replacement Effluent Treatment Facility*. Submitted January 31, 2019.
[2] Dillion Consulting Ltd., *Environmental Assessment Registration Document …,* 2019.
[3] St-Jean, S., Stephens, R., Courtenay, S. and C. Reinisch, *Detecting p53 family proteins in haemocytic leukemia cells of Mytilus edulis from Pictou Harbour, Nova Scotia, Canada.* Canadian Journal of Fisheries and Aquatic Sciences, 62, (2005): 2055- 2066.
[4] Dillion Consulting Ltd., *Registration Document Appendix O-R*. Submitted January 31, 2019.

and fauna with a note on the Pictou Co. lobster landings."[5] I would suggest this document be reviewed as well by the Department of Environment.

I do encourage you to consider what was shared in all the letters sent for review by the public during this thirty day input period. Many have worked very hard to convey their concerns and expect their government to take everything shared in to consideration. We must all take responsibility for the legacy we are leaving behind. I believe that there would be devastating adverse effects if an effluent pipe is allowed to enter the Northumberland Strait. One tainted lobster is all it takes to destroy the seafood industry of the Atlantic provinces. We must also put an end to the environmental racism that has plagued Pictou Landing First Nation for over five decades. It is unfair to ask them for an extension to the use of Boat Harbour. We must stand with PLFN now as they work towards remediating Boat Harbour.

"Beyond its economic functions, a healthy marine ecosystem is an integral support for local culture and identity and for the quality of life in adjacent communities."[6] Pictou County is much more than the Northern Pulp mill.

Regards,

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[5] Scarratt, D. J., *Bleached kraft mill effluent near Pictou, N.S. and its effect on the marine flora and fauna with a note on the Pictou Co. lobster landings.* Ottawa: Fisheries Research Board of Canada, 1969.

[6] Department of Fisheries and Oceans, *Working Group Report: Northumberland Strait Ecosystem Initiative, Habitat and Resource Protection*. Ottawa: Department of Fisheries and Oceans, 2007, 10.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 6:00:52 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmail.com)

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 6:04:44 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

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The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@hotmailcom)

From:
To: Environment Assessment Web Account
Subject: Northern Pulp"s Replacement Effluent Treatment Facility Project
Date: March 9, 2019 6:35:34 PM
Attachments: Letter to the NS Environment Minister.pdf

To Whom it May Concern,

My name is and I am writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project. I live in Londonderry . I have salt water in my blood. I am a descendant of New England planters, Acadians and Mi'kmaq; of coal miners, fishermen and lumberjacks. My ancestors have lived in Amherst, Springhill, Parrsboro, Cape Breton, Antigonish, Scot's Bay, Pugwash, and Prince Edward Island. For hundreds of years my relations have relied on the natural resources of this province for their livelihoods. If they were here today, they would be ashamed with what is being proposed by Northern Pulp.

My grandmother grew up in Amherst and spent her entire life in and out of the waters of the Northumberland Straight. My father and aunt spent their childhood summers on the beaches. my grandfather bought a small cottage in Linden, directly on the shore, and my siblings and I spent every summer of our childhoods on the beach. And now my son does. And my unborn baby will. . We are the experts of our little strip of shoreline.

Every year we see where the winter surf has pounded boulders into new positions. We watch erosion take its toll on the clay hills. We know the tides. We know when there will be an abundance of seaweed, when the water will be murky, or when the water will be calm and clear. We know when the jellyfish come and for how long they will stay. We watch eagles, seagulls, cormorants, sandpipers and gannets. We see pilot whales, dolphins, small sharks, and schools of fish. We watch the salt ships come and go from Pugwash and fishing boats checking their traps. We have seen the decline of crabs. We pick up litter. We soak up salt. We are the experts. Our hearts are in the Straight and the salt is in our blood. If effluent is pumped into the Straight, what will happen to our little piece of shoreline?

In table 4.2-4 on page 31, Northern Pulp states that a key consideration in locating their Marine Outfall Location is to "develop a solution that does not affect Boat Harbour in the future tidal state…" In this scenario, Northern Pulp is not taking responsibility for anything outside of the Marine Outfall Location. Based on common sense and knowledge of tidal waters, we all know that the effluent cannot be contained within this location. Due to the nature of marine environments being constantly in flux, it is safe to say that the effluent will reach all areas of the straight and beyond. The exact impacts on marine life and coastal areas are impossible to predict because they cannot be studied until they are happening, in which case it will be too late. But again, common sense tells us that any foreign substance that is chemically treated will have adverse effects on the environment. This is an irresponsible, "deal with it later" approach on behalf of Northern Pulp.

My family and I work in forestry across the country. I've been a tree planter, a silviculture manager, and a harvest block planner for various companies. In Nova Scotia, I have worked for Northern Pulp and Irving. I've kept my ear to the ground, listened to, and learned from the professionals. I understand this industry and I understand what closing the mill would do to our local economy. I know that a closure will affect both mill employees and contractors, my

family included. There will be an economic impact that ripples throughout the province for some time. But economies rise and fall all the time. Money comes and goes. Alternatively, we have one planet, one ecosystem. Ask yourself what is more important. Pumping effluent into the straight is absolutely backwards, idiotic and irreversible. I ask you to please do whatever is in your power as a representative and advocate for Nova Scotia's environment to do just that: represent and advocate for our environment. We cannot allow an effluent pipe into the Northumberland Straight.

In terms of the Project Justification and Alternatives (section 4.0), all I have to say is it is shameful enough that the Lahey review suggests the continued application of glyphosate on harvest blocks in Nova Scotia. Now Northern Pulp wants to dump wastewater into the Straight. These are not ecologically-focused decisions. When will the Nova Scotia government wake up and take a step forwards? I have no interest in supporting an industry that is destructive to the environment and to be honest, neither does anyone else in the forest industry that I have talked to. Northern Pulp held a meeting for its contractors, "asking them" to support their pipeline project. In fact, what they did was akin to fear-mongering. They threatened the contractors' livelihoods with the prospect of the mill closing. "Support us or you will lose your job." Please believe me when I say, this ultimatum has left us feeling helpless, guilty, and ashamed. I am personally not afraid to voluntarily abandon my post in forestry and I will not stand idly by if this effluent pipeline is approved.

I thank you sincerely for taking the time to read my letter and consider the points I have made. I am not an expert in environmental science but common sense and passion mixed with pride for our Straight compel me to take a stance, no matter how small of an impact it may have. I ask that you either a) reject Northern Pulp's proposal, or b) step aside because of conflict of interest and hand over the environmental assessment to the Canadian Environmental Assessment Agency.

Thank you,

The following is a list of friends and family who would like to show support for my letter, but who have not had the time to write their own due to the very short time period that was given to the public to respond

10 names have been redacted as per Section 20(1) of the FOIPOP Act.

Sent from Mail for Windows 10

From:
To: Environment Assessment Web Account
Subject: Northern Pulp 2
Date: March 9, 2019 6:49:57 PM

2019 March 09

To the Honorable Margaret Miller
Minister of Environment
Province of Nova Scotia
Halifax, NS

Via email to: 'ea@novascotia.ca'

Re: Project to Replace Boat Harbour Effluent Treatment Facility

Dear Minister Miller,

I will admit to having read Joan Baxter's book, "The Mill" however I think it is quite fair to say that trickery and overly-generous enticements were used by a previous Nova Scotia Government back in the 1960's to bring this mill to Abercrombie Point and that bullying and expensive Government handouts were used to keep it in operation over the past 50+ years.

I support the fact that we need jobs but not at such a heavy cost.

Based on past behaviours exhibited by the owners of this mill as well as previous Provincial governments I am concerned this project will continue to expose the Northumberland Strait fishery to the risk of industrial chemical pollution. It will also expose the 11 Kim's of the overland pipeline route to the ferry terminal to the same risk.

The environmental damage done to Boat Harbour in the past is a disgrace and an embarrassment that must not be repeated.

For most of the past forty years my family and I have spent a lot of time visiting our extended family in Pictou County. We camp at Caribou - Munroe's Provincial Park, swim at local beaches from Melmerby Beach all the way to Cape John.
We canoe and join family on boating trips from downtown Pictou to Pictou Island, stopping to fish mackerel and enjoy a dip in the Strait along the way.

The Northern Pulp mill was originally designed for a thirty year expected life according to Ms. Baxter's research. We are now at year 52, well past its "Best Before Date."

This means the mill will require significant investment from its owners if they are to adequately maintain it against wear & tear and mechanical break down as it ages further. But then again, why should they worry about upkeep if we have provided them with an Indemnity Agreement that transfers that burden onto the backs of Nova Scotia taxpayers?

We do not need nor can we afford another Sydney Tar Pond type of environmental disaster although Boat Harbour is clear proof that such a disaster already exists.

I reviewed the Dillon Report on this effluent pipe project and could see no mention of what the current useful life expectancy for this mill is.

I saw on page 42 of the online Report that, “the continued operation of the NPNS will ‘meet global market demands and supports the local and provincial forestry sector’...”

I would argue it is the other way around. I would say that our Nova Scotia forestry sector and the Nova Scotia tax payer are supporting the Northern Pulp mill. I flew over the eastern mainland in the fall of 2017 and was shocked to see the many square miles of grey wasteland between Abercrombie Point and the Eastern tip of Guysborough County. That will take a long time to replenish.

Then there is the health risk of the aerial spraying of glyphosate to kill off the deciduous trees in order to allow only coniferous trees to grow back for the benefit of this mill.

I believe the past negotiations and agreements between the Province of Nova Scotia and the various owners of the Northern Pulp mill were not made with the best interests of all of the people of Nova Scotia in mind and therefore should be considered to be null and void ab initio.

Sincerely,

x payer since 1975.

—-

Sent from my iPhone

From: Environment
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 7:06:24 PM

Project: replacement_effluent_treatment_facility_project Comments: If the environmental assessment for Northern Pulp is anything like the one done for OSCO Aggregates, then its not worth the paper it is written on. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 58 y: 19

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 7:08:09 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@gmail.com)

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 7:36:05 PM

Project: replacement_effluent_treatment_facility_project Comments: After living in Pictou County for my whole life and loving places like Powels Point in Little Harbour and Melmerby Beach, Ive been horrified by what I saw at Boat Harbour.We know not to eat the clams or mussels at Powels Point, they make you sick. We used to have class trips to Boat Harbour. I got in trouble as kids we all knew that what was happening at Boat Harbour was wrong, I even got in trouble by my teacher for trying to talk about how I felt durning the tour. If you see Boat Harbour you will never approve effluent to be pumped into the Strait. Please, for the sakes of my children and for all who love this province we call home, please no pipe. Systems fail to often to jeopardize the water that surrounds us. There has to be another way. Name: Email: @hotmail.com Address: Municipality: : Privacy-Statement: agree

x: 59 y: 25

From:
To: Environment Assessment Web Account; minister.envviroment@novascotia.ca
Subject: Please Reject NP's Replacement Effluent Treatment Facility Proposal
Date: March 9, 2019 7:40:28 PM

Dear Minister Miller;

I am writing to express my deep concern about Northern Pulp's proposal for a effluent pipe to pump waste water into Caribou Harbour and the Northumberland Strait.

I am a resident of Halifax but I grew up in the town of Pictou and I have a summer cottage in Caribou River. I am a social worker by profession and I hold a Master of Arts in International Development Studies and a Master of Social Work.

The pulp mill has had a devastating effect on the ecosystem of Pictou Harbour. As a young child I was able to swim in the Harbour but that changed after the mill was built due to contamination. Today, one can easily find deformed sea organisms along the beaches in the mouth of the Harbour and notice an ugly brown sludge on the water's edge or floating on top of the water in the middle of the Harbour.

With the upcoming and very much overdue closure of Boat Harbour, Northern Pulp has been unable to put forward a plan for effluent treatment and discharge that is convincing in terms of environmental protection. Caribou Harbour remains a diverse and rich ecosystem as does the surrounding waters of the Northumberland Strait. In summer we are able to swim, boat, fish, dig for clams and pick muscles in these waters and beaches. Our fishermen, their families and local businesses rely on this rich ecosystem for their livelihood and prosperity. The proposed effluent pipe threatens our entire way of life and must be stopped.

Traditional First Nations communities are said to plan their actions based on their effects seven generations into the future. I urge you to do respect this principle and reject Norther Pulp's proposal.

Sincerely,

From:	Environment
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 9, 2019 7:44:34 PM

Project: replacement_effluent_treatment_facility_project Comments: It is my hope the Department of Environment will reject the plans for the Effluent treatment pipe which will dump millions of liters of toxic effluent into The Northhumberland Strait. Dillion Contracting itself notes the need for more information on the effects of solids on Lobster Larvae. Joan Baxter in her review of the EA form Mar 5th entitled Northern Pulp Environment Document :Missing Mercury ...and oddles of Contradictions needs the governments attention. Senators call the Northern Pulp Plan An Environmental Disaster Fishers have been asking in every way possible for a Federal Environmental Assessment. Safe, sustainable renewable is what Nova Scotians will demand from whichever government which will take them into the future. Please reject. Name: Email: Address: Municipality: Postal-Code: Phone: ### ### - #### Fax: ### ### - #### email_message: Privacy-Statement: agree x: 49 y: 22

From: @sympatico.ca
To: Environment Assessment Web Account
Subject: MY EA Submission on the Replacement Effluent Treatment Facility Project by Northern Pulp
Date: March 9, 2019 7:51:09 PM

Good Day. This serves as my submission for the environmental assessment of the subject project, in Pictou County, Nova Scotia.

Ii was born and raised in Pictou County, Nova Scotia. I am very proud of that fact, and of my family, and friends who have also become family over the years, that either reside in Pictou County, or elsewhere in Nova Scotia. I have a great deal of respect for the hardworking people of Pictou County, who have had to withstand the water and air pollution caused by the paper mill, now for well over 50 years. That fact makes it very difficult for me when I think of its ongoing effect on the health and well-being of all those who live both in that area, and nearby, and also its effect on the whole community, both environmentally and economically.

Others are qualified to speak as to the scientific evidence of its environmental harm to the ecosystems, to its negative impact on our resource, business, and tourist industries that rely on environmental well-being, and to its impact on the medical health of our people, adults and children alike, over the years.

I can speak only from my own experience, as a person who after decades of working elsewhere, decided upon retirement, to come back to Pictou County to buy a cottage, and spend several months of each year there, with my family members and life-long friends. It is also special time to have our grandchildren come to spend time with us at the beach, for them to explore animal life along the water's edge, and find new playmates there as well. The creation of all these memories together, with family and friends, very close to the actual land where I was raised, is what matters most, at this time of my life.

But then there is the pulp mill, which continues to create the air and water pollution caused by its processes, and its impact on human health, on adults and children alike, of which our well-respected doctors have ongoing professional experience.
Healthy employment levels in a variety of sectors in Pictou County are absolutely required of course; but one's health comes first, before one can be employed or continue to be employed, and actually get to enjoy the results of that labour.

I have great faith in the resilience and capability of the people of Pictou County. I believe that the local community as a whole will be very capable of responding positively to future opportunities for economic growth and prosperity, once the crucial environmental issues have been both fully acknowledged, and fully addressed, by those in positions of responsibility in this matter. This absolutely needs to be done, in the best interests of all who live and work, or visit our historic, and very treasured part of Nova Scotia.

Sincerely yours,

Sent from Mail for Windows 10

From:
To: Environment Assessment Web Account
Subject: Response to Norther Pulp"s Environmental Assessment
Date: March 9, 2019 8:07:17 PM
Attachments: submission to NSE re Northern Pulp.docx

Please find attached our concerns regarding Northern Pulp's environmental assessment in relation to their new replacement effluent treatment facility.

Thanking you in advance for reading my letter of concern.

Thanks

Dear Margaret Miller and Nova Scotia Environment team

We are writing in relation to Northern Pulp's Replacement Effluent Treatment Facility Project. We own two businesses in the Province of Nova Scotia. A commercial fishing business located out of Caribou, NS and a small trucking company located out of the Town of Pictou. We are parents and property owners and most importantly tax payers of Nova Scotia.

After weeks of reading the environmental assessment submitted by Norther Pulp, I have many concerns; however, I do know there are hundreds of people including chemists, biologist, doctors, engineers, scientists and other knowledgeable folks that are writing in with their concerns regarding same. On that note, the following document submitted by us will include a bit of our personal issues and of course leaving out lots to the professionals that have already submitted.

The EA starts off with the Executive Summary providing a table indicating the "significance of project-related residual environmental effects on 18 items. And for some miraculous reason every single one of them is assessed at "NS" or No Significant Residual Environmental Effect Predicted". Well I can predict that I will win the lottery next year but the chances of that are slim to none. So, lets cut the bullshit!!! So as Joan Baxter states in her article in the Halifax Examiner on March 5th, 2019 *Northern Pulp's environmental documents: In other words, the on-site Activated Sludge Treatment system will effectively treat millions of litres of toxic pulp effluent a day, every day, without a hitch. The 36-inch diameter pipeline that will run 11.4 km across the causeway and then overland beside Highway 106 to Caribou Harbour will never leak or spill its contents in the Pictou watershed, or negatively affect the scenic landing point for the PEI ferry that brings tens of thousands of visitors to Nova Scotia each year. The 4.1-kilometert pipe into the Northumberland Strait that will dump millions of litres of effluent a day into the rich fishing grounds will not harm fish habitat or the ecosystem. The "dewatering process" of the sludge from the treatment facility will work well, and there is no need to worry about burning it in the mill's power boiler, even though that boiler has already caused many emissions problems.*

Within this document we will give our reasons why this project will cause adverse effects or significant environmental and health effects, negative economic effects and mitigation or lack there of, of same.

Some of our concerns with Northern Pulp's environmental assessment:

In this section we will refer to some of the concerns, discrepancies and wrong information that has been submitted by Northern Pulp.

Human Health

I live approximately 3 km from the stacks at Northern Pulp. We suffer with our breathing here. Especially on humid days. The smog sits on top of our Town and penetrates into our homes and our lungs. We cannot open our windows. I had to cut 22 trees out of my yard so that the heavy smog would have a chance to flow through as opposed to sit stagnant. I know that none of you reading this right now know exactly what that means. Maybe in the next 20 days you should take a drive down to Pictou or Pictou Landing and take a nice long inhale. You should come in the middle of the night to see 23 stacks blowing smoke while people are sleeping and then only 11 in the day. This is a regular occurrence as I work night shifts and have the pleasure of witnessing this questionable activity.

Section-9-15 Human Health Evaluation: the consultants compared the "potential human exposures and risks associated with a marine treated effluent discharge" from a Kraft pulp mill in Bell Bay Tasmania. However, it would be impossible to compare the two because **IT DOES NOT EXIST!!!! Remember this is the section where they assessed the possible impacts of human health! And remember that they determined that by comparing the two that there would be no significant health impacts!! From a mill that DOES NOT EXIST!!!!**

This is all I should have to write, but I will continue……

Mercury:

Oh wait! Northern Pulp didn't mention all the mercury that they have buried on their property! In fact, they didn't mention any of the mercury. Nova Scotia Department of Environment know about the Mercury, Northern Pulp knows about the mercury and Dillon Consultants know about the mercury; yet no mention of it in the environmental assessment!

Mercury is an environmental toxin which is persistent and bio-accumulates. It does not "go away" it can build up in the environment and in the food chain. There is no known safe level of human exposure to mercury.

Northern Pulp consultants told me at the open house that there is no mercury in their effluent. When I read the reports from the raw effluent spill from 2014 there were substantial amounts of mercury found. So why did they lie to me? Maybe they didn't think people would get their hands on those reports?

It is my opinion that given the fact that Northern Pulp has neglected to include this extremely crucial portion of concern, that the Minister of Environment should request a full impact study on this material alone. And demand proof that there is no mercury on site at Abercrombie Point as Northern Pulp is claiming

Section 8.3 Soils and Geology in relation to scallop fishing

The assessment talks about the type of bedrock along the land portion of the pipe but fails to mention any of the bedrock along the marine portion. What we do know about the bedrock along the marine portion and the outflow portion is that it is constantly changing. fishes scallops along some of this area. From year to year as he drags the ocean floor and the materials come up in his baskets onto the boat, he gets a first hand look at what is on the ocean floor. From his 23 years of experience not one year is the same as the next in the exact same location. For example (North South 14,316 and East West 29,820) in 2017 had huge boulders and huge rocks (granite, coal, shale, sandstone are some examples). So big in fact, that the weight broke cable. But in that exact same location in 2016 the ocean floor had mud and only mud. This is the same with all areas that fishes every year for the last 23 years.

There is no mention of coal. There is a substantial amount of coal on the ocean floor sub surface as well as surface all along the pipe location and outflow location. A conversation I had with a geologist from Nova Scotia said "disturbing coal deposits releases methane. Methane in either air or water isn't good. The submission is missing this information! Information that is a necessity to evaluate the impacts of the project.

I believe more information on coal deposits and the effects of disturbance and the geological report for the marine portion of the project is needed before the Minister can make a decision.

Table 8.6-2

Seasonal Sensitivity of "freshwater" fish species potentially occurring in Local Assessment Area

The chart shows zero sightings for all species including white sucker, mummichog, minnows, perch, rainbow trout, gasper au, Atlantic salmon, brook trout, and brown bullhead. sees minnows, mummichogs, rainbow trout when he is smelt fishing. They are known to inhibit brackish waters and fishes smelts adjacent to where this sight test was conducted. Gaspereau frequently come up in his traps and are a feeding fish for lobster. It is very well known that Atlantic Salmon are certainly plentiful in the area.

Just because someone put a net out for a day and didn't catch any of the species on the list, does not mean they don't inhibit the area!!

Fishing and Recreational use of the Outflow Area:

THERE IS 100% COMMERCIAL FISHING AND RECREATION ON, NEAR, AROUND THE LOCATION EXTENDING THROUGH THE WHOLE GULF REGION!

We hold licenses for 7 species in the exact location and beyond the pipe and outflow location. They include smelts, herring, swordfish, scallops, mackerel, squid and lobster. We recreationally fish bar clams, bass and mussels from the exact locations as well. Our freezer is full of bass, clams, lobster, scallops. If this pipe goes out and pumps and unidentified liquid at a relentless amount of 85 million liters per day, every day, all of this will be ruined. I cannot consume, nor give my child and other family member, friends and stranger, food that has ingested or absorbed an unidentified effluent!!!! Think about it. Or better yet, I will go over to the lagoon at Boat Harbour and grab a big pot full of effluent and cook you all up a big feed of lobsters, then you can make a decision on if this should go out into the Strait!

Recreation on this body of water and the surrounding beaches is huge! Boaters, swimmers, kayakers, beach combers, cottagers and a Provincial Park.

PERSONAL ECOMONICS

was 22 years old when he bought his commercial fishing gear and licenses. He is a third-generation fisher and fishing is in his blood. This isn't a cliché statement, this is the reality in a fishing community in NS. We have invested 1.6 million dollars over the years into this business and this is our retirement. If this project is approved and a pipe goes out into the Northumberland Strait, we will lose our stewardship. We are done! Everything we have worked for will be gone. Please consider our plea. We hire local people, we invest in the local economy. We pay substantial amount of taxes each and every year.

End Summary

I am keeping my submission short because I know of all the professionals that are taking on each and every piece of this assessment will have a thorough and fact-based submission so I will leave the scientific and technical stuff to the professionals.

We feel that Northern Pulp's submission does not prove a lack of significant risk, and is missing critical data on many issues. There is insufficient evidence to know exactly how broad any damage might be. The company's claim that damage will be "minimal" is not credible because they have no data to back up claim….just words. Fisheries, tourism and outdoor recreation are very important economic factors that should absolutely not be put at risk. As far as consultation goes: The United Nations Declaration on the Rights of Indigenous Peoples requires not just consultation, but consent by the local Indigenous population. Pictou Landing First Nation is opposed to this proposal. The company promised community consultation and we did not receive that after the first proposal was squashed by the company. The must reject Northern Pulp's proposal and close the effluent treatment, Boat Harbour on schedule.

Please reject this proposal by Northern Pulp! We cannot mitigate the Northumberland Strait. We cannot ruin an entire fishing industry. We cannot ruin our environment. We cannot put people's health at risk!!

From: @hotmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 8:21:52 PM

Project: replacement_effluent_treatment_facility_project Comments: Please take the steps that are needed to advance this Project forward. I am sure the technology is there to keep our waters and land safe and that Nova Scotia can step up to the plate and keep this Pulp Mill operating and contributing to our economy as it has for so many years. Name:
Email: @hotmail.com Address:

Privacy-Statement: agree x: 56 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 8:36:14 PM

Project: replacement_effluent_treatment_facility_project Comments: This is a positive project, proven technology that will treat effluent to a very high standard of safety for fish and humans. Similar process at Port Hawkesbury has run successfully for close to 25 years. Unfortunately much of the media reporting about this project has been extremely biased and not fact based - this is not about jobs versus environment - it is about protecting the environment and the jobs in the forest industry! I support this project completely. Name: Email: @gmail.com Address:

:

Privacy-Statement: agree x: 61 y: 25

From:	l@gmail.com
To:	Environment Assessment Web Account
Subject:	Proposed Project Comments
Date:	March 9, 2019 8:37:53 PM

Project: - Choose - Comments: I wish to convey this project, as presented, should not proceed. The life expectancy of the mill was reached back in the late 1980s, and it would be sad if it is allowed to continue to operate, poisoning our water and air and making people and ecosystems sick. Little analysis has been done on the impact on larval lobster and the Northumberland Strait is already loaded with many cumulative environmental stressors. Adding pulp waste directly to the Strait is a completely different process than running it through the Boat Harbour Tidal Lagoon with a 30 day retention time that allows solids to settle. Adding the hot pulp mill effluent with the slurry of toxins directly into the Strait has the potential to really impair the Northumberland Strait well beyond what it is now. It could be very damaging to commercial fisheries, which I am sure nobody wants to destroy. Given the risks and scale of this project, I dont see how anyone could logically say it the impacts can be mitigated. On the Forestry side, the crown forests of Nova Scotia have been largely destroyed, given away to wealthy foreign companies over the last 5 decades to produce low value pulp. There isnt much left to cut, and so why keep a dying industry with depleted resources going? We should be building our forests to be climate resilient and harvesting wood only through selective cutting for the highest value, not clear-cutting land for low-value pulp. The time has come for change, and the days of industry polluting and destroying public resources, at taxpayers expense should be over. I say yes to human health, clean water, biodiversity and sustainable resource-based industries and NO PIPE, NO MILL. The Mill has had ample opportunity to put a better plan in place, and the fact they did not do their homework simply shows their commitment to NS. I feel the NS government is in a serious conflict of interest since they are financing a lot of the work while their job also entails regulating the mill. I feel the proposal would pass the Federal Environmental Assessment process, if one were required. This really disturbs me, but our standards need to change with the times. Dilution should not always be the cure for pollution. We know better now, or at least we should. At the end of the day, if this project proceeds, the legacy of environmental damage will continue. Thank god we have a fabulous book that provides a social lens perspective on the mill since its early development back in the late 60s. We now have the opportunity to learn from the past mistakes and put a priority on human and ecosystem health. We need to do better than this proposal to simply dump it directly into the Strait. Name: Email: @gmail.com Address:

: Privacy-Statement: agree x: 59 y: 20

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Pipe and diffuser proposal
Date: March 9, 2019 9:02:56 PM
Attachments: NSEno pipe.pdf

My submission in PDF format included

– Fisher
Chairman; Gulf NS Herring Federation

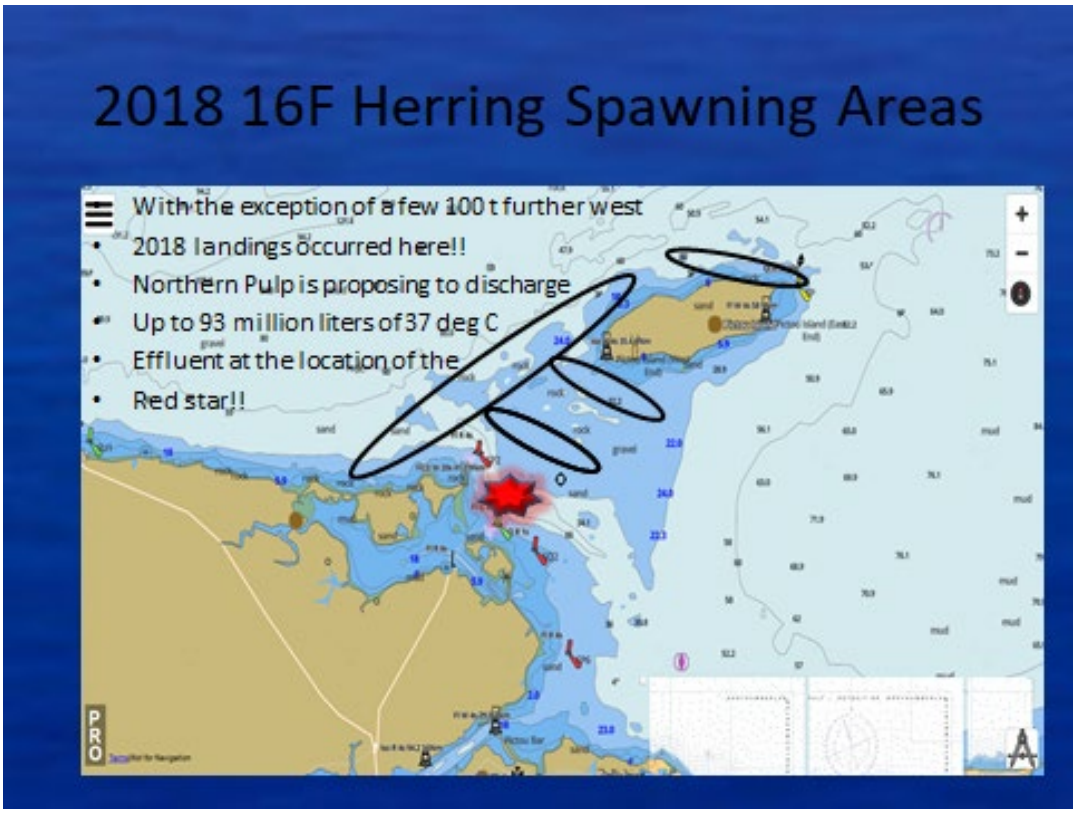
Feb 23, 2019

To: Nova Scotia Dept. of Environment

Dear Sirs/Madams,

Northern Pulp, a bleached Kraft pulp company (and the Province of Nova Scotia) are planning to construct an effluent pipe with a difuser at the location of the red star in the diagram below. The pipe is to replace the Boat Harbour Effluent treatment facility due for closure in January 2020. Boat Harbour is deemed to be one of the most toxic sites in Canada and has been a horrific injustice inflicted on Pictou Landing First Nations for over half a century.

This proposed pipe is designed to discharge up to (66)(93) million liters of 37 degree + 'treated' effluent daily into the Northumberland Strait, right in the middle of the last major active spawning area for 16F herring. The complex tides in this area, both in speed and direction, would ensure that the effluent would settle out across the entire remaining herring spawning grounds. This is the most dynamic area in the Eastern Northumberland Strait and a critical spawning ground for Lobster, Rock Crab, Herring, Ground fish and many other species.



The effluent will pour into Caribou Harbour on the rising tide and settle atop oyster beds and the salt water intake of the only fish processing plant in the area. On any given day during lobster season 100,000 pounds of live lobster could be floating in cars within Caribou Harbour directly in the path of the effluent stream.

The local Herring Spawning Stock is depleted and in the Cautious Zone and the reason for the decline is not understood. This is a Gulf of Saint Lawrence wide phenomenon. The local spawning area

has compressed in the past few years, as the stock declined to the areas outlined above. Other areas in the Eastern Gulf are in even worse condition. The Fisherman's Bank population has all but collapsed and the Northeast (North Lake) component was absent this year!

The Gulf of St Lawrence is an inland sea with counter clockwise currents that only exchanges its waters with the Atlantic once a year. It is one of the most precious marine ecosystems on earth with thousands of marine species who, spawn, nurse and migrate annually and has sensitive life stages of marine organisms present year around. It provides sustainable multi species fisheries for coastal communities in NS, NB, PEI, QC and NL. Given the rapid deoxygenation now happening in this fragile body of water (see link below), the Gulf of St Lawrence needs immediate protection, not further degradation. Most seriously, it does not need 'treated' Kraft bleached pulp effluent going into sensitive herring spawning waters, now or ever.

http://www.digitaljournal.com/tech-and-science/science/new-study-gulf-of-st-lawrence-shows-a-dramatic-oxygen-decline/article/532340

Given that DFO scientists recently reported a disturbing picture for the southern gulf of St Lawrence cod, warning of extinction by mid century, (see link below), where is the Precautionary Approach? Habitat Management? Marine Protected Regions?

https://www.cbc.ca/news/canada/nova-scotia/southern-gulf-of-st-lawrence-cod-could-be-extinct-by-mid-century-report-1.4966889

The Proponents paint a picture of this effluent as almost pure holy water. They claim it surpasses all Provincial or Federal guidelines for effluent discharges yet it created one of the most toxic sites in Canada at Boat Harbour. Any online search of pulp mill effluent turns up articles with quotes like,

- *Environmental effects on the marine environment are particularly poorly researched, even though some of the limited amount of data available suggests that lignin breakdown products of high molecular weight are not only persistent, but also highly toxic to sea urchin eggs, sperm and mussel larvae. (Gary Cherr, Bodega Bay; paper is available from ECOPOL)*
- *The role of non-bleaching factors is big and pulp wash water for example, can be more toxic than bleach plant effluent.*
- *chlorate will compete with nitrate for uptake by algae, yet chlorate acts as a herbicide rather than a nutrient.*
- *Chlorate is efficiently removed through anaerobic secondary treatment systems (eg. Lagoons), but removal in activated sludge systems is not as successful.*
- ***These long-term fish exposures are laborious, time-consuming, and expensive. However, they provide some of the most convincing evidence linking PME (pulp mill effluent) exposure to reproductive effects in fish.***

The list goes on and on with reproductive effects being flagged in most instances. Poorly understood "reproductive effects" are not too comforting when the herring stock is in need of rebuilding and this project proposes to saturate the spawning grounds with toxic effluent.

The proponents claim this effluent will be non-detectable at 100 meters. That's magic. I would question the sensitivity of the detectors or what exactly they are attempting to detect. We challenge you to go down to Boat Harbour and stand there for 10 minutes. The treated effluent is certainly detectable there at 100 meters.

This Effluent Pipe and proposal has been presented twice in the past, first in 1994 and a variation in 2004. The first of these, “The Initial Environmental Assessment for the Boat Harbour pipeline and diffuser” proposal was presented in September of 1994 and “Returning Boat Harbour to a Tidal Estuary” in 2004. Neither passed muster at the time and either failed environmental assessment or were abandoned for other reasons. Details in writing on the abandonment of the proposals are sketchy but no PIPE ever went out into the Strait.

Your Nova Scotia Department of Environment has diminished this toxic pipe proposal to “an addition to an existing facility” and as such, subject to only a Class 1 Environmental Assessment rather than a more rigorous Class 2 assessment. This is inaccurate and irresponsible. The increase in suspended solids with this proposed new AST system and its inevitable settling on spawning and nursery grounds should trigger the most vigorous assessment and likely scuttle the project entirely. We implore you to examine this project closely and recommend it for a more vigorous and comprehensive Class 2 assessment.

Respectfully,

- Fisher

Chairman: Gulf NS Herring Federation

http://www.saveourseasandshores.ca

EA@novascotia.ca

From:
To: Environment Assessment Web Account
Subject: Letter in response to Proposed Effluent Treatment Facility Northern Pulp
Date: March 9, 2019 9:29:38 PM
Attachments: Submission.pdf

March 1, 2019

Dear Minister Miller,

I am writing in response to the Northern Pulp Replacement Effluent Treatment Facility Project. I am a resident of the town of Pictou, an outdoor adventurer, a social worker working locally with children and families in the community, and a member of a fisher family. My partner and his father have harvested lobster and herring from the Northumberland Strait for 25 years.

In many respects, my position on this topic is largely intersected by the tensions in my identity as a resident of Pictou County, a civil servant to the community, and member of professional body devoted to advocating and promoting social justice and equality for all persons.

In my submission, I will express three (of many) concerns as they relate to the proposed project, and the process in which this submission has been reviewed with the community. These three concerns include the lack of community consultation, the potential impact on the Pictou Water Supply, and the lack of concrete evidence based assessments included in the environmental assessment at time of submission.

As a member of this community and a taxpayer in the province of Nova Scotia and the town of Pictou, I have become very concerned about the proposed project to replace the current Boat Harbour Treatment Facility. As a member of the Nova Scotia Association of Social Workers it is inherent in my professional values and ethics to uphold equality, autonomy, and social justice for all. The treatment of the first nations community in Pictou Landing over the past 50 years is abhorrent, and I acknowledge that Boat Harbour must close.

As a member of my community, I have worked to educate myself on the issues surrounding the Northern Pulp Effluent Treatment Facility Project over the past fifteen months since the announcement of the initial proposed project. My involvement with the Friends of Northumberland Strait group has included participating in planning and coordinating efforts as a committee of well-organized volunteers. Despite having substantial background knowledge on the subject and being a university educated professional, reading the entire proposal, consolidating my concerns, and articulating my questions has been extremely challenging. I have read much of the documentation provided by Northern Pulp, attended the open houses in December 2017, submitted questions and concerns, and I still find that the method in which this information has been communicated to the wider community has not been accessible to the people that a decision of this magnitude will impact. With a below average literacy level in the province of Nova Scotia (Literacy Counts, Statistics Canada, 2010) which is compounded by other socioeconomic issues faced in rural communities such as Pictou County, the process to review, evaluate, and respond to the 1700-page proposed project has not been fair.

The new route (which runs through the watershed that my community draws its water supply from) has not been presented to my community (the Town of Pictou) in the form of an open house. The public has had limited time and opportunity to digest the volume of materials that have been provided to them to consider in this very important proposal, and they have not been provided an opportunity in the form of a public consultation to review and reflect as a community on the project. In the absence of open houses (with the new proposed outfall location in Caribou), town hall meetings, and accessible, factual, and comprehensive information, the public and community at large is at a tremendous disadvantage to communicate and understand their concerns as they relate

to the proposed project. From my work in the past with community development, critical aspects to build relationships and trust within a community come from open and transparent dialogue that includes all stakeholders. If this community, government, and corporation (Northern Pulp) have learned anything from the legacy of Boat Harbour, is that the community must be consulted in a transparent, truthful, accessible, and meaningful way.

In Section 6.5.1 under Engagement Activities of the Project Re-Design (Northern Pulp Replacement Effluent Treatment Facility, Environmental Assessment Scopes and Methods, 2019, pg 106) there is an absence of engagement with the broader public, including an absence of engagement with the Residents of the Town of Pictou. As the project will have a footprint over portions of the town's water table (Environmental Effects Assessment, Northern Pulp, pg 186), it is my understanding the people of the town of Pictou and the Municipality of Pictou County would be considered stakeholders, and the insinuation that Northern Pulp has met with all relevant "stakeholders" throughout the course of the consultation period of this project is misleading.

As a resident of the town of Pictou, the water supply issue is of tremendous concern. The possibility of a spill or leak in the pipe over the town's water supply, and what impact this could have has not been addressed in the Environmental Assessment Registered by Northern Pulp. In October 2018 the town of Pictou announced the opening of a 5.8 million dollar investment to improve water quality and build a Water Treatment Facility (www.townofpictou.ca, New Water Treatment Plan Officially Opened, 22 October 2018). Water quality issues have been longstanding and painstaking in the town of Pictou. I have relatives who live in Pictou Landing First Nation who in 2014, 2017, and again in 2018 have been unable to drink their tap water due to spills, and possibility of contamination from the effluent being transported and treated in Boat Harbour. In Section 8.5 outlining Groundwater issues and their relation to the Town of Pictou water supply, there is an absence of clear, documented mitigation efforts that are evidence based to prevent contamination. There is an absence of reference to a specific mitigation/ground water monitoring systems that would alert necessary parties to a spill or leak, and possible contamination of water supply. The environmental assessment references that it is still unknown and unclear what exactly will be in the effluent, the parameters of monitoring and understanding the implications of a spill into a water table are yet to be determined.

The Environmental Assessment is missing important facts. On Page 12, paragraph 3, the Environmental Assessment reads "due to the EA registration timing, the study period did not facilitate a full biological field assessment for the corridor". Unfortunately, upon review of the document, there are several assessments missing from the report, and frequent reference to "will be completed upon permit" and "will be completed upon approval". Reasons listed include "seasonal constraints", "physical opposition and obstruction" (pg 12). These studies include things that are seemingly critically important to a decision on an approval for the project, including marine life studies, human health studies, and biological field assessments. This illustrates a lack of information and an incomplete assessment of the true impacts of the proposed project.

As a child I had friends who attended the Camp Maclellan United Church Camp when it was open. MacLellan Memorial Camp is situated approximately 7 km from the Boat Harbour Treatment Facility. The camp has since closed, but what I vividly remember from hearing about my friends' time there, was that they were not allowed to swim in the ocean because of contamination. This continued, until the last year the camp was open (2015). In fact, the camp had an inground swimming pool due to the issues with water quality and contamination in the beach. In 2013 When I picked my little sister up from attending her week at camp, she had a wonderful time talking about memories with her friends, but acknowledged that it was a shame they could not swim in the ocean there, because of "the stinky Boat Harbour". The outfall location of the proposed project is approximately 4.1km from the Northumberland ferry wharf, taking it approximately 5km outside of one of the most popular beaches visited by tourists and locals around. The Caribou Provincial Park is where I spend every day walking, in the summer it is where I swim, and it is where I want my children to swim. Reflecting on what the water looked like in MacLellan Memorial Camp on the beach, and the contamination that occurred on that shoreline as a result of discharge into the strait following effluent treatment from Boat Harbour, I cannot help but think of the careful measures that were taken to prevent children from swimming in that water due to contamination. I am struggling

to understand how constant flow, with an undeterminable end, of effluent can be discharged within 5 km of one of our provincial treasures, Caribou Provincial Park, and jeopardize the ability of children and families to enjoy what this coastline can offer.

Based on what I have outlined above, there is not enough information available to approve the Proposed Effluent Treatment Facility Project as submitted by Northern Pulp. I am asking that the Minister order an Environmental Assessment Report, to allow the most in-depth and comprehensive understanding of the complex issues that could face this project, including the impact of adverse effects.

Thank you for your careful consideration and review of the concerns relating to this project,

From:	
To:	Environment Assessment Web Account
Subject:	EAC Submission re. Northern Pulp Nova Scotia Corporation's Replacement Effluent Treatment Facility Project
Date:	March 9, 2019 9:35:30 PM
Attachments:	image001.png EAC Submission to NS EA for Northern Pulp Pipe Project.docx
Importance:	High

Hello. Please find attached our submission re. Northern Pulp Nova Scotia Corporation's Replacement Effluent Treatment Facility Project.

Please confirm receipt.

Thank you

Wilderness Coordinator

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March 9, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

Re: Northern Pulp Nova Scotia Corporation's Replacement Effluent Treatment Facility Project

This letter is submitted on behalf of the Ecology Action Centre (EAC), an environmental charity working since 1971 at the local, provincial, national and international level to build a healthier and more sustainable world. Our vision is 'a society in Nova Scotia that respects and protects nature and provides environmentally and economically sustainable solutions for its citizens'. The EAC works to catalyze change through policy advocacy, community development and awareness building. And, when required, we serve as a watchdog for our environment.

In that capacity, we respectfully request that the Minister reject Northern Pulp Nova Scotia Corporation (NPNS)'s proposal as outlined in their registration document under Section 34(1)(f) of the Environment Act "because of the likelihood that it will cause adverse effects or environmental effects that cannot be mitigated". We also cite that there are a number of areas in the registration document where crucial information is lacking or unknown, triggering Section 34(1)(a-c) requiring additional information and focus reports. We also cite Section 2(b)(ii) "the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation."

Despite its impressive volume, NPNS's registration document is very poor and fails to provide necessary information about key elements of their plan, including and importantly - the content of the substances they wish to pump in large volumes into the Northumberland Strait and the potential impacts that it undoubtedly will have on marine life and air quality. The registration document seems designed to obfuscate essential details, downplay them or intentionally omit them altogether. It essentially says there will be no impact of any kind. This is simply not credible. In Table E.1.1-1: Summary of the Significance of Project-Related Residual Environmental Effects Predicted. Every row and column of the table contains 'NS' which represents 'No Significant Residual Environmental Effects Predicted', including water quality, fish and fish habitat, surface and groundwater and the entire 'Accidents, Malfunctions and Unplanned Events' column. It is inconceivable that after NPNS's lengthy history of leaks, ruptures, over-limit emissions and other unplanned events that these predictions could be put forward credibly in a registration document for environmental assessment of this proposed effluent treatment facility.

NPNS has not done its due diligence to fully determine the potential impacts of their proposed project. It is the duty of Nova Scotia Environment to apply a rigorous standard of environmental protection when assessing risk and we do not feel that NPNS has provided sufficient information within their registration document to enable the province to complete the assessment. In light of this, the only acceptable decision is to reject the proponent's proposal for this effluent treatment facility. The potential for damage to our land, water and air from this proposed effluent treatment system is far too great for the province to grant approval.

The EAC's concerns about this proposed effluent treatment facility are numerous. Despite the very limited time available under this 'Class 1 undertaking' environmental assessment process (30 days) to review the proponent's registration document (1,586 pages spread over 17 documents), this letter outlines our primary concerns, which are:

- Use of an insufficient standard for effluent;
- The potential impact on the marine environment from the massive volume of effluent with its undetermined chemical and physical composition;
- Cumulative impacts and the fragility of the ecosystem of the Northumberland Strait;
- The risks associated with the effluent pipe and its pathway;
- Air pollution from burning waste sludge;
- Socio-economic impacts on fisheries and other sectors; and
- Indigenous opposition
- Lack of serious consideration of alternatives

Insufficient Standard for Effluent

NPNS had a responsibility to develop a solution that enables their operations to continue in Nova Scotia while preventing harm to the environment and the wider community. Rather than identifying an innovative solution which does these things, it is clear that NPNS's objective is simply to meet the minimum Pulp and Paper Effluent Regulations (PPER). The federal regulations are very old and are currently undergoing a major overhaul. NPNS will be required to comply with the updated PPER once the new standards are complete and accordingly, it is irresponsible for their effluent goals to just meet the existing standard. And this statement assumes that their effluent would meet the current standard, something that NPNS cannot guarantee since they cannot say what will be in their effluent until the new system is operational.

A key reasoning behind the proposed modifications to current PPER has been the ongoing degradation of fish habitat by most mills, even when in regulatory compliance. The PPER are primarily designed to prevent effluents that cause acute lethality to fish from entering nearby waterways (pg. 357) and do not deal with long-term cumulative effects or ecosystem impacts. Furthermore, according to Caroline Blais, the Director of the Forest Product and *Fisheries Act* Division at Environment and Climate Change Canada (ECCC), 70% of pulp and paper mills abiding by today's PPER have still shown deleterious impact on fish or fish habitat. A 2016 EcoMetrix study also found enlarged gonads and livers in fish tested near the current Boat Harbour effluent treatment facility's outfall location, despite the fact that Northern Pulp has routinely passed the acute lethality testing. Director Blais, in presentation for the Prince Edward Island Standing Committee on Agriculture and Fisheries in February 2019, described widening the scope of deleterious substances that may call for regulation and "reviewing the regulatory limits for existing and new substances," as central to the government's PPER modification effort. This process will also seek to develop new regulations to treat nutrient inputs, which to date have not been addressed in PPER legislation. NPNS's proposal has not adequately addressed how the company intends to meet new and more stringent effluent regulations that the federal government is working towards.

Simply meeting the PPER is a tremendously low bar to set in environmental protection and is no guarantee that harm to the environment and ecosystem will not occur, only that outdated regulatory maximums of permissible harm might be reached. This is unacceptable, particularly since NPNS cannot even identify what will be in the effluent - a major red flag that this undertaking carries unacceptable levels of risk of impact to the environment and the legitimate interests of other stakeholders. Nova Scotia Environment clearly stated to NPNS that their EA must go beyond the parameters in the Federal PPER. Their proposal as outlined in the

registration document does not do that. Aiming to achieve the lowest possible standard after decades of causing significant environmental damage to the natural world and communities surrounding the mill is simply not enough.

Effluent Content and Potential Impacts on the Marine Environment

The volume and toxicity of the liquid waste produced at the NPNS mill is significant. Boat Harbour provides incontrovertible evidence of the impact of the effluent to the current "receiving waters" - the area is devoid of life. Redirecting the effluent into the Northumberland Strait and the lower Gulf of St. Lawrence will certainly be detrimental to the health and productivity of the new "receiving waters". But unlike Boat Harbour, where most of the damage to date has been contained (and will cost taxpayers hundreds of millions to clean up), the potential damage to the Northumberland Strait will not be easily contained and will be impossible to clean up.

The Northumberland Strait is a relatively shallow area with slow moving currents far from the open sea. This makes it a very low "flushing" system. It takes approximately a year for the water to fully exchange. Northern Pulp's own reports say that on top of 60 to 80 million liters of liquid effluent they also anticipate releasing up to four tons of suspended solids in their waste water each day. In addition to that it is important to note that every drain, toilet and sink inside the mill is attached to the effluent disposal system meaning that in addition to human waste every oil or chemical spill inside the plant ends up in their effluent system. Test results in the current receiving waters (Boat Harbour) show the presence of dioxins, furans, chlorinated compounds, halogenated organic compounds and traces of heavy metals. These substances are known to have serious negative impacts to aquatic and other life. In addition to the chemicals and solids produced in the pulping process the new effluent treatment system "will require several chemical inputs, including urea, phosphorus, sodium hydroxide, sulfuric acid and an anti-foam agent to support its process." (pg. 46). So these too would be sent out into the Northumberland Strait. With so many deleterious inputs it's no wonder NPNS doesn't know what will be in their own effluent stream.

Dioxins and Furans

Research from other pulp and paper mills can provide insight on the potential risks to the marine environment associated with some of the products referenced in NPNS's project proposal. In British Columbia's Howe Sound, the Port Mellon and Woodfibre bleach kraft pulp mills contaminated the local waters so badly that several fisheries had to be shut down in the 1980s. This was due in large part to the dioxins and furans released as a byproduct of the chlorine bleaching process, the same process used by NPNS. Dioxins and furans are toxic, carcinogenic and bioaccumulative pollutants, posing a significant threat to marine species and human health via ingested seafood or otherwise. These compounds have been linked to cancer and diabetes, among other serious conditions.

In 1992, national Pulp and Paper Effluent Regulations (PPER) were put in place to mitigate harmful impacts to fish habitat, and the marine life at Howe Sound slowly began to recover. But while the dioxin and furan content in the Sound's commercial fish and crab species have been reduced by 95% or more since that time, in three of eight Dungeness crab samples collected near the Port Mellon mill in 2012, the dioxin and furan content still exceeded Health Canada's safe-consumption criteria. Federal advisories to limit crab consumption remain in effect in the area to this day. The same results also held for testing done on Dungeness crab near the Woodfibre mill, despite the fact that Woodfibre was in a relatively good "flushing" position at the mouth of the Squamish River, up until the facility's closure in 2006.

NPNS's registration document, in Section 1-7, states that "Dioxins and furans in [Northern Pulp's] effluent have virtually been eliminated since the conversion to chlorine dioxide bleaching in 1998. NPNS has never exceeded the limits as per the Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations." But we know that during NPNS's 2014 spill, on sacred burial grounds at the Pictou First Nation (PFN), proved that

at least five distinct dioxin or furan compounds were indeed still present in the mill's effluent, sixteen years after that conversion to chlorine dioxide bleaching. One of the dioxins was detected more than a kilometre down the beach from the spill site. ECCC regulations stipulate that dioxin and furan content must be non-detectable in pulp mill effluent. In addition, NPNS was found exceeding the daily release allowance for suspended solids by almost double the legal limit. Ultimately, the mill was fined $225,000 for the incident. Today, NPNS refuses to release the full suite of information on the components of the effluent they would see released into Northumberland Strait under their new proposal, and claims that the risk of contamination to marine habitat is "Not Significant". This is simply not credible.

In an attempt to explain this lack of transparency, the NPNS registration document states, "At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty **until the project is operational**" (pg. 489). An expectation that NS Environment would grant approval to this project without provision of full details of the content of this effluent to be discharged into the Northumberland Strait should be extremely suspect, particularly given the company's track record of non-compliance. This includes not only the regulatory disregard displayed during the 2014 PFN spill, but also another spill by the Mackenzie Pulp Mill Corporation, owned by Paper Excellence (NPNS's parent company). In this case, Mackenzie Pulp was fined $900,000 and added to the Canadian Environmental Offenders Registry for violating the *Fisheries Act* by neglecting to properly treat the effluent spilled into British Columbia's Williston Lake on two occasions in 2014 and 2016. Paper Excellence has proven in spill scenarios in both Nova Scotia and British Columbia that their standard of care is simply not high enough for Maritime citizens to entrust this company to operate within the bounds of legality, let alone safety, in the Northumberland Strait.

Additionally, it is important to consider the cumulative effects of adding the toxins from NPNS's effluent into the proposed discharge area. In 2002, a study conducted on Nova Scotia's North Shore tested mussels for leukemia. At a site just 500 metres from the current Boat Harbour Treatment Facility outfall location, 30% of the tested mussels were infected. At a distance of one kilometre, 23% of the tested mussels showed signs of leukemia. In contrast, 56% of tested mussels in Pictou Harbour showed leukemia - a higher rate because of the dumping of untreated sewage at the time. Conversely, mussels tested in Merigomish Harbour did not show any effects of leukemia. In the end, the scientific team pinned the results on both municipal and industrial waste products. With the proposed level of effluent expected to be released into the Strait under NPNS's new plan, we may risk a future in which continued inputs render the local area entirely unusable for shellfish aquaculture or shellfish harvest altogether.

Total Suspended Solids (TSS) and Cellulose Fibers

NPNS public relations messaging from NPNS says that the new effluent treatment facility will be better than the existing one at Boat Harbour. However, this is not credible because Boat Harbour currently allows all the solids and the worst toxic elements to settle out and for the fluid to cool, often called "polishing off", as it is held for approximately a month before its release into the Northumberland Strait. The new effluent system will attempt to "treat" and cool the effluent in a matter of hours before it is released directly into the marine environment. In private documents and in recent media interviews, NPNS executives have admitted that the effluent is likely to be no better - and could potentially be worse - than what now flows into the Boat Harbour basin (Point C).

Total Suspended Solids (TSS) largely consists of cellulose fibers. Although the document states that 85 to 95% of the lignin, cellulose, sodium sulphide and sodium hydroxide will be removed from the sludge via biological activity in treatment, there is no information provided about the 5-15% which survives treatment - the cellulose. Cellulose fibers are refractory, meaning that they don't degrade quickly or decompose well in water, especially seawater. The registration document provides, in section 5.2.2.9 on Effluent Quality, that the effluent annual average flow will have an anticipated TSS concentration of 48 mg/l of effluent which equates to

a total 3053 kg of TSS per day, i.e., a full dump truck load each day in equivalent tonnage. These fibers have the potential to settle into a deep hole or depression, smothering the bottom and causing anoxia in the underlying sediment. The document hints at this on page 347: "The discharge of effluent containing elevated levels of TSS could also cause a change in sediment quality near the diffuser due to the settlement of suspended sediment, which could cause a change in sediment characteristics such as sand and silt size fractions and/or a change in chemical composition of sediments". The TSS could very likely spread beyond the area near the diffuser due to the buoyant nature of effluent and the likelihood that the effluent plume will reach the surface of the marine water column. This is the very same TSS, known to be harmful to marine life, that NPNS was found to be pumping at a rate of double the daily legal limit into Boat Harbour during the company's 2014 spill on First Nations land.

The insoluble nature of these fibers, the proposed volume of TSS discharge, the potentially wide area of impact and the inability to observe and monitor the effluent stream make this incredibly risky and appear to guarantee a significant impact on the marine environment.

Cumulative Effects: Long Term risk in a Fragile Ecosystem

The Gulf of St. Lawrence is already one of the most highly-stressed marine ecosystems on earth. In a recent study published in the journal Nature Climate Change indicates that the Gulf of St. Lawrence is showing a dramatic decline in oxygen.

A separate study done by DFO and University du Quebec entitled "Man-Made Environmental Changes in the Southern Gulf of St. Lawrence, and their Possible Impact on Inshore Fisheries" states: "Major sources of stress on the Gulf of St. Lawrence ecosystem include climatic changes on one hand and human-induced interferences such as physical modification, pollution and harvesting on the other hand. There are indications that these changes have significant impact on the oceanography, ecology and fisheries of the Gulf. The potential danger to the fishery includes physical, biological and chemical contamination."

This is research that should be covered in effective cumulative effects assessment processes examining marine environments. Northern Pulp's Cumulative Effects research presents a marine "Regional Assessment Area" between Pictou Harbour and Charlottetown to the north, spanning approximately 60 kilometres in an east-west direction. The proponents claim that the majority of the disruption to ocean habitat is likely to take place during the project's construction phase, when the seafloor is to be dredged and laid with a rocky substrate to lay the pipeline and keep it place over the long-term. As for the operations phase, during which the pipe will dump its tens of million litres of treated effluent into the Strait, the report suggest that all concerns related to the quality of the water will dissipate within five metres of the discharge location.

The report claims that "given the likely lack of spatial overlap at this location, significant cumulative residual environmental effects to water quality or sediment quality as a result of treated effluent discharge are not likely." But several studies, as well as ECCC expert testimony before the Prince Edward Island Standing Committee on Agriculture and Fisheries referenced above, tell us that pulp and paper effluent *is* known to be harmful to fish and fish habitat in the majority of tested circumstances. In essence, the substance that Northern Pulp would inject into the Northumberland Strait *would*, undoubtedly, pose a threat to aquatic life - and the assessment document says as much - *but suggests that*, because of dilutive power of the ocean, no great harm should occur in this instance. This simply is not true and this type of outdated Industrial Age thinking, suggesting that, because the ocean is big, it should be able to absorb our waste forever, is the same thinking that now sees the entire planet awash with plastic waste.

In a Northumberland Strait context, the cumulative impacts of over 25 billion liters of toxic effluent flowing into the water every year in perpetuity are potentially catastrophic. The NPNS registration document clearly shows that there will be very little, if any, positive change in wastewater quality with the proposed effluent treatment system and information revealed through the FOIPOP requested showed NPNS suggesting that the effluent could in fact be worse. With a myriad of chemical and nutrient inputs from municipal wastewater systems, industrial operations and agricultural runoff, among others, this is no time to augment present threats to marine life by adding a continuous, high volume stream of toxic pollution into a shallow, low flowing section of the ecosystem. We need our governments and our commercial industries to work together to reduce the inputs already entering into the Strait, and we need to put plans in place to start restoring this natural Maritime treasure, as has been called for by federal studies. If we don't, we are at significant risk of creating contaminated marine habitats and unfishable dead zones in the future.

Pipeline Pathway

The effluent pipeline will go over Pictou Harbour, attached to the causeway across Highway 106 and then in a trench through the Town of Pictou's water supply area, putting both at risk in the event of a pipeline breach or spill. Similarly, the potential for pipeline failure at Caribou Harbour is considerable. These are unacceptable risks.

Air Pollution

In the plan outlined in NPNS's registration document, toxic sludge will be collected early in the effluent treatment process and will then be burned in the NPNS power boiler. Chemicals from this process, including Polycyclic Aromatic Hydrocarbons, Volatile Organic Compounds, sulphur and chlorinated compounds, benzine, cadmium, as well as fine particulate matter will be released. The NPNS registration document speaks virtuously about displacing unspecified amounts of fossil fuels by collecting and burning chemically-laden sludge from the pulping process. It states the sludge will have a 40% moisture content. This will provide no fuel (heat) value and will likely require as much or more fossil fuel to burn. Much worse is the fact that it will actually make the mill's already terrible air emissions problems even worse by burning this toxic sludge in the mill's power boiler which has no precipitator and reportedly malfunctioning/non-functioning scrubbers to "clean" the Sulphur, VOCs and other chemical compounds, and carcinogenic fine particulate matter (PM10 and PM 2.5). The NPNS registration document indicates incineration of up to 20 tonnes of chemically laden sludge per day in the power boiler. The power boiler is very old and has repeatedly failed stack emissions tests. This is a significant public health risk and yet another compelling reason to reject this proposal. Although the provincial Class 1 Environmental Assessment does not specifically require the proponent to conduct a human health risk assessment (HHRA) study, such a study should be ordered by the minister under Environment Act Section 34(1)c or b.

The NPNS registration document acknowledges that there will be additional pollutants released by burning the sludge in the power boiler and that these airborne pollutants will land on nearby "receptors" (e.g. people, animals, land, water, etc.):

"Emissions of combustion gases, particulate matter, and possibly odour from the replacement ETF during operation and maintenance could result in air contaminants that could disperse in the atmosphere to off-site receptors. Additionally, since the project will include the combustion of sludge generated in the replacement ETF for energy recovery and odour control, emissions from the combustion of such sludge in the power boiler during operation and maintenance could disperse from mill stacks to off-site receptors." (Pg. 142)

Air quality testing has been incredibly lax in and around the NPNS mill. A new, robust independent air quality monitoring program should be required of NPNS by the Minister. This should include continuous stack emissions monitoring and multiple remote sensors. This data should be made available to the public in a continuous, real-time feed over the internet.

A sample of some of NPNS's recent air pollution violations:

- In 2014 the mill reported the release of 1,290 tonnes of fine particulate matter — the equivalent of 13 Irving St. John pulp mills in one location.
- Air emissions exceeded limits 4 times in a two year span - March and September 2015, June and December 2016.
- NSE investigation in 2017 as mill exceeded air contaminant emissions limits by nearly 50 per cent in June.
- The mill exceeded emissions 3 years in a row (2015, 2016 and 2017) despite the purchase and instillation of a new electrostatic precipitator on the recovery boiler stack.

Socio-Economic Impacts

Risk to Fisheries and Aquaculture

Despite NPNS's claim that the project proposal's impact on marine life will not be significant, the company's Receiving Waters Study, prepared by Stantec in August of 2017, states, "Among the four potential outfall locations … the [chosen] outfall location provides the *smallest potential long-term cumulative effects* on the fishery and socio-economic environments, and therefore is considered the better outfall location for the discharge of the treated wastewater from the mill." (Conclusion 2.4) Here we see suggestion that NPNS is well aware that the fishery will be adversely impacted in the long term, despite public claims to the contrary. The potential impacts to fish, bivalves, crustaceans, fish habitat and critical spawning areas are outlined above. While the deleterious short term impacts of NPNS's proposed effluent treatment facility on fisheries may be limited to a relatively small area, the long-term effects could still be significant. The Lobster Fishing Area 26A, stretching east-west from Pugwash to Port Hastings and north of Souris, PEI, supports more than 700 licenses at 300 traps per license. This is a marine area worth upwards of $40 million on fisheries alone. The Northumberland Fishermen's Association notes in a position letter that the Strait is one of the "most lucrative habitat and spawning grounds for lobster, crab, scallop, herring, mackerel and groundfish" in the Gulf. Each haul is significant to the fishermen that live and work there and, as such, the long term effects on the larger fishery should be more carefully considered.

Northern Pulp has demonstrated a clear unwillingness to do the work necessary to address these concerns in their environmental assessment registration document; particularly those concerns of the lobster fishermen in the region. NPNS's consultants at Dillon Consulting even went so far as to prompt Northern Pulp via letter in February of 2018, noting the importance of further research on lobster at all of the animal's life developmental stages: "… Conducting research on lobster larvae, and potential alternative to pipe discharge into the Strait needs to be completed to demonstrate to regulators that these were properly considered and stakeholder concerns are being addressed as much as reasonably possible."

In spite of this recommendation, NPNS did not conduct any studies or provide any information on potential impacts over the various life stages of the most important commercial marine species in the Canadian Atlantic, simply dismissing the issue by saying, "It was the conclusion that it is highly unlikely that there will be serious

impact on lobster or lobster larvae given the limited area of potential impact." The assessment goes on to admit that marine studies "have been hampered by both seasonal constraints and by physical opposition and obstruction... The existing environmental conditions and associated potential environmental effects of the project therefore have been defined based on existing available information." Again, we see a standard of care set far too low, in the face of significant risks and potential consequences.

Maritimers and Maritime fishermen have told NS Environment and NPNS loud and clear that this is a risk they are not willing to have foisted upon them; that the social and economic value of the region's fisheries are simply too great. Fishing unions and associations alike have since called, for a federal environmental assessment. At a broader scale, the economic value of Atlantic Canadian seafood production is immense. Fisheries and aquaculture products account for upwards of $3 billion to the Atlantic economy, with more than 15,000 licensed fishing boats and more than 500 aquaculture outfits. The Northumberland Strait is major component of that system, and the Southern Gulf of St. Lawrence has been one of the most productive lobster regions in the country. Today, there are some 700 fishing licenses. The legitimate concerns of the Northumberland Strait fishermen, and Canadian fishermen more broadly, need to accepted and respected.

Reputational Risk to Nova Scotia Seafood Brand

Nova Scotia has an international reputation for producing high-quality seafood from "cold, clean and pristine northern waters". This is particularly true for our shellfish - lobster, scallops and oysters. The reputational risk to the industry if any harvested species becomes contaminated with pollutants is significant - particularly in emerging markets in China and southeast Asia where demand from an expanding middle class is dependent on the "clean and pristine" brand. In this regard it is instructive to recall that the discovery of a single reported case of BSE or mad cow disease in 2003 led to an immediate worldwide ban on all Canadian beef imports which lasted for years and cost the industry billions of dollars in lost sales. Imagine what one contaminated lobster could do the Canadian lobster industry's access to foreign markets. Even the idea of seafood produced in polluted waters could be enough to shut down or seriously curtail demand in sensitive markets like China. This is a serious financial risk that Nova Scotia cannot afford to take.

EAC supports the fishermen.

Tourism Industry

The tourism industry in Nova Scotia is worth $2.7 Billion and growing, creating 40,000 jobs and producing $300 million in taxes. At a regional level, tourism revenue in the Northumberland Shore Region of Nova Scotia is 7.8% of the total tourism revenues translating to $210.6 Million and over 3,200 jobs, generating about $24M in tax revenues. This sector of the economy could be much greater but is hampered by the presence of the NPNS mill.

Tourism operators have reported the length of stay in the Town of Pictou has declined from 2010, an average of 3.3 days to 2017 at 2.5 days. Tourism Operators explain the decline in visitor stays is a direct result of the air and water pollution emanating from the NPNS mill. Allowing the mill to release its effluent into the Northumberland Strait and to increase its harmful air emissions by burning large quantities of toxic sludge will only make things worse for this industry. Tourism operators in western Cape Breton (Inverness County), along the south coast of PEI and the New Brunswick coastline of the Northumberland Strait are all at risk of impacts from the proposed discharge of large volumes of effluent into the marine environment.

EAC supports the tourism operators.

Indigenous opposition

It is important to note that all of the Mi'kmaq Chiefs in the three Maritime Provinces are opposed to piping the NPNS mill's effluent into the Northumberland Strait. Chief Terry Paul identified the mill's proposal for a new effluent treatment plant as the top issue raised by Mi'kmaq leaders in their annual meeting with Provincial Cabinet in December 2017. "The first consideration is the environment" he said. "We want to ensure that whatever is done to mitigate the effluent there isn't detrimental to the fishery". He stated clearly that the chiefs cannot support the NPNS effluent pipe plan. Chief Andrea Paul of Pictou Landing First Nation has been unequivocal in stating her communities firm opposition to the proposed new effluent treatment system. "The effluent discharge is in the Northumberland Strait and for that we are opposing it" she said in July 2018. "We do not want this pipe in our waters. We need to protect our resources. All of us have an inherent duty to do that".

EAC supports the Mi'kmaq.

Unwillingness to Explore Alternatives

The pulp mill in Pictou County has a long history of putting Nova Scotia's environment and citizens at risk. Despite five years to find a suitable alternative to the Boat Harbour treatment facility and taking the opportunity to improve their environmental performance, NPNS simply offers one single option: to pollute a different area, this time spreading the potential impact much further. The registration document has been carefully tailored to reach the NPNS's preferred outcome of pumping the effluent into the sea. In preparing the document the consultants, appear to have relied almost exclusively on information provided by NPNS. There is no evidence of serious independent analysis of the options, assumptions or conclusions in the report. The Ecology Action Centre strongly disagrees and believes that NPNS could do much to 1) reduce the toxicity of their effluent by improving internal process inside the mill and 2) negate the need to dispose of their effluent into the environment at all by modifying their production process (i.e. eliminate chemical bleaching) and installing a closed-loop system.

It is clear from NPNS's registration document that the scope of exploration of alternative options was deliberately narrow and entirely restricted to finding an alternative dumping site for the effluent. All other options to reduce or eliminate the mills liquid pollution output are summarily dismissed early in the registration document, abandoning any further consideration or research for better options. On its project website, NPNS confirms this: "At the onset of the design phase a closed loop (zero effluent) treatment alternative was immediately ruled out as it is not an option for Northern Pulp. A closed loop system does not exist anywhere in the world for an elemental chlorine free (ECF) bleached kraft pulp mill. The concept is not technically or economically achievable." This is consistent with NPNS's long-held public position that only a pipeline into the Northumberland Strait will work. NPNS says the technology does not exist to close their loop. They are lying by omission.

NPNS could install and run a closed-loop system if it simply changed its production process and stopped bleaching their semi-finished kraft pulp product prior to shipping it to their Asian parent company. The result would be a light brown fiber product rather than a bright-white one. If the parent company wished to bleach some or all of the kraft pulp during its subsequent product production processes (making tissue, napkins, diapers, etc.) they could easily do so at their end. Another workable alternative would be to retool the NPNS mill to use peroxide and ozone instead of chlorine dioxide to whiten their kraft pulp and thus become a Totally Chlorine Free (TCF) mill.

The truth is NPNS could change its process and install a closed loop system but they have chosen not to. They admit as much in their registration document (Project Alternative 3: Change the NPNS Mill Type and Make a

Closed Loop System, Pgs. 25-26), stating the reason for not doing so is that it is “market prohibitive”, not that it is technically impossible. Their justification for not doing so is cost: “NPNS would not remain competitive due to high wood and electricity costs” and that “NPNS must continue to operate by producing NBSK to be economically viable”. They admitted that “Production of a different type of pulp can allow operation using closed loop systems.” But that “NPNS would not be economically viable with a different product”. Although NPNS says changing their product process is “not economically viable”, they provide no proof for these claim.

Notwithstanding their refusal to seriously consider altering their process and implementing a closed loop system, before the NPNS mill starts pumping their effluent anywhere they should first be required to improve the inside performance of their very old mill in order to significantly improve the quality of the effluent before it is sent for secondary treatment. In industry parlance this is called “tightening up the loops” inside the mill prior to the effluent treatment process. The mill employs very old (1960s era) technology. There are three specific areas that need to be modernized before sending effluent into a secondary treatment system, regardless of where the effluent is subsequently dumped. They are: #1 Optimize brown stock washing, #2 Install an oxygen delignification system in the bleaching plant and #3 Implement fail-safe systems to ensure against process upsets into the effluent treatment system. Process upsets can come from overflows of brown stock, bleach and/or black liquor.

It’s important to point out that with regard to #2, NPNS has previously said they would be installing an oxygen delignification system which would result in a 30 to 40% reduction in chlorine dioxide bleaching chemicals and thus much “cleaner” effluent. That oxygen delignification system is now missing from NPNS's registration document.

It’s also important to highlight why NPNS should be required to build in effective fail-safe systems to minimize and contain process upsets whereby the system becomes overloaded with pulping chemicals and shuts down the biological activated sludge (BAS) treatment process. In brief: NPNS has a history of frequent process upsets with its current effluent treatment system in Boat Harbour. When this happens the biological agents (bacteria, fungi and protozoa) that are used to consume organic pollution from the effluent prior to release are killed and the process stops working. In the Boat Harbour lagoon, the untreated effluent can be contained at an early stage while the system is re-inoculated with replacement biological agents so treatment can be resumed. This can take several days. In the event of black liquor or other chemical spills into the proposed new effluent treatment system, the biological agents will be killed and the system will stop functioning as it’s supposed to. In the registration document, NPNS says it plans to build a 35 million liter raw effluent spill basin that, assuming optimum conditions, will be sufficient to contain 10 to 13 hours of effluent diversion in the event of process upsets (pg. 42). That means only half a day’s worth of effluent can be contained while they try to fix the problem. But process upsets often take much longer to fix than half a day. Therefore the risk of potentially large volumes of untreated effluent by-passing the new effluent treatment system and flowing directly out into the marine environment is very high as their proposed spill basin will be too small to contain effluent volumes greater than half a day’s output while NPNS works to restore the biological agents to sufficient levels to function again.

NPNS has repeatedly minimized serious concerns about their effluent treatment plan. Vague assurances through the registration document with phrases such as ‘no significant residual environmental effect predicted’ are simply not credible, particularly in light of the vast evidence of ecosystem destruction committed at Boat Harbour. With an effluent leak only months ago in October 2018, which was discovered by a citizen walking in the vicinity of the mill, and another in June 2014 that released 47 million litres before detection, public trust is at an all-time low. Attribution of pollution in the Northumberland Strait will be challenging, ensuring that the province of Nova Scotia will have a very difficult time seeking remediation for damages. Fastidious monitoring will be required to intervene as quickly as possible and ideally this monitoring would be administered by an independent body to ensure compliance.

Conclusion

The Ecology Action Centre strongly recommends that the Minister of Environment reject NPNS's effluent treatment facility proposal as outlined in their registration document. The document fails to provide the Province with the required information to assure itself and all Nova Scotians that their proposed effluent treatment facility would be safe for the community or the environment. All evidence points to the fact that this effluent treatment facility will cause at least as much pollution as the levels at Boat Harbour, if not more, and this time the pollution will be spread over a far greater area with even less ability to contain and repair that damage in the future. It is also clear that the burning of large amounts of toxic sludge in the power boiler will make the mill's already terrible air emissions even worse. The claims by NPNS that there will be no impact of any kind is not credible and they have failed to provide evidence that this even possible. It is unconscionable of NPNS to ask, nay, demand that Nova Scotian's accept all the risks and harms so an ancient, highly-polluting pulp mill can continue operating for a few more years.

NPNS has shown a consistent sense of entitlement, often operating outside of the rules and boundaries which exist to protect our environment. NPNS even made a request to begin building elements of its proposed new effluent treatment system in mid-2018, well before submitting its proposal for environmental assessment. The sheer audacity of this request demonstrates a corporation that fully expects Nova Scotia to continue to bend to their wishes, regardless of the impacts. Now that we are within a year of the January 31, 2020 shut down date for the Boat Harbour effluent treatment system, the corporation has requested an extension to continue polluting Boat Harbour, citing a lack of time to get an alternative in place. Complying with this request would require repealing that legislation and would be an unforgivable violation of the faith of the Pictou Landing First Nations community and to every other Nova Scotian who is counting down the days until January 31, 2020.

It is time for this province to stop operating with a methodology of privatizing our shared natural resources for private profit while socializing the enormous risks and costs. Nova Scotian taxpayers will long be paying for the damage that has already been done by the pulp mill at Abercrombie Point in Pictou County. The investment to create the new pipe, a piece of infrastructure which will cost an enormous amount and likely to be charged again to the taxpayer, is making a commitment to allow this mill to continue discharging toxic effluent into our environment for many years to come. That is unacceptable. The Minister should reject this project outright. Failing that the Minister must, at the very least, order focus reports in a number of areas where information is lacking, including the composition of the effluent, baseline studies on lobsters and other marine species, baseline benthic surveys of the bottom of Caribou Bay, plans for air pollution controls and monitoring, etc. The minister should also order the mill to upgrade its internal processes and equipment to reduce its already substantial air and water pollution levels regardless of if or where they might send their effluent. But at the end of the day the Minister must not make a bad situation worse by allowing another place to be fouled and one that can never be cleaned up.

In closing we cite Premier Stephen McNeil's wise words at the annual meeting of Nova Scotia Cabinet and Mi'kmaq Chiefs on December 14th, 2017 in Millbrook: "*It has never been our government's intention and never will be our government's intention to clean up one environmental problem and move it somewhere else*."

And that is the right answer. No pipe.

Respectfully submitted,

Wilderness Coordinator
Coastal Coordinator
Marine Conservation Officer

From: @ns.sympatico.ca
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 10:08:40 PM

Project: replacement_effluent_treatment_facility_project Comments: To Whom It May Concern: I am opposed to this project on jurisdictional, environmental, and human health grounds. First of all, it should be undergoing the more extensive federal environmental assessment, as t it involves probable deleterious effects on nearby oceans, navigable waters, commercial fisheries, fish habitat, and the health of residents of the Pictou Landing First Nation. All of the above are primarily federal responsibilities. Proponents of the proposed effluent pipe claim that a closed loop system of bleach kraft effluent is not viable. This assertion needs a much more rigid analysis by an independent party. I am opposed to further dumping of effluent, containing toxins and nutrients, resulting in increased chemical and biological oxygen demand in the receiving waters. Where are the studies of potential long-term toxicity of the proposed effluent to marine life, particularly to species targeted by commercial fishers? There are none. Instead, we are told that the pulp mills effluent is too toxic to be reused within the mill. The current proposal is full of models, assumptions, and simulations yet in the final analysis we cannot tell what will happen to the Northumberland Strait marine environment and its fisheries and our health should the toxic effluent pipe be approved and constructed. Approval of the proposed project would constitute a giant leap of faith, a major uncontrolled experiment with no backstop. It is contrary to the precautionary principle and should be rejected in its entirety. Name: MD Email: @ns.sympatico.ca Address:

Privacy-Statement:

agree x: 51 y: 21

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 9, 2019 10:18:12 PM

Project: replacement_effluent_treatment_facility_project Comments: Evidence based decisions Born and raised by the water in the community of Little Harbour, the writer has invested a lifetime of work in Pictou County and is a multiple stakeholder with residential land on both the mainland and Pictou Island, an aquaculture operation, and several working woodlots. Since its inception, the pulp mill has had very real environmental and health related issues. The eerily deadened Boat Harbour â?" the once vibrantly alive tidal estuary that the pulp mill effluent passes through on its way to the Northumberland Strait â?" is now classified as a hazardous/toxic site. According to the provincial government https://novascotia.ca/boatharbour/about.asp over 200 studies have identified sediments including: o Cadmium o Dioxins o Furans o Mercury o polycyclic aromatic hydrocarbons PAHs o petroleum hydrocarbons o zinc In January 2020, when Boat Harbour will close, it has been proposed by Northern Paper that a pipeline be built out into the Northumberland Strait to take its place, directly discharging the effluent there. It is worrisome that those wastes, once deposited in Boat Harbour, will now flow directly into the Northumberland Strait. Particularly in light of the following: NORTHERN PULP, ACCORDING TO ITS OWN DOCUMENT, STATES IT DOES NOT KNOW EXACTLY WHAT WILL BE IN THIS EFFLUENT, NOR HOW MUCH: o â?oAt this time, effluent chemistry characteristics including the specific substances present in treated effluent and their anticipated concentrations will not be known with certainty until the project is operational. Some other current areas of uncertainty include limited recent or current baseline environmental media and marine food item chemistry data â?¦â? NORTHERN PAPER, ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT, Replacement Effluent Treatment Facility, January 2019 NORTHERN PULP TECHNICAL MANAGER STATES THAT EFFLUENT QUALITY WILL BE WORSE o â? oSome say effluent quality will be worse than today because of all the polishing that is happening across the Boat Harbour basin and they are correct to some extent â? Quote by Northern Pulp Technical Manager, November 2017 document obtained through Freedom of information. https://www.cbc.ca/listen/shows/information-morning-ns/segment/15672343 This proposed effluent disposal method has the potential of causing extreme environmental harm. It is therefore imperative that all decisions are rigorously evidence-based. For your consideration. Name: Email: @gmail.com Address: Municipality: Postal-Code: Phone: Fax: ### ### - #### email_message: Privacy-Statement: agree x: 54 y: 28

From:
To: Environment Assessment Web Account
Subject: Northern Pulp Replacement Effluent Pipe
Date: March 9, 2019 10:45:22 PM

Please accept this as my reasons for requesting a rejection of the current proposal submitted by Nortern Pulp for their replacement of Boat Harbour.

1. They have submitted a plan to pipe effluent at several degrees higher than normal receiving water temperatures into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard.

2. They have submitted a plan to pipe effluent containing one ton of solids per day into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard.

3. They have submitted a plan to pipe effluent containing toxins, including dioxins and furans, into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard.

4. They have submitted a plan to pipe effluent that is worse in character and quality than that which currently leaves the Boat Harbour estuary, by their own account, into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard.

5. They have submitted a plan to pipe effluent containing unknown levels of toxins, by their own account, into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard.

6. They have submitted a plan to pipe effluent into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard, that has twice been rejected when submitted previously. Which also leads to the value for tax payer dollars supplied to Northern Pulp, to recycle this twice rejected plan. It also casts doubts in every claim about about tight time lines. Doubts that cause anger. Was this recycled plan worth $6 Million?

7. They have submitted a plan to pipe effluent through a well field and watershed, essential to the local homes and broader community for water and then release the effluent into a vital ecological and highly stressed area of our ocean, that cannot endure further disregard. How many leaks and ruptures in this company's pipe does it take for this idea to be be deemed blatantly insane?

8. The proposal includes a request to give the company an additional 21 months to build said pipeline..... they had 6 years to develop a plan, and seek approval. They waited until 2018 to submit a recycled and twice rejected plan.

9. Part of their current Industrial approval, issued in 2015, included the requirement for flow metre to be installed on each end of the effluent pipe, to monitor for leaks. This has never been done. They are in violation of their current industrial approval.

10. How does one test the output on the diffuser end of the pipeline? As in, toxins, temperature, etc.

11. At a time when food security is paramount, and water resource is crucial, this mill using the volumes of fresh water daily to dilute their poisonous sludge to "meet" regulations, while risking a major food source, not to mention an economic driver in the province, is inherently unlawful.

12. The mill has issued varied statements in the media, in their proposal and in court documents about the jobs that will be impacted by a closure. I would advise that the legally binding numbers are likely the most accurate at less than 1,000, and would hope that all the noise and bolstered confusion over the future of Nova Scotia's forest industry could be cleared up with another recent bit of insight regarding PHP importing wood and wood chips from NB and Quebec at much higher rates than NS forestry companies are being paid by Northern Pulp.

13. How many fishery jobs will be impacted by this proposal?

I have many other concerns, but I feel these are fairly easily understood and are the ones that stand out for me.

Regards,

From:
To: Environment Assessment Web Account
Subject: [PROBABLE-SPAM] EA -Northern Pulp Replacement ETF
Date: March 9, 2019 11:28:11 PM
Attachments: EA submission Northern Pulp docx

Please find attached my comments on the Environmental Assessment of Northern Pulp's proposed Replacement ETF.

I would appreciate acknowledgment of receipt of my submission.

March 9, 2019
Re: EA Northern Pulp Replacement Effluent Treatment Facility

Dear Minister Miller,

I live in Pictou County, overlooking the River John, as it flows into the Northumberland Strait. I have spent the last 16 months educating myself about what Northern Pulp's proposed new ETF could mean for the Strait, for those who fish its waters, enjoy its beaches, value its complex ecosystem and love its beauty.

In that time, I have learned from fishermen many things I did not know before. I learned that lobster thrive on the rock crab that are plentiful in Caribou Harbour, that scallops release 6 million eggs, but only one develops into a scallop, that small changes can lead to marine life leaving an area where they were previously plentiful. I have learned to appreciate these waters in a way I did not before. Fishermen understand ecosystems, that the smallest to largest of marine life, plant and animal, depend on each other and the conditions they live in. I am in awe of the detailed knowledge that fishermen have of the waters, tides, currents, bottoms and creatures where they fish, because their livelihoods and their safety and the safety of their crews depend on this knowledge.

I also learned that fishermen make changes every year at their own expense in order to protect the future of their industry and to protect the environment. One example is voluntarily increasing the carapace size of lobsters which they take, which means a smaller catch in the short term but a healthier and more productive population in future years. Another example is the changes in quota which can be announced suddenly by DFO, and may mean a 50% or more decrease in allowable catch from one year to the next. Or, as last year, the closure of the lucrative snow crab fishery for part or all of a season in order to protect Right Whales.

This is the reality of life for fishing families. They do not have an automatic entitlement to make maximum profit – their profits are constantly balanced by the need to protect the environment and the future of the fisheries.

Lack of adequate public consultation
I have spent the last month immersed in 1700 pages of documentation which the public was given only 30 days to read, understand and respond to. I believe that this was not an adequate process of public consultation, especially as no Open Houses were conducted on the proposal including the new route, new outfall location, and many differences in technology, including a missing oxygen delignification system.

Lack of critical information
In those 1700 pages there are many issues to comment on. Among other issues, there is the lack of critical information on effluent composition and on the majority of the VECs, the absence of water analyses from Caribou Harbour, and the use of baseline water data from Pictou Harbour as "proxy"-- which Northern Pulp itself admits is more polluted than Caribou

Harbour -- and the very strange use of an HHE report based on a human health risk analysis of a mill-that-never-existed. I would have thought those omissions would have led you as Minister to refuse registration of the project documents as incomplete. But that did not happen, so I would hope these serious omissions will stand as red flags to your department now.

A vibrant ecosystem

Northern Pulp either exhibits no understanding of ecosystems, or does not want the Minister to understand that Caribou Harbour is a complex and vulnerable ecosystem full of life.

There is one photo which I found particularly striking.

Figure 8.12-1 on page 363 is a still photo of the bottom of Caribou Harbour. The caption states that it is devoid of macro flora and macro fauna. What is odd is that, according to Graham Edgar, Professor of marine ecology and conservation science at the University of Tasmania macro fauna are "the small invertebrates that are just marginally too small to see with the human eye." So macro fauna would not be seen -- how can the author conclude it is devoid of macro fauna?

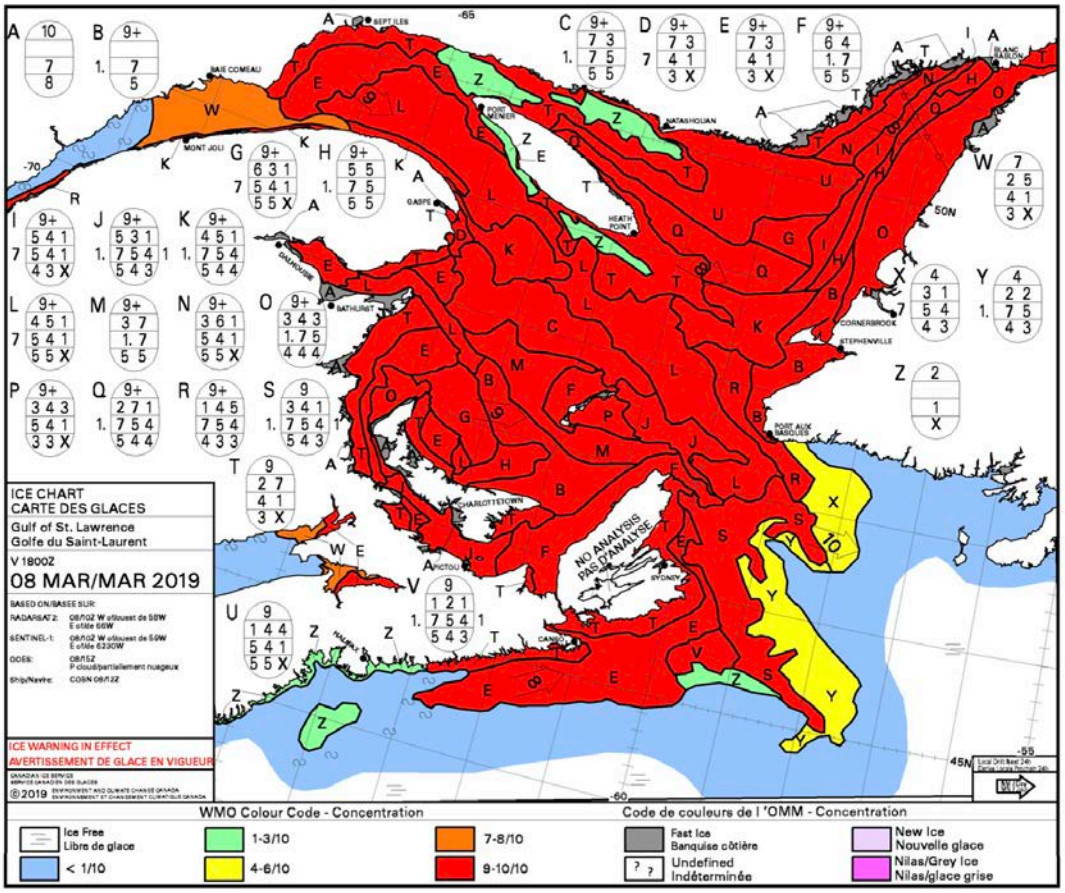
The purpose of the photo seems to be to imply that the bottom of Caribou Harbour is devoid of life. Nothing could be farther from the truth. Under that sand there could be a thriving population of bar clams, rock crab, and other species for whom Caribou Harbour serves as habitat and nursery. Floating in the water there could be many life forms, from plankton up, in various life stages, all of which are critical to a healthy ecosystem.

Ice

I would like to point to the high likelihood of ice damage to the pipe, and the inability of Northern Pulp to repair that damage in a timely way, even if it were identified in a timely way.

Northern Pulp only looks at the possibility of ice damage to the diffusers, which is dismissed as being taken care of by normal tides and currents. If that were true, diffusers would not be required. And differences of diffusion under ice conditions are ignored.

But an even greater issue is the risk of damage to the pipe itself in the shallow waters of Caribou Harbour. The proposed outfall location is in a “hole” 20 metres deep, in a narrow channel. The depth of the majority of Caribou Harbour, both closer to shore and on the far side of the proposed diffuser location, is from 0 to 8 metres deep. Damage to the pipe before it reaches the diffuser would take place in a shallow area, where sufficient flushing would not occur. The result of damage to the pipe could damage the entire rich ecosystem of Caribou Harbour for many decades. This is not a small possibility, it is a likelihood, according to fishers and a master diver I have spoken with, all of whom have watched the force of ice in the area for years and have made their own submissions to this EA.



In 10.4.4.1, Northern Pulp states, “Upon detection of any marine outfall pipe damage or diffuser fouling, repairs would be promptly performed.” **This is impossible.** Ice locks in Caribou Harbour for four months or more in the winter. The ice map of March 8, 2019 gives an indication of the thickness of ice in the area as well as the presence of fast ice in the Caribou area. It is during these winter months when the likelihood of damage to the pipe itself or diffusers, is greatest.

The Minister should consider the issue of likely ice damage to the pipe as establishing a likelihood of harm which is not mitigable. The force and duration of ice cannot be changed. The vulnerability of a pipe in those conditions is established in other submissions. The danger to Caribou Harbour is established by the fact that Northern Pulp did not choose an outfall location in the Harbour itself.

As well, the Minister should be warned by this casual reassurance of timely repair which is clearly impossible for 1/3 of the year. The Minister should take this example as a caution in relation to Northern Pulp’s many other breezy reassurances that no harm will be done or that it is mitigable, with no detail provided.

Mercury risks

Finally, I would like to raise the issue of the known presence of mercury contamination from the Canso Chemicals plant in bedrock and in 1990s era “secure landfills”, on the site adjacent to Northern Pulp very close to where the plan is for components of the proposed ETF to be set into the ground at a depth of 7 feet, requiring digging to that depth or more.

This issue only came to public attention several days ago through the release of information from the 2000 Decommissioning Report of Canso Chemicals. This raises complex risk issues which the Minister must insure are fully investigated and evaluated in the public eye, not behind closed doors, to determine whether the construction or operation of the proposed new effluent treatment plant could increase or hasten release of mercury in soil, air or water. Given that the previous elemental chlorine process used at the mill would have involved mercury, the attention given to Canso Chemicals raised questions for me as to whether the Northern Pulp site itself might also have some mercury contamination that could be released during construction or operation. These are issues that must be fully examined prior to approval of this project.

Northern Pulp’s summary no-harm-ever-to anything chart is not credible

Northern Pulp’s summary chart says that under no conditions, normal operation, malfunctions, accidents, will any significant residual harm be done to anything. That conclusion is not credible.

We can look at dead zones and environmental degradation attributed to pulp and paper mills in other locations or we can look in our own back yard to question that sunny conclusion. For almost three decades now, Boat Harbour Basin has been the Receiving Water for treated pulp

effluent from Northern Pulp. The effluent entering Boat Harbour meets PPER regulations, but Boat Harbour is far from a healthy, or even recovering, ecosystem today.

Northern Pulp's registration documents mock the Environmental Assessment process. Northern Pulp may as well have said: "We don't need to provide any hard information about the effluent, we don't need to do any studies, decades old data from other locations are good enough, we don't need to seriously consider the harm this project might do, and there is no need for the public to have the required information and scrutinize it to point out potential risks. We dare Nova Scotia Environment not to approve our application."

The proponent has addressed the risks of this project with a lack of seriousness. The proponent has provided no proof that harm will not be done. The proponent has neglected to provide the most basic data and science, e.g. no effluent composition, no water analysis of the outfall location, no lobster larvae studies, no evidence to even show that the effluent will meet federal regulations or provincial standards.

The Minister cannot make a science-based decision to approve this project, as there is no science on which to base a decision. The proponent's past record of poor compliance with regulations and a proven inability to identify leaks in a timely manner, despite being required in their Industrial Approval to have a system in place that that would insure timely detection of leaks, adds significantly to the risk of this proposed project.

I believe the Minister has grounds to reject this proposal on the basis that it has a likelihood of adverse effects or significant environmental effects, and I urge you do so. If the minister approves this project now, she will be setting a very dangerous precedent and encouraging other proponents to follow a similar path, which is inconsistent with the Environment Act.

If the Minister chooses not to reject this project, at the very least she must not accept Northern Pulp's proposal to provide future information to NSE behind closed doors, away from public examination and input. The minister must require a process which allows for full public examination and input into the many issues for which data has not been provided. That would require the Minister to order a full environmental assessment report.

Sincerely,

From:
To: Environment Assessment Web Account
Subject: Northern Pulp EA public submission from CPAWS NS
Date: March 9, 2019 11:39:42 PM
Attachments: Northern Pulp EA_CPAWSNS letter_March2019_FINAL.pdf

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To: Nova Scotia Environment

Please find attached, a written submission from the Nova Scotia Chapter of the Canadian Parks and Wilderness Society, for the project registered by Northern Pulp Nova Scotia Corporation.

Thank you

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www.cpaws.org
twitter: @NSwilderness

CPAWS
CANADIAN PARKS AND WILDERNESS SOCIETY
NOVA SCOTIA CHAPTER

Canadian Parks and Wilderness Society
Nova Scotia Chapter
P.O. Box 51086 Rockingham Ridge
Halifax, Nova Scotia
B3M 4R8

March 9, 2019

To: Nova Scotia Environment:

The Nova Scotia Chapter of the Canadian Parks and Wilderness Society (CPAWS-NS) has reviewed the Environmental Assessment Registration Document prepared by Dillon Consulting for Northern Pulp Nova Scotia Corporation for the proposed Replacement Effluent Treatment Facility. This proposed undertaking includes a 15.5km long pipeline, which is intended to empty into the marine environment of the Northumberland Strait.

CPAWS-NS is concerned about this proposed undertaking and the impact it could have on the environment and the inshore fishery. We are also concerned about the rushed manner in which this Environmental Assessment Registration Document appears to have been prepared.

As an organization, we had intended on providing a thorough and detailed review of one aspect of the environmental assessment review, dealing solely with "wetlands". I have a Ph.D. in wetland ecology from the Wetlands Research Centre at the University of Waterloo, and have provided advice to the Nova Scotia government for the development of a provincial wetland policy. Unfortunately, so little information has been provided within the Environmental Assessment Registration Document for the proposed Undertaking dealing with "wetlands" that CPAWS-NS is unable to carry out a proper review. In fact, it is shocking just how little information is provided.

The consultants acknowledge the deficiency in the information provided for the wetland assessment, stating the following:

> *"It should be noted that fall 2017 to summer 2018 field investigations were undertaken at the replacement ETF footprint area and surrounding area, but as an alternate pipeline route was selected in the fall of 2018 (see Section 5.3) and due to the fall/winter*

> *timing of route selection, only a preliminary reconnaissance visit of the pipeline footprint area was undertaken" (Pg. 223)*

That "preliminary reconnaissance" consisted of a single day of fieldwork, undertaken on December 3, 2018. That's one day of fieldwork, undertaken at a time of year when vegetation surveys could not be completed. This is appalling in its deficiency. I'm actually surprised it was put forward in such a condition.

The Environmental Assessment Registration Document goes on to say that the wetlands were assessed using a "desktop review".

> *"Wetlands outside of the replacement ETF footprint area (i.e., along the pipeline footprint area) were assessed primarily via a desktop review with a preliminary field reconnaissance visit." (Pg. 225)*

Sorry, but a "desktop review", combined with a single day of reconnaissance fieldwork undertaken at a time of year when a proper assessment cannot be completed, is absolutely unacceptable. They state on Pg 224 of the report that part of their desktop review actually involved using Google Streetview.

The consultants state that a "significant portion" of the study area has "not been surveyed in detail for wetlands":

> *"The proposed location of the effluent pipeline changed following the completion of the wetlands program for the ETF footprint area during the summer of 2018. As such, a significant portion of the PFA (i.e., the pipeline footprint area) has not been surveyed in detail for wetlands." (Pg. 231)*

That is an absolutely outstanding statement for a Proponent to make in an Environmental Assessment Registration Document, that a significant portion of the wetlands in the study area has not actually been surveyed in detail. Astonishing.

The Proponent goes on to admit that the wetland delineations could not be completed because it was "too late in the growing season to accurately delineate wetland boundaries or accurately identify plants."

> *"Full delineations and evaluation of wetland functions for the wetlands adjacent to the pipeline footprint area was not possible since the revised alignment for the pipeline was only defined in the fall of 2018, when wetland delineation/functional evaluation would have been uncertain (i.e., it was too late in the growing season to accurately delineate wetland boundaries or accurately identify plants, especially SAR and SOCC)."* (Pg. 232)
> (SAR = Species at risk; SOCC = Species of Conservation Concern)

Although the Proponent says it was "not possible" to have completed the wetland assessments, we find that to be rather disingenuous. The Proponent has had a lot of time to prepare for this environmental assessment, yet has made big changes only months prior to submitting the Environmental Assessment Registration Document. Poor planning on their part does not constitute an emergency on anyone else's part. A more prudent course of action would have been to delay registering the proposed Undertaking until the required wetland

evaluations could have been completed. At present, the Province of Nova Scotia has insufficient information about potential impacts on those wetlands to be able to make an informed decision on this environmental assessment.

The deficiencies in the wetlands review are even more concerning, considering that the proposed undertaking occurs in an area with numerous wetlands. That "desktop review" alone identified 24 wetlands within the study area, including 11 swamps, 4 bogs, 3 fens, 2 marshes, 1 salt marsh, 1 wet meadow, and 2 vernal pools. Detailed on the ground assessments could identify additional wetlands, given the density at which wetlands seem to occur near this proposed pipeline route. In an area of elevated wetland density, you'd think that the Proponent would have been even more careful in ensuring that the required wetland assessments were completed.

Detailed field surveys appear to have only been carried out at 2 of the 24 identified wetlands. The section on wetlands in the Environmental Assessment Registration Document provides a lot of information about wetland type and function, but hardly any of that is site-specific information for wetlands actually occurring within the study site.

I would like to review the detailed field assessments for every one of these wetlands. I'd like to review what species are found there, how the ecosystems change spatially, and what is the nature of the wetland edge condition. I'd like to review how the hydrology may be impacted by this proposed undertaking, and to assess how the fieldwork was set up to ensure objectivity. But, I cannot, because the majority of the wetlands in the study site simply have not been assessed on-the-ground, so that sort of information is unavailable for review.

Despite the lack of evidence presented, and despite only carrying out a single day of fieldwork where no real data was generated, the Proponent reaches a rather firm conclusion that the proposed undertaking will not impact wetlands. The report states the following:

> *"With the proper implementation of proposed mitigation measures, impacts to wetlands as a result of construction of the project are not anticipated to be significant." (Pg. 240).*

I simply cannot see how anyone could reach such a conclusion about wetlands from the paltry amount of data provided. It is not okay for a Proponent to seek environmental approvals now, without having completed the necessary work, under the promise that it will be done at a later date, after approvals are already received. That's not how environmental assessments should work.

Using just the limited review of the wetlands portion of the Environmental Assessment Registration Document alone, and disregarding any other potential problems with this project and impacts on the environment, the Province of Nova Scotia cannot, in good conscience, approve this project as currently submitted. Seeing just how deficient the report is for wetlands gives me serious concerns that other sections of the Environmental Assessment Registration Document are similarly deficient.

CPAWS-NS respectfully requests that the Minister of Environment refer this proposed Undertaking to a Full Class 2 Environmental Assessment, so that a proper environmental assessment can be carried out. We also respectfully request that the provincial government

contact the federal government to initiate a Federal Environmental Assessment for this proposed Undertaking.

Thank you for your consideration

Executive Director
Canadian Parks and Wilderness Society – Nova Scotia Chapter

From: @sierraclub.ca>
Sent: March 9, 2019 11:45 PM
To: Environment Assessment Web Account
Subject: Comments on the Northern Pulp Nova Scotia Corporation's proposed Replacement Effluent Treatment Facility (ETF) Project
Attachments: SCCF_NS_EA_NorthernPulp_Mar_9_2019.pdf

To whom it may concern:

Please find attached comments from Sierra Club Canada Foundation on the Northern Pulp Nova Scotia Corporation's proposed Replacement Effluent Treatment Facility (ETF) Project.

Yours truly,

National Programs Director

--

SIERRA CLUB CANADA FOUNDATION

National Program Director

Toll-free: 1.888.810.4204

Visit our website. Like us Facebook.
Find us on Twitter.

Our success depends on the support of like-minded individuals and organizations. Please donate today.

FONDATION SIERRA CLUB CANADA FOUNDATION

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442, Halifax, Nova Scotia B3J 2P8
Sent by Email: ea@novascotia.ca

Re: Comments on the Northern Pulp Nova Scotia Corporation's proposed Replacement Effluent Treatment Facility (ETF) Project

March 9, 2019

To whom it may concern:

Please find below our comments regarding the Northern Pulp Nova Scotia Corporation's proposed Replacement Effluent Treatment Facility (ETF) Project.

We recommend that the Minister of Environment reject this project because it will cause adverse and significant environmental effects that cannot be mitigated. We are also deeply concerned that no federal impact assessment has been performed on the proposed project, since the project will result in transboundary impacts on fish, fish habitat, fisheries, seabirds, and endangered species. Without federal impact assessment, this process cannot fully assess the impacts of the proposed project.

The issue of pollution from Northern Pulp and its predecessors has negatively impacted the environment, health, and social fabric of Pictou County and the region for decades. It is both a literal and figurative toxic legacy of half a century of environmental racism. Allowing continued pollution of the environment and, in particular, allowing continued negative impacts on indigenous communities via this project would impede our responsibility to engage in reconciliation and our obligation to uphold the UN Declaration of the Rights of Indigenous Peoples.

Upon rejecting the proposed project, we recommend that the Minister, with leadership from Nova Scotia's Premier, Mi'kmaq leaders and elders, and federal representatives proceed immediately to work with Pictou Landing First Nation and surrounding communities to develop a sustainable development plan for the region.

Sincerely,

National Programs Director

Sierra Club Canada Foundation – CRA Charity # 11914 9789 RR0001
PO Box 2007 Stn B, Ottawa Ontario K1P 5W3
Tel. (613) 241-4611, Toll Free 1-888-810-4204
sccfoundation@sierraclub.ca, www.sierraclub.ca

1. EA Registration document inadequately assesses the sensitivity of the proposed receiving environment for effluent: the Northumberland Strait in the Southern Gulf of St. Lawrence.

The Gulf of St. Lawrence is a semi-enclosed sea that is vitally important to thousands of marine species, including endangered whales and fish. Coastal communities and renewable industries such as fishing and tourism rely on this productive but threatened ecosystem.

The EA registration document fails to incorporate the vulnerability of the Gulf, and in particular, two recent findings on its vulnerability:

1. Impacts of climate change altering ocean currents and creating hypoxic conditions. Researchers found that the Gulf of St. Lawrence will be impacted by these effects more than any other marine ecosystem on the planet (Rapid coastal deoxygenation due to ocean circulation shift in the northwest Atlantic. *Nature Climate Change*. 8: 868–872. https://www.nature.com/articles/s41558-018-0263-1); and
2. Department of Fisheries and Oceans scientists have warned cod in the Southern Gulf are on the verge of extirpation (Continued decline of a collapsed population of Atlantic cod (*Gadus morhua*) due to predation-driven Allee effects. *Canadian Journal of Fisheries and Aquatic Sciences*, 2019, 76(1): 168-184, https://doi.org/10.1139/cjfas-2017-0190).

Continued stressors on this ecosystem, such as the release of large volumes of warm effluent containing nutrients and pollutants will contribute to further degradation of this ecosystem.

2. Risks of mercury contamination inadequately assessed

The EA Registration document fails to identify or assess impacts of construction and operation of the proposed treatment facility near an existing mercury waste dump and mercury contaminated soil.

According to research unearthed by Joan Baxter and published in the *Halifax Examiner*, a mercury containment site and mercury contaminated soil are present at the proposed effluent treatment site (Northern Pulp's environmental documents: missing mercury, a pulp mill that never was, and oodles of contradictions. Mar 5, 2019).

The EA document fails to evaluate the risks associated with disturbing this contaminated soil and mercury containment site on the environment, human health and local fisheries.

3. Information on pollutants (including heavy metals, dioxins, and furans) contained in effluent to be released into the environment is inadequate

The EA does not identify amounts, concentrations and make-up of pollutants (such as heavy metals, dioxins, furans) being released from the proposed treatment facility. On a precautionary basis, the assessment should identify the various potential pollutants to be released, the range of possible concentrations, and means taken to ensure these remain a safe levels. Instead, the EA lists potential pollutants but does not evaluate the range of possible effluent characteristics. As a result, the risk to the environment and human health are not adequately assessed.

A study performed by the Mi'kmaq Conservation Group and sampling undertaken by Nova Scotia Environment after the 2014 spill of effluent from a pipeline leak indicate that dioxins, furans, and mercury

are still present in effluent released by Northern Pulp. This research is absent from the document's Human Health Evaluation (Section 9.0), and should be included in evaluating risks.

Complete information on pollutants to be released from the pipe (identity of pollutants, range of concentrations and seasonal variability) are not adequate to assess effectiveness of mitigation measures proposed or risks to environment and human health.

4. EA process has allowed inadequate time and capacity for consultation

The time and capacity provided to experts, stakeholders, and community members to engage in this environmental assessment process has been inadequate to fully assess risks.

From: noreply@petition.web.net
To: Environment Assessment Web Account
Subject: In support of Northern Pulp"s EA application
Date: March 9, 2019 11:47:18 PM

I am writing in support of the Environmental Assessment application submitted by Northern Pulp for its new treatment facility.

A lot has been said about Northern Pulp and its impact on the local community. I stand in agreement with many, including Unifor, that Boat Harbour must close and be cleaned up to respect Pictou Landing First Nations people and their land. I also know there are many positives about having 300 good-paying jobs in Pictou, supporting thousands more across Nova Scotia, particularly in rural communities.

The Nova Scotia Environment Act is an essential piece of legislation designed to protect our shared environment and guide our economic development. The Act rightly spells out its purpose through a set of principles for sustainable development that should guide its application, including:

------> The linkage between economic and environmental issues, recognizing that long-term economic prosperity depends upon sound environmental management and that effective environmental protection depends on a strong economy.

In this situation, science should determine the best path forward. Nova Scotia, along with the rest of Canada, has among the highest global standards for environmental stewardship in the forestry sector.

The job of government and every person we elect to represent us in government is to find the best way forward when there are many competing and sometimes opposing interests. Communities across Canada manage to find a fair balance where good mill jobs coexist with a prosperous fishing industry and thriving communities.

We can and must find this balance for Pictou. There is a lot at stake: jobs, the environment, and respect for First Nations. We can and must find a solution that supports all three.

Thank you.

Signed by:

@shaw.ca)

From:
To: Environment Assessment Web Account
Subject: assessment re: Northern Pulp
Date: March 10, 2019 12:00:30 AM

March 8, 2019

The Hon. Margaret Miller
Minister of Environment
NS Environment
Box 442
Halifax, NS B3J 2P8

Minister Miller,

To me this Review is about the environment and the environment only My presentation is based on quotations from studies, positions papers and press releases from Canadian government Institutions. It is not about what I think. Or jobs. It's about the reality that the world we are living in today is changing rapidly due many sources of pollution.

The first crisis is the DE oxygenation of the Gulf or St. Lawrence (Northumberland Strait) water. a "In the Gulf of St. Lawrence, Oxygen in the lower depths has dropped by 55 per cent since 1930. We feel this issue has to be looked at and deserves more attention," said Denis Gilbert, one of the 22 co-authors and a Scientist with the Department Fisheries and Oceans. The Gulf of St. Lawrence is rapidly losing Oxygen,faster than almost any other marine ecosystem.

Acidification, mostly caused caused by burning fossil fuels is corroding and preventing formation of shells. The increased acidy will lower the saturation state of the waters with respect to calcite and aragonite and likely affect the ecology of carbonate-secreting organising such as coccolithophores, foraminifera, pteropods, mollusks, crustaceans,echinoderms, gastropods and corals.

The Canadian Journal of Fisheries and Aquatic Sciences stated" Their is a high probability that Atlantic Cod will be Extinct in the Southern Gulf of St. Lawrence by mid century, even with no commercial fishing". Other finfish such as turbot, wolfish and snow crab are listed along with other less known species.

"It started off as a bit of a dip, but then it got more profound" says Pierre Pepin, a senior researcher with the Department of Fisheries and Oceans in St. John's Newfoundland. "we're looking at values that are 50 per cent of what we saw five years ago. that's a substantial

decline”.”The tiny organisms live near the oceans surface and underpin the entire marine food web, feeding the smallest and largest of creatures that call the ocean home. Small but mighty, they are what makes life on Earth possible.

In the Canadian Journal of Fisheries and Aquatic Sciences an article “Linking Zooplankton assemblages with oceanographic zones in an Atlantic coastal ecosystem” states that “Shallow (5- 35 metres water) coastal waters, with their proximity to human populations, are likely to experience greater changes to ecosystem structure and functions from climate change and human impacts than offshore waters. Concerns of declining fisheries landings and deteriorating habitat quality in Northumberland Strait led to an assessment by Fisheries and Oceans Canada.”.

The Gulf of St. Lawrence is dyeing. We must do everything we can to help this ecosystem survive. We can not dump 90 million litres de oxygenated pollution daily into this body or water and expect it to survive. we can not continue on the same path.

There is not enough money in Canada to bring it back.
If WE stand by and let the Gulf of St. Lawrence die

Sincerely,

From:
To: Environment Assessment Web Account
Subject: MY EA Submission for Northern Pulps Replacement Effluent Treatment Facility Project
Date: March 10, 2019 12:00:57 AM
Attachments: EA Submission for Northern Pulps Replacement Effluent Treatment Facility Project.pdf

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To whom this may concern,

Please see my attached comments regarding the Northern Pulp's Replacement Effluent Treatment Facility Project proposal.

Kind regards,

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

Dear Environmental Minister Margaret Miller,

I am writing in relation to Northern Pulp' s Replacement Effluent Treatment Facility Project proposal.

My personal connection to the Northumberland Strait comes from being born and raised in New Glasgow, NS. After high school, I left to pursue higher education and upon completing my degree in Leadership and International Development worked in the development field in Zambia and Guyana. I returned to Pictou County and it was upon my arrival that I learned of Northern Pulp's plan to pipe treated effluent into the Northumberland Strait—water that I grew up on. I have treasured memories of traveling to Prince Edward Island via the Northumberland Strait, and of time spent camping at Caribou-Munroe's Island Provincial Park. Returning as an adult this past summer I continued to take advantage of swimming in the Strait and walking its shoreline. Having grown up seeing the environmental impact of Northern Pulp on Boat Harbour and smelling and breathing the air emissions from its facility I felt it was important to review the company's Replacement Effluent Treatment Facility proposal as I'm concerned of its potential environmental impact.

Some of my concerns about the proposal and process include the following:

1. **The length and complexity of Northern Pulp's Replacement Effluent Treatment Facility Project proposal.** The 1600-page document and technical language used undoubtedly make it difficult for the average citizen to read and to be critical of the proposal. This will likely result in excluding much of the population that could be impacted by this project. Additionally, a 30-day period limits the number of people who are able to fully review and comment on the document.

2**. Potential risks to human health.** In section 9.0, page 489 of the proposal: Human Health Evaluation, Northern Pulp reports that "At this time, effluent chemistry characteristics (including the specific substances present in treated effluent and their anticipated concentrations) will not be known with certainty until the project is operational." It concerns me that this project could be approved without fulling understanding the potential health impact. If further investigation is not done on potential human health risks waiting until the project is operational may be too late.

3. **Northern Pulps claim of "No Significant Residual Environmental Effect".** In its Executive Summary, The company claims that out of 18 "Valued Environmental Components" none are considered to have a Significant Residual Environmental Effects. To me, this sounds massively optimistic and my question is what if the company is wrong? Based off my second concern

around health implications the company already admits that it doesn't actually know some of the potential impacts of this new facility.

Based off these concerns I sincerely hope you will consider rejecting the proposed Northern Pulp Replacement Effluent Treatment Facility Project. If you don't feel you can do this with the evidence before you, please call for a full Environmental Assessment report on this proposal.

Sincerely,

From: @gmail.com
To: Environment Assessment Web Account
Subject: Proposed Project Comments
Date: March 10, 2019 12:01:28 AM

Project: replacement_effluent_treatment_facility_project Comments: The issues with the Environmental Assessment start even before the Table of Contents. In the cover letter, Dillon Consulting mentions that they are submitting the document in accordance with requirements for a Class 1 project. Looking at the NS Environment website about Environmental Assessments https://novascotia.ca/nse/ea/faqs.asp, Pulp mill is listed explicitly as a Class 2 project. Additionally, this project also contains waste incineration plans for waste from the effluent treatment, which also qualifies for a Class 2 Assessment. Performing only a Class 1 assessment is a failure to follow the standards set out by Nova Scotia Environment. From here, the issues continue. Section 2.3 acknowledges that a full biological field assessments were not conducted to accelerate the process and to limit the period during which the mill would sit idle without a treatment facility. It then clarifies that the environmental effects have been defined based on existing available information from literature and other desktop information sources and that field data collection to complete the application will be conducted in Spring and Summer of 2019. By starting construction before the assessment has been completed, this assessment is assuming the outcome is a foregone conclusion - the project will have no impact on the environment. This is confirmed by the summary page. Unfortunately, due to the brief comment period allowed, I cannot perform an in-depth review of the entire 700 page assessment. I grew up in Pictou, and feel strongly that this project should not proceed. On a side note, I was living in a small town in Japan for the last 3 years. Several times I saw products available for purchase that were from Atlantic Canada - Lobster and Oysters. Never once have I seen a paper product proudly proclaiming provincial provenance - whether at home or abroad. There is no pride, no publicity, and no future for Nova Scotia in the paper industry. Name: Email: @gmail.com Address:

Privacy-Statement: agree x: 46 y: 22

Northern Pulp Nova Scotia
Replacement Effluent Treatment Facility

N.S. ENVIRONMENT
ENVIRONMENT ASSESSMENT BRANCH
MAR 09 2019
RECEIVED

I am a Commercial Fisherman out of Caribou Wharf
I have fished out of Caribou for 32 years
I am presently fishing lobster, herring, and rock crab

I am asking the Nova Scotia Environment Minister to reject NPNS Replacement Effluent Treatment Facility, or in the very least, do a full environment assessment report on NPNS Replacement Effluent Treatment Facility for all the following reasons mentioned below.

Northern Pulp is asking the fisherman to believe in the science. I could not agree more.

Page 489 9.1
Human Health Evaluation

NPNS states, "At this time, effluent chemistry characteristic (including the specific substances present in treated effluent and their anticipated concentration) will not be known with certainty until the project is operational."

I believe that their Replacement Effluent Treatment Facility will harm the ecosystem of the Northumberland Strait.
-Which will be harm full to the fishing industry.
- Will affect the Tourist industry.
-This Environmental Assessment Registration Document is incomplete and shows misleading information.

How it will affect the fishery

NPNS is anticipating the effluent to meet compliance with federal PPER into Northumberland Strait. Page 120 E.

I bring your attention to Table 5.6-1 of page 120.
Total Suspended Solids, unit mg/L, value 48.

THIS IS THE MOST IMPORTMENT NUMBER OF THE ENTIRE DOCUMENT

And a quote from Stantec .
"Pg 345: From Stantec Preliminary RWS, May19 2017: "...Density of the effluent for modeling purposes was assumed to be 996.32 kg/m3. This density was estimated based on an assumed average effluent temperature of 37C and total dissolved solids (TDS) of 4 g/L (KSH, per comm 2017).

NPNS told us at the public meeting in Dec 2017 that this new system would release 5 to 20 % of the solid matter (TSS) into the Northumberland Strait, which would be estimated at 2000 pounds per day. As well, this toxic solid (TSS) would just go away.

The Fisherman Association has had conversation with leaders in this field and feel that 20 to 40 % is more of an obtainable number.

I did the math based on peak flow rate 85,000,000 L per day. I have 4080 kg per day or 8994.86 pounds per day. If my math is right, THAT'S A LOT OF TOXIC SOLIDS. See attachment.

Boat Harbour is approximately 360 acres. It takes between 30 and 45 days for the effluent to go through the number of stages before it reaches the Northumberland Strait. Where it enters the Strait, it is a very small waterway, with very little tide. (I would guess it is 200 feet across).

I believe that Boat Harbour is doing it job and that there is very little to no toxic solids (TSS) entering the Strait. NPNS new RETF is better than what is going into Boat Harbour, but it is NOT BETTER than what is coming out of Boat Harbour.

I believe the cost to clean up Boat Harbour is mainly because the toxic solids (TSS) that is left behind.

The Boat Harbour clean up is now estimated to be 217 million dollars to clean up the contaminated sediment at the bottom of the Boat Harbour lagoon.

NPNS explains on " Page 67 and 68 Table 4.2-4 " why is cannot go into Pictou Harbour and the Middle River.

NPNS is saying that Pictou Harbour will become another Boat Harbour because it has limited mixing.

NPNS says it will have the same affect on the Middle River, as well potentially effect the maintenance of the equipment at the Middle River Pumping Station and inside the mill. (Similar style impacts as described in regarding the use of a closed loop system above).

I am guessing that Pictou Harbour is 20 times bigger than Boat Harbour.

In these two statements, NPNS is stating that it will create another Boat Harbour effect on Pictou Harbour, and after it goes through a water treatment plant at the Middle River Pumping Station, it is still going to cause damage to their system. Accumulation of chlorides and potassium are especially corrosive for the mill's boilers and often to lead to scale build-up.

How is this a better plan?
How is this not going to have a negative affect in the Northumberland Strait?

Under a freedom of information act, our lawyer has found some very damaging information.
-NPNS technical manger said in an email in November 2017 that the effluent going into the Strait would be worse in the new outfall location than what is coming out of Boat Harbour now. Boat Harbour has a polishing affect now that the new one is missing.
-NPNS does not know what is in the effluent when it comes out of the new outfall location area.
- It was recommend to NPNS that a lobster larvae study be done.
Appendix 14 page 3
Lobster Larvae Study
NPNS/Dillon unable to respond to concern at this time; will investigate further.

Where the outfall is entering the Strait, is in a narrow channel. I believe that is 80 feet deep. You only have to go 100 yards north and you are in 40 feet of water, prime lobster bottom. You go 100 yards south; you are in 40 feet of water, where the Caribou Harbour channel begins.
Appendix E1 Page 18 Figure 3.1
They say the tide is going NW 54% of time and SE 31% of time. What is it doing the other 14% of time. Are we supposed to draw our own conclusion?

This is going to create a dead zone due to the following reasons.
-The increase in water temperature (25 c winter and 37c summer). Now high for the summer might be 20c, an adult human would find 37c to be uncomfortable. How is anything at a young critical stage going to survive?
-The amount of effluent and toxic solids (TSS)
-What is in the effluent, which is unknown?

I believe that the toxic matter (TSS) is going to have an affect on the existing fisheries.
My understanding is that effluent for pulp mills slow down the growth and reproduction system in a female lobster. But they say that they are still good to eat? Where is this toxic solid (TSS) going to settle? West as far as Toney River? East as far as Lismore? North as far as PEI?

Human Health Evaluation Page 540 shows a huge affected area.

I believe the out fall site (dead zone) will affect the future fisheries. Lobster larvae going through site will not survive.

How can we have sustainable fisheries?

Fisheries and Agriculture confirmed that 70 per cent of pulp and paper mills which meet (Pulp and Paper Effluent Regulation) cause harm to fish and fish habitat, and that Northern Pulp is one of the mills which are presently causing harm to fish habitat.

A study that was published in 2005 showed that outside Pictou Harbour, 30 % of mussels at a site 500 metres from Boat Harbour outfall had leukemia. At a site one kilometer from the same outfall, 23 % had leukemia.

In 2018, there was a shellfish closure where Boat Harbour enters the Strait. It ran 6 km east to Black Point. See attachment from Department of Fisheries.

How it will affect the Tourist Industry

I live across the road from the Munroes Island and Provincial Park entrance since 1985. Prior to that since 1969, I lived on Old Orchard Lane 200 meters from the waters edge, which is located between the Provincial Park and the Pictou Lodge. One individual that has a year round home and rents 30 yearly sites to seasonal trailers mostly owns this property. There is also four private owned cottages and one more year round house, all within 100 meters from the shoreline.

In the early 70s at that time the Pictou Lodge was closed, its front row of cabins was falling down its banks from erosion. This bank is roughly 75 feet high.

The fishing boats from Maritime Packers (which does not exist anymore) and the Caribou Ferry Wharf could take the Little Entrance, a channel that separated Munroe's Island from the Provincial Park beach, to the open water of the Strait. That has filled in 1979 due to a massive storm.

The province of Nova Scotia designated Munroes Island as a sanctuary around 2000, protecting birds, fish, and wild life. For more information, look under Caribou-Munroes Island Hiking Trails.

I have walked these beaches since 1969. In my 50 years, I have seen the affects that Mother Nature has on the area. The beach is one of best beaches in Pictou County, if not Nova Scotia. There is sand from Munroes Island to the point off Pictou Lodge. You can get strong winds from the north and the beach is covered in eelgrass and seaweed. This happens every fall.

The Provincial Park offers 95 campsites. It is often sold out in the summer months, and the beach is very well used by local people and out of town visitors. The Province of Nova Scotia has continually put money into the park doing upgrades. I see and hear the trucks in the offseason.

I think the Pictou Lodge speaks for its self as one of the nicest resorts in the Province of Nova Scotia.

When the park is closed in the offseason, every day I see cars parked at the entrance, a lot more on weekends, using the park and beach for walking, snow shoeing and skiing.

The outfall area is .9 km from Munroe's Island and roughly three km away from the Pictou Lodge. This effluent and toxic solids (TSS) is going to settle somewhere. With the tides and winds, how can the effluent and toxic solids not wind up in the eelgrass and seaweed, eventually landing on the beach from Munroe's Island to the Pictou Lodge? It will only be a matter of time before this area would not be safe for swimming and affecting the life of animals that exist on Munroe's Island.

Prior to Boat Harbour being build, the Pictou Harbour Light House beach was a fantastic place for swimming. It is very close to where Boat Harbour enters the Strait. Now it is not safe for swimming because of the effluent from Boat Harbour.

Environmental Assessment Registration Document is incomplete and shows misleading information

-NPNS is referring a lot of its information based on it original site off Pictou Harbour.
-NPNS was told by fisherman in their public meeting in Dec of 2017 that the site would not passed because it the water was too shallow and the ice would cause damage. It cost NPNS six million dollars to find out this same information. We were right.
-If survey work was done on NPNS second choice, what makes you think it would pass when their first choice failed?
-NPNS has no public meeting on their new site. NPNS says they don't have enough time.
- NPNS has not done any surveying, videotaping, test holes and core samples off this new site.
-I do not see in these documents (E1) 17 beta-estradiol (E2) estriol (E3) 17 alpha-ethinylestradiol receiving water studies.
-If the tide rises 54 % of the time at the outfall, where is Caribou Harbour getting it water? *When the tide raises it go into harbours.*
-NPNS has no information on the long-term affect of Caribou Harbour.
-NPNS has provided insignificant data through out these documents.
-NPNS has not done a lobster larvae study.
-There are new pulp mill regulations that come out in 2020. How does NPNS know they can meet them if we don't know what they are?
-NPNS environment impact may not be known until the future.

Section 8.12.2.5 pages 368 and 369
Showing maps of rock crab and Lobster.

I started fishing rock in 1990.
Personally, I am fishing rock in the channel where the diffuser is to be located. Going east as far as 5 miles east of Pictou Island, on the south side of Pictou Island fishing as close as you can get where the sand is, to three mile off Big Island. Meeting boats from Pictou Landing First Nation and Lismore, as well as other boat from Caribou.
See map attachment. I colored in red where I fish, and in green where I know other NS fisherman are fishing. I know boats from PEI fish out of Wood Island are fishing somewhere; I have to think that they are fishing where NS boats are not. I made a blue circle where I think they fish. Wherever there is soft bottom, someone is fishing rock crab.

I started fishing Lobsters in 1987.

When you buy a lobster license in this area of NS, you have to fish where the seller had fished in the past.

I am fishing lobster at the edge of the channel where the new out fall is proposed. Staying east of the ferry run, going north halfway to PEI where I meet up with the PEI boats. I know for a fact, in June, that boats from Caribou Harbour, Pictou Landing First Nation, Sinclair's Wharf and Lismore are fishing the soft bottom between NS shoreline to Pictou Island and heading east as far as they are allowed.

A boat from Lismore was charged this last spring for fishing over the line. IT'S TEN MILES OUT. Lobster fishing in our area is very good right now. Lobster catches are by far the highest in my 32 years of fishing. They are everywhere.

See map attachment. I colored in red where I am fishing. Colored in green is where I know other NS lobster boats are fishing. Also, circled in blue, is where I think PEI boats are fishing.

Page 495 and 496 9.2.1
Human Health Evaluation

" The specific pathways, and routes that were identified as being relevant for the project are as follows " It goes on to mention that PLFN has approximately 100 people in the commercial fishing industry.

Why is Caribou Harbour not listed? Caribou Harbour has around 70 commercial fishing boats listed as their homeport. Most boats have three people on them (210 people). There is also a few boats at Pictou Island Wharf and a few more at Sinclair's Wharf. During lobster season alone, there are three lobster buyers. One of them is North Nova Seafood's, which operates a fish plant in Caribou Harbour. In 2019, North Nova Seafood sent out around 500 T4 slips. Caribou Ferry Wharf is the central location of the commercial herring fishery. I believe in 2018, there were four herring buyers with boats from Pugwash and Cape Breton and everywhere in-between.

NPNS is so inaccurate in these maps and statements. I not sure if they are completely trying to mislead the public on how little fishing is in this area, or is NPNS using out dated information. In the meeting NPNS had with the fisherman in Dec 2017, they were not aware of any fishing done at the original site. The fisherman told them at that meeting their information is incorrect. NPNS was told at a stakeholder's meeting that their maps were incorrect. A phone call to the Department Of Fisheries in Pictou would verify how much fishing is done in this area.

If NPNS is so inaccurate and misleading on something so simple to find out the proper information, what does it say about finding out real science on the affect that the effluent and toxic solids (TSS) in going to have in the Northumberland Strait?

How can we trust NPNS science that is stated in this document, if they do not know what is in the effluent when it come out of the pipe?

At the Dec 2017 public meeting NPNS had with the fisherman, a fishermen's group representative from New Brunswick stated that Stantec did the work when the Confederation Bridge was built. The Stantec study showed building the bridge would not affect the lobster fisheries. The representative stated that they saw negative affect on the fisheries right away and took years for the fisheries to rebound.

Appendix E3 Page 4
Stantec, Sign-off sheet
-Reflects Stantec's professional judgment.
-Do not take into account any subsequent changes.
-Did not verify information supplied by others.
-Not responsible for cost or damages of any kind.

Appendix C Page 19
KSH Disclaimer
-Should not be viewed as definitive.
- Does not guarantee such accuracy of such estimates.
-Bear no responsibility.

NPNS used this words a lot –Best industry practice
-Minimize potential impact
-Anticipate
-Not recommended
- Not significant adverse

I have one phase for the Minister, PERCAUTIONARY PRINCIPAL.

It comes down to the Province of Nova Scotia taking all the liability responsibility when this Effluent Replacement Treatment Facility fails.

Page 441 8.14.4.2
Commercial Fisheries and Aquaculture Compensation

First paragraph states, "The potential of the project to impact commercial fisheries and aquaculture could occur from effects on marine population, damage to vessels or gear, or interruption to loss to access to ground."
During the NPNS public meeting with the fisherman in Dec 2017, it was directly asked if there was going to be a bumper zone put around the out fall, and how big of an area would be closed for shellfish? We are still waiting for the answer.

Since I fish where this outfall is located, my income is going to be directly affected, and I will be one of the first fishermen in line to sue.

I am asking the Environment Minister of Nova Scotia to reject NPNS Replacement Treatment Effluent Facility, or the very least, order a full environment assessment report on NPNS Replacement Treatment Effluent Replacement Facility.

March, 04, 2019

$48 \frac{mg}{L}$ $85{,}000 m^3$ per day

$1 m^3 = 1000 L$

$85{,}000 \cancel{m^3} \times \frac{1000 L}{1 \cancel{m^3}} = 85{,}000{,}000 L$ per day

$48 \frac{mg}{\cancel{L}} \times 85{,}000{,}000 \frac{\cancel{L}}{day} = 4{,}080{,}000{,}000 \frac{mg}{day}$

$1 mg = 1 \times 10^{-6} kg$

$4{,}080{,}000{,}000 \frac{\cancel{mg}}{day} \times \frac{1 \times 10^{-6} kg}{1 \cancel{mg}} = 4080 kg/day$

$1 kg = 2.20462$ pounds

$4080 \frac{\cancel{kg}}{day} \times 2.20462 \frac{pounds}{\cancel{kg}} = 8994.86$ pounds/day

$4080 \frac{kg}{day}$ or $8994.86 \frac{pounds}{day}$

Home

Check the map and Prohibition Orders before harvesting!

For fishing seasons, size and quota limits refer to the Regulations and Variation Orders under the Fisheries Act. Contact your local DFO office for details.

Anyone harvesting bivalve shellfish, i.e. shellfish with two shells, including all clam species, oysters, cockles, mussels and scallops, is responsible for ensuring that an area is designated as safe for harvesting. Eating contaminated shellfish can cause serious illness or be fatal.

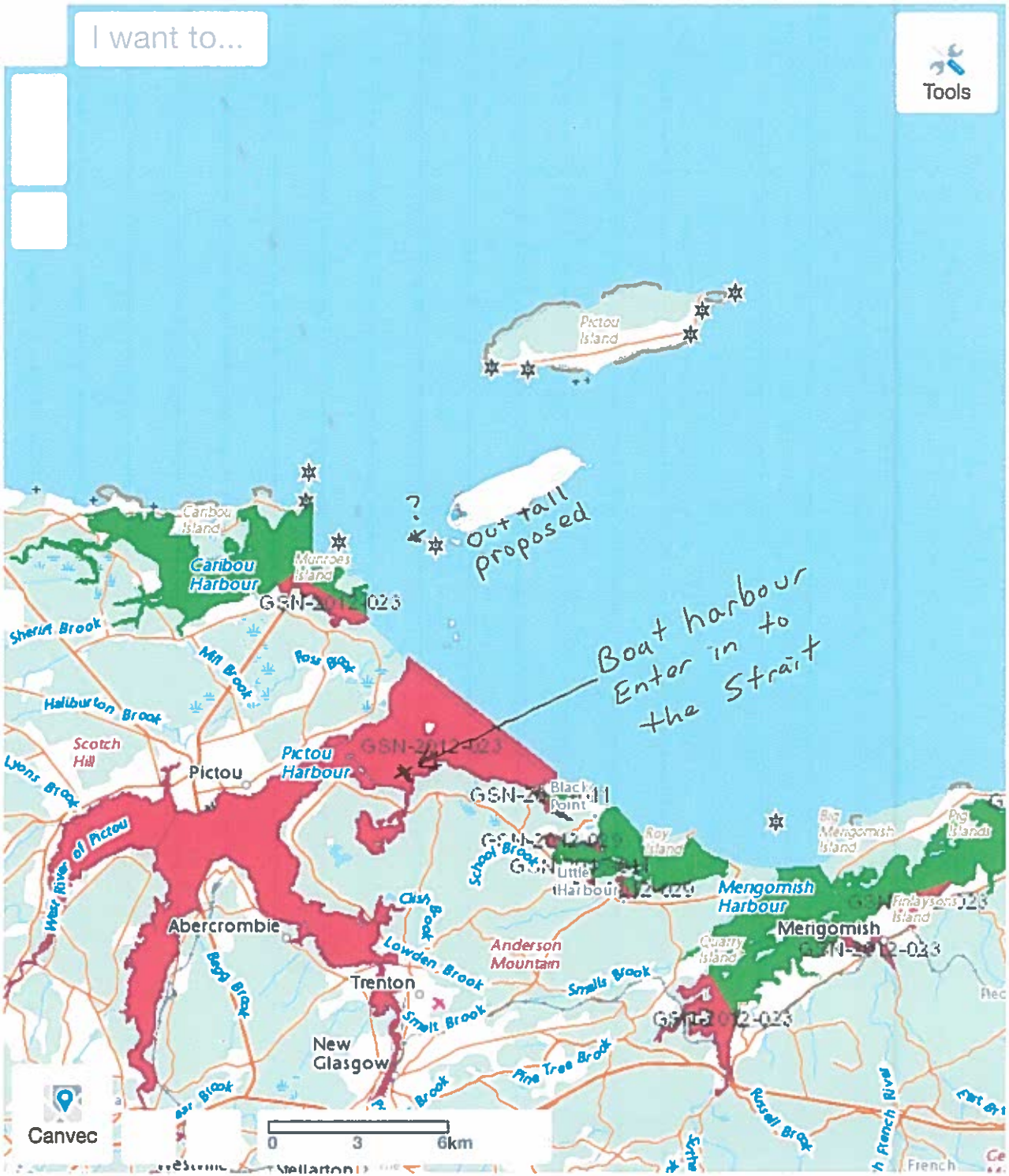
Shellfish should not be harvested in unmonitored areas or within 125 metres (410 feet) of a wharf, a marina, an aquaculture operation or a floating house. Unless clearly stated otherwise, all closures extend to the coastline.

Legend

- **Green** areas are **approved** for harvesting of all species of bivalve molluscs
- **Red** areas are **prohibited** for all species of bivalve molluscs
- **Red hatching** are areas where harvesting of only some species of bivalve molluscs is **prohibited**
- **Yellow** areas are under **variation orders** issued for conservation, safety or contamination

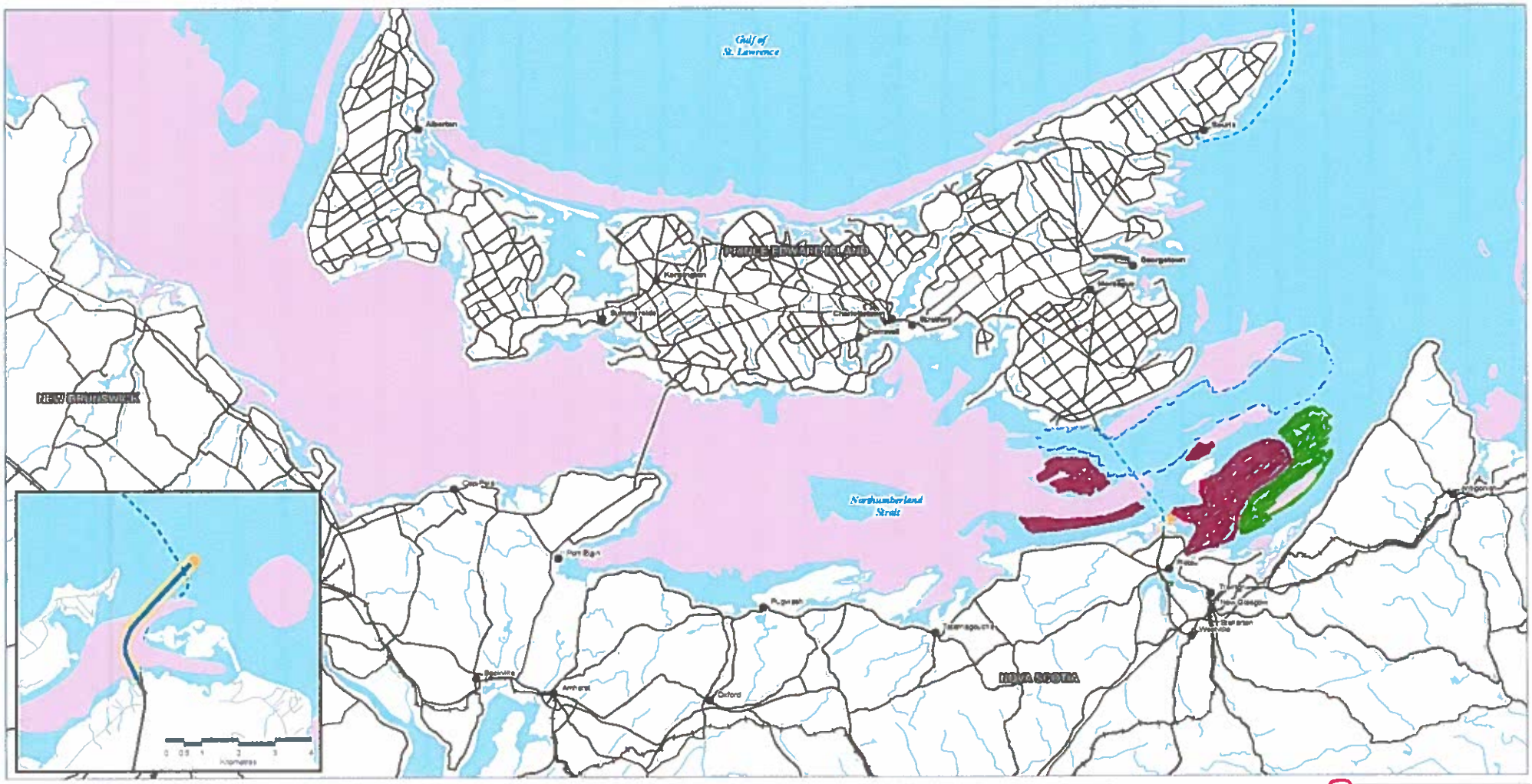
Zoom in and click on an area for more information

Shellfish harvesting and safety



Home

8.12.2.5



Northern Pulp Nova Scotia Corporation
Replacement Effluent Treatment Facility
Environmental Assessment

Rock Crab Fishing in the Northumberland Strait
Figure 8.12-3

NORTHERN PULP NOVA SCOTIA CORPORATION

Outfall Diffuser Location
Rock Crab Fishing Resource [1]
Marine Local Assessment Area
Marine Project Footprint Area*
Terrestrial Project Footprint Area*

Red where I have Fished
Green, I Know other Fishing are

Blue circle where PEI Boats are fishing

DILLON CONSULTING

MAP CREATED BY: HH
MAP CHECKED BY: BB
MAP PROJECTION: NAD 1983 UTM Zone 20N

0 2.5 5 10 15 20
Kilometres

Source: JWEL (2011)
PROJECT 17-0431

Red - where I Fish Lobster
Green - I Know that other Lobster Fisherman or Fishing

Blue circle where I think PEI Boats are fisling

1)

March 6, 2019

Dear Ms. Miller,

My name is , and I live in Pictou, Nova Scotia with my husband. We have raised our daughter in Pictou and she is now a university student. I am a graduate of The University of Toronto. I am not a scientist, but have many years of lived experience with issues of environment, nature and health. As a young girl, I kept tropical fish, and I learned much about the fragility of marine life through my experiences.

I am writing to you with my concerns regarding The Replacement Effluent Treatment Facility Project, submitted by Northern Pulp.

I have many grave concerns about the possibility that NP would be allowed to go ahead with this project.

My first concern, which is a general one, is that the size of this document alone would warrant much more scrutiny than a Class 1 assessment would give it. The contents of this document are extremely complex and would affect the environment around Pictou , the environment in Caribou, and the waters of the Northumberland Strait, which assuredly impacts all of Atlantic Canada's provinces. It is too long to read through and say that it is a simple project in any way.

My second concern: Under Key Federal Regulations on page 20, (Section 3.2) NP claims that no Federal EA triggers have been determined. I dispute the classification that this treatment facility is an extension of the old one. It is completely new in it's many plans. The building of a pipe, running it to the Northumberland Strait, is not at all an extension of Boat Harbour. (However, I suppose it is the same in the fact that they plan to throw their trash into another body of water, rather than build a container to hold it.) I look at Boat Harbour and it's destruction and know that destruction will only increase if a direct pipe goes into the Northumberland Strait. If it is indeed the "same" plan, then an EA Assessment would seem vital to maintain the health of the ocean they intend to use to receive their garbage/effluent.

My Third concern: On page 50, (section 5.3.1.1) NP claims that all construction will take place on their right of way boundaries. However,the proposed pipe would run alongside the Watershed for the town of Pictou. If only the effluent running through the pipe understands those boundaries too! Given the record of NP's pipe failures and spillage, and given the fact that monitoring is minimally carried out at best, disaster would be imminent for the drinking water for the town of Pictou. There is nothing more necessary

for human life than clean water. Nothing. Pipes break. And pipes buried under the ground don't reveal the spillage until the damage has already occurred.

in addition to this, NP's massive use of fresh water is an obscene waste. They have been draining the water tables in Pictou county for decades, rather than build a closed loop system. It is 2019. We have knowledge that our lifegiving resources are being depleted.

My Fourth Concern: On page 45, (Section 5.2.2.8 paragraph 4) they state that the sludge from the effluent will be burned in their existing power boiler. My God! The sludge will go into the air and everyone will breath it! And the power boiler is a malfunctioning piece of aged machinery. They state that this sludge "partially displaces the use of fossil fuel." They won't use a closed loop to save on water consumption, but make a feeble attempt in this statement to make it seem like they are conservation minded by reducing their use of fossil fuel. And all the while, depending on an aged and malfunctioning power boiler that never meets the low standards that government has outlined for it! This sludge will contain many toxins. I site the visual containment at Boat Harbour. Boat Harbour is now so polluted that careful cleanup costing millions (or billions) is necessary. There was a reason for containment, and putting that garbage into the air distributes it very quickly into people's bodies. Wow.

My Fifth Concern: In this NP document there are many pages of the description of the work to be done to lay the pipe. It is vast and complicated, and also speaks of this project not being an extension of the present containment at Boat Harbour. (And thus ineligible for a quick assessment.) Some of these descriptions sound like clearcutting around our Pictou town area. On page 52,(Section 5.3.1.4) they describe "grubbing" which is removing stumps, vegetation and top soil. They write of conserving topsoil. Thousands of acres of clearcutting all across the province and they have never once "conserved topsoil." On page 51 (Section 5.3.1.3 Paragraph 4) they refer to paying attention to bird migrations and nesting. Having seen and read of their clearcutting in Nova Scotia, I know they don't pay any attention to these issues. I can only conclude from these statements that they are lying.

My Sixth concern: on Page 79 (Section 5.3.2.4) they state that this pipeline will last for 50 to 100 years. Imagine the state of the Northumberland Strait after all that time. I've seen Boat Harbour. There is not enough"dilution" in any body of fresh natural water to dilute the massive amount of heated foreign substance that will accumulate.
Add to that the state of our forests. They are disappearing at an alarming rate. In 50 to 100 years what trees will we have? This is all unacceptable, unsustainable. Do you have children and grandchildren? Don't you care that after we are gone we will leave our children and grandchildren a blighted poisoned world? Because allowing this is happen will create a diminished world. An ugly unliveable world.

Then they go onto say on the same page the amount of heated effluent to be discharged into the Strait on a daily basis. The numbers are astounding, mind boggling. 62,000 m3 to 85000 m3 per day! 1m3 equals 1000 litres! There is an insanity to this. Million and millions of litres created with our fresh water from our water

3)

tables and thrown,heated, into the fragile and temperature sensitive saline environment of our Strait, from which we get our food. So, food and water destroyed wantonly in this process. Unimaginable, but if allowed, horrifying. Destruction of the environment on a massive scale.

Top of page 84: (Section 5.6.1 E) "The effluent is expected to meet requirements…. " But even if you put heated fresh water with NO effluent in it into the Strait in those quantities, we would have a vast warming of that ocean. We now have enough evidence now that the temperature of oceans are rising, and changing life/climate on this planet for the worse. If this effluent actually meets any requirements, then the requirements must be changed.

And I finish my letter to you with this: On page 88, (Section 5.7.1) NP states they are "committed to developing this project in an environmentally sustainable manner.." I have never seen them operate in an environmentally sustainable manner. I live in the town of Pictou and have experienced daily what you, the government, have let them get away with. If they were intending to operate environmentally they would build a new plant, with new stacks and power boiler, a closed loop system and container for their effluent. Boat Harbour would have ceased to be an issue and they would have cleaned it up themselves instead of letting the taxpayers of Nova Scotia pay for that.

This document is set up to read well, but it contains horrors. I ask you, I implore you to send this proposal off to the CEAA. Or stop this nonsense right here and now and shutter this wretched company. Jobs to replace the mill can be found, with determination and imagination. But life, water, food, and natural resources can never be reclaimed if this plan is allowed to go forward. Never.

Sincerely,

@gmail.com

Nova Scotia Salmon Association
202 Cloverville Rd.
Antigonish, Nova Scotia, B2G 2M8

Atlantic Salmon Federation
Fédération du Saumon Atlantique
P.O. Box 396, Chester, Nova Scotia, B0J 1J0

March 5, 2019

Replacement Effluent Treatment Facility Project
Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8

To Whom It May Concern:

We are writing on behalf of the Nova Scotia Salmon Association (NSSA) and the Atlantic Salmon Federation (ASF) concerning the environmental assessment (EA) of the proposed replacement effluent treatment facility being advanced by Northern Pulp Nova Scotia Corporation. The NSSA and ASF have a good working relationship with the proponent, as Northern Pulp Nova Scotia Corporation has been supportive of our salmon recovery work through numerous in-kind contributions, and we actively consulted with the company in the lead up to their EA filing. However, upon reviewing the environmental assessment registration document, we have concerns and reservations about the proposed project and its potential effects on wild Atlantic salmon and the ecosystem that supports them in this important region.

Nova Scotia's Northumberland Strait coastline is home to 15 salmon bearing rivers between Amherst and Antigonish. Part of the Southern Gulf of St. Lawrence population complex, Atlantic salmon in this area have been assessed as a *species of special concern* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This designation was assigned due to long-term trends of population decline and a multitude of current threats. COSEWIC members also considered the fact that nearby Atlantic salmon populations have been listed as endangered under Canada's *Species at Risk Act*, or have been recommended for an endangered listing.

The designation of Atlantic salmon in this area as a species of special concern is important to the environmental assessment process because salmon are an ecological keystone species that provide insight and perspective to the status of other foundational fish like gaspereau and smelt. The health of salmon populations is a general indicator of overall ecosystem health. We therefore feel it is especially important that the principles and values espoused by the N.S. Environment Act be rigorously applied to this and other developments in the area.

During consultations with Northern Pulp prior to the EA filing, we identified several areas with respect to wild Atlantic Salmon where their research was data-deficient. We offered to assist in gathering the information required. The most concerning deficiency was a lack of information with respect to how the proposed outfall impact zone will overlap with salmon migration routes and salmonid congregation points spatially and temporally at critical life stages. This data gap was not addressed, but is noted by the proponent in their EA filing (Section 8.6.2.4 page 217). Although the effluent coming out of the outlets will meet specifications of federal *Pulp and Paper Effluent Regulations*, those regulations mandate that the effluent be further diluted within a prescribed distance from the outlet. These dilutions are necessary to ensure the receiving water meets acceptable parameters for biological oxygen demand, chemical oxygen demand, temperature, salinity, etc. in order to ensure aquatic life will not be harmed and ecosystems not disrupted.

Given the need for dilution, even compliant designs will create an impact zone where negative effects will occur. To fully understand the risks posed by this impact zone it is crucial to understand how the impact zone will overlap spatially and temporally with sensitive species, such as Atlantic Salmon in this area. Without this baseline data it is not possible to predict impacts or monitor and validate actual impacts once the facility is in operation. This severe limitation has been raised with the Provincial Fisheries Minister's staff and the proponent.

There was also a deficiency with respect to the impact zone modelling done by the proponent. Although we recognize modelling necessitates some educated guesswork, the assumptions used in the EA registration document, such as ambient temperatures and time of year, were not in line with when wild Atlantic salmon would likely be present in the impact zone, i.e. during the spring and fall congregation and migration periods. It is clear from the filing documents that there is some misunderstanding by the proponent of the biology and behavior of the species involved. For example, they cite papers noting that Atlantic salmon swim in the upper portion of the water column and suggest there will be a minimal impact because the outlet pipes are on the seafloor. This assumption is incorrect because while migrating Atlantic salmon are indeed pelagic (associated with the water column) as opposed to benthic (associated with the sea floor) the shallowness of the depths involved with the outfall and the impact zone will be well within the zone that would be occupied by salmon, and many other important fish species, migrating and congregating in that geographic area.

We were disappointed upon seeing Northern Pulp's EA filing that deficiencies identified ahead of time were not addressed and there does not appear to be a plan to do so. This is a major oversight that needs to be corrected before any consideration of releasing the project from the assessment process. Given the potential for negative impacts, the threats currently faced by salmon, and what they represent within the ecosystem, we cannot afford to have this or any other operation cause unintended negative consequences. It is therefore essential to the ongoing environmental assessment process that proper baseline data is collected over the appropriate spatial and temporal scale. It is only with proper baseline data that the extent of potential impacts can be assessed, that effective monitoring can occur, and that mitigation and adaptive management plans can be developed and implemented as necessary.

From our research and consultations, we have also identified several other areas of concern that are not adequately addressed in the proponent's EA documents. For example, compared to Boat Harbour, the new treatment facility will reduce the capacity to hold <u>untreated</u> effluent in the event of an emergency from 30 days down to a proponent-estimated 8-12 hours. Although it is known to occur, there is no publicly available information on how often an untreated effluent is required to be held each year and the duration of those periods. Given the size, age, and complexity of the mill, a capacity of only 8-12 hours seems insufficient for operators to identify and rectify problems, or to idle the plant while the problem is being fixed. The filing is also vague on how the proponent is planning to provide real-time monitoring of the effluent and how the company will deal with other emergency issues associated with effluent treatment and containment. Given the current regulations surrounding monitoring of effluent (monthly acute lethality testing) coupled with this uncertainty in monitoring and holding capacity this would mean that untreated effluent could potentially be discharged for a significant period of time before it would be detected and stopped by the proponent or detected by legally mandated monitoring. This is a serious concern. Therefore the holding capacity issue and emergency action plans involving effluent treatment and mill idling need to be addressed within the filing documents in order to properly assess the potential

impacts of this project and develop appropriate monitoring and reporting conditions for the facility's operation.

Another area of concern is with the transition in effluent systems from the current Aerated Stabilization Basin treatment (ASB) system to the proposed biological Activated Sludge Treatment (AST) system. While these newer systems have shown they can provide higher BOD reduction efficiency, they are more susceptible to settling issues and disruption to the biological community that is central to this effluent treatment process. So called biological upset can occur regularly if not carefully managed by experienced operators. Therefore, this new system will require more highly trained operators and more testing to maintain effluent below legally required levels. The EA filing does not address these challenges associated with the changeover in process. The filing documents do not identify what testing will occur to ensure that the new system will be working efficiently and within desired parameters prior to the switch over from the ASB system nor the mechanisms that will be put in place to ensure proficiency of their operators and the operational procedures for the new facility. There is also a lack of information concerning procedures for detecting and mitigating known issues such as biological shock, bulking, or for other failures within the treatment facility or within the mill. Failures in any one of these areas could lead to untreated effluent being pumped into Northumberland Strait, relying only on voluntary transparency by the proponent and the federally mandated monthly testing to detect the issue. This is a significant failure in the EA. More information is required before an informed decision can be reached on this project.

The outfall diffuser location is also an area of concern. The proposed location of the outfall diffusers is just beyond the inlet to Caribou Harbour. This area is known to have issues with sedimentation, infilling, and ice scour. It is not clear from the EA filing if this has been considered and how infilling may affect the performance of the diffusers. It is conceivable that it could result in blockages that would disrupt the diffusion patterns that are needed to ensure proper mixing to get the effluent within the legally required tolerance levels at the prescribed distances from the outflow pipe. As there is no information on the spatial and temporal distribution of fish migration routes or congregation points it is difficult to predict how changes to diffusion patterns could affect salmonids and other species. Additionally, the concealed nature of the diffusers means that issues with the effluent or with the diffusion pattern may not be detected in a timely manner.

On behalf of NSSA, ASF, our affiliates, associated members, and volunteers we urge the NS Environmental Assessment Branch to require that this project be subject to the most rigorous standards to ensure that this highly sensitive and ecologically important area is protected. The provincial Level 1 EA submitted by the proponent is insufficient for achieving this standard. Due to the potential to release deleterious substances and threaten species at risk and the potential to have multijurisdictional impacts, this review should be conducted via the federal environmental assessment process. Regardless of that decision, we will continue working to ensure that the best interests of the ecosystem and salmonids are represented and protected.

Sincerely,

President
Nova Scotia Salmon Association

Director of NS and PEI Regional Programs
Atlantic Salmon Federation

The Northern Pulp and Paper Mill has been poisoning the environment surrounding Abercrombie Point from the day it started production.
The pollutants released into the atmosphere have been dispersed over Eastern Canada and beyond.
It has interacted with similar- blowing across North America and within the atmospheric chemistry creating products that are detrimental to the ecosystem of all air breathing lifeforms and subsequently ending up in the water systems for the future to absorb.
A large part of what is produced in this mill is now sitting in landfills all over the continent.
The destruction,disruption of the ecosystems and diversity of natural wildlife in the woodlands that are being mowed down to feed this operation and the loss of its maximum global warming carbon dioxide absorbing /recycling capability is short sighted.
The fossil fuels burnt in the power generation plant to provide the electricity to run this operation create more pollution and carbon dioxide emisions as well as increased electromagnetic field emissions ...as do the logging trucks and logging operations and not to downplay the dangers imposed by their presence on the rural highways.
From the beginning residents living around this plant for miles have suffered from the stink and health effects of breathing this mix of slow poisons.
Those near the Boat Harbour dump have been unknowingly infected much more.
A common rule of law states that a person has reasonable right of enjoyment of their property.
This plant is in violation of that right.
The concept of pumping this scientifically treated effluent into the Northumberland Straight-out of sight and out of mind of the locals is doomsday for the marine ecosystems there and beyond.
The ocean is still relatively natural and useable as a food source in comparison to our land based sources which are increasingly being chemically and genetically enhanced and disturbingly modified by human ingenuity.
The ocean has provided long term and until recently -sustainable- income to many.
How does the pollution created by the same number of jobs in the fishing industry compare to that of this plant?
...and which occupation has more value to the community other than money?
The concept of tax dollars being used/donated to create some jobs for a few decades??? with no concerns for the long term effects on the environment and its ability to feed all of life's myriad of interdependent organisms is in violation of a governments legal-duty of care- and negligent.
The question arises -if it is now pure enough for the Straight why are they going to the trubble to pump this thru a pipe out there?Why not just dump it into Pictou harbour.Why not put it in swimming pools /lagoons on the site and properties of those making money from this and require them to swim,bath,wash their cloths and water their gardens, for a period of time to show all how pure they believe this to be.Why couldn't it be shipped in tankers to the yards,neighbourhood of its owners?
...and what else might find its way out there under the cover of darkness?
...and how does this chemically mix with all the other chemicals,drugs,plastics,etc.now working their way downhill towards the ocean from our septic systems and landfills ?
It's reprecussions will become evident in time and beyond repair.

A small percentage of the community have benefitted financially from the plant and the health care and drug store businesses.are assured to prosper into the future.
The wealth of few have affected the health of all.
The original minds that put this there have all grabbed their spoils and slithered away with no accountability for their short sighted efforts.
This plant is old technology wise and has been paying for itself and may still be viable for a few years more?? but it's time is near.
It has left its legacy for the future to deal with.
The minds and backgrounds of previous governments have donated tax dollars to this business in support of the wealth and witl spend more in health care for the elderly because of the health effects from its pollution.
The expression -know when to fold 'em -has merit in this case
The loss of the jobs for those responsible for this can be viewed as the best thing that has

happened to the community since this plant began.They can be viewed as accomplices to a crime.

It would be but a minor blink to the local economy and would open up development opportunities for the town of Pictou that are now being repressed because of its annoying unpredictable stink.

Employment opportunities come and go thruout any community thruout any year.Some empoyees have job skills that will be of value.

Tax dollars can be invested in others to re-educate,retrain,relocate and temporarilly support their living needs.

The community can be called upon to help them in their time of duress.

The community as a whole is better off in the long term to not have all its eggs in one basket owned and controlled by some come from aways!

thank you

@ns.sympatico.ca

March 4, 2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS
B3J 2P8

Dear Sir/Madam

Re: Northern Pulp Proposed Replacement Effluent Treatment Facility Project

To introduce ourselves, we are retired, in our early 70's & reside on Caribou Island, directly facing Caribou Harbour. We love our view of the harbour, the water, beaches & air quality except when there is a southwest wind. That is when we get the putrid toxic plume from the pulp mill which was supposed to have been remediated years ago at great expense to the taxpayers of this Province. Nothing was ever done & probably never will be. Our lives & health have been directly impacted due to the mill's total disrespect & disregard for people in this community.

In all due respect, we vehemently reject the Project because of the likelihood that it will cause adverse effects & additional devastating environmental effects that cannot be mitigated.

At best, the proposed Project is a case study, based on just bits & pieces of unprovable data with the entire process lacking in credibility. There were never any public consultation meetings by Northern Pulp on the proposed project; in fact the only consultation made was on the wrong project; i.e.: Pictou Harbour.

The voluminous registration document is rife with unsubstantiated & very confusing data. As one example we refer you to the Table of Contents, Section 7.0, Sub-Sections 7.4 - Factors to be Considered & 7.41 - Scope of Factors to be Considered. By the consulting engineers own admission, their "Scope Sign-off Sheet" is at best based on unverified information supplied by others, hearsay, etc. for which they assume no responsibility. A Scope of Work should contain any milestones, reports, deliverables, time lines & note the biggest risks to the successful (Not Defensible) completion of this type project, just to name a few. In our view this alone defeats the Project!

Add to all this is the fact that Northern Pulp does not know just exactly what the effluent is comprised of. Yet they want to pump millions upon millions of this toxic sludge into our waters with no concerns for our health, the environment, tourism, wildlife, fish habitant and absolutely no appreciation for nature, just to name a few. Just exactly what would be the long term effects on Caribou Harbour? There is no long term data providing any insight and what data is provided is totally insufficient. Why should that be surprising considering the study is based on the Pictou Harbour route.

There are no provisions to protect our ecosystems & not even enough data to meet current regulations.

Very questionable & misleading information is contained in various parts of Appendix E3 - Preliminary Receiving Water Study. For example, please note Sec. 2.0 - Far Field Modelling, Sub. Section 2.1.2.5 - Currents. This information is old data and again based on Pictou Harbour, not Caribou Harbour. Also, please carefully note Sub. Section 4.2.2 - Ice Conditions, which states among other factors and it is emphasized that ice conditions in the Northumberland Strait are highly variable and the ice cover varies considerably from year to year.

The Caribou Harbour ecosystem is constantly evolving and will not survive the adverse effects should Northern Pulp's effluent be allowed to be dumped into the Strait! We do not feel any portion of the process has been fair to the community at large. We feel that Northern Pulp have failed the test and the undertaking should be rejected. At the very least, the Project should undergo a Class 2 EA.

Respectfully Submitted

UNITED ASSOCIATION
of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada

Founded 1889

Letters should be confined to one subject

Mark McManus
General President

Patrick H. Kellett
General Secretary-Treasurer

Michael A. Pleasant
Assistant General President

UA Local Union:

Subject:

244. P.O. Box 40. St. Andrews
Antigonish County, Nova Scotia, B0H-1X0
Phone 902-386-2551/Fax 902-386-2006
Email: ualocal244@ns.sympatico.ca

N.S. ENVIRONMENT
ENVIRONMENT ASSESSMENT BRANCH
MAR 09 2019
RECEIVED

March 9/2019

Environmental Assessment Branch
Nova Scotia Environment
P.O. Box 442
Halifax, NS, B3J 2P8
Fax: (902) 424-6925

Replacement Effluent Treatment Facility Project.

Attachments

- Term Employees Employed at Northern Pulp 2018
- No Plan B Possible Forestry Sector - Northern Pulp/Paper Excellence Canada

The following comments are submitted on behalf of the Membership of UA Local 244 Antigonish Plumbers, Pipefitters, Welders, Instrument Technicians and Apprentices.

Our comments include concerns of the entire Construction Industry Management and Labour.

My name is , Business Manager of UA Local 244.

I am a Red Seal Steamfitter - Pipefitter by Trade.

My first Industrial Job was the Pulp Mill currently owned by Northern Pulp.

Most of our comments will refer to negative socio economic issues.

Northern Pulp is a Company that puts 2.1 Billion Dollars Per Year into the Provincial Economy.

We have an experienced Construction Industry to build the new Effluent Plant.

We will leave technology and scientific comments to the Professionals in those areas.

The Construction Industry has not been included in any of the negatively affected Groups, that would lose jobs.

The attached "Term Employees" indicates Trades People who worked directly for Northern Pulp during 2018 when extra help was needed inside the Mill.

That totals 180 Employees and $1,409,715.52 for the year. This has continued over the 52 years that Mill has been there and in most years the numbers were much greater . This number does not include other Trades People and Employees of Contractors who were employed in the Mill. The new Effluent Plant would be an 18 Month Project.

A Brief History

Many of the Senior Nova Scotia Tradespeople worked at the Mill in 1965-66-67 during Construction.

Fishing was so bad up in River John, Tatamagouche, Wallace and Pugwash Areas that many fisherman from the Area joined the Construction Unions and only a very few left the Mill during Construction to go fishing .

The hourly rate for Pipefitters at the time as $3.80 per hour and that was more than a Lobster Fisherman could make at the time.

To this day a large number of Fisherman are Tradespeople in the Construction Industry when Fishing Seasons are closed.

For about the first 30 years or more the effluent was black going into Boat Harbour and black going out into Pictou Harbour from where it went out into the Strait. Not that it was a good thing but the Fishing Industry has been thriving during the past 52 years without negative effects from the Mill.

Recently a Fisherman Friend told me that the prevailing water flow in the Strait goes up and around Prince Edward Island. That would mean the effluent from the Mill would also be going the same direction and there has been record lobster catches up around the Prince Edward Island Causeway in recent years.

Plan B - There is none!

Any long term Nova Scotia Taxpayer would remember how successive Governments of all the Party's spent massive amounts of Taxpayer money on "Make Work Projects" that produced little or nothing. Probably in the billions.

Northern Pulp wants to Clean Up the mess they inherited when they bought the Mill in 2011. Whether it was previous Owners or previous Governments that wanted to run Boat Harbour. None of it should of happened the way it did.

That is all in the past and Northern Pulp is not responsible for it.

Everyone needs to face up to the fact that Rural Nova Scotia has not been doing well for many years. Northern Pulp is the Key Player in a highly integrated supply and demand system that the whole economic system benefits from.

Everyone loses when a major Industry shuts down.

Even those who would think of it as a win would soon realize:

- their taxes are going up,
- they can't sell their property for half of what it is worth,

- Hospitals will become First Aid Stations,
- Schools would close because the last of your Family Members will have to move away to find work.
- Poverty, Employment Insurance and Welfare will all dramatically increase.

I repeat THERE IS NO PLAN B and there never has been one.

There is a Plan A however. Leave good enough alone!

Grant Northern Pulp an extension on the use of Boat Harbour until the new Effluent Plant is up and running. The Nova Scotia Government should pay the Natives in Pictou Landing a negotiated amount for their inconvenience.

There is a Win Win Solution for every problem if enough effort is put forward.

I agree that the Residents of Pictou Landing and Surrounding Area have been negatively affected by the whole Boat Harbour fiasco for Fifty Two years. I also agree that it should be closed but to me it looks like successive Governments have signed up to be responsible for everything. The current Government has taken an aggressive approach with Northern Pulp by cancelling a legal agreement with Northern Pulp to operate Boat Harbour until 2030.

The cancelling of that Agreement in 2014 reduced the length of the Lease by 10 years and 11 months.

In 2015 the Government tried to force and unrealistic Industrial Approval on Northern Pulp. Northern Pulp appealed and it went to Supreme Court. On the first day of Court the Government backed off on the issues under appeal, however this would of cost the Company many hundreds of thousands of dollars in legal fees and preparations.

The Boat Harbour Act also became Law in 2015 along with the five year deadline.

Most if not all of this was done with no consultation with the Mill. Without getting into all the details Northern Pulp has had their hands tied by several Branches of Government before the arbitrary deadline was put in place and it still continues with the Government pointing the finger at Northern Pulp that you should be ready.

My take on the cancellation of the Boat Harbour Lease to Northern Pulp Ten Years and Eleven Months early could leave the Nova Scotia Government fully responsible for all expenses and lost profit incurred by Northern Pulp.

Not to mentions the complete demolition and cleanup if Northern Pulp is forced out of Business.

At one of the earlier Open House meetings Chief Andrea Paul spoke about the closure of Boat Harbour. Some of the Environmentalists in the room started pushing for the closure of Northern Pulp. Chief Andrea Paul got up and said we never asked for the Mill to be Shut Down we just want Boat Harbour cleaned up.

I have no idea how this has evolved to a point where two people, Premier Stephen McNeil and Chief Andrea Paul have the authority to Shut Down a huge portion of a very fragile economy.

The best solution for everyone would go something like this..

The only way to avoid Northern Pulp from being shut down is to grant an extension of the operation of Boat Harbour until the new effluent plant at Northern Pulp is up and running.

The Government of Nova Scotia signed off on a deal to close Boat Harbour and dictated a date of closure without consulting the Industries effected.

The Government has been in negotiations in regard to compensation for the closure of Boat Harbour so they are on the hook.

The Agreement on the closure date for Boat Harbour was made between the Government and Pictou Landing Chief Andrea Paul.

I know Pictou Landing is not a rich community and they do deserve to be compensated if the Government does not live up to the closing date of January 31/2020.

THE NOVA SCOTIA GOVERNMENT IS LIABLE

The question is, do they want to be liable for destroying several Industries with the Shut Down of Northern Pulp or pay Pictou Landing Residents what it is worth to extend the Boat Harbour closure date until the new effluent plant is complete.

Either way the Natives would see the closure of Boat Harbour.

The new effluent plant proposed by Northern Pulp will have a positive effect on the Environment as well as Employment and the socio economic situation in the Province.

In a CBC Interview with the Premier in Sydney over Christmas there was some suggestion that if Northern Pulp closed we would still have one Mill in the Province. That other Mill has already cut Producers to the bare bone as it is, just imagine if there was no competition. I expect the Forest Industry will speak for themselves on that issue.

It is time that common sense comes to the table. Northern Pulp wants to clean the Mill up to world class standards.

Sincerely,

Business Manager

UA Local 244

TERM EMPLOYEES EMPLOYED AT NORTHERN PULP NOVA SCOTIA IN 2018

LOCAL 83 CARPENTERS 3 MEMBERS	**Total Hrs Worked** 1,296.00	**Total Hrs Paid** 1,544.50	**Total All Earnings** 57,701.26
LOCAL 1178 MILLWIGHTS/MACHINISTS **60 MEMBERS**	**Total Hrs Worked** 13,275.25	**Total Hrs Paid** 15,338.25	**Total All Earnings** 552,660.09
LOCAL 409 SHEET METAL WORKERS **1 MEMBER**	**Total Hrs Worked** 187.50	**Total Hrs Paid** 231.25	**Total All Earnings** 8,505.82
LOCAL 244 **PIPEFITTERS/WELDERS/INSTRUMENTATION** **97 MEMBERS**	**Total Hrs Worked** 16,309.00	**Total Hrs Paid** 19,147.50	**Total All Earnings** 686,547.22
LOCAL 625 ELECTRICIANS **12 MEMBERS**	**Total Hrs Worked** 1,129.00	**Total Hrs Paid** 1,357.50	**Total All Earnings** 49,869.94
LOCAL 116 INSULATORS **1 MEMBER**	**Total Hrs Worked** 184.00	**Total Hrs Paid** 220.00	**Total All Earnings** 8,092.11
LOCAL 615 LABOURERS **6 MEMBERS**	**Total Hrs Worked** 1,860.00	**Total Hrs Paid** 1,976.00	**Total All Earnings** 46,339.08
TOTAL OVERALL **180 MEMBERS**	**34,240.75**	**39,815.00**	**1,409,715.52**

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

March 6, 2019

For Immediate Release

No Plan B Possible for Forestry Sector

(Abercrombie, NS) Last week, both Premier Stephen McNeil and Progressive Conservative leader Tim Houston had an opportunity to debate the future of the forestry sector. Lacking in the conversation was discussion regarding providing Northern Pulp with a short extension to complete its new wastewater treatment facility.

"It needs to be said: without Northern Pulp there can be no plan B that does not include massive job losses," states Jean Francois Guillot, Vice President Operations East with Paper Excellence Canada, owner of Northern Pulp. "The forestry sector's future was discussed in the legislature last week, but no one discussed a short extension for our wastewater treatment facility."

"Without a short extension, we will be forced by the government to cease operating and that will cost jobs throughout rural Nova Scotia."

Northern Pulp's new wastewater treatment facility will ensure no untreated wastewater ever leaves the site and will then continue our practice of releasing treated wastewater into the Northumberland Strait. "Once this new project is completed, we will be one of the most environmentally responsible mills in Canada," said Guillot. "We too want to see Boat Harbour cleaned up, we want to finish our new treatment facility; we just need a little bit more time to get that done."

"Our partnerships with sawmills, forestry contractors and private woodlot owners are critical to its success and the rural economy," said Guillot. "Our new wastewater facility will reduce our environmental impact while ensuring we can continue to help the Nova Scotian economy."

"Any plan for the future of the forestry sector that does not include Northern Pulp will be a plan for the managed decline of the sector in Nova Scotia."

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Quick Link:
Northern Pulp's wastewater treatment project was officially registered on February 7, 2019 with Nova Scotia Department of Environment. The project document is publicly available via https: novascotia.ca nse ea Replacement_Effluent_Treatment_Facility_Project

Media Contact:
Kathy Cloutier
Communications Director, Paper Excellence Canada
media@northernpulp.com

From:
To: Environment Assessment Web Account
Subject: RE: Warning: send failed for one or more of recipients
Date: March 11, 2019 12:54:28 PM

There must be further assessment as so much is at stake for NS and PEI and NB. We do not know the ingredients. They will start burning contaminated sludge without a thorough study of emission concerns, the environment, the fisheries, sea life and tourism. All are at risk the strait can freeze so how will the warmth flow impact lobster spawning grounds. Much further studies need to be done. Thank you

-------- Original message --------
From: Failed Delivery Notifier >
Date: 2019-03-08 16:24 (GMT-08:00)
To: @shaw.ca
Subject: Warning: send failed for one or more of recipients

Your mail (subject "Environmental assessment of effluent treatment facilit") sent on March 8, 2019 at 5:24 PM Mountain Standard Time could not be delivered to one or more recipients. For further assistance, please contact admin.

ea@novasctia.ca: Invalid Address

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