NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

NORTHERN PULP NOVA SCOTIA MILL TRANSFORMATION PROJECT

Class II Environmental Assessment Registration

NORTHERN PULP NOVA SCOTIA

NOVEMBER 2021

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FIGURES

ACRONYMS

AC CDC	Atlantic Canada Conservation Data Centre
ADCP	Acoustic Doppler Current Profiler
AOX	Adsorbable Organic Halides
ARIA	Archaeological Resource Impact Assessment
ASB	Aerated Stabilization Basin
BAS	Biological Activated Sludge
BAT	Best Available Technology
BOD	Biochemical Oxygen Demand
CAAQS	Canadian Ambient Air Quality Standards
CAC	Criteria Air Contaminant
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
CFIA	Canada Food Inspection Agency
CNWA	Canadian Navigable Waters Act
CO_2eq	Carbon Dioxide Equivalents
COD	Chemical Oxygen Demand
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSQG	CCME Sediment Quality Guideline
CWS	Canadian Wildlife Service
dBA	A-weighted Decibels
DFO	Fisheries and Oceans Canada
DO	Dissolved Oxygen
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
ECF	Elemental Chlorine Free
EEM	Environmental Effects Monitoring
ELC	Environmental Liaison Committee
EMP	Environmental Management Plan
EMS	Environmental Management System
EPP	Environmental Protection Plan
ETF	Effluent Treatment Facility
FAA	Fisheries Act Authorization
FWAL	Fresh Water Aquatic Life (CCME guidelines)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GPS	Geographical Positioning System
HADD	Harmful Alteration, Disruption or Destruction of Fish Habitat
HDPE	High Density Polyethylene
HHERA	Human Health and Ecological Risk Assessment
HVAC	Heating, Ventilation, Air Conditioning
KMKNO	Kwilmu'kw Maw-klusuaqn Office
IBA	Important Bird Area
ISO	International Organization for Standardization

ISQG	Interim Sediment Quality Guideline
Leq	Sound Level Equivalent
LFA	Lobster Fishing Area
MARI	Maritime Archaeological Resource Inventory
MBBA	Maritime Breeding Bird Atlas
MBBR	Moving Bed Biofilm Reactor
MBCA	Migratory Birds Convention Act
MEKS	Mi'kmaq Ecological Knowledge Study
MLA	Member of Legislative Assembly
NAFO	North Atlantic Fisheries Organisation
NPNS	Northern Pulp Nova Scotia
NSNRR	Nova Scotia Natural Resources and Renewables
NSECC	Nova Scotia Environment and Climate Change
NS ESA	Nova Scotia Endangered Species Act
NSPW	Nova Scotia Public Works
NSWA	Nova Scotia Wildlife Act
OAAQC	Ontario's Ambient Air Quality Criteria
PAH	Polycyclic Aromatic Hydrocarbons
PEL	Probably Effects Level
PID	Parcel Identification (number)
PLFN	Pictou Landing First Nation
PM	Particulate Matter
PPER	Pulp and Paper Effluent Regulations (under the Fisheries Act)
ROW	Right of Way
RWS	Receiving Water Study
SAR	Species at Risk
SARA	Species at Risk Act
SBS	Styrene Butadiene Styrene
SFA	Scallop Fishing Area
SOCC	Species of Conservation Concern
SSTL	Site Specific Target Level
TCU	True Colour Unit
TDS	Total Dissolved Solids
TRS	Total Reduced Sulphur
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
VEC	Valued Environmental Component
VOC	Volatile Organic Compound
WESP-AC	Wetland Ecosystem Services Protocol-Atlantic Canada
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

This document is being submitted to Nova Scotia Environment and Climate Change (NSECC) to register the *Northern Pulp Nova Scotia Mill Transformation Project* as a Class II undertaking under the Nova Scotia *Environmental Assessment Regulations*.

The project components have been designed to meet "best available technology" (BAT) standards for the pulp and paper industry. BAT is defined as "the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges" (United Nations *et al.* 2005). BAT for the mill includes both the technology used and the way in which the facility is designed, built, maintained, operated and decommissioned. "Available technology" refers to those techniques that are accessible to the mill and that are developed on a scale that allows implementation, under economically and technically viable conditions, while the term "best" means effective in achieving a high general level of protection of the environment.

Project Summary

Northern Pulp Nova Scotia Corporation (NPNS), a subsidiary of Northern Resources Nova Scotia Corporation, produces high-quality bleached elemental chlorine-free kraft market pulp at the mill at Abercrombie Point. The NPNS pulp mill is located at Abercrombie Point adjacent to Pictou Harbour in Pictou County, Nova Scotia. The project will be sited on PID 00864538, which is owned by NPNS.

NPNS proposes to transform the mill to become "environmentally best in class" in Canada, by redesigning mill operations using BAT, and constructing and operating a new advanced effluent treatment facility (ETF). An advanced tertiary treatment stage will be added to the already proposed primary and secondary BAT ETF. The tertiary treatment stage will operate year-round, making NPNS the only kraft mill in North America to have tertiary treatment on its total mill effluent year-round. This additional stage of effluent treatment will result in effluent sufficiently clean to be discharged into the Pictou Harbour estuary. The treated effluent outfall location will be finalised once a receiving water study (RWS) has been completed.

The project outcomes will include:

- No odour in local communities during normal operations;
- Fewer visible plumes above the mill;
- A reduction in greenhouse gas (GHG) emissions;
- An online environmental dashboard to communicate mill environmental performance based on environmental standards discussed below;
- A significant reduction in volume and contaminants contained in the effluent;
- A significant reduction in freshwater usage, and
- An updated mill appearance with new exterior siding and finishes.

The registration of this project is during a unique period in our history, driven by the ongoing global pandemic, at a time where economic stimulus is an essential element in promoting economic recovery for the Province of Nova Scotia and its citizens. The continued operation of the NPNS mill will ensure that it meets global market demands and supports the local and provincial forestry sector.

Kraft pulp manufacturing will provide a market for pulp grade wood and wood chips to support the full implementation of sustainable, ecological forestry practices in Nova Scotia as envisioned in the Lahey Report (Lahey 2018). The global market demand for kraft pulp provides paper products used in our everyday lives. The demand is increasing due to the recent commitment to move away from single-use plastics and replace them with biodegradable wood and pulp containing alternatives with less environmental impact. The recent pandemic has highlighted the increased need for paper-based hygiene products and medical personal protective clothing and masks. Kraft pulp is an important commodity in supplying these needs.

NPNS will invest more than $350 million in the *Mill Transformation Project*, which is expected to provide 600 construction jobs for a period of two years. Significant longer-term benefits to Nova Scotia will include (Gardner Pinfold 2019):

- 330 direct and 2,679 indirect jobs, and $128 million in annual worker income gained throughout the economy, or $1.28 billion over ten years;
- 1,379 companies supporting mill operations, with 943 suppliers in Nova Scotia, and
- $279 million annual operating spending, with most spent in Nova Scotia; that is, $2.79 billion in the next ten years.

Regulatory Overview

The Minister of the Environment and Climate Change for Nova Scotia has determined that the *NPNS Mill Transformation Project* is a Class II undertaking under the Nova Scotia *Environment Act* (as per correspondence of July 16, 2021). This registration document has been submitted to initiate an environmental assessment (EA) process under the *Environmental Assessment Regulations*.

In addition to the provincial environmental assessment process, several provincial and federal approvals and permits will be required for construction and operation of the project. Permits will be obtained from NSECC under Part V of the *Nova Scotia Environment Act*, including wetland and watercourse alteration approvals. Federally, authorizations will likely be required under the *Fisheries Act* and the *Canadian Navigable Waters Act*.

Regulatory, Public and Indigenous Engagement

In 2019, NPNS registered a Class I undertaking for the construction of a replacement ETF and a pipeline to Caribou Harbour. The *Replacement ETF Project* failed to gain wide acceptance by the public. Concerns raised by stakeholders concentrated on three significant themes: the pipeline routing, the outfall location and concern for the fisheries in the Northumberland Strait. NPNS acknowledged those concerns and recognized the need for a new solution, and subsequently withdrew this project voluntarily. These concerns are addressed in detail later in the document.

NPNS sought broader community input in the new solution. In September 2020, the voluntary Environmental Liaison Committee (ELC) was established to work independently and provide community feedback to NPNS. It comprises 18 individuals from various backgrounds who are willing to share their knowledge. They have done significant work to summarize the comments obtained through the EA process for the *Replacement ETF Project*, and to obtain the perspectives and input from community members through in-person meetings. Their feedback has been the catalyst for the transformation of the mill and development of the *NPNS Mill Transformation Project,* which will

mitigate the concerns that the public brought forward in the previous project. Their work will continue through the EA and into the operational phase of the project.

Since June 2021, in preparation for the registration of this *Mill Transformation Project*, NPNS has undertaken 40 focus group meetings with various stakeholders, to introduce the project and obtain their input. Engagement will be ongoing throughout the EA, and will include input through the project website: Tomorrow's Mill (https://www.tomorrowsmill.ca/). Many of the previously expressed concerns have been addressed by the new design for the mill and ETF.

The regulatory, community and Indigenous engagement undertaken for that project since 2017 has been incorporated into the design of this *NPNS Mill Transformation Project*. Comments received during the regulatory and public review of the previous EA also form part of the consultation record for this project.

NPNS continues to seek engagement with the all the Mi'kmaw communities of Nova Scotia, including Pictou Landing First Nation (PLFN). NPNS has worked in good faith with PLFN to resolve three conditions precedent to PLFN engaging with NPNS, raised by PLFN in the spring of 2020. These three conditions were addressed to the satisfaction of PLFN. While PLFN does not wish to participate in the ELC as a committee member, NPNS looks forward to working collaboratively with the community prior to and as a participant in the Crown consultation process.

Project Description

The NPNS mill was originally built by Scott Maritimes Pulp Limited in 1967 as part of a Government of Nova Scotia initiative to encourage industrial development in the Pictou area. Incentives for development were raw water supply from the Middle River, and effluent treatment at the Boat Harbour ETF. The introduction of the provincial *Boat Harbour Act* in May 2015 prohibited the facility from receiving and treating effluent from NPNS after January 31, 2020. With no other immediate solution for effluent treatment, the mill ceased producing pulp and was placed into hibernation in April 2020.

The *NPNS Mill Transformation Project* proposes to upgrade the current mill processes to meet BAT to ensure that the mill's environmental performance meets best in class within Canada. In addition, NPNS will add an advanced tertiary treatment stage to the already proposed primary and secondary BAT ETF, which will allow discharge of the effluent into the Pictou Harbour estuary. A summary of the project components is provided in the table below.

Category	Components/Activities
Mill Transformation Components	
Washing and Screening	▪ Modern secondary knotter to fully recover uncooked wood and black liquor from the pulp. ▪ Collection of sulphur-containing gases from brown stock washer hoods.
Oxygen Delignification	▪ Two-stage oxygen delignification to remove lignin prior to bleaching. ▪ On-site oxygen generation.
Bleach Plant Modification	▪ Modification to existing bleach plant to carry out first bleaching at medium consistency.
Lignin Separation	▪ Lignin separation system to extract lignin from black liquor as a saleable product or for use as fuel in the mill.

Category	Components/Activities
Green and White Liquor Clarifier Upgrades	▪ Repurpose the #2 green liquor clarifier as a green liquor storage tank. ▪ Repurpose the white liquor clarifier into a second green liquor clarifier. ▪ Decrease the flow to both green liquor clarifiers in parallel to reduce their rise rates. ▪ Construct a new white liquor clarifier.
Calcium Liquor Cycle Upgrade	▪ White liquor pressure filter repurposed as a lime mud filter. ▪ Lime mud flash dryer installed at the inlet of the kiln to recycle hot kiln. exhaust waste heat to drive off water in the lime mud.
Recovery Boiler Low-Odour Conversion	▪ Indirect contact evaporator to reduce the volume of boiler stack emissions. ▪ A fourth level air system installed on the recovery boiler to allow the proper introduction of sulphur-containing gases for destruction in the recovery boiler. ▪ Installation of a larger economizer to increase energy efficiency. ▪ Collection of vent gases that contain pollutants of concern.
Scrubber Decommissioning and Replacement	▪ Decommission recovery boiler Modo scrubber. ▪ Replace power boiler venturi scrubber with a wet electrostatic precipitator. ▪ Add a lime mud flash dryer to the kiln.
Steam Stripper System Upgrade	▪ Upgrade steam stripper to provide more capacity, by installing additional trays and upgrading the feed and discharge pumps.
Spill Containment and Cooking Chemical Recovery Upgrades	▪ Low-solids evaporation system to pre-evaporate dilute liquor recovered from the recovery boiler area. ▪ An additional liquor storage tank as a spill buffer. ▪ Spill basin to provide a buffer in case of an emergency shutdown. ▪ Improve current chemical spill containment and recovery.
Water Use	▪ Install cooling towers on the cooling water loops within the mill. ▪ Cooling towers constructed as part of the ETF to indirectly cool effluent to temperatures optimal for biological treatment.
Effluent Treatment Facility Components	
Primary Treatment	▪ Automatic raked bar screen to remove any large debris. ▪ Circular clarifier to remove solid by gravity.
Secondary Treatment	▪ Veolia's AnoxKaldnes™ biological activated sludge (BAS) process, which combines moving bed biofilm reactor (MBBR) technology with conventional activated sludge.
Tertiary treatment	▪ Rotating disc filters (Veolia's Hydrotech Filters), will remove a significant amount of suspended biosolids and effluent colour.
Sludge management	▪ Rotary presses to process the solids generated by the ETF. ▪ New high-efficiency precipitator installed on the power boiler stack.
Effluent Discharge	▪ Effluent will be discharged into the Pictou Harbour estuary via a pipeline with a multiport diffuser.

NPNS is committed to developing the project in an environmentally responsible manner, consistent with sustainability principles, and to ensuring public and worker health and safety during the construction and operation of the project. Several environmental protection and management measures will be implemented to guide the construction, operation and maintenance, and decommissioning of the project, including the development of an Environmental Management Plan and an Emergency Response and Contingency Plan.

The *NPNS Mill Transformation Project* will produce solid waste (construction and domestic), air emissions (including GHGs), noise emissions, and effluent discharge. All emissions and discharges will be below regulatory standards.

Description of the Existing Environment

Numerous baseline studies were undertaken as part of the *Replacement ETF Project* registration (Dillon 2019a, b) that are relevant to the *NPNS Mill Transformation Project*. Additionally, ambient air monitoring was conducted during the hibernation period in 2021. These have provided the bases for the site description; some of the key findings are summarized below.

- Historical records of air contaminants within the airshed for 2015-2017 indicate that the ambient air quality in the area was below regulatory criteria. Odour, which is not able to be measured, was present in the surrounding community. Several air quality dispersion modelling studies have been undertaken for the mill during operation.
- Ambient air quality monitoring at the NSECC monitoring station located in the Town of Pictou for the mill pre-and post-hibernation periods for criteria air contaminants indicates that there has been little change in concentration for most parameters before and after mill hibernation. It is evident that several contaminants are present in the atmosphere, potentially from other sources, including both local and distant sources of pollution.
- Ambient air quality monitoring at the fence line of the NPNS property in March 2021 (post-hibernation), indicated that several contaminants are present in the atmosphere from other sources of pollution. These include total suspended particulates (TSP), particulate matter ($PM_{2.5}$), several metals, benzo[a]pyrene, naphthalene, dioxins and furans, several volatile organic compounds (VOCs), combustion gases, acetaldehyde and formaldehyde.
- Sound monitoring during mill operation indicated that sound levels were generally below the guideline thresholds for identified receptors.
- Groundwater quality at the site is consistently within NSECC's Environmental Quality Standards for potable water at a commercial site with coarse grained soils, except for sodium and chloride, which are indicative of wells near marine waters.
- The NPNS property at Abercrombie Point is situated on a promontory that is bounded to the north, east and west by estuarine reaches of the Middle and East rivers. Surface waters within the project area include two small streams and two wetlands. The water quality shows some indication of impacts from upstream uses. Only WC-2, draining from a wetland to the east of the mill, has available fish habitat and has potential for American eel and possibly brook trout, although only stickleback were observed during site visits.
- Two wetlands have been delineated and assessed within the project footprint. Wetland WL-1 is a small (0.036 ha) wet meadow that will be completely altered by the project; wetland WL-2 is a larger (0.12 ha) shrub swamp to the east of the mill, that will be partially altered due to the construction of the spill basin.
- The site falls within the Northumberland Lowlands EcoDistrict, and has terrestrial habitat typical of a disturbed site. Over 35% percent of the plant species observed in the project area are not native to Nova Scotia. No plant species of conservation concern have been observed during field surveys and no habitat for epiphytic lichen species of conservation concern were observed within the project area.
- Pictou Harbour and the area surrounding the mill at Abercrombie point has a highly diverse avian fauna. It is one of the main stopovers for migratory bird species and provides breeding habitat for some key species. Species at risk that have been observed near the project area

include the barn swallow, Barrow's goldeneye, common nighthawk and eastern wood pewee. Thirteen species ranked as rare or uncommon by the Atlantic Canada Conservation Data Centre (AC CDC) have been observed near the site.

- Wildlife near the project site tend to be common species abundant in the area. There is potential for species at risk to visit the site occasionally, including bats (little brown myotis, northern myotis, tri-coloured bat), moose, monarch butterfly and yellow-banded bumblebee. Snapping turtle and wood turtle are known to occur in the tributaries of the Middle and East rivers.
- The marine environment of Pictou Harbour within the vicinity of the project has not been well studied and additional field information is required. Species at risk that may visit Pictou Harbour include harbour porpoises.
- Archaeological studies have been undertaken for the land portion of the project and the spill basin has been redesigned to accommodate a known archaeological site. Little information is available on marine archaeology, except that there are ~29 known shipwrecks in Pictou Harbour.
- A Mi'kmaq Ecological Knowledge Study (MEKS) was undertaken in 2018 and updated in 2019. The report is currently under review with the Kwilmu'kw Maw-klusuaqn Office (KMKNO). The studies concluded that no traditional activities are currently undertaken at Abercrombie Point.

Assessment Process and Anticipated Impacts

The *NPNS Mill Transformation Project* is expected to interact with a range of environmental components. It is anticipated that potential adverse impacts would be limited through the design of the project using BAT, and the implementation of a series of mitigation measures and compensation plans. To ensure that the applicable environmental standards, permit obligations and conditions are met, NPNS will implement a comprehensive monitoring program. This will entail monitoring air quality, effluent discharge quality, surface and groundwater quality, and GHGs (including energy usage and reduction). An environmental effects monitoring (EEM) program under the *Pulp and Paper Effluent Regulations* (*PPER*) will be undertaken. EEM is a science-based performance measurement tool used to evaluate the adequacy of effluent regulation in protecting fish, fish habitats and the usability of fisheries resources.

Beneficial economic effects of the project are anticipated to be significant and long-lasting, and will extend beyond the local community and region. This includes employment, training, and service opportunities during the construction phase, as well as the operating phase, maintenance and continuing capital improvements. The project will also support NPNS' commitment to healthy forests and ecological forestry in Nova Scotia (Lahey 2018). Harvested trees not suitable for lumber (tree-tops, center rot, broken trees or crooked portions), which were previously processed at NPNS, are currently being left on the ground, increasing the risk of future forest fires. Today, with NPNS not operating, 700,000 metric tonnes of pulpwood remain in the forest as debris with no income to the landowner. Having access to a centrally located pulp mill in Nova Scotia is the best economic value for this low-quality wood fibre that is not suitable for lumber.

A significant amount of baseline information is available from studies undertaken at the site for the previous *Replacement ETF Project* (Dillon 2019a, b). Given that there has been little change at the site since then, it is expected that additional field investigations will not be required for the atmospheric

(air and noise), terrestrial (vegetation and birds) or freshwater (wetlands and watercourses) environment, and that baseline information collected to date will be sufficient. Studies that are anticipated to be required as part of the EA process include: an RWS, marine benthic field investigations, air quality dispersion and deposition modelling, noise modelling, a human health and ecological risk assessment (HHERA) and a marine archaeological resource impact assessment.

Conclusion

Clearly defined effluent limits are necessary inputs for the detailed design of the new tertiary treatment stage of the ETF, as well as being a required input to the RWS. NPNS will assume that the draft *PPER* will become the future legal enforcement limits and that these will be applied in Nova Scotia, as is done in most jurisdictions in Canada, including all Atlantic Canada. A significant revision of any environmental limit after the fact would delay the design and construction of the project. The design engineers and potential equipment vendors selected to bid on the project cannot finalize the design unless the end goals are known.

The proposed *NPNS Mill Transformation Project* has been developed in response to community concerns, while using today's BAT to transform the mill into a best-in-class operation. NPNS has a strong desire to resume operation in Nova Scotia and play an integral role in the economic recovery of Nova Scotia. NPNS will invest more than $350 million in the *Mill Transformation Project*, subject to further engineering work and a final investment decision. The project will result in 600 jobs during construction and providing permanent, much needed direct and indirect jobs in rural Nova Scotia. It will support the province's forestry sector, allowing for the full implementation of sustainable, ecological forestry practices in Nova Scotia as envisioned in the Lahey Report (Lahey 2018). The ELC is committed to continuing community engagement throughout the EA process and into the operational phase of the project. NPNS looks forward to the ELC's input, as well as the input from regulatory, public and Indigenous stakeholders.

1.0 PROJECT OVERVIEW

1.1 INTRODUCTION

Northern Pulp Nova Scotia Corporation (NPNS), a subsidiary of Northern Resources Nova Scotia Corporation, produces high-quality bleached elemental chlorine-free (ECF) kraft market pulp at the mill at Abercrombie Point, Pictou County, Nova Scotia. Capable of producing over 310,000 tonnes of northern bleached softwood kraft pulp per year, it ceased production on January 12, 2020 and is being maintained in a hibernated state, pending resumption of mill operations. NPNS proposes to transform the mill to become "environmentally best in class", by redesigning mill operations using best available technology (BAT), and constructing and operating a new advanced effluent treatment facility (ETF) on-site (see: Tomorrow's Mill - https://www.tomorrowsmill.ca/).

This document is being submitted to Nova Scotia Environment and Climate Change (NSECC) to register the project as a Nova Scotia Class II undertaking under the Nova Scotia *Environmental Assessment Regulations*. It includes a description of the proposed project and its purpose, the regulatory framework within which it is being undertaken, the baseline environmental and socio-economic conditions at the site, consultation and engagement activities undertaken, and proposed studies to form part of the environmental assessment (EA).

In 2019, NPNS registered a Class I undertaking for the construction of the ETF, including an effluent pipeline discharging offshore from Caribou Harbour (Replacement Effluent Treatment Facility Project - https://novascotia.ca/nse/ea/Replacement_Effluent_Treatment_Facility_Project/), which has since been withdrawn. Numerous baseline studies were undertaken as part of that EA registration. Given that, apart from the pipeline route, the footprint of the two projects is the same, much of the information on existing environment conditions and potential for impacts presented in this registration document has been referenced from the previous EA Registration Document and Focus Report, prepared by Dillon (2019a, b). The local environment has experienced little, if any, change since then.

1.2 PROJECT INFORMATION

1.2.1 Project Name

The undertaking will be referred to as the *Northern Pulp Nova Scotia Mill Transformation Project*.

1.2.2 Project Location

The NPNS pulp mill is located at Abercrombie Point adjacent to Pictou Harbour in Pictou County, Nova Scotia (**Figure 1.1**). The project will be sited on PID 00864538, which is owned by NPNS. The pipeline will extend into the Pictou Harbour estuary, with the pipeline route finalised once the receiving water study has been completed.

1.2.3 Public Funding of the Undertaking

Public funding from the province of Nova Scotia is not anticipated for the project. The Province of Nova Scotia made contributions to past studies undertaken for the previous *Replacement ETF Project*, which is referenced in this document.

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

KEY MAP:

LEGEND:

- NPNS Property
- First Nations Lands

N
W E
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PROJECT:

PROJECT:
NPNS MILL
TRANSFORMATION PROJECT

PROJECT NO.: 211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
PROJECT LOCATION
ABERCROMBIE, NS

FIGURE NO.:	REVISION NO.:
1.1	0

SCALE: 1:30,000
0 200 400 800 1,200 1,600 Metres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY: T. MOREHOUSE	CHECKED BY: J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-12

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Path: S:\GIS\2_PROJECTS\2021\211_10812_NorthernPulpMill_Modernization_EA_NS\8_MXD\RegistrationDocFigures\20211023_211_10812_NPNS_FIG1_1_PropertyBdyLocation.mxd

1.3 PROPONENT INFORMATION

The name, address, identification of the proponent, and additional contact persons for the EA of the proposed undertaking are as follows:

Name of Project	Northern Pulp Nova Scotia Mill Transformation Project
Name of the Proponent	Northern Pulp Nova Scotia Corporation
Address of the Proponent	**Mailing Address:** PO Box 549 Station Main New Glasgow, Nova Scotia B2H 5E8 **Civic Address:** 260 Granton Abercrombie Road Abercrombie, Nova Scotia B2H 5C6
Proponent Environment Assessment Contact	Mr. Dale Paterson Tel. 902 752 8461 x 203 Email. dale.paterson@northernpulp.com
Proponent Executive Contact	Mr. Bruce Chapman Tel. 902 752 8461 x 273 Email. bruce.chapman@northernpulp.com

Signed by BRUCE CHAPMAN

On behalf of NORTHERN PULP NOVA SCOTIA CORPORATION

1.4 PURPOSE OF AND NEED FOR THE UNDERTAKING

The NPNS mill was originally built by Scott Maritimes Pulp Limited in 1967 as part of a Government of Nova Scotia initiative to encourage industrial development in the Pictou area. Incentives for development were raw water supply from the Middle River, and effluent treatment at the Boat Harbour ETF.

The Boat Harbour ETF was originally owned and operated by the Province of Nova Scotia. In 1995, NPNS' predecessor (Kimberly-Clark Corporation) took over the operation of the ETF under a 10-year lease, which was later extended to 2030. However, the introduction of the provincial *Boat Harbour Act* in May 2015 prohibited the facility from receiving and treating effluent from NPNS after January 31, 2020. With no other immediate solution for effluent treatment, the mill was placed into hibernation in April 2020.

The kraft pulping process produces wastewater as a by-product of its industrial process and the treatment of this effluent is fundamental to the continued operation of the NPNS mill. A new ETF was proposed in 2019 and a Class I undertaking registered under the Nova Scotia *Environment Act*. This was withdrawn in 2021 when it became apparent, from public input to the EA process and consultation with the broader community, that a more transformative approach was required. Through the work of the Environmental Liaison Committee (ELC) (see **Section 3.2.2**), the project has been redesigned to include an upgrade of the mill processes to ensure that they meet BAT.

The project purpose is to upgrade the current mill to meet BAT and provide a new means for treating and disposing of the effluent, to ensure that the mill's environmental performance meets best in class within Canada.

The continued operation of the NPNS mill will ensure that it meets global market demands and supports the local and provincial forestry sector. The mill provides significant benefits to the Province of Nova Scotia, including (Gardner Pinfold 2019):

- 330 direct and 2,679 indirect jobs, and $128 million in annual worker income gained throughout the economy;
- 1,379 companies supporting mill operations, with 943 suppliers in Nova Scotia, and
- $279 million annual operating spending, with most spent in Nova Scotia.

1.5 REPORT ORGANIZATION

Table 1.1 identifies the sections of the document where requirements for a Nova Scotia Class II EA Registration may be found.

Table 1.1: Concordance Table with Nova Scotia Environmental Assessment Regulations *and Class II Requirements*

EA Requirement	Location in Document
Name of the proposed undertaking	Section 1.2.1
Location of the proposed undertaking	Section 1.2.2
Name, address and identification of the proponent	Section 1.3
Contact persons and contact information	Section 1.3
Name and signature of the signing authority	Section 1.3

EA Requirement	Location in Document
Nature and sensitivity of the area surrounding the proposed undertaking	Section 5.0
Purpose and need of the proposed undertaking	Section 1.4
Proposed construction and operation schedules	Section 4.6
Description of the proposed undertaking	Sections 1.2 and 4.0
Environmental baseline information	Section 5.0
List of various authorizations required	Section 2.0
Sources of public funding for the proposed undertaking	Section 1.2.3
Steps to identify public and Indigenous concerns about adverse effects or environmental effects	Sections 3.2 and 3.3
List of public and Indigenous concerns about adverse effects or environmental effects	Section 3.2 and 3.3
Steps to address public and Indigenous concerns about adverse effects or environmental effects identified	Section 3.4

2.0 REGULATORY OVERVIEW

The Minister of the Environment and Climate Change for Nova Scotia has determined that the *NPNS Mill Transformation Project* is a Class II undertaking under the Nova Scotia *Environment Act* (as per correspondence of July 16, 2021). A Class II undertaking is typically a larger scale project with potential to cause significant environmental impact and will require formal public review and public hearings.

There are several federal and provincial laws applicable to the undertaking. NPNS is committed to adhering to all regulatory requirements during the proposed design, construction and operational phases of the project. Potential regulatory requirements (permits or approvals) are summarized in **Table 2.1**, with key legislation briefly described below. Further consultation with regulatory agencies will be required throughout the EA process to determine permitting for both the construction and operation of the project. Additional regulatory requirements may also be identified in the EA conditions, following submission and approval of the Class II EA.

Table 2.1: Relevant Environmental Legislative Requirements Applicable to the Project

Legislation	Summary of Applicability	Potential Requirement for Approval/Permit
PROVINCIAL		
Environment Act and Regulations - *Environmental Assessment Regulation*	Class II undertaking requires Ministerial Approval before proceeding. Adherence to EA Approval Terms and Conditions will be required.	Yes – EA Approval
Environment Act and Regulations – *Activities Designation Regulations*	Section V – Construction of project components	Yes
	Industrial Approval (IA) – the mill will operate in compliance with overall IA for the NPNS operation, including Middle River water withdrawal.	Required for mill operation
	Wetland and Watercourse Alteration (Division I – Water). Impacts to both wetlands and watercourses are anticipated.	Yes
	Construction related activities for on-site fuel storage, sewage disposal or water withdrawal.	To be determined with contractor
Environment Act and Regulations -*Contaminated Sites Regulations*	Requirements for contaminated sites on provincial land (no contaminated sites previously identified). Applicable regulations will be adhered to if contaminated soil is identified during construction.	Not anticipated
Environment Act and Regulations – *Petroleum Management Regulations*	Petroleum storage requirements to be met as applicable.	Not anticipated
Environment Act and Regulations - *Environmental Emergency Regulations*	Requirements to be met if environmental emergency occurs.	No
Endangered Species Act (NS ESA)	Protection of listed species and their habitat.	Not anticipated
Wildlife Act	Among other wildlife management requirements, prohibits hunting or killing of raptors, or disturbance of bird and turtle nests, as applicable (turtle nests not previously identified, however contingency planning in place).	No, assuming prioritizing clearing outside of nesting season for both birds and turtles. If timing above not possible, mitigation and approval as required by the Canadian Wildlife Service (CWS) or provincial regulators

Legislation	Summary of Applicability	Potential Requirement for Approval/Permit
Special Places Protection Act	Heritage Research Permit is required for Archaeological Resources Impact Assessment (ARIA).	Yes
Forests Act – Forest Fire Protection Regulations	Requirements for fire suppression equipment for operations/construction in forested land to be met.	No
Dangerous Goods Transportation Act and Regulations	Requirements for safe transport of dangerous goods to be met, if applicable.	No permits required. All carriers will comply with the Act and Regulations regarding placards and training
Other Possibly Applicable Permitting/Approvals		
Labour Standards Codes, Building Code	Applicable labour requirements and building codes to be met.	No
Nova Scotia *Crown Lands Act* and Regulations (*Beaches Act*)	Crown land easements, leases, and licenses. Although land portion of the project is on NPNS property, leases or right-of-way agreements may be required for the pipeline/outfall. *Beaches Act* permit could be required if removal of sand, gravel, stone or other materials from beaches is required.	Yes
Nova Scotia *Public Highways Act*	Any work within a public road right-of-way would require a Work Within Highway Right-of-Way from the Nova Scotia Department of Public Works and approval from the Minister.	Not anticipated
Occupational Health and Safety Act and Regulations	Workplace health and safety requirements to be met.	Not anticipated
Special Move Permit Access Nova Scotia – *Motor Vehicle Act*	Required to move a vehicle (or oversized vehicle) exceeding weight or dimension limits on a public road.	Likely required for delivery of large project components
Industrial Approval		
Permits to Construct and Operate	Permit to construct and operate under Industrial Approval	Yes
FEDERAL		
Impact Assessment Act (IAA)	This project is not specifically listed as a designated project under the *Physical Activities Regulations* of the *Impact Assessment Act*. In some circumstances, the Minister may designate projects that are not part of the project list.	Not required, as determined by Impact Assessment Agency review
Canadian Environmental Protection Act (*CEPA*) – *Disposal at Sea Regulations*	Pollution prevention requirements and direction on priority substances and deleterious substances to be met, as applicable.	May be required if ocean-based disposal of dredge material is required during construction of the pipeline
Fisheries Act – Section 35 (1)	No person shall carry out any work, undertaking or activity that results in the harmful alteration, disruption or destruction (HADD) of fish habitat, unless permitted under the *Fisheries Act*. HADD is anticipated for the effluent pipeline construction.	*Fisheries Act* Authorization (FAA) required. Fisheries and Oceans Canada (DFO) determination required
Fisheries Act – Section 36 (3)	Deposit of deleterious substance is prohibited. NPNS is required to meet the *Pulp and Paper Effluent Regulations (PPER).*	No permit required. Effluent is expected to meet current and future *PPER*

Legislation	Summary of Applicability	Potential Requirement for Approval/Permit
Fisheries Act – Pulp and Paper Effluent Regulations (PPER)	Sets limits on maximum deposits of total suspended solids (TSS) and biological oxygen demand (BOD). *PPER* does not allow deposits of effluent acutely lethal to fish and contains requirements for environmental effects monitoring (EEM). Authorizations may be requested for exceeding maximum specified concentrations or for combining treated effluent with other effluent.	No approval required. Information on any proposed change to an outfall structure shall be submitted at least 90 days before the change is made.
Migratory Birds Convention Act (*MBCA*) and Regulations	Protection of migratory birds, nests, eggs and/or young. Prohibition related to deposit of substances harmful to migratory birds.	No. Authorizations or permits are required to destroy or take a migratory bird nest or to be in possession of a live bird/nest/egg or a carcass. Effort will be made to prioritize any clearing activity outside of breeding bird season, and marine construction timed appropriately
Species at Risk Act (*SARA*)	Protection of listed wildlife species at risk and their habitat.	Not anticipated
Canadian Navigable Waters Act (*CNWA*)	Potential triggers are activities that may interfere with navigation on scheduled waters – e.g., construction activities and presence of the pipeline and outfall.	Approval likely required. Consultation with Transport Canada required to confirm if approval is required prior to pipeline construction.
Transportation of Dangerous Goods Act and Regulations	Documented handling, storage, emergency response requirements for transportation of dangerous goods if such good required for construction or operation.	No permits/approvals required. All carriers will comply with the Act and associated Regulations.

2.1 KEY PROVINCIAL LEGISLATION

2.1.1 Nova Scotia Environment Act

In addition to the Class II EA submission process, as part of the site development, a series of approvals will be required pursuant to Part V of the *Nova Scotia Environment Act* and the associated *Activities Designation Regulations*. These approvals will be sought following the approval of the provincial environmental assessment. They include permits such as Division 1 Water – Watercourse and Wetland Alteration Approval, and a new NPNS Industrial Approval.

2.2 KEY FEDERAL LEGISLATION

2.2.1 Impact Assessment Act

This project is not specifically listed as a designated project under the *Physical Activities Regulations* of the *Impact Assessment Act* (*IAA*). Correspondence (July 21, 2021) from the Impact Assessment Agency has indicated that the project is not a designated project under the Act. It is anticipated that the Agency will be required to review the Class II provincial EA Registration Document for a final assessment and determination.

2.2.2 Fisheries Act

Section 35 of the *Fisheries Act* states that no person shall carry out any work, undertaking or activity that results in the harmful alteration, disruption or destruction (HADD) of fish habitat. The marine based

portion of the effluent pipeline and outfall will be located within the Pictou Harbour estuary, and there is potential for HADD during the construction and installation of the effluent pipeline. DFO will determine the need for a Fisheries Act Authorization (FAA) through their request for review process. If a FAA is required for the project, a compensation project will be required to offset any anticipated HADD impacts.

2.2.3 Fisheries Act - Pulp and Paper Effluent Regulations

The *PPER* were developed under the *Fisheries Act* to manage threats to fish, fish habitat and human health (related to fish consumption) from pulp and paper mill deposits into water frequented by fish. The *PPER*, and those regulations cited by the *PPER*, regulate the quality of effluent discharge, and remain under the jurisdiction of Environment and Climate Change Canada (ECCC). Continued compliance with *PPER* will be a requirement of project design and a significant consideration in the design of future monitoring programs. The treated effluent is anticipated to comply with current and future federal *PPER*.

2.2.4 Canadian Navigable Waters Act

It is anticipated that the construction of the effluent pipeline will require review and approval under the *CNWA* by Transport Canada. Potential permitting triggers include activities that may interfere with navigation on navigable waters (e.g., construction activities and presence of the outfall pipe). The pipeline will be constructed to discharge into Pictou Harbour estuary from Abercrombie Point. Pictou Harbour is part of the Northumberland Strait, ultimately connected to the Atlantic Ocean, which is identified as a "scheduled water" under the *CNWA*.

3.0 REGULATORY, PUBLIC AND INDIGENOUS ENGAGEMENT

Engagement with regulators, residents, Indigenous communities and stakeholders of various backgrounds has been ongoing for several years as NPNS has considered alternatives to the Boat Harbour ETF. Five principles guide NPNS' engagement, including:

- Inclusion: involve those that are to be affected or potentially affected by the project in the decision-making process;
- Responsiveness: address input received in a timely fashion;
- Accessibility: materials, engagement sessions, and processes will be made accessible to a diverse range of participants;
- Transparency: clearly communicate how information received was used in the planning and design decision-making processes, and
- Respect: a safe and comfortable environment will be maintained so that individuals can freely communicate their opinions and directions.

Details of the efforts to engage regulators, Indigenous communities and the public during the EA process for the *Replacement ETF Project* are presented in the previous EA Registration Document (Dillon 2019a) and the Focus Report (Dillon 2019b). The same key themes remain the focus of Pictou Landing First Nation (PLFN), the public, and industry stakeholders. Concerns and interests were clearly heard, resulting in the development of the current *NPNS Mill Transformation Project*.

3.1 REGULATORY CONSULTATION

Government engagement for the project (and its predecessor) has been ongoing since the introduction of the *Boat Harbour Act* in May 2015. Federal and provincial regulatory departments have been consulted to present the planned project(s), receive feedback on regulatory requirements and seek regional or topical expertise. Regulators and agencies that have taken an active interest in the project include, but are not limited to:

Provincial

- Nova Scotia Environment and Climate Change;
- Nova Scotia Natural Resources and Renewables (NSNRR, previously Department of Lands and Forestry);
- Nova Scotia Office of L'Nu Affairs (previously Office of Aboriginal Affairs);
- Nova Scotia Public Works (previously Nova Scotia Transportation and Infrastructure Renewal);
- Nova Scotia Communities, Culture and Heritage;

Federal

- Impact Assessment Agency (previously Canadian Environmental Assessment Agency);
- Fisheries and Oceans Canada;
- Environment and Climate Change Canada;
- Canadian Wildlife Service;

- Health Canada;
- Transport Canada, and
- Public Services and Procurement Canada.

Because of the importance of the mill to local industries and communities, elected officials have requested to be kept informed. Meetings have been held with local MLAs and municipal elected officials to provide information on the mill background and existing operations, the proposed project, and the EA process. Engagement with regulators, agencies and elected officials has included in-person meetings or correspondence, group meetings and site visits.

3.2 PUBLIC CONSULTATION

3.2.1 Public Engagement (2017 – 2019)

Public consultation has been ongoing since 2017 when it was launched for the EA registration of the *Replacement ETF Project*, through in-person meetings, direct written communication, and digital input and information (see Dillon 2019a). A project contact list was developed and is updated regularly. As well as the regulatory contacts, it includes local representatives, municipal contacts, Mi'kmaw communities, local agencies, interest groups, and members of the public who indicated that they would like to be informed.

In-person sessions included a series of public open houses during the project initiation in December 2017, as well as a community open house at PLFN. Information presented at the open houses included an introduction of the work that had been completed to date, a description of the proposed project, and an overview of the work undertaken for the EA.

A project initiation newsletter, which included the invitation to the first open house sessions, was mailed to residents and businesses of Pictou County, commercial fishing groups, representatives of the Mi'kmaq community and government. NPNS also used print media to place notices of public open house events and provided ongoing responses to media inquiries for print and radio. A project specific phone number and email address were set up so that questions and comments could be submitted and responded to quickly and efficiently.

As the project design progressed, additional meetings were held with interested parties, including:

- Rotary Club of New Glasgow;
- Atlantic Salmon Federation and Nova Scotia Salmon Association;
- Forestry industry as represented by Canadian Woodlands and Woodlot Owners and Central Region Woodlot Owners, and
- Commercial fishers, as represented by the Northumberland Fishermen's Association, the Gulf Nova Scotia Fishermen's Coalition, the Gulf Nova Fleet Planning Board, the Inverness South Fishermen's Association, the Maritime Fishermen's Union, Prince Edward Island Fishermen's Association, and the Gulf Nova Scotia Bonafide Fishermen's Association.

NPNS responded to over 200 emails, letters and comment forms during the engagement process for the previous EA (see Dillon 2019a, b). Comments received during the regulatory and public review of the previous EA also form part of the consultation record for this project.

3.2.2 Environmental Liaison Committee (2020 - Current)

A significant part of NPNS' community engagement has been through the independent ELC, established in September 2020, which was recognized by the Supreme Court of British Columbia as a standing *ad hoc* committee pursuant to terms of reference within the *Companies' Creditors Arrangement Act* (*CCAA*) involving NPNS. The voluntary ELC comprises 18 individuals from local community, forestry, fishery, environmental science and business backgrounds who are willing to share their knowledge; they are not formal representatives of specific sectors. Current information on the ELC and its work may be found at: The Environmental Liaison Committee - https://elc4ns.ca/. The mandate of the ELC is to encourage any transformation of the mill be done in a manner that respects the environment (land, sea, air and aesthetics) and promotes economic and social well being for its community partners, while respecting the unique cultural and traditional requirements of our Indigenous communities (ELC 2021). The objectives of the ELC are to:

- Attempt to identify, review, and prioritize potential environmental, forestry, marine, and community engagement issues and solutions related to NPNS' operations;
- Consider NPNS' commitment to building long-term, mutually beneficial relationships with stakeholders and rightsholders when proposing potential solutions related to their operations;
- Reach a consensus on the issues and potential solutions related to NPNS' operations, and
- Present findings to NPNS for further action related to the company's operations.

From October 2020, the ELC met weekly, and more recently bi-weekly, to identify and discuss NPNS' operations; review alternatives to existing practices or previously proposed solutions, and identify opportunities that could lead to solutions for a modernized mill using BAT, while following progressive forestry practices. The ELC generated a list of issues, questions and grievances related to the mill's actual or perceived impact on air quality, water quality and usage, the thermal impact of the effluent on Pictou Harbour and/or the Northumberland Strait, and solid waste disposal. These concerns were the catalyst for the redesign of the original project and resulted in the current *NPNS Mill Transformation Project*.

The ELC aims to ensure that the concerns of stakeholders and rightsholders are clearly understood and addressed in NPNS' proposed solutions, and ELC members have been meeting with and reviewing input from the public. The ELC has invited a series of presenters to attend ELC meetings to obtain various perspectives, guidance and insight from third parties. Twenty-eight presentations have been made to date, with discussion afterwards to allow individuals to freely express their concerns or opinions (ELC 2021).

The ELC has publicly advertised as well as invited different groups to come forward and participate in similar discussions as a means of engaging the community and concerned parties affected by the mill. As a result of these meetings, the ELC has been able to communicate community concerns to NPNS and, where applicable, have those concerns addressed.

Going forward, the ELC will continue to reach out to individuals and groups who have previously expressed concerns about NPNS' operations. Feedback received through the ELC will be used to shape the EA approach, and help in the design of the project, including any mitigation measures proposed.

3.2.3 Recent Engagement with Government and Stakeholders (2021)

Since June 2021, NPNS has held a series of meetings with government and public stakeholders as part of engagement related to the current project (**Table 3.1**). Each meeting included a presentation on the *NPNS Mill Transformation Project* and a discussion session. In total, 40 meetings were held, either in person or online, between June and October 2021. These were also attended by one or more ELC representatives.

Table 3.1: Stakeholder Engagement, 2021

Date	Stakeholders in Attendance	Activity	Attendance
June 3, 2021	Town of New Glasgow	Virtual Meeting	7
June 4, 2021	Forestry Stakeholders - Forestry Associations, Major Sawmillers.	Virtual Meeting	19
June 7, 2021	Pictou County Chamber of Commerce Board of Directors Chamber Executives of Truro & Colchester, and of East Hants & Amherst ELC member	Virtual Meeting	15
June 9, 2021	PC Leader of Opposition MLA Pictou West MLA Pictou East ELC member	Virtual Meeting	7
June 10, 2021	NS Lands & Forestry	In Person Meeting - Truro	5
June 10, 2021	Pictou County Mayors & Warden Ernst & Young monitor ELC member	Virtual Meeting	10
June 16, 2021	MLA Pictou West ELC member	In Person Meeting - Pictou	4
June 17, 2021	Northern Pulp Woodlands Employees	In Person & Virtual Meeting	7
July 9, 2021	Unifor Executives ELC member	Virtual Meeting	12
July 13, 2021	Forest Nova Scotia Canadian Woodlands Forum Cumberland County Forestry Advisory Committee Large Private Landowners Association ELC members	Virtual Meeting	103
July 14, 2021	NPNS retirees ELC member	Access Live Meeting	85
July 14, 2021	Gulf Nova Scotia Bonafide Fishermen's Association ELC Members	In Personal Meeting - Abercrombie Fire Hall	8
July 15, 2021	Maritime Aboriginal Peoples Council Native Council of Nova Scotia ELC member.	Virtual Meeting	9
	Media via Access Live Facebook Live viewers	News Release Media - Access Live	21
	NPNS employees ELC member	Access Live Mtg 1 Access Live Mtg 2	85
July 16, 2021	Northumberland Fishermen's Association ELC members.	In Personal Meeting - Abercrombie Fire Hall	9

Date	Stakeholders in Attendance	Activity	Attendance
July 19, 2021	Town of Pictou Council ELC members Facebook Live	Council Meeting Virtual & FB Live	216
July 20, 2021	Municipality of Pictou County Council ELC member	In Person Council Meeting YouTube	186
July 21, 2021	Town of Stellarton Council Meeting ELC member	In Person Council Meeting	7
August 3, 2021	Municipality of the County of Colchester Council ELC members	Council Meeting Virtual Meeting	17
August 12, 2021	NPNS retirees ELC member	In Person Meeting	14
August 23, 2021	Town of Westville Council ELC member. Facebook Live viewers (34)	In Person Council Meeting Virtual & FB Live	47
August 26, 2021	NPNS retirees ELC member	In Person Meeting	14
August 31, 2021	Town of Trenton Council ELC member	In Person Council Meeting	16
September 1, 2021	NPNS Key Supplier Meeting #1. ELC member	In Person & Virtual Meeting	13
September 2, 2021	Town of Truro Council Meeting ELC members	Council Meeting Virtual & FB Live Website	16
September 3, 2021	Heritage Gas Company	Virtual Meeting	5
September 9, 2021	Media Briefing - Chronicle Herald	In Person Meeting	4
September 9, 2021	NPNS Key Supplier Meeting #2 ELC members	In Person & Virtual Meeting	12
September 14, 2021	NPNS Key Supplier Meeting #3 ELC member	In Person & Virtual Meeting	22
September 21, 2021	Municipality of the County of Antigonish ELC member	In Person Council Meeting	11
September 23, 2021	Deputy Minister NSECC & Team	In Person Meeting	5
September 30, 2021	NP Woodlands employees	In Person Meeting	10
	Wood Suppliers ELC members	Virtual Meeting	19
October 4, 2021	NS Salmon Association ELC member	Virtual Meeting	16
October 8, 2021	Irving Equipment ELC member	Virtual Meeting	12
October 12, 2021	Commission of the Village of Bible Hill ELC member	In Person Meeting	13
October 14, 2021	Nova Scotia Chambers of Commerce ELC members	Virtual Meeting	16
October 22, 2021	Deputy Minister NS Natural Resources and Renewables & Team.	In Person Meeting	9
October 27, 2021	Landowners Organization ELC member	Virtual Meeting	17

3.2.4 Identified Issues and Concerns

A review of all the comments through the EA process for the *Replacement ETF Project*, as well as recent stakeholder input, has led the ELC to identify several areas to be addressed by NPNS:

- **Vision** - A vision was needed to address the sustainable future of NPNS.
- **Lack of Community Trust and Leadership** - Many stakeholders felt that NPNS should have been more active in dealing with environmental issues. The ELC heard concerns from many stakeholders regarding the leadership at the mill. It was their view that leadership prioritized mill production over managing public issues and stakeholder concerns.
- **First Nations** – NPNS needed to take the necessary steps and time to reconcile with PLFN and be committed to building relationships, respecting Mi'kmaq rights and traditions, and supporting their social, cultural, environmental and educational goals.
- **Transparency** - NPNS needed to build trust and transparency with the community.
- **Water Quality** – Water quality concerns were provided in the comments on the previous EA Focus Report (Dillon 2019b) and by ELC members. These were conveyed to the design engineers for the project itself, resulting in the current project design.
- **Air Quality** – Many stakeholders expressed frustration with the odour caused by operation of the mill and there were concerns raised about the air quality in the community. Additionally, many people commented on the visibility of stack emissions. These were conveyed to the design engineers for the project itself, resulting in the current project design.
- **Forestry Practices** - Most stakeholders felt strongly that forestry in Nova Scotia must be done in accordance with best practices as outlined in the Lahey Report (Lahey 2018), and in a manner that foresters could make a living. Stakeholders expressed a desire for NPNS to show leadership in supporting the full implementation of the Lahey Report.
- **Energy** – ELC members requested further information on the carbon footprint (greenhouse gases, GHGs) of NPNS. NPNS was requested to make further improvements, if possible.
- **Appearance** – The appearance of the mill needed upgrading to provide an updated, modern appearance.

3.3 INDIGENOUS ENGAGEMENT

Engagement with the Mi'kmaq of Nova Scotia has been ongoing since 2017 during the EA process for the *Replacement ETF Project*. NPNS recognizes the rights and traditions of the Mi'kmaq and is committed to building a meaningful, long-term relationship with local communities, particularly PLFN. The engagement activities that were undertaken for the previous EA assisted in providing the basis for the revision of the project and the design of the *NPNS Mill Transformation Project*. The issues and concerns raised during that process are considered relevant for the current project. **Table 3.2** provides a summary of all engagement activities with the Mi'kmaq from 2017 to present, with additional information provided below.

Table 3.2: Indigenous Engagement from 2017 to 2021

Date	Engagement Activity
April 26, 2017	Consultation meeting between PLFN and the Province of Nova Scotia *
	Technical review, preliminary engineering of ETF, feedback on possible outfall locations
August 25, 2017	Consultation meeting between PLFN and the Province of Nova Scotia *
	Project and schedule update, presentation of Receiving Water Study of Pictou Road outfall alternatives for discussion and feedback.
November 23, 2017	Consultation meeting between PLFN and the Province of Nova Scotia *
	Project update and overview of EA process for discussion and questions.
January 8, 2018	Open house for PLFN community members to share project plans and gather feedback and concerns.
January 10, 2018	Native Council of Nova Scotia: Overview of NPNS facilities and business, existing conditions at Boat Harbour ETF, project overview, EA process and next steps
June 11, 2018	Consultation meeting between PLFN and the Province of Nova Scotia *
	Review of marine survey findings and update/sharing of all other studies being undertaken.
October 30, 2018	Consultation meeting between PLFN and the Province of Nova Scotia *
	Project update including BAS system, presentation of Caribou outfall alternative for feedback and concerns.
April 29, 2019	Consultation meeting between PLFN and the Province of Nova Scotia *
	Focus Report process, timeline and engagement opportunities; PLFN perspective on environmental matters.
July 3, 2019	Consultation meeting between PLFN and the Province of Nova Scotia *
	Seek feedback on methodology for impact assessment of treated effluent on key marine species.
July - September 2019	Provide methodologies and seek feedback for proposed studies to address concerns raised by PLFN including: ▪ Air Dispersion Modelling including contaminants of concern; ▪ MEKS; ▪ Fish and Fish Habitat Impact Assessments ▪ Future EEM Monitoring Program
November 12, 2019	Consultation meeting between PLFN and the Province of Nova Scotia *
	NPNS landfill, EA and Project schedules.
March 2020 - March 2021	Meetings and email communications to address PLFN concerns related to: ▪ Mill shutdown winterization activities ▪ Mill hibernation activities ▪ Boat Harbour ETF decommissioning plans ▪ Boat Harbour ETF transition plan to prevent odours caused by potential septicity ▪ Air quality – pollution dispersion roses ▪ Effluent pipeline inspection and decommissioning ▪ *Replacement Effluent Treatment Plant Project* EA ▪ Aerated stabilization basin decommissioning
October 2020 - January 2021	Meetings and email communications to seek input into the removal of the effluent pipeline from Indian Cross Point to Hwy 348 to address PLFN concern that NPNS may try to regain approval to start-up the mill and continue using the BHETF. PLFN participated in the removal of the pipeline.
October 2020 -January 2021	ELC meeting notes and press release shared with PLFN for comments. Subsequently, PLFN requested that ELC communications cease.
May 14, 2021	Draft of Mill Transformation Project Description sent by email to PLFN for comment.

Date	Engagement Activity
May 19, 2021	Final Mill Transformation Project Description shared with PLFN via email.
May 28, 2021	Offer to review Mill Transformation Project Description and answer questions.
July 6, 2021	Offer to present Mill Transformation Project Presentation and answer questions.
July 13 thru 15, 2021	Mill Transformation Project consultation update, project press release and link to www.tomorrowsmill.ca project website.
July 15, 2021	Native Council of Nova Scotia meeting: Overview of Mill Transformation Project
* Consultation meeting under the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference between PLFN and the Province of Nova Scotia regarding proposed NPNS *Replacement Effluent Treatment Plant Project*	

3.3.1 Indigenous Engagement (2017 – 2019)

As part of the process for the EA for the *Replacement ETF Project*, NPNS engaged with the Mi'kmaq of Nova Scotia as part of its responsibility as proponent under the *Environmental Assessment Regulations*, and attended the Provincial Crown's formal consultation meetings when invited. Details of this engagement are provided in the EA Registration Document (Dillon 2019a) and the Focus Report (Dillon 2019b). Engagement was completed through direct communication, in person meetings, and digital communication and input.

As per Section 6 of the 2010 Mi'kmaq Nova Scotia Canada Consultation Terms of Reference, PLFN led the consultation on behalf of the Assembly of Nova Scotia Mi'kmaq Chiefs. Engagement was predominantly with PLFN Chief, Council and staff. Members of PLFN were concerned about the project and submitted comment forms following a community engagement session held in January 2018.

The Crown as represented by the Province of Nova Scotia maintains regular consultation with PLFN as with all Indigenous communities in the province. Prior to the initiation of the previous EA process, NPNS as proponent was invited to participate in meetings held by the Province and PLFN to discuss early project planning and design of a replacement ETF, beginning in March 2017. NPNS looks forward to subsequent holistic consultation meetings (including settlement and funding).

3.3.2 Mi'kmaq Ecological Knowledge Study (2018 - 2019)

The Mi'kmaq people have a long-existing, unique and special relationship with the land and its resources, which involves conservation of natural resources, as well as spiritual ideologies. This knowledge is held by Mi'kmaq individuals and has been passed on from generation to generation. This process is referred to as *kisaku kinutemuatel mijuijij*, in the Mi'kmaw language, and is an important part of their culture. In early 2018, a Mi'kmaq Ecological Knowledge Study (MEKS) was undertaken by a highly regarded Indigenous consultant (Membertou Geomatics Solutions) on behalf of NPNS, as a means by which to incorporate Mi'kmaw environmental concerns and ecological knowledge into the previous project. Fifty-two knowledge holders from PLFN were interviewed between March and June 2018.

In 2019, an update to the prior MEKS was undertaken to reflect the re-alignment of the effluent pipeline. Interviews were undertaken by the MEKS Team with Mi'kmaq knowledge holders from the communities of PLFN, Paq'tnkek and Millbrook First Nations. The interviews took place from May 2019 until June 2019. Information gathered during the previous report was implemented into the 2019 study.

Consistently, topics of concern in the draft MEKS included illness in the community and the risk of negative impact the project was believed to pose to fisheries and fish habitats. PLFN has a clear history and connection to Boat Harbour (A'se'k). The clean up of Boat Harbour was another regular theme of input provided.

3.3.3 Recent Engagement with Pictou Landing First Nation (2019 - Current)

NPNS has committed to the following three principles to guide any future business activities with PLFN and with all the Mi'kmaq of Nova Scotia:

- Listen, learn and respect Indigenous beliefs, traditions and values;
- Work with integrity and in direct communication and collaboration, and
- Find respectful ways to move forward together with valuable guidance from the Mi'kmaq.

NPNS is prepared to engage in discussions to identify meaningful reconciliation, including partner relationships that will promote employment, entrepreneurship, skills training and education, health and welfare, environmental sustainability practices, and other social and community benefits for current and future generations of members of PLFN. NPNS has worked in good faith to address three conditions precedent to PLFN engaging with NPNS, raised by PLFN in the spring of 2020. These were:

- Withdraw the *Replacement ETF Project* from the EA process.
- Withdraw the application for judicial review of the Minister of Environment's decision to require the submission of an EA Report for the *Replacement ETF Project*.
- Address PLFN's concerns regarding discrimination on social media platforms.

By spring 2021, NPNS had met all three conditions. A fourth condition precedent involving litigation filed by PLFN in 2010, was subsequently raised and is currently under review. NPNS looks forward to working collaboratively prior to and as a participant in the Crown consultation process.

In October 2020, after consultation with NSECC and NS Lands, NPNS removed the effluent pipeline between Indian Cross Point and Hwy 348 in Pictou Landing. This had been a point of contention with PLFN, and NPNS approached the project with the hope of building goodwill between PLFN and NPNS that would lead to working together in the future.

In the fall of 2020, NPNS approached PLFN to be a part of the newly formed ELC. PLFN did not wish to participate in the ELC as a committee member. The ELC will continue to encourage dialogue with PLFN, but was asked to stop sending the minutes of their meetings to PLFN in December 2020.

In addition to providing information related to decommissioning and hibernation, NPNS shared a description of the *Mill Transformation Project* with PLFN in May 2021, and has offered to engage in detailed discussions with them.

3.3.4 Identified Issues and Concerns

The main concerns voiced during Mi'kmaq engagement have been:

- Impacts to human health, especially to Mi'kmaq community members who forage on the land and in the waters in and around the site;
- Impacts to fish and fish habitats, and the resultant impacts on fisheries;

- The clean-up of Boat Harbour (this is a provincial concern, not related to NPNS or this project);
- Impacts to the value of the recreational and natural landscapes, and
- General environmental impacts (odour and appearance) to the local area.

3.4 STEPS TAKEN TO ADDRESS IDENTIFIED CONCERNS

Through extensive engagement and the work of the ELC, NPNS realized that stakeholder concerns could only be addressed through a transformation of the mill. The proposed changes to mill operations and processes, and the new ETF (i.e., the *NPNS Mill Transformation Project*), are designed to transform operations based on BAT, adopting technology and practices that will make the mill a best-in-class operation (see **Section 4.0**). Feedback on the proposed project during the outreach since June 2021 has been constructive, with further consultation planned throughout the development of the EA.

NPNS also recognizes that to succeed, a best-in-class mill must be operated by an organization with a best-in-class culture, and that building relationships based on trust and transparency takes time and significant effort. The company is committed to transforming its approaches and processes, to invest in its societal license to operate, and to build relationships based on trust and transparency, including:

- Implementation of an ISO 14001 compliant environmental management system (EMS), which provides a framework for effective environmental management. NPNS will be audited regularly for compliance and these results will be publicly available.
- An online environmental performance dashboard will be publicly accessible on NPNS' website.
- An independent third party will be retained to conduct environmental testing mandated by regulatory permits. Test results will be posted on the website at the same time as they are submitted to regulators.
- Cameras will be installed on-site and live-streamed so the community can view equipment installation.
- The NPNS website will contain up-to-date information and research conducted during the EA, including frequently asked questions and answers.
- During operations, an annual environmental update meeting will be held for the public to review the environmental performance of the operation, discuss upcoming projects, and answer questions about NPNS' operations including forestry.

4.0 PROJECT DESCRIPTION

4.1 BACKGROUND

In 1965, the Nova Scotia government, envisioning a heavy industrial park in Abercrombie Point, offered raw water supply and effluent treatment as incentive to incoming industries. Three companies were attracted to the area through these incentives. Scott Paper Company and Canso Chemicals took advantage of both the raw water supply and the effluent treatment at the Boat Harbour ETF; Michelin Tire Canada opted for the raw water supply only.

The mill, currently owned by NPNS, was constructed by Scott Maritimes Limited in 1967, and was operated by them until it was sold to Kimberly-Clark Inc. in 1995. Neenah Paper Company of Canada purchased the mill in 2004 and operated it until 2008, when it was sold to NPNS. NPNS operated the mill from 2008 until its closure in 2020. Paper Excellence Canada Holdings Corporation acquired an ownership interest in Northern Resources, the parent company of NPNS, in 2011.

More than $118 million has been invested in capital improvements at the mill since 2011, of which $70 million has been invested in environmental projects: reducing effluent flow; reducing odour, particulate, and GHG emissions, and improving air quality monitoring. Mill upgrades have included: power boiler and recovery boiler upgrades (2011); power boiler scrubber retrofit and black liquor oxidation system (2012); conversion to natural gas (2014), and recovery boiler electrostatic precipitator (2015). These upgrades have led to enhanced environmental performance of the mill, such as:

- Reductions in odorous emissions by more than 90% on average;
- Reduced recovery boiler particulate emissions by 99% on average;
- Reduced mill-wide particulate emissions by more than 80% on average;
- Reduced greenhouse gas emissions by replacing Bunker C fuel with natural gas;
- Reduced organics loading to the effluent so that biological oxygen demand (BOD) was less than 20% of the federal *PPER*, and
- Reduced solids loading in the effluent so that total suspended solids (TSS) was less than 15% of the federal *PPER*.

The Boat Harbour ETF was used to treat effluent from the mill facility from 1967 until January 2020. The process for the treatment of effluent at the Boat Harbour ETF by NPNS was straightforward:

- Effluent from the mill was piped into settling ponds where solid materials, primarily wood fibre and lime, were separated and periodically transferred to a landfill site;
- The remaining water was transferred to an aerated stabilization basin (ASB) adjacent to Boat Harbour, where bacteria metabolized the organic pollutants in the effluent to bring its properties to levels that allowed safe discharge into the environment, and
- The treated wastewater was released into the Boat Harbour basin and from there flowed over a dam into the Northumberland Strait. The treated wastewater was tested at the point of discharge into Boat Harbour in compliance with federal and provincial environmental regulations. The Boat Harbour basin proper was not part of the operating Boat Harbour ETF under the lease.

The Boat Harbour ETF was originally owned and operated by the Province of Nova Scotia. In 1995, NPNS' predecessor took over its operation under a 10-year lease, which was later extended to 2030. However,

the introduction of the provincial *Boat Harbour Act* in May 2015 prohibited the facility from receiving and treating effluent from NPNS after January 31, 2020. With no other immediate solution for effluent treatment, the mill was placed into hibernation in April 2020.

4.2 CURRENT MILL PROCESSES

The current mill configuration and associated processes are described below to provide a general understanding of the bleached kraft process, and to establish the baseline conditions of the mill. **Figure 4.1** shows a flow diagram of the current processes and configuration within the mill.

4.2.1 Fibre Processing

The kraft process (shown as the black pathway on **Figure 4.1**) is as follows:

- Round pulpwood is debarked, chipped and screened, or wood chips are purchased from sawmills.
- Wood chips are conveyed to the **cooking plant** where they are fed into a continuous, **single vessel digester**. Steam and white liquor (caustic and sodium sulphide) are added under pressure to separate the lignin from the cellulose fibre in the wood.
- The cooked chips are washed in a **pressure diffuser** and two **vacuum washers**, then screened to remove uncooked chips, knots and impurities (sand, wood slivers, dirt, etc.) and thickened in another vacuum washer (decker).
- The unbleached pulp then goes to a **five-stage bleach plant**, where the pulp goes from brown to white using chlorine dioxide, caustic, gaseous oxygen and hydrogen peroxide. The mill currently runs a conventional ECF bleaching sequence, consisting of three bleaching stages and two washing stages.
- The bleached pulp is then dewatered and dried to form thick pulp sheets, which are pressed into bales and shipped to customers.

4.2.2 Sodium Liquor Cycle

Mill processes are based on the concept of recycling and reuse of chemical products and there are several cycles for reuse of materials. The intent of the sodium liquor cycle (shown as the green pathway on **Figure 4.1**) is to recycle the black liquor resulting from the digestion process into white liquor that is used for digestion. Sulphur compounds are present at all stages to protect the cellulose wood fibers from damage.

- The black liquor, which contains dissolved lignin naturally present in the wood and inorganic cooking chemicals, is extracted from the unbleached pulp by **vacuum washers**.
- The black liquor, containing about 15% wood solids or lignin (by weight) is thickened via **several stages of evaporators**, which use steam to bring the liquor solids content to approximately 50%.
- The thickened black liquor is put in direct contact with the flue gases from the recovery boiler to further concentrate it to about 65%. This is done in the **direct contact evaporator.**
- The strong black liquor is fired into the **recovery boiler**, where it is burned to produce heat, which is converted to steam in the boiler. The inorganic portion of the black liquor is collected at the bottom of the boiler. Referred to as “smelt”, it consists mainly of sodium carbonate, sodium sulphate (saltcake) and sulphur compounds.

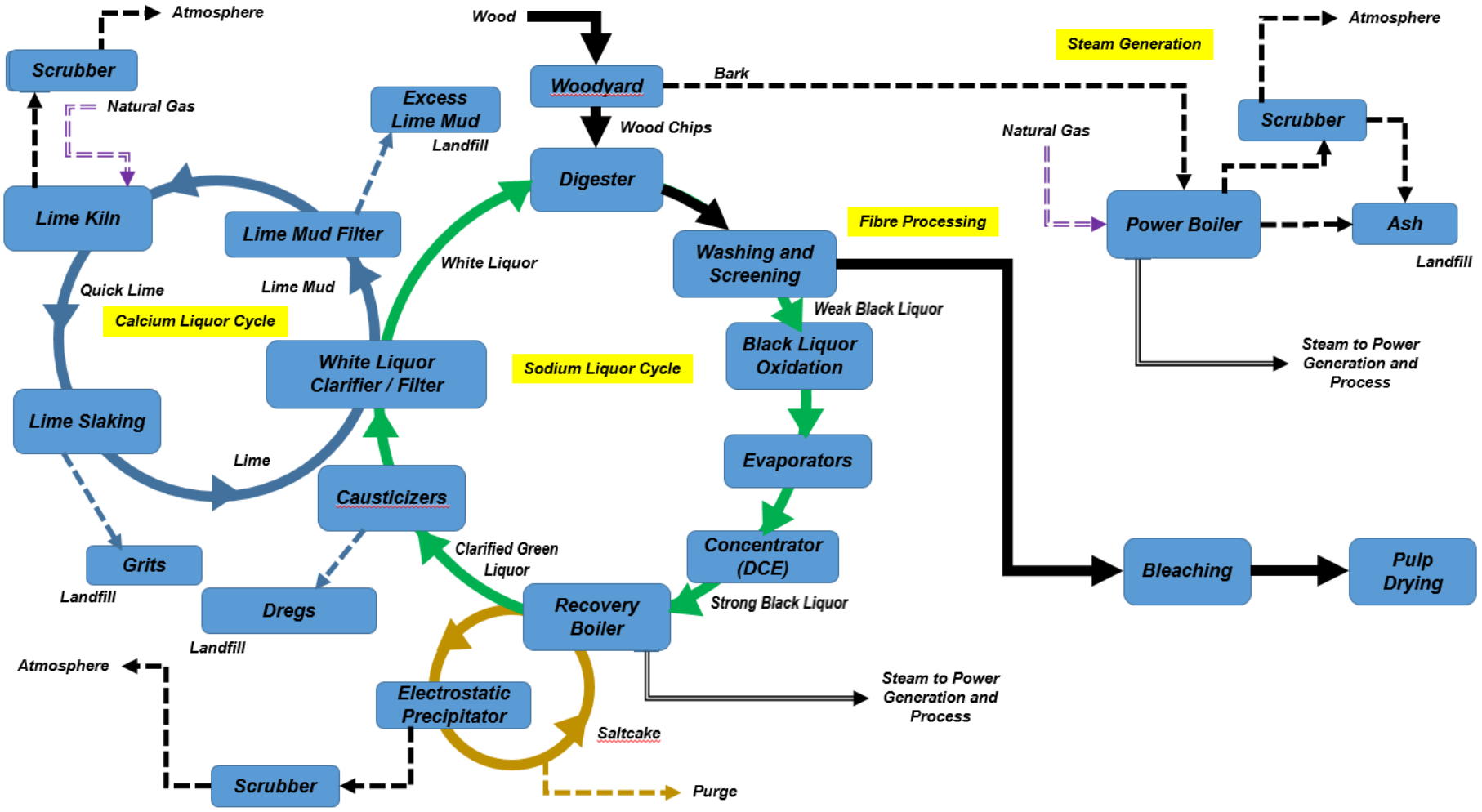


Figure 4.1: Current Mill Process Configuration.

- This smelt is dissolved in water to form **green liquor**, which is clarified and then sent to a series of tanks called **causticizers**, where the sodium carbonate is converted to caustic using lime (now called white liquor).
- The white liquor is then clarified by settling the unreacted lime in a **white liquor clarifier** and sent to the digester to be reused in the chip cooking process.

4.2.3 Calcium Liquor Cycle

The calcium liquor cycle (blue pathway on **Figure 4.1**) recycles and reuses the calcium carbonate or lime mud, as follows:

- Cleaning of the causticizers yields calcium carbonate, or lime mud (solids). These are cleaned, washed and thickened prior to being sent to a **lime kiln**.
- In this kiln, high heat is applied to the lime mud to drive off the bound carbon dioxide, which changes to quick lime. Off gases from the combustion process are passed through a **scrubber at the exit of the kiln**, to remove both particulate matter and residual sulphur compounds that were released from the lime mud.
- This quick lime is added in the causticizer to reactivate the white liquor.

4.2.4 Steam Generation

Steam is required in several parts of the kraft process. It is generated by the **power boiler** and the **recovery boiler** as follows:

- The bark removed from the wood logs, as well as other wood debris, is sent to the **power boiler**, where it is burned to produce high pressure steam. Natural gas is also used as a complementary fuel intermittently in the winter to maintain steam production.
- The steam from both the power and recovery boilers is sent to the **turbine** to produce more than 90% of the mill's electricity needs. By-product steam from the turbine is then used in the kraft process for heating and drying purposes.
- Air emissions from the power boiler are controlled by a **wet scrubber**, while the emissions from the recovery boiler are controlled by both an **electrostatic precipitator** and a **wet Modo scrubber.**
- The solids (fly ash) collected in the power boiler scrubber are blended with the bottom ash and sent to a holding pond for dewatering and ultimate disposal in the on-site landfill.

4.2.5 Effluent Treatment

Effluent is generated at various stages in the kraft process, as indicated in **Figure 4.2.** Effluent collection and treatment are critical to the mill process.

- Effluent and excess cooling water from the mill is collected through **a network of pipes and floor trenches** and sent to a central collection point, where carbon dioxide is injected, if necessary, in the **lift pumps** to control the wastewater's pH level.
- Until January 2020, the lift pumps sent the untreated effluent, via a large diameter pipe, under the East River to the **Boat Harbour ETF**. This was a secondary treatment plant with a primary settling pond and secondary aerated stabilization basin, to metabolize the organic compounds present in the wastewater and bring its properties to levels that allowed the mill to discharge it to the Boat Harbour basin and from there it flowed over a dam into the Northumberland Strait.

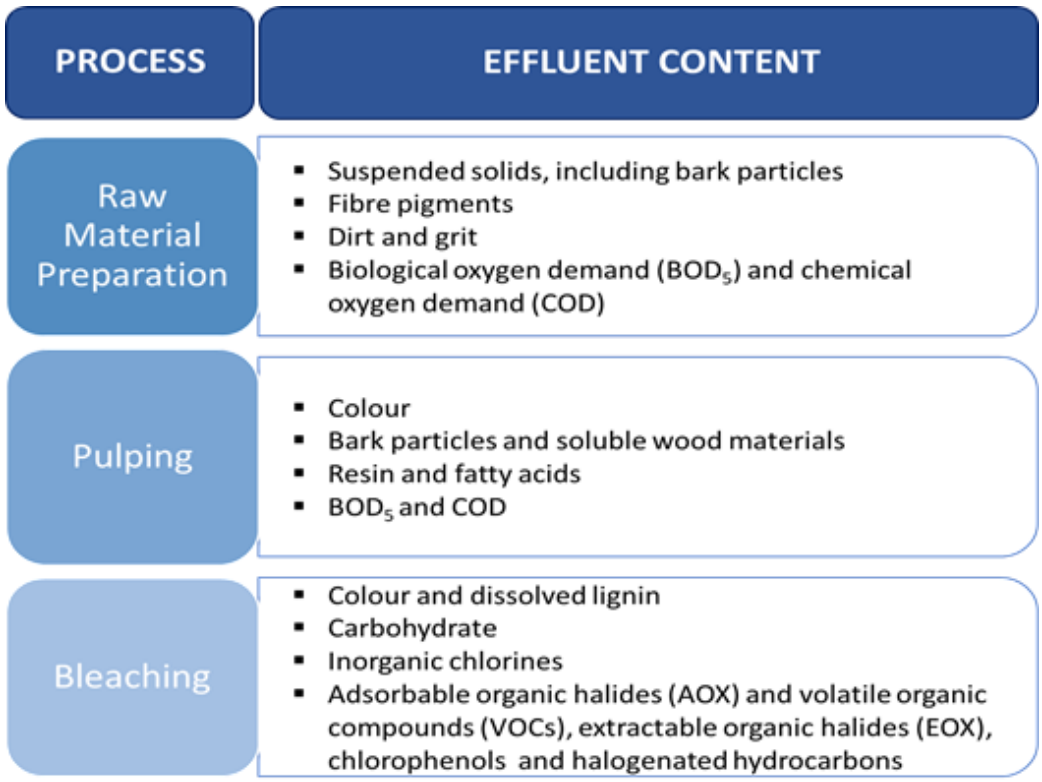


Figure 4.2: Effluent Streams Generated During the Kraft Process.

4.3 PROJECT COMPONENTS

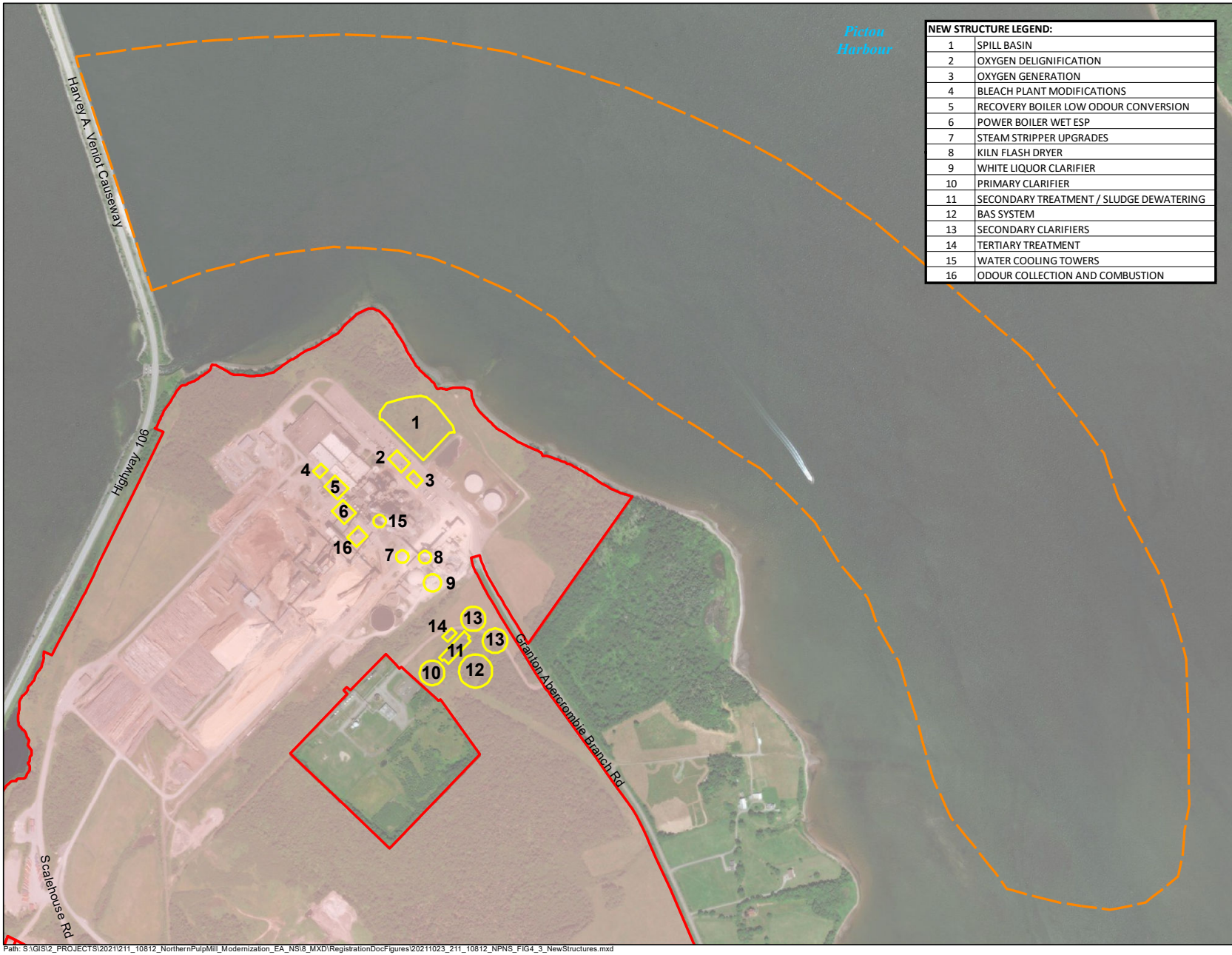
Project components include the infrastructure and process components that will be changed or upgraded as part of the project. The chosen technologies meet the definition of BAT, further described in **Section 4.3.3.** The layout of the project's components on the site is shown in **Figure 4.3**. Most of the mill components will be within the footprint of the current mill (**Figure 4.4**); the oxygen delignification and oxygen generation buildings will be built on the current parking area. The ETF components and spill basin will be constructed on natural land.

4.3.1 Mill Transformation Components

4.3.1.1 Washing and Screening

After the wood chips are cooked in the digester, they are washed and screened to remove uncooked chips, knots, rocks and gravel. Existing secondary knotters in the screening area will be replaced with a **modern secondary knotter** allowing full recovery of uncooked wood and black liquor from the pulp. The uncooked wood and black liquor will be separated from the rocks and gravel and returned to the digester for recooking.

One of the sources of odour from the mill operation arises from the direct venting of washer hoods in the brown stock area (where unbeached pulp is washed). The high-volume, **low-sulphur concentration gases will be collected** from the brown stock washer hoods to minimize the odour from this area. This volume of air, once collected, will be piped and used as a boiler air supply.



NEW STRUCTURE LEGEND:	
1	SPILL BASIN
2	OXYGEN DELIGNIFICATION
3	OXYGEN GENERATION
4	BLEACH PLANT MODIFICATIONS
5	RECOVERY BOILER LOW ODOUR CONVERSION
6	POWER BOILER WET ESP
7	STEAM STRIPPER UPGRADES
8	KILN FLASH DRYER
9	WHITE LIQUOR CLARIFIER
10	PRIMARY CLARIFIER
11	SECONDARY TREATMENT / SLUDGE DEWATERING
12	BAS SYSTEM
13	SECONDARY CLARIFIERS
14	TERTIARY TREATMENT
15	WATER COOLING TOWERS
16	ODOUR COLLECTION AND COMBUSTION

KEY MAP:

LEGEND:

- Marine Study Area
- New Structure Locations
- NPNS Property

N
W E
S

PROJECT:

PROJECT:
NPNS MILL
MODERNIZATION PROJECT

PROJECT NO.: 211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
NEW STRUCTURES &
POTENTIAL DISCHARGE AREA

FIGURE NO.:	REVISION NO.:
4.3	0

SCALE: 0 50 100 200 300 400 Metres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY:	CHECKED BY:
T. MOREHOUSE	J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-18

WSP Canada Inc.
1 Spectacle Lake Drive,
Dartmouth, Nova Scotia
www.wsp.com

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Figure 4.4: 3-Dimensional Rendering of Project Components.

4.3.1.2 Oxygen Delignification

Oxygen delignification, often called oxygen bleaching, is considered BAT for ECF bleached pulp production. It is the first step of the bleaching process; in this stage oxygen and alkali are used to remove a portion of the residual lignin in the pulp after cooking. It is a "bridging step" between cooking in the digester and final bleaching.

Oxygen delignification can be installed as either a one-stage or a two-stage system, with the two-stage system able to remove more residual lignin than a single stage. NPNS has opted to install the more advanced **two-stage system**, which is able to reduce the residual lignin going to the bleach plant by as much as 50 to 60%. The additional lignin that is removed is recovered with the black liquor instead of being lost to the effluent in the final bleaching process. The use of oxygen delignification will:

- Reduce the chlorine dioxide bleaching chemicals;
- Reduce the adsorbable organic halides (AOX) loading to effluent treatment (fewer chlorine compounds);
- Increase the process yield (kg of pulp per tonne of wood);
- Reduce the chemical oxygen demand (COD) loading to effluent treatment, and
- Increase the thermal efficiency of the process (more lignin is sent to the recovery boiler).

Oxygen delignification requires oxygen to implement and will require on-site oxygen generation. A new building will be constructed next to the oxygen delignification building to house the **oxygen generator** (see **Figure 4.3**).

4.3.1.3 Bleach Plant Modification

To be considered BAT, the existing **bleach plant** will be modified to carry out the first bleaching stage at medium consistency (6-9% pulp fibre). Medium consistency bleaching is more efficient than low consistency bleaching and is possible due to the higher-consistency upstream oxygen delignification stage.

4.3.1.4 Lignin Separation

To process the additional black liquor recovered by oxygen delignification and improved spill collection systems, about 10% of the lignin present in the black liquor will be extracted as a by-product, instead of being burned in the recovery boiler. Otherwise, the additional lignin solids would bring the recovery boiler over its design capacity. Excess lignin will be extracted from the black liquor stream to create a side-stream of natural biopolymer that is becoming a substitute for fossil fuels and their derived polymers (plastics). The lignin may be burned to replace fossil fuel at the mill or sold commercially as a green energy raw material. There are several proprietary commercial processes available to **separate lignin** from the other components of black liquor; the technology selection will follow in the detailed engineering phase of the project.

4.3.1.5 Green and White Liquor Clarifier Upgrades

The installation of oxygen delignification will create an additional solids load to the recovery boiler and increase the amount of liquor that must be processed through the sodium liquor recovery cycle. To manage the additional flow, the following process changes will be carried out:

- Repurpose the #2 green liquor clarifier as a **green liquor storage tank**;

- Repurpose the white liquor clarifier into a second **green liquor clarifier**;
- Decrease the flow to both green liquor clarifiers in parallel to reduce their rise rates, and
- Construct a new **white liquor clarifier**.

4.3.1.6 Calcium Liquor Cycle Upgrade

The installation of oxygen delignification will increase the mill's caustic (white liquor) requirements. The lime mud pressure filter, lime mud thickener and the lime kiln will all be undersized once oxygen delignification is implemented. To address this, the following process changes will be carried out:

- The white liquor pressure filter (Ecofilter) will be repurposed as a **lime mud filter**, to work in parallel with the existing pressure filter (Clarifil).
- A **lime mud flash dryer** will be installed at the inlet of the kiln. Along with providing more lime production capacity, the flash dryer will recycle hot kiln exhaust waste heat to drive off water in the lime mud before it enters the kiln. This will significantly reduce the amount of fossil fuel needed to operate the kiln.

4.3.1.7 Recovery Boiler Low-Odour Conversion

To ensure there is minimal odour during normal operating conditions, NPNS will convert the recovery boiler to a low-odour configuration. This will allow the combustion of spent cooking liquor (black liquor) at higher concentrations. The following will be added to the recovery boiler as part of the low-odour conversion:

- An **indirect contact concentrator** will replace the direct contact evaporator to produce a solids level of 83%; thus, reducing the volume of the boiler stack emissions;
- A **fourth level air system** will be installed on the recovery boiler to allow better distribution in the combustion zone and the proper introduction of sulphur-containing gases for destruction in the recovery boiler, and
- A **larger economizer** will be installed in the recovery boiler to increase energy efficiency.

The new technology will incorporate the collection of vent gases that contain pollutants of concern. These will either be scrubbed to remove pollutants, or be incinerated in the recovery boiler and the lime kiln to recover and return elements to the process (e.g., streams containing sulphur compounds). Additionally, a **backup combustion device** for both the concentrated and dilute sulphur-containing off-gases, currently sent to the recovery boiler and the lime kiln, will be installed.

4.3.1.8 Steam Stripper System Upgrade

The mill already has an effective condensate stripping system, with condensates recycled in the mill extensively as dilution and wash water in the brown stock area. While these condensates are relatively clean, they still contain reduced sulphur compounds that can be released to the air, creating odour issues if the vent gases from the various washers and other pieces of equipment are not collected and treated. The **steam stripper** will be upgraded to provide more condensate stripping capacity, by installing additional trays as well as upgrading the feed and discharge pumps surrounding the stripper system. Improved collection and burning of organic vapours will increase green energy recovery at the mill and prevent them from leaving the mill as COD load in the effluent.

4.3.1.9 Scrubber Decommissioning and Replacement

The current mill configuration led to multiple visible plumes, caused mainly by the water used to scrub the flue gases from the recovery boiler, the power boiler and the lime kiln. To address these, the following process changes will be implemented:

- The **decommissioning** of the recovery boiler **Modo scrubber**, which is currently required to reduce the amount of sulphur being released to the atmosphere. This sulphur will now be collected within the new advanced process.
- The replacement of the power boiler venturi (wet) scrubber with a **wet electrostatic precipitator**. A wet scrubber is no longer required for sulphur removal, as the mill no longer uses Bunker C fuel oil in the boiler. This will also significantly reduce particulate matter emissions from the boiler.
- The addition of a **flash dryer** in the lime kiln to support oxygen delignification, and decrease the natural gas used.

4.3.1.10 Spill Containment and Cooking Chemical Recovery Upgrades

To bring the mill's spill collection system to BAT status, the following will be carried out:

- **Low-solids evaporation system** - A separate low-solids evaporation system will be installed to pre-evaporate dilute liquor recovered from the recovery boiler area process sewer, prior to recycling it into the main liquor evaporation system.
- **Spill buffer tanks** - An emergency spill tank was installed in 2011 with the capability of handling either weak or heavy liquor. An additional liquor storage tank will be constructed as part of the low-solids evaporation system.
- **External spill basin** - A spill basin, with a capacity of 35,000 m^3, will be built to provide a buffer between the mill and the new effluent treatment facility in case of a major process upset. This spill basin, able to contain ~20 hours of mill effluent, would be normally kept empty.
- **Chemical spill containment and recovery** - The spill containment, collection, detection, and recovery system will be upgraded to minimize both liquor losses and the potential impact of inorganic chemical spills. Floor trenches will be re-routed, bulk chemical storage tanks will be diked, and increased instrumentation, such as additional pH and conductivity sewer measurements, will be installed.

4.3.1.11 Water Use

Water is used in various processes throughout the mill including washing and transporting pulp, pulp bleaching, diluting and preparing process chemicals (in the sodium and calcium cycles), generating steam and electricity, and as cooling water. A simplified water balance is provided in **Figure 4.5**. Most water used by the mill is pumped from the Middle River, although some enters the mill process in the form of moisture in the raw wood. Much of the water is recycled through the processes, with water leaving the mill as vapour, pulp water content and effluent discharge.

Water from the Middle River was previously withdrawn at an annual average of about 75,000 m3/day; with the mill transformation, the future abstraction from Middle River will drop to about 50,000 m^3/day. Water reduction projects will include the decommissioning of the power boiler wet scrubber and the installation of **cooling towers** to recycle water. The mill's present configuration includes collection of

non-contact cooling water for reuse in the pulping process, but the temperature of the returning water prohibits it from being reused for cooling and excess warm water is wasted as effluent.

One new set of cooling towers will be constructed on the cooling water loops within the mill to sufficiently cool the warm returning water and allow it to be reused again for cooling applications. A second set of cooling towers will be constructed as part of the ETF to indirectly cool effluent to temperatures that are optimal for biological treatment. A more expensive option to incorporate indirect cooling through a combination of cooling towers and heat exchangers was chosen to mitigate potential odour releases. As an added benefit, the warm freshwater loop will be able to provide low grade waste heat that may be utilized in another project.

These changes will bring the mill to BAT status with respect to its use of cooling water, as well as reduce the overall water consumption and reduce seasonal variability in water withdrawal.

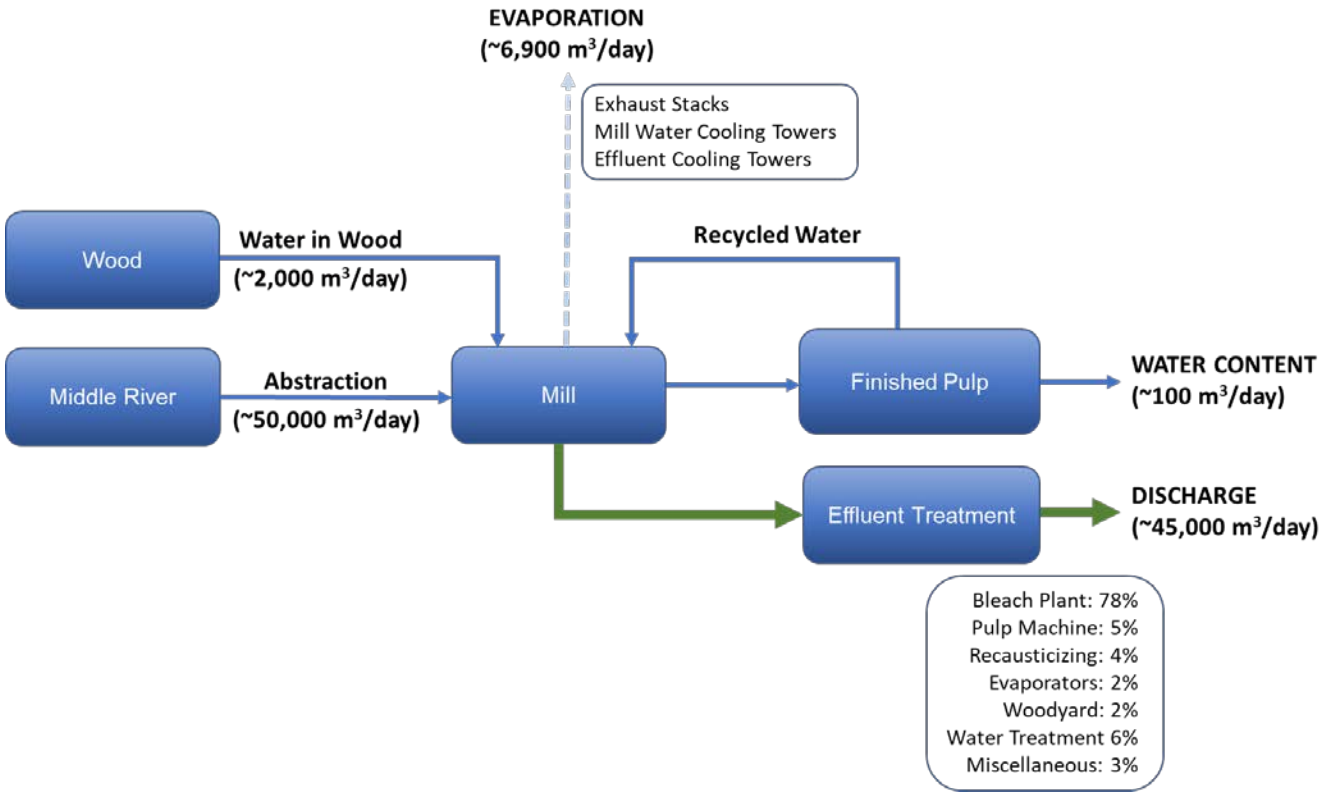


Figure 4.5: Water Use at the Mill.

4.3.1.12 Mill Façade and Aesthetics

The mill transformation will include the exterior of the building and its aesthetic appeal, as well as the changes to the internal components. The most obvious change will be the significant decrease in the visible plumes from the stacks. These are caused mainly by the water used to scrub the flue gases from the recovery boiler, the power boiler and the lime kiln. With the decommissioning of the Modo scubber and the replacement of the power boiler venturi (wet) scrubber with a wet electrostatic precipitator, visible plumes will be minimized.

In addition, considerable work will be undertaken to rejuvenate external areas of the mill, including the cleaning of brick facades, cladding replacement, obsolete equipment and tank removal, repainting and general landscaping.

4.3.2 Effluent Treatment Facility Components

Kraft mill effluents are characterized by their content of suspended solids, organic matter and colour due to the presence of lignin, lignin derivatives and tannins. Additionally, mill effluents contain AOX and wood extractive compounds (resin acids, fatty acids, phytosterol) and show high conductivity due to the chemical compounds used in the digestion process of pulp. Changes to the mill configuration will ensure a reduced amount of effluent to the ETF (design flow) and reduced organic loading and chlorinated compounds in the untreated effluent.

The ETF is designed to transform mill effluent to meet or exceed environmental standards for discharge to the receiving environment through the implementation of a three-stage treatment process (also referred to as "advanced treatment"). When leaving the secondary treatment system, the treated effluent will meet all applicable discharge regulations, but NPNS is proposing a new tertiary treatment system, after the secondary treatment and before discharging the effluent to the receiving environment.

All new components associated with the proposed ETF will be located on the mill property, beside the main mill access road (see **Figure 4.3**). This includes the primary clarifier, effluent cooling towers, the aeration basins, both secondary clarifiers, tertiary treatment, and the new building(s), which will house the effluent pumps, heat exchangers and cooling towers, aeration blowers, sludge dewatering system, and the effluent treatment system control room.

4.3.2.1 Primary Treatment

Primary treatment, which is the removal of solid waste from the effluent, will take place in two stages. First, an automatic **raked bar screen** will be installed ahead of the lift station to remove any large debris that may make it into the mill's floor trenches. Several **internal spill containment** measures (re-routing of floor trenches, bulk chemical storage tank diking, etc.) will be implemented within the mill to minimize the potential impact of inorganic chemical spills on the ETF. Secondly, a concrete **circular clarifier** will be installed, which will remove solid waste, primarily wood fibres and lime, by gravity.

4.3.2.2 Secondary Treatment

Secondary treatment of wastewater applies biological processes to break down dissolved and suspended biosolids using bacteria. The mill ETF secondary treatment will consist of **Veolia's AnoxKaldnes™ biological activated sludge** (BAS) process, which combines moving bed biofilm reactor (MBBR) technology with conventional activated sludge. The BAS treatment process was developed based on modern biotechnological principles and the **MBBR technology**. The individual components in the BAS system will be resized from the previous design (see previous *Replacement of ETF Project*, Dillon 2019a), based on the reduced design effluent flow and reductions in organic loading and chlorinated compounds in the untreated effluent because of the mill transformation.

This system is considered BAT for secondary treatment of kraft pulp mill effluent. Similar system configurations are currently in operation at 52 pulp and paper facilities worldwide, including over 20 chemical pulp mills (60–75% of all the biological effluent treatment plants in the pulp and paper industry

use activated sludge systems). The system is also extensively used in municipal wastewater treatment applications; there are over 800 municipal and industrial BAS systems installed globally.

The BAS process is designed for a soluble COD removal efficiency of up to 70% overall when combined with oxygen delignification. The MBBR system is a pre-treatment stage, designed to remove about 40% of the easily or readily biodegradable soluble COD present in the untreated effluent. It acts as a buffer to protect the activated sludge system from peak loads, and to manage upsets prior to the activated sludge treatment stage. This promotes a stable and more efficient activated sludge process, with improved sludge settling characteristics. A larger activated sludge stage is designed for a solids retention time of seven days, the duration that activated sludge bacteria remain in the system. It is expected to remove up to 30% more of the soluble COD.

With the reduction in untreated COD stemming from the various process modifications (oxygen delignification, better solids recovery, etc.), the effluent colour will be significantly reduced before treatment. Additionally, nutrients, in the form of nitrogen and phosphorus, come primarily from the effluent treatment plant itself since that process needs nutrients to function properly. Proper dosing and monitoring will be put in place to minimize carryover.

4.3.2.3 Tertiary Treatment

The tertiary treatment stage, consisting of **rotating disc filters** (Veolia's Hydrotech Filters), will remove a significant amount of suspended biosolids and effluent colour. The TSS load has been estimated at 1.2 kg/t (from the 2019 annual average of 2.5 kg/t) and colour at 300 TCU (from the 2019 annual average of 980 TCU) due to the tertiary treatment. The tertiary treatment stage will operate year-round, making the mill the only kraft mill in North America to have tertiary treatment on its total mill effluent year-round. The addition of an advanced tertiary treatment stage to the already proposed primary and secondary effluent treatment stages will allow discharge of the effluent into the Pictou Harbour estuary.

4.3.2.4 Sludge Management

Pulp mill sludge is an organic residual generated from the ETF. These solids will be removed, collected, thickened, and used in the power boiler. **Rotary presses** will be installed to process the biological solids, with the resulting solids content averaging about 30%. To alleviate and mitigate the public concerns associated with the burning of sludge, a new **high-efficiency precipitator** will be installed on the power boiler stack. This will reduce water consumption and be significantly more efficient at collecting particulate from the stack.

4.3.2.5 Effluent Discharge

The effluent from the ETF will be discharged into the Pictou Harbour estuary from Abercrombie Point. The exact discharge point will be determined through a detailed receiving water study to be undertaken as part of the environmental assessment and engineering design process, but the approximate marine study area is indicated in **Figure 4.3**. Effluent will be released through a pipe, fitted with an engineered multi-port diffuser to meet BAT. The diffuser will promote mixing within the discharge area allowing the effluent to be mixed with ambient waters more efficiently to background concentrations.

A large spill basin, with a volume of 35,000 m^3 will be built to provide a buffer between the mill and the ETF in case of a major process upset. The spill basin will be able to contain 20 hours of mill effluent and

will be kept empty during normal operation of the mill. It will provide environmental protection for the ETF as well as the receiving environment.

4.3.3 Design Standards and Codes

The project components have been designed to meet BAT standards for the pulp and paper industry. BAT is defined as "the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges" (United Nations *et al.* 2005). BAT for the mill includes both the technology used and the way in which the facility is designed, built, maintained, operated and decommissioned. "Available technology" refers to those techniques that are accessible to the mill and that are developed on a scale that allows implementation, under economically and technically viable conditions, while the term "best" means effective in achieving a high general level of protection of the environment.

The project will be constructed to meet applicable federal and provincial environmental, industrial, building, and safety codes and standards. Building codes, such as the *National Building Code of Canada,* provide safety factors for environmental loading (e.g., snow load, high winds, seismic events), and project-specific activities and events. Compliance with these reduces the potential for adverse environmental effects because of an accident, malfunction or unplanned event. The engineering design of the project will consider and incorporate potential future changes in the forces of nature that could affect its operation or integrity (e.g., climate change), and project components and infrastructure will be designed and built to adapt to or withstand these effects.

Predicted concentrations of air contaminants of the mill transformation project will be assessed against the Maximum Permissible Ground Level Concentration Limits presented in the Nova Scotia *Air Quality Regulations* (150/2017, as amended on October 12, 2017). Fine particulate matter will be assessed against ambient air quality standards included in the Canadian Ambient Air Quality Standards (CAAQS). The remaining air contaminants of interest will be compared to Ontario Regulation 419/05- *Air Pollution – Local Air Quality* (O. Reg. 419/05) criteria, in the absence of Nova Scotia provincial standards and for comparison purposes.

Effluent discharge will meet the federal *PPER*. The existing *PPER* incorporated scientific research and data to develop Canadian standardized pulp mill effluent limits, which all pulp and paper mills in Canada must adhere to. The purpose of the *PPER* is to manage threats to fish, fish habitat, and human health from fish consumption, by limiting the deposit of deleterious substances into fish bearing waters. The *PPER* set limits on the amounts of BOD and suspended solids that may be deposited, and prohibit deposits of effluents that are acutely lethal to fish. Significant improvements in the quality of the effluent from pulp and paper mills have been achieved in Canada since the *PPER* were first published in 1971.

New draft *PPER* were issued for consultation by ECCC in 2017 and will be finalized and implemented at some point in the future. ECCC has gathered and evaluated five decades of data to establish the new draft *PPER*. The NPNS effluent discharge will be designed to meet or exceed the new anticipated and more stringent federal *PPER*.

Clearly defined effluent limits are necessary inputs for the detailed design of the new tertiary treatment stage of the ETF, as well as being a required input to the RWS. NPNS will assume that the draft *PPER* will become the future legal enforcement limits and that these will be applied in Nova Scotia, as is done in most jurisdictions in Canada, including all Atlantic Canada. These will be used as the worst-case effluent

quality inputs in the RWS, and the ETF design. If the results of the RWS and risk analysis indicate potential detrimental effects to human health or the environment, these will be mitigated through design to improve effluent quality. A significant revision of any environmental limit after the fact would delay the design and construction of the project. The design engineers and potential equipment vendors selected to bid on the project can not finalize the design unless the end goals are known.

A list of applicable regulations for the project is included in **Section 2.0**. Operation will be conducted under a provincial Industrial Approval for the overall pulp facility.

4.4 PROJECT PHASES AND ACTIVITIES

4.4.1 Construction Phase

The construction phase will be initiated following the receipt of EA approval and all required permits, approvals, licenses and authorizations for the project (see **Section 2.0**). During construction, environmental monitors will enforce the construction specifications, site-specific environmental mitigation measures contained in the project Environmental Management Plan (EMP, see **Section 4.8**), and any regulatory approval conditions. Applicable best practices, restrictions and details from the EMP will be included in the construction drawings so that construction methodology is compliant with it.

Construction activities for the project include both new construction and repurposing of existing components as described in **Section 4.2**. All project construction activities will occur within NPNS property boundaries at Abercrombie Point, except for the effluent pipeline into the receiving water. A temporary work area (i.e., for equipment and staging areas) will be located close to the construction of the ETF, with the final location to be determined.

4.4.1.1 Engineering Survey and Utility Location

Prior to final design and construction, a survey crew will survey and stake any boundaries of the new components not previously surveyed, as well as all temporary workspaces and access routes required for construction purposes. The marine-based pipeline placement will be surveyed when permitted by weather and/or marine traffic.

Following site surveys, all utilities (e.g., telephone lines, power lines) will be located. Buried services will be "daylighted" if there is any confusion in their location. Temporary and permanent environmental buffer areas will also be marked in the field.

Geotechnical investigations will be required to determine final design details for both terrestrial and marine pipe installations.

4.4.1.2 Vegetation Clearing

Vegetation clearing consists of removing trees, stumps, and brush to allow access for construction. Most of the project area is clear of substantial vegetation. However, clearing will be required for:

- NPNS mill and Canso Chemicals access road relocation;
- The ETF facility to the south-east of the existing mill;
- The spill basin on the north-east of the property;
- Effluent pipeline on NPNS property, and
- Temporary staging area(s).

Areas to be cleared will be defined by staking installed during site preparation activities. Clearing will be completed primarily by using mechanical brush cutter and mulcher attachments on standard forestry equipment. Heavy duty mechanical methods may be supplemented by manual methods (e.g., chain saws, brush saws). Vegetation will be maintained along wetlands and watercourses buffers as much as possible, and where necessary (e.g., near wetlands and drainages), clearing will be conducted manually and permits will be obtained, where required.

Clearing activities will be conducted outside of the typical bird breeding season (early April to end of August) to the extent possible, to prevent the undue disturbance of migratory birds or their nests, as per the *MBCA*. If clearing is required within this season, CWS will be consulted and mitigation developed to meet *MBCA* requirements. This may include a survey by trained ornithologists to determine if nesting is occurring within these areas; a buffer will be maintained around active nests until the young have fledged.

Erosion and sedimentation control techniques will be employed during vegetation clearing, as well as for subsequent construction activities, to minimize erosion of exposed areas and sedimentation in surface waters. Dust suppression will also be employed during vegetation clearing activities to minimize the potential environmental effects of fugitive dust to offsite locations.

4.4.1.3 Grubbing and Grading

Grubbing includes the removal and disposal of stumps and roots remaining after vegetation clearing and is anticipated for site clearing. Grubbing will be conducted using a skidder or bulldozer to remove the roots and stumps of cleared vegetation. Grubbings will be stored within the defined project area, in inactive areas, and used as fill material during construction. Any grubbings will be buried at pre-selected locations and away from watercourses and other sensitive environmental features. Selection of these locations will be done during detailed design in compliance with leaf and yard waste disposal as defined in the *Nova Scotia Solid Waste-Resource Management Regulations*.

Grading consists of the stripping and conservation of topsoil and development of the base (including proper sloping and sub-base material selection) for construction activities. A central part of preparing any area for construction activities, grading will occur for the ETF components as well as onsite pipeline construction.

Environmental control measures such as sediment fencing, ditching diversion, or other site-specific erosion and sediment control measures will be installed by construction crews prior to commencement of grading activities. Where required, graded areas will be grubbed and topsoil stripped and stockpiled for reuse. The grading crew will conserve the topsoil such that different soil types are not mixed, and appropriate signage will be applied to stockpiles. The conservation of topsoil is important for the successful restoration of certain soils that may be disturbed by construction, and will be salvaged and stored separately from subsoil.

4.4.1.4 Temporary Facilities, Laydown Areas and Access Roads

To support construction activities, it is anticipated that workspace will be required for temporary facilities. Temporary facilities that will be required for construction personnel and equipment include:

- Material laydown areas;
- Contractor/material gate house and parking;

- Fencing, lighting and security;
- Contractor trailers including canteens and washrooms, and
- Construction management including site engineering.

Laydown areas and temporary facilities will be located on the NPNS property; the exact location is still to be decided, but potentially in the area east of the mill access road.

The construction footprint will be entirely within NPNS property and will likely be fenced-in with its own security entrance and materials receiving area. Contractor parking is assumed to be external to any fenced-in area. It is anticipated that all trucking of materials will arrive via the existing mill access road to the security and receiving area.

The existing access road to the Canso Chemicals property will be blocked off and a new paved road will be provided along the side of the new ETF. To facilitate future maintenance activities, granular access roads will be provided around the ETF, where appropriate.

4.4.1.5 Effluent Treatment Facility Construction

To facilitate construction of the new ETF components, the site will be cleared of all existing vegetation, which includes grasses, shrubs and trees. Following vegetation removal, general excavation and grading will be undertaken. Engineer-approved backfill material and compaction will be used to meet geotechnical specifications, as required. Conventional earth-moving equipment (e.g., dozers, excavators, tandem trucks) will be used. Surface water and erosion control will adhere to project's EMP and mitigation measures.

The BAS building will be a structural steel braced-frame construction. It will have insulated metal wall panels and a galvanized steel roof deck, with a single-ply styrene butadiene styrene modified bituminous roof system. A reinforced concrete dado wall will run the full perimeter of the building. The reinforced concrete ground floor slab will be sloped to collecting floor trenches where required. Elevated floors will be made of reinforced concrete over galvanized steel decking. The building's major equipment and tank foundations will be of reinforced concrete mat or spread footing. Interior walls for electrical, heating ventilation air conditioning (HVAC), lab/control and blower rooms will be of masonry construction. There will be a new small tertiary treatment building added just north of the BAS building.

Primary and secondary clarifiers will be of reinforced concrete construction, slab on grade, with either cast-in-place or pre-cast walls founded on shallow spread footings. Access platforms for operation and maintenance will be galvanized steel construction with galvanized serrated steel grating.

The spill basin will be earth berm construction with a high-density polyethylene (HDPE) liner on geotextile and granular base. The south sides of the basin will be formed against the existing ash settling basin and top of berm level will also match the existing basin and adjacent plant road elevations. A ramp will provide access down into the basin for cleaning. The spill basin will be emptied by a pump located in a reinforced concrete intake structure. Access for removal and pump maintenance will be via a steel platform connecting to the concrete structure where a monorail will be used for removal.

4.4.1.6 Pipeline Construction

The effluent pipeline will extend across land from the ETF to the shoreline and out into the marine environment, to a location in the general area indicated in **Figure 4.3**. The terminus of the effluent pipe

will consist of an outfall location with a multi-port diffuser designed with risers and diffuser valves to enhance velocity and mixing above the benthic layer. The precise location and design of the diffuser outfall will be determined by the receiving water study.

The land-based portion of the pipeline will be buried and properly secured to prevent tampering by unauthorized parties. The entire land portion of the pipeline will be designed for heavy equipment traffic. Where possible, the route of the pipeline will avoid sensitive areas, such as wetlands and watercourses.

As the engineering design and underwater surveys progress, the pipeline designer and marine contractor will recommend installation methods for the intertidal/near shore zone and marine portions of the pipeline. NPNS will give preference to bottom-lay or directional drilling where feasible to minimize environmental disturbances. It is possible that multiple techniques may be employed including trench excavation by traditional mechanical means. This may involve the installation of a gravel access from the shore to facilitate the trench excavation and pipeline installation through the intertidal zone. A small jetty may also be required. It is anticipated that the entire trench will be covered with the previously excavated seabed material and graded to match existing conditions using a towed grader bar. Pending marine surveys, imported granular fill material may be required in certain areas.

All pipeline, outfall and port diffusers will be constructed from HDPE materials. Assembly of components will be by fusion welding and flange coupling. A staging area will be required for the marine contractor for pipeline construction, for the assembly, fusing and testing of the pipeline. It is anticipated that the pipe will arrive by flat-bed hauler trucks to the staging area in 17 m lengths. Individual lengths of pipe will be joined by fusion welding using a fusing machine. The pipeline will be hydrostatically tested on land with water to check pipeline and pipe fusion integrity and to confirm it will be suitable for the intended service and operating pressures. An underwater survey will be completed to set the design and a post-construction survey will confirm that the pipeline is installed to design grade and alignment.

Throughout construction, environmental controls (e.g., silt curtain) will be utilized as required and as prescribed in environmental permits and approvals. Removal and disposal of dredged material is not anticipated. Detailed deployment plans will be completed by the marine contractor to verify the entire installation operation, including in the near shore environment, and dive teams will support underwater activities throughout the pipeline installation, including inspection of the pipeline during the deployment.

Commissioning of the pipe will consist of inspections by divers of the installed transmission pipe and outfall. The exterior of the marine outfall, including the diffusers, will be videotaped to confirm diffusion patterns while under operation.

4.4.1.7 Mill Component Construction and Repurposing

Installation of the new mill components and repurposing of existing components will require demolition of some of the existing equipment. Several areas will require some level of demolition, including the existing guardhouse, the Modo scrubber inlet ducting, the inlet of the kiln, the power boiler venturi scrubber and the direct contact evaporators. The guardhouse will be demolished and will be relocated within the new oxygen delignification building. The existing fencing and parking lot lighting fixtures will also have to be removed, with new temporary structures put in place until the building is completed.

Minimal demolition is foreseen in the rest of the mill other than the major civil works required. Construction of the required new buildings (oxygen delignification, lignin separation and oxygen

generation) will require significant excavation (3.5 m); the excavated materials, once tested, will be used as backfill for construction.

During the construction of the new buildings, the existing mill structures will be rejuvenated, with the cleaning of brick facades, changes in building siding, and other similar works so that the look of the existing structures matches that of the new ones.

4.4.1.8 Construction Sequencing

Because the mill is currently not in operation, the construction completion sequence will be crucial to ensuring efficient mill start-up. This completion sequence is: 1) spill basin, 2) ETF and outfall, 3) power boiler wet electrostatic precipitator, 4) recovery boiler systems and 5) all other mill modifications/additions. Respecting this construction sequencing will allow the mill to properly commission each part of the facility, existing and new, in a manner that is environmentally sound.

4.4.1.9 Site Cleanup and Stabilization

Following construction, disturbed areas will be restored and stabilized. Previously graded areas will be restored to match pre-construction conditions, where practical. All disturbed areas from construction will be reinstated to existing conditions. Topsoil, where previously segregated, will be graded out and will be seeded. Sediment fencing will remain in areas adjacent to watercourses and wetlands until the vegetation has been re-established.

4.4.1.10 Commissioning

Commissioning is the process of tests and verifications to confirm all systems and components have been installed to specification, and operation can begin. Commissioning will be completed by the contractor and main equipment suppliers in conjunction with NPNS. Commissioning will first involve confirming installation, controls and operation between the contractor and the manufacturer.

The first part of the mill to be commissioned will be the spill basin. Once fresh water has been run through its components, it will be used as a holding/recycling tank for the subsequent commissioning activities. The mill and ETF will be placed in trial mode to confirm operability of mechanical equipment as specified by the manufacturer. This stage of commissioning is typically completed over a period of a few weeks and will involve running fresh water through all the new components. It will also include the periodic release of water through the new outfall, for testing and to control the inventory of commissioning water in the spill basin.

Following the ETF water tests, a similar procedure will be carried out for the power boiler and the recovery boiler. The spill basin and the various tanks within the ETF (clarifiers, aeration tank) will be used as commissioning water storage tanks.

After the water runs on the ETF and the boilers, NPNS will fire up the boilers with natural gas to commission both boilers and allow the mill to produce steam, which will be required for commissioning the other process areas. The steam that cannot be condensed and returned to the boilers will be vented to atmosphere during this commissioning period,

Once this is done, NPNS will begin to bring raw materials back to the mill site, including pulp wood and chips as well as all bulk process chemicals. Water testing of the remaining sections of the mill will also take place.

Prior to full commissioning of the mill components, the ETF will be seeded with base organic sludge from an external source and a source of organic content (molasses, methanol or another source of "food") will be provided to help in the development of the biomass within the system. Once sufficient biomass is present in the system, mill effluent from the commissioning activities will gradually be introduced to the ETF to develop conditions for long-term continuous operation. These trial operations typically occur over a period of four to six weeks but may be longer depending on temperature and time of year. During trial operations, sludge removal and sludge management dewatering will be optimized.

4.4.1.11 Environmental Inspections

During the construction work undertaken by NPNS and its contractors, site inspections will be undertaken by the contractor, NPNS' Environmental Team or a designate. Site inspections will include environmental monitoring and compliance with the EMP, environmental approvals and legislation.

An Indigenous person will be invited to work with NPNS during the earth moving and civil works to assist in the preservation of Indigenous artifacts and history.

4.4.2 Operation and Maintenance Phase

The operation and maintenance phase will begin immediately following the completion of construction phase activities, including the commissioning all project components. The mill is expected to produce an estimated 310,000 tonnes per year of northern bleached softwood kraft.

NPNS will be responsible for:

- Operation, maintenance, and inspection of all mill and ETF components;
- Ensuring that all mill components are operated in accordance with applicable regulations, including the provincial Industrial Approval and the *PPER*;
- Ensuring woodlands operations are operated in accordance with applicable regulations and certifications;
- Monitoring of air emissions and effluent quality discharged to the receiving environment;
- Maintenance of above and below ground facilities;
- Emergency response;
- Implementation of an ISO 14001 Environmental Management System (EMS) that will be audited regularly to ensure compliance to international management standards;
- Maintaining an online environmental dashboard accessible on NPNS' website;
- Awareness and education of local stakeholders, including members of the public and emergency responders, and
- Third-party reporting and compliance testing for the operating site.

The EMP will address the operation and maintenance phase of the project. A range of standard operation and maintenance measures have been developed and documented in NPNS' operating manuals. The manuals provide a cross reference to specific tools for environmental protection and system integrity during the operation phase. These tools will include patrolling, monitoring, reporting, corrective action and documentation, as well as emergency response.

The existing ambient air monitoring program at the facility is expected to continue during future operation and will collect data on the concentration of the various air contaminants over time for comparison to the Nova Scotia Air Quality Regulation Maximum Ground-Level Concentrations and the model predictions conducted for the project. All emissions will meet the conditions outlined in the provincial Industrial Approval for the mill.

The ETF will be designed for 45,000 m^3/day annual average (55,000 m^3/day peak flow) of effluent that is created through the kraft pulp mill process. The process will be automated with online instrumentation and adjusted both manually and automatically as influent parameters change. Confirmation of ETF performance will require effluent sampling consistent with conditions of the Industrial Approval. In the unusual event that one of the clarifiers or aeration stages must be emptied for inspection or repair, plans will be developed to gain access without a release of untreated effluent to the environment. A spill containment basin will be used to hold effluent in the event of a power failure and will be sized to allow for an orderly shutdown of the facility.

Maintenance activities at the mill and ETF will be undertaken as required and are expected to include routine equipment inspections. Routine inspections of the ETF equipment are typically performed while the equipment is full and in operation. On occasion, planned shutdowns will be undertaken for scheduled maintenance of specific equipment.

The use of chemicals, outside of the normal process chemicals, would include chemicals used for cleaning during shutdowns, and cleaning or flushing of the ETF plant. No additional chemicals will be required than those used previously prior to hibernation. The generation of hazardous wastes requiring treatment or disposal is not anticipated. Generation of hazardous wastes requiring treatment or disposal will be in accordance with the provincial Industrial Approval.

4.4.2.1 Material Handling and Logistics

Similar to the previous operation of the mill, all truck traffic in and out of the site will be via the main access road. No change to the truck traffic to the site is expected from previous operation. The wood, chips and bark will continue to be delivered via the woodlands access road (Scalehouse Road). Remaining deliveries will be through the main mill access road (Granton Abercrombie Branch Road).

4.4.2.2 Maintenance Shutdowns

NPNS undergoes regularly scheduled maintenance shutdowns to complete repairs and upgrades to the mill. During maintenance shutdowns, operating procedures will be required at the ETF to address the changes that reduced flow and/or organics have on operation of the system. Procedures will also address the resumption of normal production. The biological environment in the ETF will be adjusted to maintain the growth media for the reduced biological loads. Nutrient addition will be reduced or stopped to match the waste directed to the ETF. Operational procedures such as sludge withdrawal and waste from clarifiers will be adjusted according to the reduced loadings to the ETF. The objective will be to maintain a healthy bacterial population such that once the plant shutdown is complete performance at the ETF can ramp-up with resumption of mill production.

In the unusual event that a shutdown occurs during winter conditions, additional measures may be required to maintain adequate temperature in the treatment system to prevent biological activity entering the dormant stage. If the treatment system cools off too much it could potentially increase the period required to re-establish normal operation at the ETF.

4.4.2.3 Effluent Pipeline Operation and Maintenance

NPNS will operate and maintain the effluent pipeline in accordance with standard procedures designed to ensure the integrity of system components, including American Society for Testing and Material, American Water Works Association and Canadian Standards Association standards. The pipeline will be designed for a minimum 50-year design life. HDPE pipelines depending on local conditions can have an operational service life that could reach 100 years. Vegetation control along the pipeline corridor will be accomplished primarily by mechanical means.

Once built, ongoing repair and maintenance will be carried out as necessary to support the operation of the ETF and its associated components indefinitely. Incremental replacement of individual diffuser riser components may be required for continued operation. An inspection program will be developed and implemented by NPNS, based on specified standard procedures and design recommendations.

The outfall and diffuser will be designed to accommodate regular inspections and maintenance. Inspections and maintenance activities will typically be undertaken by dive teams.

4.4.3 Decommissioning Phase

All mill and ETF components will be operated and maintained to provide safe and efficient service for several decades and likely much longer with repairs and standard maintenance. However, if unforeseen events occur, some facility components may require decommissioning. Any obsolete facilities will be decommissioned or abandoned according to provincial regulations and the most current version of the appropriate Canadian Standards Association (CSA) standard of the time.

Salvageable material will be recycled or reused. Waste material such as welding rods and concrete will be disposed of in accordance with relevant regulatory requirements.

4.5 LABOUR REQUIREMENTS

Development of the project will provide direct and indirect benefits for the Nova Scotian and Canadian economy, and especially the population of northern Nova Scotia as the NPNS facility resumes pulping operations. Northern Pulp will again contribute to the community by maintaining active employment of 330 people, creating more than 2,679 jobs in Nova Scotia, and spending more than $279 million annually and supporting a supply chain of 1,379 companies through mill and woodlands operations (Gardner Pinfold 2019). NPNS is committed to using local resources, including Indigenous resources, where economically and technically feasible to provide benefit to Nova Scotians, particularly residents of Pictou County and neighbouring counties.

During construction, activities will be carried out largely by third-party heavy equipment contractor(s) who will implement land surveying, site clearing, earth moving, leveling, contouring, temporary workspace preparation, water management features, and ultimately construction and commissioning activities for the project. The contractor(s) will work under the supervision of a NPNS representative (or designate). It is expected that the contractor(s) would be required to hire additional staff to carry out these construction activities. It is anticipated that the construction phase will provide 600 full-time jobs for 24 months.

During operation, it is not anticipated that additional employees above pre-hibernation staffing levels will be required since the project replaces existing infrastructure. Training of personnel will be required for the operation of the new mill components and ETF.

Decommissioning requirements are unknown currently. However, it is assumed that a third-party heavy equipment contractor would be required to undertake these activities.

4.6 PROJECT SCHEDULE

The anticipated project schedule is as follows:

- **Construction** will proceed for a period estimated at 24 months, beginning as soon as the EA review has been completed and the applicable permits, approvals or other forms of authorization have been obtained. It is expected that construction will begin in the fourth quarter of 2024. Commissioning will take place as equipment becomes available and continue for an estimated period of 1 to 3 months after the end of construction.
- **Operation and maintenance** will commence immediately following the construction phase and will continue to operate efficiently and safely for decades with a well-maintained system. It is expected that the operation and maintenance phase will begin in the fourth quarter of 2026.
- **Decommissioning** of the project will be conducted following the end of useful service life of the project components or at the end of the life of the NPNS facility.

4.7 EMISSIONS AND WASTE MANAGEMENT

NPNS, through the conditions of the various permits and approvals it will receive to enable construction and operation of the project, will meet the compliance standards outlined in applicable regulations. Where no such standards exist, industry best practices will be adopted. Volumes of wastes and concentrations of contaminants will be reduced through best management practices, following applicable legislation, and mitigation planning including the development of an EMP. Appropriate recycle programs and waste handling will conform to Pictou County standards.

4.7.1 Air Emissions

The potential air contaminant emissions of concern for the construction phase of the project would primarily be particulate matter (PM, including its common size fractions PM_{10} and $PM_{2.5}$) from fugitive sources (e.g., excavation and earthworks, material handling, soil storage piles) as well as combustion gas emissions such as carbon monoxide (CO), nitrogen oxides (NO_X), and sulphur dioxide (SO_2) from the combustion of fossil fuel by construction equipment.

Air emissions from the operation of the mill and the ETF are emitted primarily from the biomass boiler, recovery boiler, smelt dissolving tank, lime kiln, high level roof vent, and ETF. The new mill configuration will considerably lessen air emissions. It is expected that the inventory of air emissions for the project will include criteria air contaminants (CACs), metals, polycyclic aromatic hydrocarbons (PAHs), reduced sulphur compounds and terpenes. All air emissions will be under the thresholds defined in the Nova Scotia *Air Quality Regulations*, under the *Environment Act*.

Air emissions include odour, which can be related to a variety of factors, sources and compounds. Similar to instances of reported odour occurrences in the past, there is the potential for odour to be detected at locations beyond the NPNS property during specific meteorological conditions. However, with the new mill configuration, this is expected to lessen considerably, to the extent that it may not be noticeable. Approximately 40% of this project's capital spending will deal directly with odour and air quality improvements.

GHG emissions from the project will occur during construction and operation of the project. The primary sources of GHGs will be CO_2, methane (CH_4), and nitrous oxide (N_2O), as carbon dioxide equivalents (CO_2eq) from fossil fuel combustion.

4.7.1.1 Predicted Reductions in Air Emissions

The project design aims to significantly reduce emissions to the atmosphere from the mill including the following:

- 80% reduction in total reduced sulphur (TRS) emissions, from an average of 65 t/year in 2019 to an estimated 13 t/year, so that there is no detectable odour in surrounding communities;
- 75% reduction in power boiler particulate, from 120 mg/Rm^3 (corrected to 11% O_2) in 2019 to an estimated 30 mg/Rm^3;
- 70% reduction in visible stack plumes;
- 50% reduction in chlorine dioxide emissions, from 13 t/year in 2019 to an estimated 6.5 t/year, and
- 9% reduction in greenhouse gases, from 55,500 tonnes CO_2eq per year to an estimated 51,000 tonnes CO_2eq per year. The mill has already made significant progress in this regard, with its 2019 emissions 40% below its 1990 discharges. The total GHG emissions from the mill were, and will continue to be, less than 0.5% of Nova Scotia's total GHG emissions.

4.7.2 Noise Emissions and Vibration

Noise emissions from the project will occur during construction, operation and maintenance phases. Construction noise will generally be intermittent, as equipment is transient and operated on an as-needed basis and mostly during daylight hours. Noise emissions will adhere to local noise bylaws.

Noise sources during operation and maintenance will be mitigated using mufflers on equipment where possible, carrying out routine maintenance of equipment to maintain it in good working order, and limiting noise producing activities. The project site is relatively distant from (>500 m) nearby residences, and the existing presence of a significant tree buffer will reduce noise emissions so that the project is unlikely to cause undue nuisance to off-site receptors. Noise abatement measures will be installed if noise emissions exceed federal, provincial or municipal noise guidelines or limits.

4.7.3 Effluent Discharge

Effluent discharge from the mill will be from the ETF. It is estimated that the ETF will accept an estimated annual average of 45,000 m^3/day (55,000 m^3/day peak flow) of wastewater that is created through the process at the plant and will discharge the treated effluent at an outfall location in the Pictou Harbour estuary. The prediction of project performance will be based upon expected water quality characteristics of the treated effluent including the following parameters: AOX, total nitrogen, total phosphorus, colour, COD, biochemical oxygen demand (BOD_5), TSS, dissolved oxygen (DO), pH, temperature and total dissolved solids (TDS). The effluent shall comply with the current and future federal *PPER*.

4.7.3.1 Predicted Reductions in Water Use and Effluent Discharge

The modernization of the mill and construction of the advanced ETF will lead to significant reduction in water use and improvements in effluent quantity and quality, including:

- 33% reduction in water abstraction from the Middle River from an annual average of ~75,000 m^3/day in 2019 to an estimated 50,000 m^3/day (refer to Figure 4.5);
- 50% reduction in TSS from an average of 2.5 kg/tonne of finished product in 2019 to an estimated 1.2 kg/tonne of finished product;
- 72% reduction in BOD, from 2.2 kg/tonne of finished product in 2019 to an estimated 0.6 kg/tonne of finished product;
- 68% reduction in COD, from 54 kg/tonne of finished product in 2019 to an estimated 17 kg/tonne of finished product;
- 70% reduction in colour from an average of 980 TCU in 2019 to an estimated 300 TCU, and
- 50% reduction in chlorine-based compounds, from 0.12 kg/tonne of finished product in 2019 to an estimated 0.06 kg/tonne of finished product.

4.7.4 Liquid and Hazardous Waste

Liquid wastes generated during construction include oils, grease and fuels from the construction equipment and solvents, plus any inadvertent fuel spills. These wastes will be collected and disposed of in accordance with applicable local and provincial regulations. Liquid wastes from construction crews, including sewage and domestic wastewater, will be collected and disposed of consistent with local and provincial standards.

Liquid wastes typically produced during mill operation and maintenance will be primarily from domestic water use. Lube oil for the pumps and other mechanical equipment will be changed regularly, brought into the equipment locations and removed in barrels; the waste product will be taken to an approved disposal and/or recycling facility.

4.7.5 Solid Waste

Solid wastes generated during construction will include brush, stumps, grubbings, extra subsoil and rock, temporary fencing, signs, metal containers, canisters as well as scrap pipe, cables, welding rods, and domestic wastes. Scrap paper and other office wastes will also be generated.

During operation and maintenance, the sludge from the BAS™ process will be burned in the NPNS boiler, limiting the amount of solid waste generated in addition to other solid wastes that are produced during daily operation of NPNS facilities. Solid wastes will be collected and disposed of in a manner consistent with local and provincial standards. Previous mill operations sent approximately 15,000 metric tonnes per year to the onsite industrial landfill, including: ~1,700 tonnes of fly ash; ~1100 tonnes of bottom ash; ~8,000 tonnes of process sludges; ~2,000 tonnes of wastewater sludges (primary), and ~2,000 tonnes of wood residue.

NPNS will open the additional cells that have previously been designed for the #3 landfill. A new leachate system will be installed in the cells that will be tied into the existing leachate collection system for that landfill. The types of materials that will be sent to the landfill will be consistent with past operation of the facility.

Similar to existing operations, NPNS will continue to actively cooperate with municipal waste reduction and recycling programs and will encourage conservation throughout its facilities. Non-hazardous wastes will be separated as recyclable and non-recyclable, with recyclable material collected and transported to

a licensed recycling facility. Waste management procedures will be outlined in the EMP and comply with provincial solid waste resource management regulations as well as additional municipal and disposal facility requirements. Non-recyclable wastes will be disposed of according to NPNS's existing waste management procedures.

4.7.6 Erosion and Sedimentation

There is potential for erosion and sedimentation in both freshwater and marine systems, as well as sediment re-suspension associated with in-water construction activities for the marine pipeline installation and development of outfall location. The EMP will include plans for erosion and sediment control measures and will be developed prior to commencement of construction activities. At a minimum surface run-off and sedimentation control will adhere to NSECC standards and guidelines. Erosion and sedimentation are not expected to be a concern during operation of the mill.

4.8 MALFUNCTIONS, ACCIDENTS AND UNPLANNED EVENTS

Accidents, malfunctions, or unplanned events that could occur during any phase of the proposed project potentially include:

- **Accidental release of a hazardous material** - An accidental release of fuel or other liquid hazardous materials used in vehicles or heavy equipment on-site may occur during refuelling of machinery or trucks as a result of human error or equipment malfunction. During operation, there is potential for release of chemicals used in the Kraft and effluent treatment processes as well.
- **Failure of erosion and sediment control measures -** A failure of an erosion and sediment control measure during construction of the project could result in mass wasting of soil or siltation of receiving watercourses or the marine environment.
- **Accidental release of effluent from the ETF or pipeline** - An accidental release of effluent could occur at the ETF or along the length of pipeline during the operation and maintenance phase of the project. An accidental release of effluent may be the result of equipment failure, human error, or material failure.
- **Marine outfall damage/fouling** - Damage to the marine pipeline could result in a release of effluent in conditions that might not allow for proper diffusion. The diffuser may be subject to marine fouling and will require ongoing maintenance.
- **Accidental release of off-specification effluent** - Off-specification effluent refers to effluent that does not meet regulatory requirements before release from the ETF. The cause of off-specification effluent could be the result of an unplanned process change in the pulp mill or a malfunction in the ETF process.
- **Berm failure** - Failure of the berm forming the walls of the spill basin during the operation phase could impact soil and water quality. Berm failure could be in the form of a leak, releasing material over time, or a complete collapse of one or more basin walls.
- **Vehicle accident** - A vehicle accident is possible during all phases of the project. It includes a potential collision with other vehicles, pedestrians, wildlife, or structures/objects, and potentially poses a risk to the health and safety of workers, the public, or wildlife and potential for damage to infrastructure.

- **Discovery of a heritage resource** - Previously undiscovered archaeological artifacts could be uncovered during excavation of topsoil and overburden as well as from other earth moving activities on the site during the construction phase.

Contingency planning is a key component of NPNS' approach to its operations at the mill. NPNS has developed detailed operational procedures to guide its everyday operations and has developed contingency and emergency response procedures to quickly address mill upsets or abnormal operating conditions. Various emergency scenarios will be incorporated in planning for operation of the new mill components and ETF, including potential for failure and repair.

4.9 HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT

NPNS is committed to developing the project in an environmentally responsible manner, consistent with sustainability principles, and to ensure public and worker health and safety during the construction and operation of the project. Several environmental protection and management measures will be implemented to guide the construction, operation and maintenance, and decommissioning of the project:

- Employing good planning, design and management practices to comply with regulated and/or industry design and management standards to satisfactorily deal with environmental risks such as seismicity, unusual weather events, flooding, and erosion;
- Siting facilities to avoid sensitive areas such as wetlands, watercourses and important habitat types, where possible, and maintaining as much of a mature tree buffer as possible surrounding these features;
- Minimizing the footprint of project facilities and activities to reduce the amount of disturbed land, wetlands, and water resources;
- Employing good planning, design and management practices to comply with standards and objectives for air contaminant emissions, noise, vibration, and surface runoff;
- Using the **best available technology** currently available for mill processes and the ETF, to minimize emissions and protect the health and safety of surrounding communities;
- Implementing progressive environmental protection, mitigation, and management strategies that avoid or minimize adverse environmental effects, and maintain or enhance positive effects;
- Preparing and implementing an **EMP**, which will contain mitigation measures to avoid and reduce potential adverse environmental effects that might otherwise occur from routine project activities, including emergency response and contingency procedures;
- Preparing and implementing **project-specific emergency response and contingency procedures** as part of the EMP to advise project personnel on how to implement specific actions to respond to accidents, malfunctions, or unplanned events, and
- Continue to engage the community, such that, wherever possible, concerns about the project have been accommodated to the extent possible in its design, construction, operation, and decommissioning.

5.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

In 2019, NPNS registered a Class I undertaking for the *Replacement ETF Project*, including an effluent pipeline discharging offshore from Caribou Harbour, which has since been withdrawn. Numerous baseline studies were undertaken as part of that EA registration. Given that, other than the pipeline route, the footprint of the two projects is the same, much of the information on existing environment conditions has been extracted from the previous EA Registration Document and Focus Report, prepared by Dillon Consulting (2019a, b), with some updated information provided.

5.1 REGIONAL SETTING

5.1.1 Geology and Soils

The regional geology is composed of a mixture of igneous, sedimentary and metamorphic rocks with a wide range of ages. The older Ordovician age rocks in the area display complex structure related to the development the Appalachian Mountains during the Acadian Orogeny. A series of basins formed during the Carboniferous and were infilled with sediments, organic material and evaporites. These Carboniferous rocks are generally flat with folding and faults primarily related to the opening of the basin and deposition of large quantities of material. The project area at Abercrombie Point is underlain by bedrock of the Late Carboniferous Pictou Group (undivided). The bedrock is composed of a sedimentary sequence of interbedded mudstone, siltstone, sandstone, conglomeritic sandstone and minor coal seals and generally displays flat bedding planes with vertical fractures.

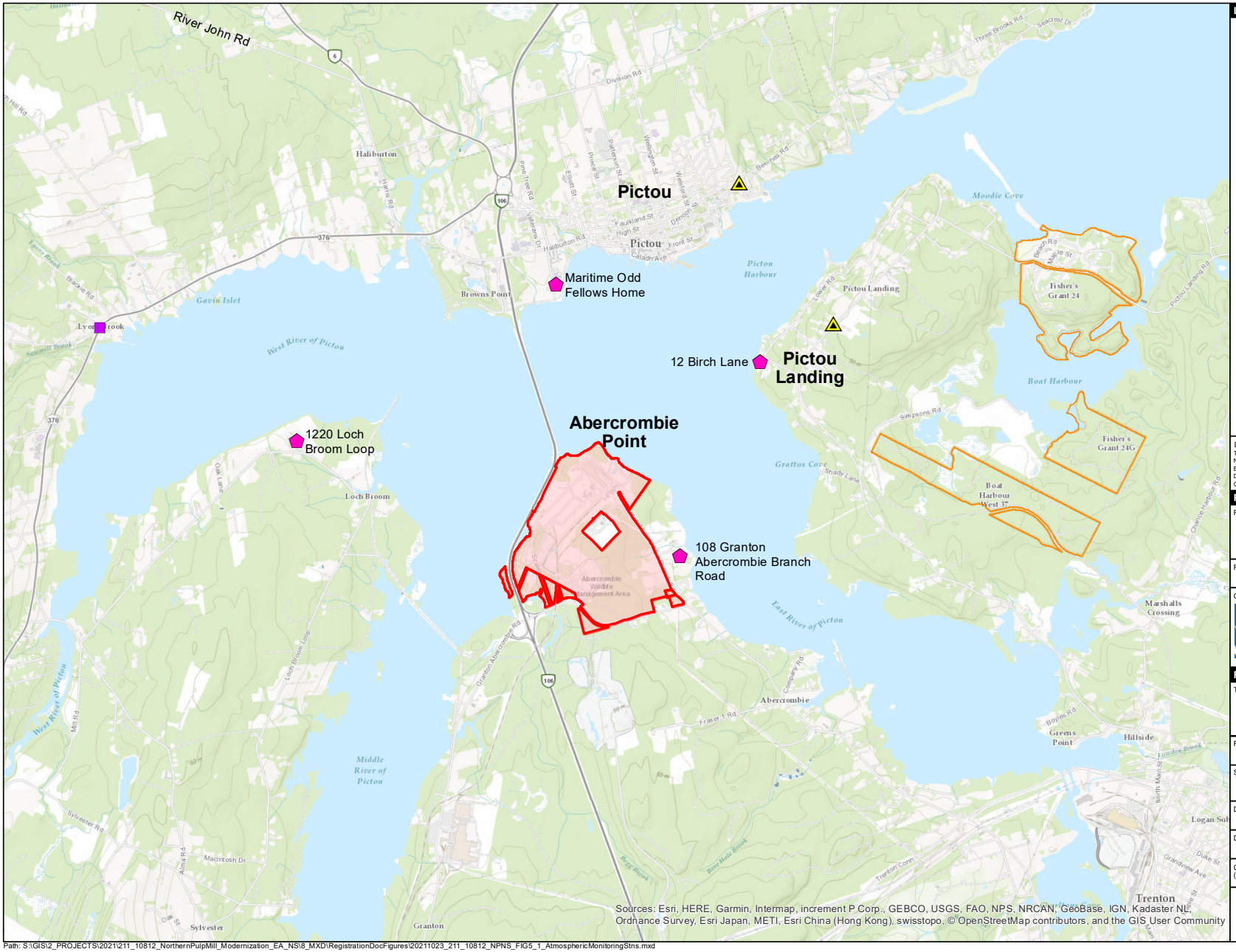
The surficial geology underlying the project site is a silty till plain composed of ground moraine and streamlined drift deposited during the Wisconsinan glacial stage. The Nova Scotia Geoscience Atlas (NSDLF 2021a) describes the surficial unit as silty, compact, material derived from both local and distant sources, and the topography as flat to rolling with few surface boulders and till thick enough to mask bedrock undulations (i.e., thickness of 3-30 m).

The soils of Abercrombie Point are described as Pugwash Association, a moderately well drained to imperfectly drained sandy loam to loam over compact reddish-brown sandy loam to loam till derived from Carboniferous sandstone. This Association is generally characterized as having good surface drainage with higher-than-average permeability. Based on site observations, the NPNS facility is blanketed by reddish brown silty, sandy, clay till. Till thickness varies from a thin veneer of less than one metre to a covering greater than seven metres (Dillon 2012).

5.1.2 Climate

Nova Scotia lies in the mid-temperate climate zone and, despite being surrounded by the ocean, the climate of Nova Scotia is classified as continental rather than oceanic. The ocean is, however, a major influence on Nova Scotia's climate, moderating temperatures in winter and summer. Winter temperatures are higher and summer temperatures are lower than those encountered in communities farther inland. The stable temperature of the Atlantic Ocean moderates the climate for most of the province, other than northern Nova Scotia where heavy ice build-up in the Gulf of Saint Lawrence makes winters colder. The province is dominated by westerly winds, and is prone to frequent coastal fog.

Climate normals for the nearest weather station at Lyon's Brook (~5.7 km; **Figure 5.1**) are presented in **Table 5.1**. Climate normals are used to summarize or describe the average climatic conditions of a location, and are updated every decade.



LEGEND:

- Climate Station
- Air Quality Monitoring Stations
- Noise Receptors
- NPNS Property
- First Nations Lands

N W E S

PROJECT:

PROJECT:
NPNS MILL TRANSFORMATION PROJECT

PROJECT NO.: **211-10812**

CLIENT:
NORTHERN PULP NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
ATMOSPHERIC ENVIRONMENT MONITORING STATIONS

FIGURE NO.:	REVISION NO.:
5.1	0

SCALE: 1:40,000
0 200 400 800 1,200 1,600 2,000 Metres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY: T. MOREHOUSE	CHECKED BY: J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-07

WSP Canada Inc.
1 Spectacle Lake Drive,
Dartmouth, Nova Scotia
www.wsp.com

Path: S:\GIS\2_PROJECTS\2021\211_10812_NorthernPulpMill_Modernization_EA_NS\8_MXD\RegistrationDocFigures\20211023_211_10812_NPNS_FIG5_1_AtmosphericMonitoringStns.mxd

Table 5.1: Representative Climate Normals for Lyon's Brook

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature Normals, Lyons Brook NS (1981 - 2010)													
Daily Average (˚C)	-6.2	-5.9	-1.7	4.2	10.2	15.3	19.3	19.1	14.8	9.2	3.7	-2.5	6.6
Daily Maximum (˚C)	-1.5	-1.1	2.9	8.6	15.6	20.9	24.8	24.5	20.0	13.7	7.4	1.5	11.4
Daily Minimum (˚C)	-11.0	-10.7	-6.2	-0.3	4.7	9.7	13.8	13.6	9.6	4.7	-0.0	-6.5	1.8
Precipitation Normals, Lyons Brook NS (1981 - 2010)													
Rainfall (mm)	40.2	31.6	50.4	74.3	82.7	89.7	76.6	81.4	117.6	128.1	117.5	63.2	953.3
Snowfall (cm)	69.6	63.1	49.9	19.3	1.2	0.0	0.0	0.0	0.0	0.4	17.6	57.9	279.0
Precipitation (mm)	109.7	94.7	100.3	93.7	83.9	89.7	76.6	81.4	117.6	128.6	135.1	121.1	1,232.2
Source: Canadian Climate Normals (Government of Canada 2021a)													

5.1.3 Ecological Land Classification

Nova Scotia's Ecological Land Classification (Neily *et al.* 2017), provides a systematic grouping of ecological and biophysical features, using climate, elevation, topography, bedrock, and vegetation. The project area lies within the Northumberland Lowlands EcoDistrict, which is within the vast Northumberland/Bras d'Or Lowlands Ecoregion. The Northumberland Lowlands EcoDistrict is bounded to the south, east, and west by the uplands of the Cobequid Hills, Pictou Antigonish Highlands, and the Cumberland Hills, respectively. Elevations along this low coastal plain rarely exceed 50 m above mean sea level, with all but one watershed (the Nappan River) flowing north into the warm, marine waters of the Northumberland Strait.

Surficial till deposits are derived from Carboniferous sedimentary rocks, such as red sandstones, siltstones and shales. There are four dominant soil types within the EcoDistrict; these are: Queens series soils, Pugwash series soils, Debert series soils, and Hansford series soils. In general, these soils are shallow to bedrock or compacted till, which in combination with the shelter provided by higher terrain in the surrounding EcoDistricts often results in moisture deficits during the growing season (Neily *et al.* 2017).

The Northumberland Lowlands EcoDistrict is approximately 70% forested and the soils support predominantly softwood forests composed mostly of red spruce, hemlock, white pine and black spruce. In disturbed areas (either natural or anthropogenic), early successional species such as balsam fir, red maple, white and grey birch, and both trembling and large-toothed aspen dominate. As soil drainage becomes increasingly poorer, black spruce, red maple and tamarack become increasingly dominant canopy species. Treed and shrub wetlands are scattered throughout the landscape, with 5.5% of the EcoDistrict considered wetland (Neily *et al.* 2017).

The Northumberland shore is dissected by several rivers, many of them forming extensive estuaries with eel grass beds, saltmarshes and submerged estuarine mud flats. The area of estuarine flats is the second highest of any EcoDistrict in Nova Scotia.

5.2 ATMOSPHERIC ENVIRONMENT

5.2.1 Air Quality

Air quality is a measure of the degree to which ambient air (i.e., air around us) is pollution free; it is characterized by the quantity of air contaminants in the atmosphere in comparison to applicable air quality objectives.

In 2018, an air dispersion modelling study to support the EA for the *Replacement ETF Project* was conducted. The original air dispersion modelling study focused on air contaminants regulated under Nova Scotia Regulation 150/2017 - *Air Quality Regulations* (2017) and those included in the mill's Industrial Approval (2011-076657-A01). These contaminants include carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulate matter (TSP), and fine particulate matter ($PM_{2.5}$).

An expanded dispersion modelling assessment was conducted in 2019 aimed at assessing the *Replacement ETF Project* 's potential effects on ground-level concentrations for air contaminants of interest to the project. The revised inventory of air contaminants for the project included metals, PAHs, volatile organic compounds (VOCs), reduced sulphur compounds, dioxins and furans and terpenes. These contaminants do not have Nova Scotia provincial standards, but may be assessed against the limits prescribed in the *Canadian Ambient Air Quality Standards* (CAAQS) or Ontario *Regulation 419/05: Air Pollution – Local Air Quality*.

Historical records of air contaminants within the airshed for 2015-2017 are available from NSECC's Town of Pictou monitoring station and total suspended particulate (TSP) monitoring conducted by NPNS at Pictou Landing (see **Figure 5.1**; **Table 5.2**). These represent ambient air quality during the period when the mill was operational.

Table 5.2: Ambient Monitoring Data – 2015-2017 Maxima

Air Contaminant	Averaging Period	2015 Maximum	2016 Maximum	2017 Maximum	Regulatory Criterion	No. of Exceedances
O_3 (ppb)	1-hour	60.8	48.9	64.8	82	0
TSP (µg/m³)[a]	24-hour	-	-	63.2	120	0
	Annual	-	-	15.4	70 (geometric mean)	0
$PM_{2.5}$ (µg/m³)	24-hour	32.8	25.2	16.1	30[c]	0
	Annual	7.0	4.5	5.3	-	0
NO_2 (ppb)	1-hour	18	13	14	210	0
	Annual	1	0	0	50	0
SO_2 (ppb)	1-hour	0	34.5	42.1	340	0
	24-hour	ND	5.5	11.7	110	0
	Annual	0	0.2	0.5	20	0
TRS (ppb)[b]	1 hour	9.1	9.1	10	30	0
	Annual	0.2	0.2	0.2	6	0

a TSP data provided by NPNS
b H_2S criteria used for comparison to total reduced sulphur (TRS) monitored data
c CCME Canada-Wide Standard for $PM_{2.5}$ (3-year average of the 98th percentile of the daily 24-hour average)

Ambient air quality monitored at the Pictou monitoring station for the mill pre-and post-hibernation periods (one year of data) are shown in **Table 5.3.** The transition period, during which the mill had stopped production, but was still operational, occurred between January 12, 2020 and April 15, 2020. The data indicate that there has been little change in concentration for most of the parameters, with most being within the variability of the data. A full statistical analysis will be undertaken as part of the EA. From these results, it is evident that several contaminants are present in the atmosphere, potentially from other sources, including both local and distant sources of pollution.

Table 5.3: Pre- and Post-Hibernation CAC Concentrations at Town of Pictou (2019-2021)

Parameter	Pre-Hibernation (11/01/2019 - 11/01/2020)			Transition Period (13/01/2020 - 14/04/2020			Post Hibernation (16/04/2020 - 16/04/2021)		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
O_3 (ppb)	12.1	42.5	27.7	24.3	47.0	38.1	12.3	53.2	29.7
NO_X (ppb)	0.0	4.9	1.5	0.5	7.1	1.9	0.1	5.6	1.1
NO (ppb)	0.0	1.7	0.3	0.0	0.9	0.3	0.0	0.7	0.2
NO_2 (ppb)	0.0	4.2	1.2	0.2	6.1	1.5	0.0	5.2	0.8
$PM_{2.5}$ (µg/m³)	1.8	13.3	4.9	1.8	8.9	4.8	1.3	12.5	4.6
TRS (ppb)	0.0	1.4	0.2	0.0	0.4	0.1	0.0	0.5	0.1
SO_2 (ppb)	0.0	4.3	0.3	0.0	5.9	0.6	0.0	14.4	0.4

In March 2021, NPNS contracted Stantec to undertake an ambient air quality monitoring program for additional contaminants at the fence line of the NPNS property at Abercrombie Point, to provide a baseline during mill hibernation (i.e., not operational). Parameters included TSP, $PM_{2.5}$, metals, PAHs, dioxin and furans, speciated VOCs, combustion gases (SO_2, NO_X, H_2S), aldehydes and ammonia. Results were compared to the Nova Scotia *Air Quality Regulations*, CAAQS, Ontario's Ambient Air Quality Criteria (OAAQC). The full report is provided in **Appendix A**, summarized as:

- **TSP** - Concentrations of TSP ranged from 5 to 19 µg/m³, below the *Nova Scotia Air Quality Regulation* of 120 µg/m³.
- **$PM_{2.5}$** - Measured concentrations of $PM_{2.5}$ ranged from 2.5 to 6.5 µg/m³, below the threshold limits of the CAAQS (27 µg/m³) and OAAQC (30 µg/m³).
- **Metals** – Most of the metals were not detectable, with the exception of aluminium (0.029 – 0.167 µg/m³), barium (<0.001 - 0.002 µg/m³), boron (<0.001 – 0.043 µg/m³), copper (0.036 – 0.076 µg/m³), iron (0.022 – 0.147 µg/m³), manganese (0.001 – 0.007 µg/m³), titanium (<0.001 - 0.005 µg/m³), vanadium (<0.001 - 0.004 µg/m³) and zinc (<0.001 – 0.008 µg/m³). Metal concentrations were below OAAQC.
- **PAHs** – 24 of the 37 PAHs monitored were above detection limits, with concentrations ranging from <0.0025 ng/m³ (benzo[a]pyrene) to 3.54 ng/m³ (naphthalene). Only benzo[a]pyrene and naphthalene are identified in the OAAQC; both were below threshold limits.
- **Dioxins and Furans** – Four of the seven dioxin congeners monitored were detectable, while seven of the ten furan congeners were detectable. Total PCDDs and PCDFs (TEQ) (dioxan and furan equivalents) ranged from 0.000521 pg TEQ/m³ (lower bound) to 0.0361 pg TEQ/m³ (upper bound), and were below the OAAQC.

- **Speciated VOCs** – 11 of the 47 VOCs monitored were detectable; all were below the OAAQC.

  Combustion Gases – These were sampled over a month, from March 10 to April 6, 2021. Hydrogen sulphide (0.06 µg/m^3), sulphur dioxide (0.81 µg/m^3) and nitrogen dioxide (1.75 µg/m^3) were all below the threshold for the *Nova Scotia Air Quality Regulations*.
- **Ammonia and Aldehydes** – Ammonia and aldehydes were sampled on two dates only. Ammonia was not detectable, while acetaldehyde (1.2 µg/m^3) and formaldehyde (1.1 µg/m^3) were below the OAAQC.

Once again, it is evident that several contaminants are present in the atmosphere, potentially from other sources of pollution. These include TSP, $PM_{2.5}$, several metals, benzo[a]pyrene, naphthalene, dioxins and furans, several VOCs, combustion gases, acetaldehyde and formaldehyde.

Odour is another consideration with respect to air quality. It is associated with a variety of factors, sources and compounds, and is difficult to measure. There is potential for odour to be perceived at locations beyond the facility property during specific meteorological conditions because of the low detection threshold of some compounds released from the kraft process.

5.2.2 Acoustic Environment (Noise)

The acoustic environment focuses on ambient noise within the study area, both natural and man-made. Sound quality is characterized by the emission of sound waves from various sources, their propagation through the atmosphere, and their detection by noise sensitive receptors. Sound is typically measured as a pressure level in units of A-weighted decibels (dBA).

Baseline sound monitoring was completed in December 2017 to establish sound levels in areas surrounding the NPNS mill during operation. It consisted of at least 72 hours of continuous sound monitoring at four discrete noise receptor locations identified at locations surrounding the NPNS facility (see **Figure 5.1**). The maximum, minimum, and mean hourly equivalent sound levels (1-hour Leq) for daytime, evening and nighttime and 90th percentile sound levels are presented in **Table 5.4**.

Table 5.4: Baseline Sound Monitoring Results, December 15-19, 2017 (from Dillon 2019a)

Receptor ID	Receptor Description	Maximum Hourly Leq (dBA)	Minimum Hourly Leq (dBA)	Geometric Mean Leq (dBA)	Lp90 (dBA)
Daytime (7 am – 7 pm) – NSECC Guideline 65 dBA					
R1	Maritime Odd Fellows Home - Single Story Residential	61.7	40.9	49.5	43.8
R2	Single Story Residential	57.7	37.5	47.0	43.4
R3	Two Story Residential	47.8	28.3	39.4	33.4
R4	Two Story Residential	58.3	39.0	47.2	42.4
Evening (7 pm – 11 pm) – NSECC Guideline 60 dBA					
R1	Maritime Odd Fellows Home - Single Story Residential	52.7	41.9	47.2	40.5
R2	Single Story Residential	61.4	41.9	50.0	46.2
R3	Two Story Residential	48.6	25.5	36.1	31.6
R4	Two Story Residential	53.0	37.1	46.0	41.8

Nighttime (11 pm – 7 am)) – NSECC Guideline 55 dBA					
R1	Maritime Odd Fellows Home - Single Story Residential	51.8	36.7	45.1	37.1
R2	Single Story Residential	60.1	34.6	45.5	42.1
R3	Two Story Residential	47.0	22.6	37.9	32.0
R4	Two Story Residential	52.5	32.8	44.9	41.0

The receptors can be described as follows:

- Receptor R1 was a 47-bed continuing care facility, located in the Town of Pictou, across from the NPNS mill. At the time of the baseline sound monitoring, the dominant sound sources at R1 included breaking waves, rustling of trees, and a low frequency hum from the mill.
- The second receptor, R2, was a small single-story residential building, located in Pictou Landing across the East River. The dominant sound sources at R2 were operational noise from the mill and waves breaking along the shoreline.
- Receptor R3 was a two-story residence located to the west of the mill across the Highway 106 causeway. The predominant sound source audible at R3 was the rustling of the trees; however, some sounds from the mill could be heard. R3 is located along a rural road with minimal traffic.
- Receptor R4 was located approximately 750 m to the southwest from the NPNS mill. Dominant sound levels at R4 included traffic noises from Abercrombie Branch Road and operational sounds from the mill.

5.3 WATER RESOURCES

5.3.1 Groundwater

Groundwater is used as a water source for potable water and industrial water within the region. It also interacts with surface waters and can influence the quantity and quality of surface waters. Information on groundwater was obtained from available historical data for the area, based on the Nova Scotia Groundwater Atlas (NSDLF 2021b), regional water resource reports, municipal water supply wells, and private wells.

Most groundwater in the Pictou and Abercrombie area comes from water found within two major bedrock aquifer units: the Cumberland Group (Malagash Formation) or the Pictou Group (undivided) (see **Section 5.1**). The project area is located within the Pictou Group, within which groundwater is generally of variable quality, with moderate hardness and potentially high iron concentrations, as well as high sodium and chloride content indicative of potential saltwater contamination (Hennigar 1968).

A review of wells within ~1 km of the NPNS property boundary was undertaken by Dillon (2019a). Thirty-four drilled wells were identified within ~1 km of the NPNS site, 26 for domestic water use, two for commercial, and six undefined. Data for these indicate that wells in the area are generally shallow, high producing wells (based on the average well yield), and draw water from a sedimentary bedrock aquifer.

The NPNS facility is located within a non-municipally serviced potable groundwater area; however, the closest residential well is greater than 500 m from the site and it is assumed that the adjacent Canso Chemicals site (where two wells were installed in the 1970s) does not contain a viable potable water source, and there are no known groundwater receptors within 500 m of the project area (Dillon 2019a).

5.3.1.1 Groundwater Wells at the NPNS Site

There are two production wells on the NPNS site that are used for non-potable purposes, the Scalehouse well and the Construction Gate well (**Figure 5.2**), which have been routinely sampled as part of a monitoring program since the late 1990s. Up to three industrial wells have been drilled on the property over time, two in the mid-1960s and one in the late 1980s for Scott Maritimes (Dillon 2019a). The first two wells were drilled to 152.4 m and 143.3 m depth, with bedrock encountered at 6.1 and 0.91 m (respectively) and static water levels at 5.5 m depth. The third well was drilled to a much shallower depth of 30.5 m depth, with bedrock encountered at 6.1 m and static water level at 6.1 m, and has since been decommissioned.

Although pumping tests were conducted for each well, the estimated well yield was not provided on the logs. Groundwater occurs near surface, generally within 1 - 3 m. The shallow flow system is consistent with surface topography. A watershed divide intersects the far eastern portion of the NPNS site in a general north-south direction. Groundwater flow east of the divide is in a southeasterly direction towards the East River, while groundwater flow west of the divide is in a west-northwest direction towards the Middle River. Both rivers discharge to Pictou Harbour. Overall, groundwater flow across the NPNS site is predominantly westward to northwestward and towards the harbour (see **Figure 5.2**).

5.3.1.2 Groundwater Quality

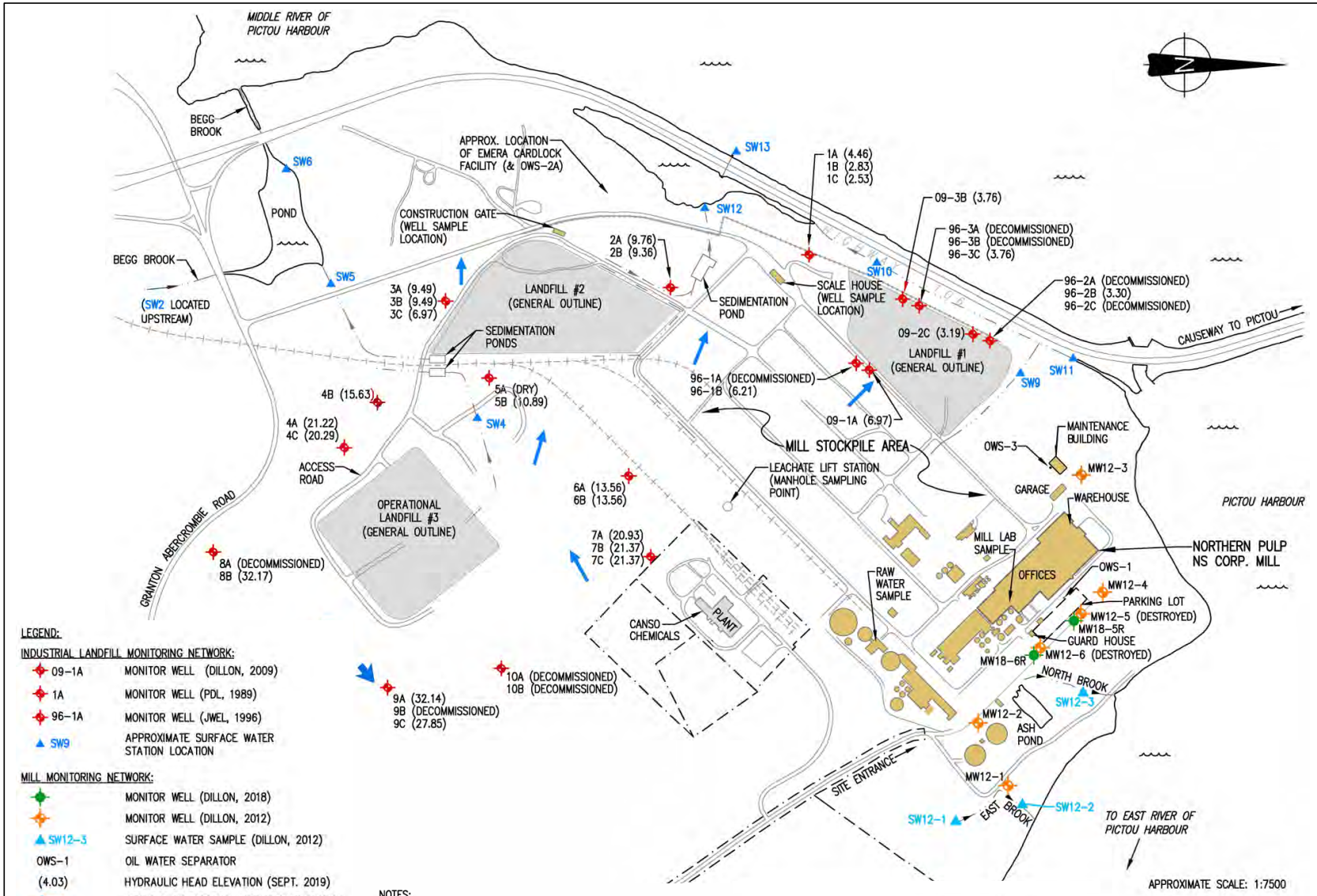
A groundwater monitoring program is conducted as part of the on-going monitoring of the industrial facility and as a requirement of the current Ministerial Order. There are two groundwater monitoring networks currently operated at the NPNS site. The Industrial Landfill Monitoring Network was established to monitor effects from the industrial landfills present on the site (two closed and one operational). It comprises 27 monitoring wells at 12 locations (see **Figure 5.2**). Scheduled groundwater monitoring, in compliance with NSECC requirements for the management of industrial waste, has been conducted in association with operational Landfill 3 since 1989.

In 2012, the NPNS Monitoring Network was established for the operational portion of the NPNS site, and is closest to the project footprint area. It consists of six (surficial) monitoring wells that have been sampled semi-annually since 2012 (see **Figure 5.2**). The results of the groundwater monitoring programs are summarized in annual reports that document historic sampling results and identify trends in water quality. Except for sodium and chloride in some monitoring locations, the groundwater quality at the site is consistently below NSECC's Environmental Quality Standards for potable water at a commercial site with coarse grained soils (NSECC 2021). The water quality is consistent with groundwater near marine waters and with regional groundwater quality (Gibb and McMullin 1980).

5.3.2 Surface Water

Surface waters consist of all freshwater resources, including wetlands, watercourses, water bodies, and surface water drainage channels. The NPNS property at Abercrombie Point is situated on a promontory that is bounded to the north, east and west by the estuarine reaches of the Middle and East rivers (**Figure 5.3**). It is located within the East/Middle/West Pictou (WDP/1DP) primary watershed (NSE 2018).

Watercourses within the project area were initially identified based on available background literature and mapping. In addition, an evaluation of the surface waters on the NPNS property was undertaken in October 2017 and June 2018 (Dillon 2019a).



LEGEND:

INDUSTRIAL LANDFILL MONITORING NETWORK:

- 09-1A — MONITOR WELL (DILLON, 2009)
- 1A — MONITOR WELL (PDL, 1989)
- 96-1A — MONITOR WELL (JWEL, 1996)
- SW9 — APPROXIMATE SURFACE WATER STATION LOCATION

MILL MONITORING NETWORK:

- MONITOR WELL (DILLON, 2018)
- MONITOR WELL (DILLON, 2012)
- SW12-3 — SURFACE WATER SAMPLE (DILLON, 2012)
- OWS-1 — OIL WATER SEPARATOR
- (4.03) — HYDRAULIC HEAD ELEVATION (SEPT. 2019)
- GENERALIZED GROUNDWATER FLOW DIRECTION
- WATERSHED DIVIDE (APPROXIMATE LOCATION)
- DRAINAGE DITCH/STREAM AND SURFACE WATER FLOW DIRECTION
- RAILWAY TRACKS
- PROPERTY BOUNDARY

NOTES:

1. SW1, SW3, SW7 AND SW8 DELETED FROM PROGRAM.
2. MAP DETAILS ARE APPROXIMATE AND REPRESENT INFORMATION OBTAINED FROM PRECEDING PDL/JWEL REPORTS, SITE PLANS PROVIDED BY CLIENT AND NOVA SCOTIA PROPERTY ONLINE DATABASE. FEATURES SUCH AS LANDFILL FOOTPRINTS AND WELL LOCATIONS ARE INTENDED TO PRESENT GENERAL OVERALL SITE CONDITIONS.

LEGEND:

SOURCE: Dillon Consulting Limited
2020 Annual Monitoring Report

PROJECT:

PROJECT:
NPNS MILL
TRANSFORMATION PROJECT

PROJECT NO.: 211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
GROUNDWATER & SURFACE WATER MONITORING NETWORK

FIGURE NO.:	REVISION NO.:
5.2	0

SCALE: NOT TO SCALE

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY: T. MOREHOUSE	CHECKED BY: J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-20	REVISION DATE: (YYYY-MM-DD) 2021-10-25

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LEGEND:

- Surface Water Sample Locations
- Field Delineated Watercourse
- Field Delineated Wetland
- NPNS Property

N
W E
S

PROJECT:

PROJECT:
NPNS MILL
TRANSFORMATION PROJECT

PROJECT NO.: 211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
SURFACE WATER RESOURCES

FIGURE NO.:	REVISION NO.:
5.3	0

SCALE: 0 100 200 400 Metres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY:	CHECKED BY:
T. MOREHOUSE	J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-05

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Figure 5.3 shows the location of watercourses and wetlands on Abercrombie Point, in the vicinity of the project footprint. The project will occupy a portion of the northeast side of the NPNS property. Surface water drainage in this area flows via two small streams to the Pictou Harbour estuary (WC-1 and WC-2). In addition, two wetlands were identified within the vicinity of the project footprint, WL-1 and WL-2 (see **Section 5.5.1 Wetlands** for further details).

WC-1 (see **Figure 5.4**) (referred to as **East Brook** in NPNS monitoring) is a small, seasonal drainage located south of the mill, with the upstream portion of this watercourse within the project footprint area. WC-1 receives flow from road ditches, from the forest to the east of the watercourse, and from NPNS facility non-contact water, which discharges ephemerally from a concrete culvert adjacent to the WC-1. It includes runoff from the adjacent Canso Chemicals property (via a natural spring).

Figure 5.4: Photographs of WC-1 (October 2017; from Dillon 2019a).

WC-2 (**Figure 5.5**), referred to as **North Brook**, primarily receives storm water drainage from the NPNS facility and parking area and outflow from a field-identified wetland (WL-2).

Figure 5.5: Photographs of WC-2 (October 2017; from Dillon 2019a).

5.3.2.1 Surface Water Quality

Referred to as the Mill Monitoring Network, the baseline surface water data set for the project area consists of quarterly samples collected between 2012 and 2020 from three stations in the northeast area of the property. One site is upstream (SW12-1) of any mill influence and two are downstream of the mill (SW12-2 and SW12-3; see **Figure 5.2**).

The results of the monitoring have been compared to the Canadian Council of Ministers of the Environment, Water Quality Guidelines for the Protection of Aquatic Life, Freshwater (CCME FWAL; CCME 2021a). The East Brook, which is monitored both upstream and downstream of the inflow from mill contact water indicates that there is little impact from the mill, with both upstream and downstream sites having similar properties. Over the years there have been several exceedances of the guidelines at all

three sites, most commonly for chloride, aluminium, arsenic, cadmium, chromium, copper and iron, with an occasional exceedance of mercury (see **Appendix B**).

The 2019 and 2020 sampling programs are indicative of the pre- and post-hibernation conditions of the mill:

In 2019 (pre-hibernation):

- SW12-1 had exceedances during the low flow season in chloride (which ranged from 58 – 200 mg/L), ammonia (0.097 – 7.0 mg/L), total chromium (<0.001 – 0.0011 mg/L) and copper (<0.002 - 0.0044 mg/L);
- SW12-2 had exceedances in chloride (75 – 190 mg/L), ammonia (<0.05 – 5.6 mg/L) and total chromium (<0.001 – 0.0011 mg/L), and
- SW12-3 had exceedances in chloride (200 – 300 mg/L), fluoride (<0.1 – 0.13 mg/L), total chromium (<0.001 – 0.0011 mg/L) and iron (0.34 – 0.70 mg/L).

In 2020 (post-hibernation):

- SW12-1 had exceedances in chloride (72 – 350 mg/L) and ammonia (0.097 – 3.8 mg/L);
- SW12-2 had exceedances in chloride (57 – 160 mg/L), aluminium (<0.023 – 0.80 mg/L), total chromium (<0.001 – 0.0018 mg/L), copper (0.0005 – 0.0045 mg/L) and iron (<0.05 - 0.73 mg/L), and
- SW12 -3 had exceedances in chloride (140 – 330 mg/L) and manganese (0.14 – 0.87 mg/L).

Neither of the watercourses are impacted by PAHs or VOCs, with concentrations for these substances non-detectable throughout the monitoring period from 2012-2020.

5.4 TERRESTRIAL ENVIRONMENT

5.4.1 Vegetation

The project area falls within the Northumberland Lowlands EcoDistrict and tends to be associated the Mixedwood Forest Group from *Forest Ecosystem Classification for Nova Scotia* (Neily *et al.* 2013).

Field surveys were conducted of the ETF footprint area on the NPNS property in early October 2017 and June 2018 (Dillon 2019a). A baseline plant list (including scientific names) for the site is provided in **Appendix C**). Industrial land uses dominate the NPNS property and the location of the proposed ETF is mostly already cleared; **Figure 5.6** provides photographs of the habitat present on the site. No old growth forest habitat was identified within the vicinity of the proposed project footprint.

Over 35% percent of the plant species observed in the project area are not native to Nova Scotia. Most of these species were associated with the industrial, agricultural or roadside disturbed areas, such as box elder, Norway maple, woolly burdock, common wormwood, Canada horseweed, wild carrot, common St. John's wort, birds-foot trefoil, coltsfoot and tufted vetch. Exotic species such as eastern helleborine and mouse-ear hawkweed occur within the forested areas on the site.

Coastal habitats near the project area were inhabited by non-native species such as common wormwood, butter-and-eggs, old-man-in-the-spring, field sowthistle and brittle-stem hempnettle. Wild parsnip, marshpepper smartweed, alder-leaved buckthorn, rambler rose and curly dock occur within wetter drainage areas. Both alder-leaved buckthorn and rambler rose are considered potentially problematic invasive species (Hill and Blaney 2010) and can outcompete and shade out native plants.

Agricultural area and access road to the mill

Wetland (WL2) in proposed spill basin area

Typical forest in ETF footprint area

Standpipe area

Figure 5.6: Typical Habitat Within and Adjacent to the Project Footprint (from Dillon 2019a).

An Atlantic Canada Conservation Data Centre (AC CDC) report was requested for the project area for the *Replacement ETF Project* EA (**Appendix D**; Dillon 2019a), which indicated potential historical occurrence of priority species (i.e., plants and animals) within a 5 km buffer zone. Historical occurrences of priority species at Abercrombie Point only included Richardson's Pondweed, to the west of the project area. The field investigation within the project area provided a reasonable level of confidence for the likelihood of priority flora habitat at the site. All the species identified were provincially ranked as either exotic (SE) or widespread, abundant/common and secure (S4/S5).

The potential for non-vascular priority plant species (i.e., lichens and mosses) was also evaluated and focused on those species outlined in the *Provincial Special Management Practices for At-Risk Lichens* (NS DNR 2018). Most priority non-vascular plant species require very specific micro-habitats to survive and reproduce; nearly all priority lichen species in Nova Scotia are epiphytic, persisting on the bark surface of

mature trees in contiguous forested habitats. The AC CDC report (**Appendix D**) indicated that the nearest record for a priority non-vascular plant species was over 30 km from the project site. During the field surveys, no habitat for epiphytic lichen species of conservation concern were observed within the project area. Jelly lichen (ranked as S3 uncommon) and variable forklet moss (ranked as S3S4 uncommon to widespread) were observed in the fall of 2017 and June 2018, along eroding eastern shoreline on the NPNS property.

5.4.2 Avian Fauna

Avian fauna includes all resident and migratory terrestrial birds, shorebirds and marine bird species within the land portions of the project area, as well as the adjacent marine environment. Migratory birds include those listed under the *MBCA*, while priority birds are mostly species listed as protected under the *NS ESA* or the *Wildlife Act*.

The north shore of mainland Nova Scotia, including the Northumberland Strait and Pictou Harbour provides habitat for a wide variety of bird species. Most bird species found in Nova Scotia are migratory and are protected under the *MBCA*. Due to Nova Scotia's location, there are many species of birds that only visit the area during their spring and fall migrations. Spring migration is from March to early June, peaking in May, and fall migration lasts from August to October, but can be first detected in July for some birds. By mid-October and early November, many of the birds remaining in the area are likely birds that have arrived from more northerly climes and will overwinter within the area.

Nesting in northern Nova Scotia can begin as early as mid-March, as with the barred owl, and continue into early-September, as with the American goldfinch. However, most birds are engaged in nesting activities from mid-April to late August (CWS Nesting Zone C3).

A desktop analysis to identify potential avian species within the projects site, as well as for the potential pipeline route was undertaken for the original *Replacement ETF Project*. This was followed up with several field surveys to cover the various birding seasons, including (Dillon 2019a, b):

- Habitat evaluation at the ETF footprint area and Pictou Harbour – October 2017, and June 2018
- Overwintering bird surveys on December 7, 2017, January 26, 2018, and March 20, 2018;
- Breeding bird survey on June 16, 2018
- Migratory bird surveys, on May 14, 2018 and May 9, May 24, June 10, and July 5, 2019;
- Survey for common nighthawk, double-crested cormorants, owls and raptors (including raptor nests), during migratory bird surveys.

Due to the likelihood of bird species ranging over a wide area, the work undertaken to identify bird species for the *Replacement ETF Project* (which included a larger project area) provides a comprehensive list of potential bird species in and adjacent to the project area at Abercrombie Point. Species lists (including scientific names) from the desktop analyses and various surveys are provided in **Appendix E.**

5.4.2.1 Marine and Shorebirds

Due to its coastal location, many of the bird species are considered marine (either sea- or shorebirds). Common inshore seabirds that inhabit the Northumberland Strait include various species of gulls, terns, and cormorants. These are birds that spend substantial time at sea in shallow bodies of water, where food is easily accessible, and then they will return to land at night to rest. Some common species of waterfowl

that are found in the Strait include black scoter white-winged scoter, surf scoter, long-tailed duck, common, American black duck, green-winged teal, greater scaup, Canada goose, red-breasted merganser and common goldeneye.

The Northumberland Strait ranks second only to the Bay of Fundy in importance as a stopover location for migrating shorebirds. It is estimated that over 30 species of shorebirds will gather during the spring and fall migrations (JWEL 2001). The extensive mudflats provide a crucial food source for migrating birds. Migrating shorebirds typically have staging areas that they will return to year after year. Common shorebirds that can be found in abundance during the migrating period include semipalmated sandpiper, semipalmated plover, sanderling, short-billed dowitcher, black-bellied plover, least sandpiper, greater yellowlegs, dunlin and red knot (JWEL 2001).

Although most of species are migratory, there are some species that are found year-round and breed in the area. Species that have been known to breed in the Northumberland Strait include the common tern, arctic tern, piping plover, semipalmated plover, double-crested cormorant and great cormorant, razorbill, willet, ring-billed gull, great blue heron, and black guillemot.

Large numbers of double-crested cormorants are known to nest in Pictou Harbour, on the old pilings adjacent to the Pictou Causeway. These birds arrive as early as the first week in April and start to build nests almost immediately (Cohrs 1991). Piping plovers have also been historically observed in Pictou Harbour and are known to nest on sandy beaches in Pictou County (Cohrs 1991). Other species historically observed in Pictou Harbour include: semipalmated plover, black-bellied plover, common loon; barrow's goldeneye, common goldeneye, common tern, killdeer, ruddy turnstone, sanderling, short-billed dowitcher, greater and lesser yellowlegs, and spotted, semipalmated and pectoral sandpipers (see **Appendix E**). In the late winter, various species of waterfowl are known to congregate in estuarine areas on either side of the Pictou Causeway due to the availability of open water for foraging.

5.4.2.2 Species of Conservation Concern

The following birds are species at risk listed under *SARA* federally or under the NS *ESA* provincially that have been observed within or adjacent to the project area during field surveys:

- **Barn Swallow** - The barn swallow is listed as **Threatened** federally under *SARA* and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), **Endangered** by the NS *ESA*, and as **S2S3B** by the AC CDC. Several barn swallows were observed during the May 2018 surveys on the ETF site and around the NPNS facility.
- **Barrow's Goldeneye** - The Barrow's goldeneye (eastern population) is listed as **Special Concern** federally under *SARA* and COSEWIC, and as **S1N** by the AC CDC. Several Barrow's goldeneye were observed during the January 2018 surveys west of the project site, along the shores of Pictou Harbour.
- **Common Nighthawk** - The common nighthawk is listed as **Threatened – Schedule 1** under *SARA* and COSEWIC, as **Threatened** under the NS ESA, and as **S2B** by the AC CDC. Several individuals were detected during the 2019 migratory bird survey program. They were heard performing courtship displays (i.e., wing 'booms') from two different locations during the common nighthawk survey conducted on June 17, 2019.
- **Eastern Wood-Pewee** – The eastern wood-pewee is listed as **Special Concern** under *SARA* and COSEWIC, and as **Vulnerable** under the *NS ESA*. In Nova Scotia, it is listed as **S3S4B** by the AC CDC.

Two individuals were detected during the 2019 migratory bird survey program on June 10, 2019. The birds did not appear agitated or aggressive towards each other, which is suggestive of a breeding pair.

The following birds, listed as rare or uncommon in Nova Scotia by AC CDC, have been observed during field surveys on or near the project site. Their rarity status is indicated by S3 (uncommon in province), S2 (rare in province), S1 (extremely rare in province); their breeding status by N (not breeding) or B (breeding), and their migrant status as M (migrant):

- **Bufflehead** - Bufflehead is listed as **S3S4N** by the AC CDC. Small numbers of bufflehead were observed during the overwintering bird survey within Pictou Harbour and around the Pictou Causeway.
- **Cliff Swallow** - Cliff swallow is listed as **S2S3B** by the AC CDC. Several cliff swallows were observed during the 2018 breeding bird survey on and around the NPNS property, gathering nesting materials; one bird was observed returning to a nest structure attached to the existing NPNS building. Based on the colonial nature of this species and the above observations, it is likely that cliff swallows are using the existing NPNS building as a colony site.
- **Common Goldeneye** - The common goldeneye is listed as **S2B, S5N** by the AC CDC. They were observed during the December 2017, and January and March 2018 surveys on the NPNS property. Open wetlands adjacent to the project area may provide suitable breeding habitat for this species. The ice-free waters of Pictou Harbour may provide habitat for this species during migratory periods.
- **Common Tern** - The common tern is listed as **S3B** by the AC CDC. Over 160 common terns were detected during the migratory bird survey on May 18, 2018 in the vicinity of the Pictou Harbour.
- **Gray Catbird** - The gray catbird is listed as **S3B** by the AC CDC. Two gray catbirds were detected during the breeding bird survey on June 16, 2018. Both were detected in shrub-dominated habitats on the north-side of the Pictou Causeway. Additional potential breeding habitat for this species includes shrubby, disturbed areas and wetlands.
- **Great Cormorant** - The great cormorant is listed as **S2S3B** by the AC CDC. One great cormorant was detected during the overwintering bird survey in December 2017 in the Pictou Harbour. While there are no known great cormorant colonies nearby, they have been known to nest amongst double-crested cormorants.
- **Greater Yellowlegs** – The greater yellowlegs is listed as **S3B, S3S4M** by the AC CDC. One individual of greater yellowlegs was detected during the 2019 migratory bird survey.
- **Killdeer** - The killdeer is listed as **S3B** by the AC CDC. Two killdeer were observed during the migratory stop-over survey on May 14, 2018, and one was detected during the 2019 migratory bird survey. Potential breeding habitat for killdeer adjacent to the project area includes disturbed areas, agricultural lands and any graveled area, including road shoulders.
- **Red-breasted Merganser** - The red-breasted merganser is listed as **S3S4B/ S5N** by the AC CDC. Hundreds of red-breasted merganser were observed during the overwintering bird survey, primarily during the December 2017 and March 2018 visit; 12 birds were detected during the migratory bird survey on May 14, 2018, and six individuals were detected during the 2019 migratory bird survey. No red-breasted merganser were detected during the breeding bird survey.

- **Red-Breasted Nuthatch** – The red-breasted nuthatch is listed as **S3** by the AC CDC. One red-breasted nuthatch was detected during the 2019 migratory bird survey program. The bird was engaged in territorial singing when it was detected and was likely establishing a breeding territory.
- **Ruby-crowned Kinglet** – Ruby-crowned kinglet is listed as **S3S4B** by the AC CDC. They were detected on seven occasions during the 2019 migratory bird survey program.
- **Swainson's Thrush** – Swainson's thrush is listed as **S3S4B** by the AC CDC. One bird was detected during the 2019 migratory bird survey program. It was engaged in territorial singing when it was detected and, therefore, was likely on and defending an established breeding territory.
- **Veery** – The veery is listed as **S3S4B** by the AC CDC. One Veery was detected during the 2019 migratory bird survey program. It was engaged in territorial singing when it was detected and was likely on and defending an established breeding territory.
- **Wilson's Warbler** – Wilson's Warbler is listed as **S3B** by the AC CDC. One Wilson's Warbler was detected during the 2019 migratory bird survey program, on the NPNS property within wetland WL-2 on May 24, 2019.

In addition to the birds observed during the field surveys, there are numerous species that have the potential to be in the area based on a review of AC CDC and Maritime Breeding Bird Atlas (Bird Studies Canada 2015) records that are listed under *SARA* federally or under the *NS ESA* provincially, or have been ranked as rare or uncommon in Nova Scotia by AC CDC. A full list of bird species that have the potential to be in the area or observed during field surveys is provided in **Appendix E**.

5.4.2.3 Special Areas for Avian Fauna

Parks and Protected Areas

There are several parks and protected areas within approximately 100 km of the project area that are known to provide important habitat for, or be frequented by, marine birds, including:

- Multiple coastal provincial parks that are known for birdwatching, including Blue Sea Beach Provincial Park, Caribou-Munroes Island Provincial Park, Gulf Shore Provincial Park, Heather Beach Provincial Park, and Powell's Point Provincial Park.
- Bird species classified as critically imperiled and/or vulnerable to extirpation or extinction are known to occur at Amherst Shore Provincial Park, Blue Sea Beach Provincial Park, Fox Harbour Provincial Park, Melmerby Beach Provincial Park, Rushton's Beach Provincial Park, and Waterside Beach Provincial Park (Nova Scotia 2021). There has been recorded potential for piping plover at the Cape John Beach Provincial Park and Lighthouse Beach Nature Reserve (Nova Scotia 2021).
- The Pugwash River Estuary Conservation Lands contain forest and marsh habitat for a variety of staging and migrating waterfowl, such as Canada goose, American black duck, great blue heron, and green-winged teal. This estuary is also home to the piping plover and barrow's goldeneye, both of which are species at risk. There have been 27 species of shorebirds documented in the region during spring and fall migration periods (Nature Conservancy of Canada 2018).
- The Wallace Bay National Wildlife Area provides important habitat for migrating and nesting waterfowl. American black duck, green-winged teal, and northern pintail all regularly breed here (Government of Canada 2017a).

Important Bird Areas (IBAs)

IBAs are discrete areas that support nationally or globally important groups of birds. The criteria used to identify important habitat are internationally standardized and are based on the presence of species of conservation concern (Moore and Couturier 2011). IBAs are not legally protected but are often found within areas that have been designated as protected areas by federal or provincial authorities. There are several IBAs around the Northumberland Strait, but the closest IBA is High Bank (PE005), which is approximately 35 km away. In recent years, High Bank has supported an average of 92 nests of great cormorants annually, which represents almost 1.5% of the estimated North American population of the species.

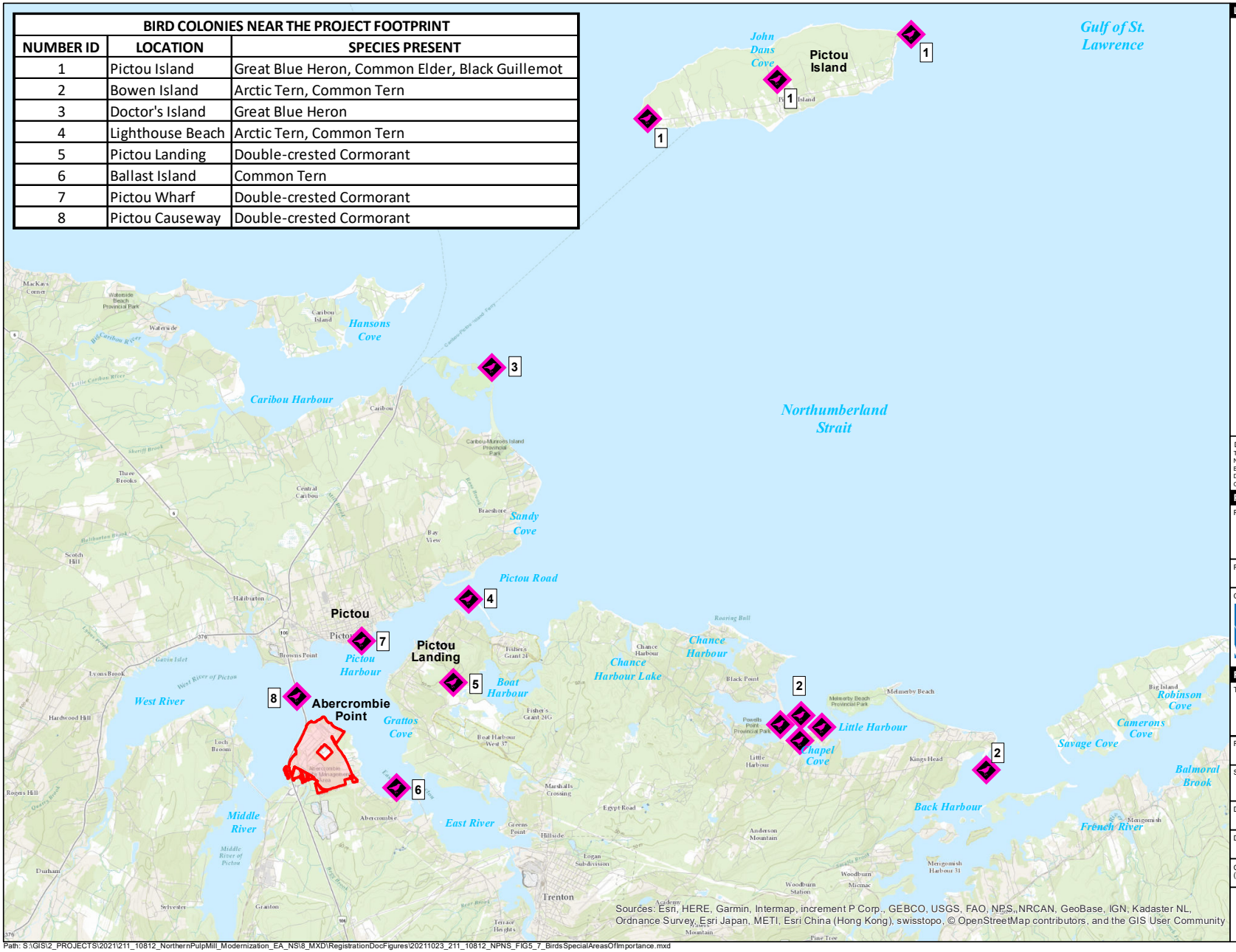
Bird Colonies

Bird colonies near the project area are shown on **Figure 5.7. Table 5.5** identifies several areas in and around Pictou Harbour that either currently support, or have previously supported, breeding colonial seabird species.

Table 5.5: Historical Bird Colonies in and Around Pictou Harbour (CWS 2019)

Location	Species	Year	Colony Size	Approximate Distance
Pictou Wharf	Double-crested Cormorant	1972	100 breeding pairs and active nests	2.4 km
Pictou Causeway	Double-crested Cormorant	1974-current	88-180 breeding pairs	0.5 km
Pictou Landing	Double-crested Cormorant	1987	71 breeding birds	4.1 km
Pictou Oil Pier	Double-crested Cormorant	1987	172 breeding birds	2.5 km
Doctors Island (Gulf of St. Lawrence), NS	Great Blue Heron	1960	30 pairs	10.7 km
Pictou Island East Point, NS	Great Blue Heron	1980	53 pairs	25.1 km
Pictou Island West Point, NS	Great Blue Heron	1987	60 pairs	19.0 km
	Common Eider	2008	Unspecified	19.0 km
Pictou Island, NS	Black Guillemot	2008	16 individuals	19.0 km
	Great Blue Heron	2008	Unspecified	19.0 km
Bowen Island, NS	Common/Arctic Tern	1995	3 individuals	13.3 km
Little Harbour, NS	Common Tern	1995	300 individuals	13.1 km
End of Lighthouse Beach, NS	Common/Arctic Tern	2007	39 pairs	5.6 km
Little Harbour, sandspit between Bowen Island and Mainland, NS	Common/Arctic Tern	2007	54 pairs	12.7 km
Ballast Island, NS	Common Tern	2011	77 pairs	2.8 km

BIRD COLONIES NEAR THE PROJECT FOOTPRINT		
NUMBER ID	**LOCATION**	**SPECIES PRESENT**
1	Pictou Island	Great Blue Heron, Common Elder, Black Guillemot
2	Bowen Island	Arctic Tern, Common Tern
3	Doctor's Island	Great Blue Heron
4	Lighthouse Beach	Arctic Tern, Common Tern
5	Pictou Landing	Double-crested Cormorant
6	Ballast Island	Common Tern
7	Pictou Wharf	Double-crested Cormorant
8	Pictou Causeway	Double-crested Cormorant



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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LEGEND:

- Bird Colony
- NPNS Property

SOURCE: Dillon 2019
Environmental Assessment Registration Document Replacement Effluent Treatment Facility

N W E S

PROJECT:

PROJECT:
NPNS MILL
TRANSFORMATION PROJECT

PROJECT NO.: 211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
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FIGURE:

TITLE:
SPECIAL AREAS OF IMPORTANCE FOR BIRDS

FIGURE NO.:	REVISION NO.:
5.7	0

SCALE: 1:100,000
0 0.5 1 2 3 4 5 Kilometres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY: T. MOREHOUSE	CHECKED BY: J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-18

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5.4.3 Wildlife

To provide information on the potential for occurrence of priority wildlife and associated habitats within the project area, a desktop review was undertaken, as well as the following field investigations:

- Habitat evaluation at the ETF project area – October 2017 and June 2018, and
- Investigation of potential priority herptile habitat at the project area was conducted by J. Gilhen (herptile specialist) – June 7, 2018.

A site-specific AC CDC report (**Appendix D**) including priority species and significant or managed areas, was obtained. The potential for priority wildlife species was based on species identified within 5 km of the project area (or farther if potential wide-ranging species) and comparison of the site habitats with potential habitat requirements for the identified species.

5.4.3.1 Typical Wildlife Species

Based on the habitat characteristics of the project area, typical wildlife species expected to occur include common species to the Pictou Lowlands that are characteristic of disturbed and agricultural habitats, forested and riparian habitats, and coastal areas. Common species (considered secure in the province) include white-tailed deer, eastern coyote, red fox, American red squirrel, eastern chipmunk, snowshoe hare, North American porcupine, northern raccoon, and several common rodents such as red-backed vole, muskrat, mink, short-tailed weasel, and American beaver may also occur in suitable habitats. Although less common, river otter are also expected in the area. Bobcat and American black bear may also be expected to occur in the general area. During site visits to the project area, a high density of deer signs was observed, particularly in the treed area to the north and west of the existing NPNS facility (Dillon 2019a).

Nine native reptiles (4 turtles and 5 snakes) and 13 amphibians are known to occur in Nova Scotia (NSDLF 2021c). Species anticipated to occur within the general area include common frogs and toads (wood frog, northern spring peeper, and American toad), salamanders (yellow spotted and blue spotted) and snakes (common garter and redbelly). No federal or provincial threatened or endangered amphibian or reptile species are anticipated with the area; however, an uncommon form of blue spotted salamanders (polyploid) have been recorded in the Braeshore area (located approximately 4 km to the north and east of the project) (pers. comm. J. Gilhen, herptile specialist). The old field and edge habitat as well as isolated wetland/alder swale areas and second growth mixed forest areas at the NPNS property provide habitat for amphibians and snakes. During the June 2018 site visit to the project area, no amphibian larvae were noted in the shallow cattail ditches.

Seventy-one butterfly and 116 odonate species are known to occur in Nova Scotia (NSDLF 2021c). Priority invertebrates with potential to occur in the local assessment area are discussed further below.

5.4.3.2 Wildlife Species of Conservation Concern

The AC CDC site-specific report (**Appendix D**) indicated that there are no historical records of federally or provincially protected terrestrial wildlife and that no bat hibernacula had been reported within 5 km of the project area. Several non-*SARA* or *NS ESA* listed priority invertebrates were recorded by AC CDC within 5 km of the proposed project. The habitat surrounding the project area is suitable for species of conservation concern known in the general area. Protected species that were identified as potentially occurring in the project area based on habitat characteristics are summarized in **Table 5.6**.

Table 5.6: Summary of Potential Listed SARA/NS ESA Terrestrial Wildlife Species (from Dillon 2019a)

Species	Status*	Habitat of Interest	Potential Occurrence in Project Area
Mammals			
Little Brown Myotis (*Myotis lucifugus*)	**SARA:** Endangered Schedule 1 **NS ESA:** Endangered **Prov. Rank:** S1/ At Risk	Waterways, wetlands and forest edges.	Foraging is expected within the project footprint during the summer. Migratory individuals may pass through the area on the way to/from hibernaculum in the spring and late summer/fall.
Northern Myotis (*Myotis septentrionalis*)			
Tri-coloured Bat (*Perimyotis subflavus*)			
Moose (*Alces alces americanus*; Mainland Population)	**NS ESA:** Endangered **Prov. Rank:** S1/At Risk	Incidental throughout.	Although unlikely, due to known species distribution, individuals may incidentally occur.
Herptiles			
Snapping Turtle (*Chelydra serpentine*)	**SARA:** Special Concern Schedule 1 **NS ESA:** Vulnerable **Prov. Rank:** S3/ Sensitive	Watercourses and wetlands, riparian gravel/sand areas.	Although unlikely, due to known species distribution, individuals may incidentally occur.
Wood Turtle (*Glyptemys insculpta*)	**SARA:** Threatened Schedule 1 **NS ESA**: Threatened **Prov. Rank:** S2/ Sensitive	Watercourses and wetlands, riparian gravel/sand areas.	Habitat not identifed in project area
Invertebrates			
Monarch (*Danaus plexippus*)	**SARA:** Special Concern Schedule 1 **NS ESA:** Endangered **Prov. Rank:** S2B/ Sensitive	Butterfly of variety of habitat types – farm or urban fields, roadsides, open areas with abundant milkweed and wildflowers.	Occasional individuals may breed or forage in habitat at the project site during the summer to fall period.
Yellow-banded Bumble Bee (*Bombus terricola*)	**SARA/COSEWIC:** Special Concern**,** Schedule 1 **NS ESA:** Vulnerable **Prov. Rank:** S3/ Sensitive	This species is a habitat generalist within open coniferous, deciduous and mixed hardwood forests, wet and dry meadows bordering riparian zones, and along roadsides, urban parks, gardens and agricultural areas.	Although habitat may be present adjacent to the project footprint area, the likelihood of the occurrence of the bee is reduced by low numbers currently in the province.
Notes: *Status notes (as of December 2018) - S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province, SU: unrankable (lack of info). The use of 'S#S#' is to denote a range in rank used to indicate any uncertainty about the status of the species or community. Qualifiers: B= Breeding (breeding population), N = Nonbreeding (nonbreeding population) ? = Inexact/Uncertain, H = Historic (possibly extirpated), M = Migrant and SNR = Not yet assessed in province.			

Other species of conservation interest and their potential to interact with the project are summarized in **Table 5.7**.

Table 5.7: Summary of Potential for Other Species of Conservation Concern (from Dillon 2019a)

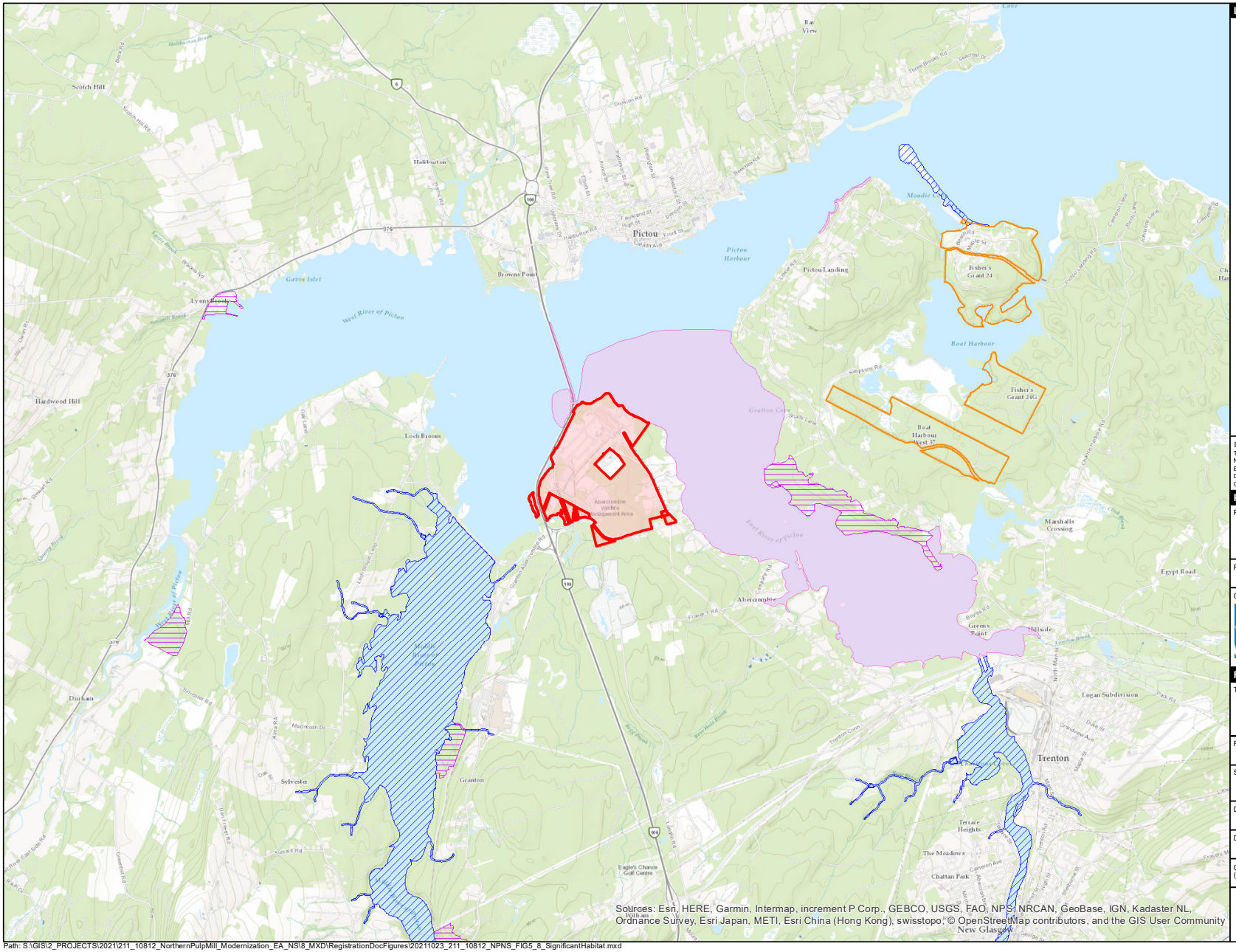
Species	AC CDC Status*	Habitat Features	Potential Occurrence in Project Footprint Area
Herptiles			
Four-toed Salamander (*Hemidactylium scutatum*)	S3 Secure	Closely associated with sphagnum areas bordering streams and in sphagnum bogs during spring breeding season. During summer, adults have been found in woodland habitats (NS Museum of Natural History 2021).	Not anticipated within project footprint area but may occur in adjacent habitats if present.
Invertebrates			
Acadian Hairstreak (*Satyrium acadica*)	S1 Undetermined	Butterfly associated with willows (the host plant), wet meadows, fields, stream banks and is often found in roadside ditches (Layberry *et al.* 2002). The species flies from late June to mid-August and is most often observed in July (Layberry *et al.* 2002).	May incidentally occur within the project footprint area where wet areas or water features are present.
Baltimore Checkerspot (*Euphydryas phaeton*)	S2S3 Secure	Butterfly associated with fresh-water marshes, wet roadsides, meadows (Payzant and Payzant 2012). Flight period is mid-June to early August.	May incidentally occur within the project footprint area where habitat features are present.
Bronze Copper (*Lycaena hyllus*)	S2 Secure	Butterfly associated with open wet habitats usually marshes not overgrown with cattails including manmade ones. Host plants include docks and knotweeds; nectaring occurs on flowers. Flight periods early July to mid-September.	May incidentally occur within the project footprint area where habitat features are present. Recorded in Maritime Butterfly Atlas (AC CDC 2021) in adjacent West River 10 km square.
Common Roadside Skipper (*Amblyscirtes vialis***)**	S3S4 Secure	Butterfly species is almost always seen on the ground, on trails, gravelly or sandy roads, and road verges, usually in wooded areas (Layberry *et al.* 2002).	May incidentally occur within the project footprint area where habitat features are present.
Eastern Pearlshell (*Margaritifera margaritifera*)	S2 Sensitive	A freshwater mussel associated with flowing water of rivers and streams (small to medium sized) with mud, sand, gravel or stony bottom substrate (Davis 2007).	This species may incidentally occur within the project area
Ebony Boghaunter (*Williamsonia fletcheri*)	S2 May be at risk	Dragonfly found in bog type from white cedar, black spruce, larch, to other forests with bogs/ bog or fen pools (WOS 2018).	Not anticipated within the project footprint area but may occur in adjacent suitable bog habitat.
Forcipate Emerald (*Somatochlora forcipata*)	S2S3 May be at risk	Dragonfly species occurs at small spring-fed peatland streams, in or out of woodland. Larvae sprawl on bottom among detritus (IUCN 2018)	Not anticipated within the project footprint area but may occur in adjacent suitable peatland stream habitat.
Grey Comma (*Polygonia progne*)	S3S4 Secure	Butterfly associated with open forests, roadsides along forested areas (Payzant and Payzant 2012). Overwinter as adult and flight periods April to mid-June and mid-July to early September. Host plant is currents (AC CDC 2021).	May incidentally occur within the project footprint area where habitat features are present.
Jutta Arctic (*Oeneis jutta*)	S3 May be at risk	Butterfly species is found only in black spruce-tamarack bogs and it prefers the edges of treed areas. Flight period mid-May to early July. Host plants are sedges (AC CDC 2021).	Unlikely in the project footprint area but may incidentally occur within adjacent suitable habitats.
Kennedy's Emerald (*Somatochlora kennedyi*)	S1S2 May be at risk	Dragonfly associated with open fens, small ponds, shaded bog ponds, shallow bogs, and slow open streams in bogs or marshes (WOS 2018).	Unlikely in the project footprint area but may incidentally occur within adjacent swamps, shaded bogs or open streams.

Species	AC CDC Status*	Habitat Features	Potential Occurrence in Project Footprint Area
Lance-Tipped Darner (*Aeshna constricta*)	S3 Secure	Dragonfly associated with lakes, ponds, marshes and slow streams and is observed in flight from early June to early October (Lung and Sommer 2001).	Unlikely in the project footprint area but may incidentally occur within adjacent ponds, marshes and slow streams.
Northern Cloudywing (*Thorybes pylades*)	S2S3 Sensitive	Butterfly found nectaring at flowers usually in partially wooded places and meadows, and may occur in built-up areas (Layberry *et al.* 2002). There is only one generation from mid-May to early-July (Layberry *et al.* 2002). Host plants legumes, vetch and beach pea (AC CDC 2021).	May incidentally occur within the project footprint area where habitat features are present.
Maine Snaketail (*Ophiogomphus mainensis*)	S2S3 May be at risk	Dragonfly species of small rapid rocky streams and rivers in forest. Larvae burrow in sandy substrates (IUCN 2018).	Unlikely in the project footprint area but may incidentally occur within adjacent rocky streams.
Question Mark *(Polygonia interrogationis*)	**Prov. Rank:** S3B/ Secure	Butterfly, usually seen in or near woodlands, but in late summer in good migrant years it can be found in almost any habitat. (Layberry *et al.* 2002). Host plants include nettle, elm and hops (AC CDC 2021). There are two generations per year, with the overwintering generation typically observed from late May to early July (Layberry *et al.* 2002).	May incidentally occur within the project footprint area where forested areas are located adjacent to the project footprint area. Recorded in Maritime Butterfly Atlas (AC CDC 2021) in Caribou 10 km square.
Salt Marsh/Maritime Copper (*Lycaena dospassosi*)	S2 At risk	Butterfly associated with salt marshes along the Northumberland Strait (Payzant and Pyzant 2012). Flight period mid -July to mid-August. Adults collect nectar on marsh and marsh edge flowering plants; and host plant is silverweed.	Although unlikely to occur within the project footprint area, this species may incidentally occur in adjacent habitat. Recorded in Maritime Butterfly Atlas (AC CDC 2021) in adjacent 10 km square.
Striped Hairstreak (*Satyrium liparops strigosum*)	S2S3 Sensitive	Butterfly of forest openings and thickets as well as trails and gardens. Nectaring on flowers, especially milkweed. Flight period early July to late August. Host plant shrubs and trees in rose family (AC CDC 2021).	May incidentally occur within the project footprint area where habitat features are present.
Taiga Bluet (*Coenagrion resolutum*)	S1S2 May be at risk	Damselfly, associated with a variety of non-moving waters including marshes, ponds, bogs, and sloughs (WOS 2018).	Not anticipated in project footprint area; may occur in adjacent swamps, shaded bogs or open streams.
Notes: *Status notes (as of December 2018) - S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province, SU: unrankable (lack of info). The use of 'S#S#' is to denote a range in rank used to indicate any uncertainty about the status of the species or community. Qualifiers: B= Breeding (breeding population), N = Nonbreeding (nonbreeding population) ? = Inexact/Uncertain, H = Historic (possibly extirpated), M = Migrant and SNR = Not yet assessed in province. (AC CDC 2021).			

5.4.3.3 Significant Habitats

According to the NSDLF, significant habitats include sites where species at risk or other species of conservation concern can be found or sites where unusually large concentrations of wildlife occur, or habitats known to be rare in the province. Significant habitats related to wildlife, within 5 km as identified on the provincial dataset (NSDLF 2021d) include the species at risk habitat for wood turtles in the Middle and East Rivers south of the project area (**Figure 5.8**)

The site-specific AC CDC report (see **Appendix D**) provided the locations of significant or managed areas within 5 km of the project footprint area. According to this, one significant area and seven managed areas



LEGEND:

- NPNS Property
- First Nations Lands

SIGNIFICANT HABITAT

- Species at Risk
- Other Habitat
- Migratory Bird

N W E S

PROJECT:

PROJECT:
NPNS MILL TRANSFORMATION PROJECT

PROJECT NO.: **211-10812**

CLIENT:
NORTHERN PULP NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
SIGNIFICANT HABITATS FOR TERRESTRIAL WILDLIFE

FIGURE NO.:	REVISION NO.:
5.8	0

SCALE: 0 500 1,000 2,000 Metres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY:	CHECKED BY:
T. MOREHOUSE	J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-07

WSP Canada Inc.
1 Spectacle Lake Drive,
Dartmouth, Nova Scotia
www.wsp.com

Path: S:\GIS\2_PROJECTS\2021\211_10812_NorthernPulpMill_Modernization_EA_NS\8_MXD\RegistrationDocFigures\20211023_211_10812_NPNS_FIG5_8_SignificantHabitat.mxd

are located within 5 km of the project, of which the Abercrombie Wildlife Management Area is related to wildlife. It is regulated under the Abercrombie *Wildlife Management Area Designation and Regulations* and is located on privately-owned land at Abercrombie Point. The key regulation is a prohibition on hunting and trapping. It includes both developed and forested areas with some small areas of water and wetland. It was designated following the establishment of a nature trail in the area in the 1970s. It also includes 1.8 ha of Pictou Harbour east of the Pictou Causeway where the double-crested cormorant colony is.

5.5 FRESHWATER ENVIRONMENT

5.5.1 Wetlands

Wetlands are defined as lands that either periodically or permanently have a water table at, near or above the land's surface or that are saturated with water, and sustain aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and biological activities adapted to wet conditions (NSE 2011). They are widely recognized as providing a host of ecosystem functions and benefits and are protected under the Nova Scotia Wetland Conservation Policy (NSE 2011), and the *Activities Designation Regulations* pursuant the NS *Environment Act* require an approval from NSECC before any alteration of a wetland.

Following a preliminary desktop identification and analysis, wetlands within the project area were surveyed by Dillon biologists certified in wetland delineation and functional assessment on June 12, 2018 (**Appendix F**; Dillon 2019a). The presence or absence of wetlands was evaluated in accordance with the US Army Corps of Engineers Wetlands Delineation Manual (USACE 1987) and all wetlands were classified using the Canadian Wetland Classification System (National Wetland Working Group 1997). Wetland functional assessments were completed for each wetland within the site using the Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC; Adamus 2018).

Two wetlands were identified within the project area, WL-1 within the footprint of the proposed ETF and WL-2, within the footprint of the proposed spill basin (see **Figure 5.3**). The characteristics of each are summarized in **Table 5.8,** and wetland delineation datasheets and functional assessment summaries are provided in **Appendix F.**

Table 5.8: Results of Field Assessment of Wetlands Within the Project Area (from Dillon 2019a)

Wetland	Wetland Type	Key Wetland Functions[1]	Rare Plants	Total Delineated Area (ha)	Area (ha) of Wetland Potentially Affected by the Project activities[3]
Wetland WL-1	Wet meadow	None [2]	No	0.036	0.036
Wetland WL-2	Shrub swamp	Surface water retention Resident fish habitat Aquatic invertebrate habitat Amphibian and turtle habitat Waterbird feeding habitat Waterbird nesting habitat Songbird, raptor and mammal habitat	No	0.75	0.12
Total Wetland Area				**0.786**	**0.156**

1. Key wetland functions are those functions that scored as 'higher' during the WESP-AC.
2. The WESP-AC functional assessment for this wetland did not identify higher scoring functions. The functions for this wetland scored low and moderate.
3. Wetland area affected includes both direct footprint and likely area of impaired function.

Wetland WL-1 – 0.036 ha Wet Meadow

WL-1 is situated within the ETF footprint, south of the current mill location. It is characterized as a 0.036 ha seasonally flooded and permanently saturated wet meadow that is generally flat and located on at the toe of a gentle slope (**Figure 5.9**). There is no inlet stream and outflow appears to be temporary through the ditch along the adjacent roadway.

Small stand of willow trees

View towards road where ditch runs

Innundation and hummocky ground

Small outlet channel from WL-1 into ditch

Figure 5.9: Wetland WL-1 – Wet Meadow (from Dillon 2019a).

WL-1 does not have a treed overstory. The shrub layer was dominated by willow. The herbaceous understory layer was dominated by woolgrass, field horsetail, and common marsh bedstraw. All the dominant species in the vegetation community identified at Wetland WL-1 are wet adapted based on their indicator status (USACE 1987); therefore, it is considered to have a "hydrophytic" or wet adapted vegetation community. There were no vegetation species at risk or species of conservation concern observed during the desktop or field delineations of this wetland. The wetland also had wet soil indicators in the form of a thick organic layer at the surface that is slower to decompose due to wet conditions that occur in this wetland on a seasonal basis. The wetland had several hydrology indicators including, surface water present, a high water table and saturation of soil as well as a sparsely vegetated concave surface, aquatic fauna, a hydrogen sulphide odour, surface soil cracks, stunted and stressed vegetation. The origin of the wetland was likely a shrub swamp that has naturalized into a wet meadow following clearing and ditching.

Wetland 2 (WL-2) – 0.75 ha Shrub Swamp

Wetland WL-2 is located on the eastern side of the mill, between the parking lot and shoreline, within the footprint of the spill basin. Based on the results of the field assessment, Wetland WL-2 is characterized as a 0.75 ha shrub swamp that is permanently saturated, seasonally flooded and is generally flat (i.e., basin position) (**Figure 5.10**). No stream inflow was observed and a seasonal outflow channel exists east of the wetland and drains north to the Pictou Harbour.

View of WL-2 from NPNS parking lot

View of WL-2 from NPNS parking lot

Ponded area within WL-2

Dense shrubs and rip-rap on edge of WL-1

Figure 5.10: Wetland WL-2 – Shrub Swamp (from Dillon 2019a).

The overstory (trees) within the wetland was dominated by white pine and American mountain-ash, with some red maple. The shrub layer was dominated by broadleaf cattail and also contained field horsetail, woolgrass, cinnamon fern, sweet pea, valerian and common marsh bedstraw.

The vegetation community identified at WL-2 (shrub swamp) is comprised of greater than 50% wet-adapted vegetation species based on their indicator status (USACE 1987); therefore, this wetland is considered to have a “hydrophytic” or wet adapted vegetation community. There were no plant species of conservation concern observed during the desktop or field delineation. The wetland also had wet soil indicators in the form of a thick organic layer at the surface that is slower to decompose due to wet conditions. A hydrogen sulphide odour was observed, indicating decomposition of organic material in a

low oxygen environment. The origin of the wetland appears to be natural, but it is likely that the hydrology and drainage have been altered by the construction of the adjacent parking lot and associated stormwater inputs from the NPNS facility.

5.5.2 Freshwater Fish and Fish Habitat

Freshwater fish and fish habitat include freshwater watercourses that support habitat for fish. They are protected under the federal *Fisheries Act*, which defines fish broadly as fish, shellfish, crustaceans and marine animals, and fish habitat as "spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes".

Freshwater resources are described in **Section 5.3.2**. The NPNS property at Abercrombie Point is situated on a promontory bounded by the estuarine areas of the Middle and East rivers. The surrounding waters are estuarine, meaning that they are tidally influenced and tend to be more marine (saltwater); they are described in more detail in **Section 5.6.**

In general, tributaries which flow to the East, Middle and West rivers are shallow and fast flowing, with substrates of gravel and cobble with good to excellent riparian vegetation for cover (Miles 1983). The freshwater environments of the East River, Middle and the West River support habitat for salmonids (i.e., Atlantic salmon, brook trout, and brown trout), various species of cyprinids (minnows), and American eel (Cairns *et al.* 2012; see also **Appendix G**). This section focuses on the streams at Abercrombie Point that drain into Pictou Harbour.

Freshwater aquatic habitats at Abercrombie Point were assessed in June 2018 and June 2019 (Dillon 2019a, b). Three short watercourses were identified flowing to Pictou Harbour, WC-1, WC-2 and WC-3 (see **Figure 5.3**); their habitat and species (potential and observed) are summarized in **Table 5.9.** WC-1 does not have any fish habitat and will not support fish; WC-3 is not within the project footprint and will not be affected by project activities; WC-2 is described below.

Table 5.9: Watercourse Fish Habitat Adjacent to the Project Footprint Area (from Dillon 2019a)

ID and Name	Character	Potential Fish Habitat
WC-1, Unnamed Tributary to Pictou Harbour/East River	Intermittent flow drainage channel varying from an agricultural and road ditch in the upper reaches to steep ravine (likely partially manmade) in the lower reaches. At the intersection with the East River estuary, a large barrier beach and driftwood obstruction prevents fish access except at times of extreme flow.	Not fish habitat
WC-2, Unnamed Tributary to Pictou Harbour/East River	Small semi-permanent drainage channel with intermittent flow in the head water. Steam flow with a mix of riffle and run sections. The width of the assessed area was 0.5-1 m (wet) and ~ 2 m (bankfull) and 15-30 cm depth. Collects drainage from NPNS facility and parking lot as well as WL-2.	Yes – minnow rearing/feeding/ spawning. Potential brook trout and American eel**
WC-3, Unnamed Tributary to Pictou Harbour	Ditched upstream of project footprint area; within footprint intermittent to tidal. Connected with Pictou Harbour. The width of the assessed location was 0.5 -2 m (wet) and ~2 m (bankfull), and depth was approximately 10-30 cm.	Primarily feeding and passage potential
** Priority fish species		

Unnamed Tributary to Pictou Harbour/East River (WC-2)

WC-2 is a small, semi-permanent watercourse that originates from wetland WL-2 and discharges non-contact storm water. WC-2 also receives a channelized drainage input from the parking area located on the north side of the NPNS facility. This narrow, incised channel was assessed as fish habitat. WC-2 was flowing moderately at the time of the June 2018 and 2019 assessments and the channel pattern was sinuous. The morphology of this watercourse consisted primarily of runs and small pools; however, much of the channel was choked with emergent vegetation such as cattails, rushes and blueflag iris. The substrate was composed of boulders (5%), cobbles (10%), large gravel (20%), small gravel (25%), and fines (40%). The relatively high proportion of fines composing the substrate is likely the result of runoff from upstream stormwater. Both banks were composed primarily of fines and alternated from sloped to undercut. In-stream cover was provided by abundant in-stream and over-hanging vegetation, as well as a moderate amount of bank-undercutting.

The average channel and wetted widths in the storm water discharge area was generally less than 1 m. Average measured water depth was approximately 0.1 m; pool depth was 0.3 m in June 2018 and 2019. Its immediate surroundings consist of open grassland with riparian vegetation consisting mostly of herbaceous species such as cattails, soft rush, blue flag iris, goldenrods, and sedges. Nearby woody species are sparse, but speckled alder, sweet gale, willows and roses are present in the area. Crown closure was estimated at 51-75%.

The aquatic habitat of WC-2 has limited potential for brook trout spawning, with low but sufficient flow, access to upstream habitat and access to the marine environment. Although a corrugated metal culvert with a backwater detention feature is present, it does not currently prevent access to the watercourse from the marine environment at high tide. Within the upper reaches of WL-2, potential rearing habitat was present, owing to good cover and back eddies observed. Overwintering habitat was lacking due to insufficient depth. Storm water flow may reduce freezing conditions. Electrofishing in June 2019 captured ninespine stickleback. Stickleback habitat is anticipated throughout the watercourse.

5.5.2.1 Priority Freshwater Fish Species

Screening for potential priority freshwater fish species included a review of fish species listed by the AC CDC (**Appendix D**) and of fish species expected to be in the area. The AC CDC report had no historic records of fish species of conservation concern observed within a 5 km radius of the project area; however, fish species are not often included in AC CDC data collection. Based on current information, there is no federally identified freshwater critical habitat for fish within the project area.

American eel, which have been identified as **Threatened** by COSEWIC have the potential to occur in WC-2. They are widespread and are known to occur in suitable habitat throughout Nova Scotia (Cairns *et al.* 2012). As eels spawn at sea, freshwater habitat is expected to be used for elvers (young eels), and adult foraging. American eels are also likely to occur in the surrounding marine habitat (see **Section 5.6.2**).

Brook trout is considered a sensitive species although it is not listed federally or provincially. They inhabit large and small lakes, rivers, streams, creeks, and spring ponds, preferring good quality waters and have a narrow pH range. They are sensitive to poor oxygenation, pollution, and changes in pH. Brook trout are anticipated to occur in most permanent watercourses flowing into the Pictou Harbour estuary area (MacMillan 2014). Potential brook trout habitat was observed within the project area at WC-2, but no fish were observed.

5.6 MARINE ENVIRONMENT

5.6.1 Marine Physical Environment

Pictou Harbour is a natural harbour located on the Northumberland Strait, on the northern shore of Nova Scotia. The Northumberland Strait is a long, narrow, shallow body of water located in the Southern Gulf of St. Lawrence, with its water primarily derived from the surface layer of the Gulf. Currents are mainly driven by tidal and wind effects that are part of the larger circulation dynamics of the Gulf of St. Lawrence. The current in the Northumberland Strait generally flows in a southeasterly direction (NS Museum of Natural History 1996).

Pictou Harbour is a partially mixed estuary that sits at the confluence of the East River, Middle River, and West River and flows into Northumberland Strait. The maximum depth of Pictou Harbour is approximately 9.75 m (Navionics 2018). Tides within Pictou Harbour area are complex, comprising a semi-diurnal (twice daily) component and a diurnal (daily) component (ENSR 1999). Typically, during ebb and flood tides, the water column is not stratified, but may become slightly stratified during slack water events (ENSR 1999).

In inshore areas of the Northumberland Strait, such as Pictou Harbour, water temperatures are typically below zero during the winter months with ice cover (i.e., January to March) (Petrie and Jordan 1993). Water temperatures begin increasing in March and peak in August with a maximum average water temperature of approximately 18 °C. Following the month of August, water temperature declines and again reaches 0 °C in December prior to the formation of sea ice.

5.6.1.1 Water Quality

Baseline water quality for Pictou Harbour is described from historical sampling undertaken in 1990, 1995 and 1998 (Dalziel *et al.* 1993; JWEL 1996; ENSR 1999). This information will be updated by a marine sampling program to be undertaken in 2022.

Surface water salinities measured in Pictou Harbour in 1995 were generally greater than 25 psu but varied with the tidal cycle (JWEL 1996). Due to the estuarine nature of the harbour, peak salinities of 28 to 29 psu were recorded at high tide while lower salinity values were observed during low tides (JWEL 1996). Salinity and temperature were measured in Pictou Harbour in December 1998, where salinity ranged from 23.5 to 27.5 psu, and water temperature ranged from 1 °C to 3.5 °C (ENSR 1999). Water sampling at 15 sampling stations was conducted in Pictou Harbour in 1990 (Dalziel *et al.* 1993) and is summarized in **Table 5.10**.

Table 5.10: Water Quality of Pictou Harbour (Dalziel et al. 1993)

Parameter	Unit	Range
General Chemistry		
Total Organic Carbon (TOC)	mg/L	1.67 - 0.87
Particulate carbon	mg/L	0.22 – 1.45
Salinity	psu	21 - 28
Nutrients		
Phosphate	µg/L	131 - 348
Nitrate	µg/L	ND - 31

Parameter	Unit	Range
Particulate Nitrogen	µg/L	44 - 114
Silicate	µg/L	380 – 1,089
Metals		
Dissolved cadmium	µg/L	0.015 - 0.05
Dissolved copper	µg/L	0.45 - 1.46
Dissolved iron	µg/L	3.65 - 18.8
Dissolved lead	µg/L	0.025 - 0.094
Dissolved manganese	µg/L	0.84 - 8.01
Dissolved nickel	µg/L	0.30 - 0.52
Dissolved zinc	µg/L	0.02 - 1.46

5.6.1.2 Sediment Quality

Information on the sediment quality in Pictou Harbour is available from the literature, as well as from a field survey program undertaken for the *Replacement ETF Project* (Dillon 2019b).

Chaudhary *et al.* (2020) undertook an extensive sediment sampling program in July 2018 and May 2019 in the Pictou Harbour estuary and out into the inshore area of the Northumberland Strait. The study focused on the concentration of metals, dioxins and furans, and methyl mercury in surficial sediments, which were compared to the CCME Sediment Quality Guidelines (CSQG) for the Protection of Aquatic Life (CCME 2021b). In general, there was no indication of industrial contamination in the samples, with all contaminant concentrations in the sediment below the more stringent Interim Sediment Quality Guidelines (ISQGs), and some below the background concentration range in coastal sediments of Nova Scotia (Loring *et al.* 2016).

In 2018, a paleolimnological analysis was undertaken on Sitmu'k Lagoon, upstream of Lighthouse Beach, a barrier beach near the outfall of Boat Harbour (Wyles 2019). The lagoon sediment consisted 70% of silty clay matrix with mixed organics (woody material). Geochemical analysis was conducted on core sediment samples for select metals including calcium, copper, iron, potassium, manganese, lead, rubidium, strontium, titanium and zinc. Comparing the samples to CSQG (ISQG), copper and lead exceedances were observed in 23.1% and 15.4% of the samples respectively. The data did not indicate significant industrial impact at the site (Wyles 2019).

In 2019, Stantec conducted a sampling program of existing marine sediment in Pictou Harbour as part of a larger sampling program for the *Replacement ETF Project* (Dillon 2019b). Sediment cores were taken at five sampling locations adjacent to the Pictou Causeway, with samples taken at different depths at three of the sites (**Figure 5.11**). Grain size distribution analysis indicated that most of the sediments were silt (75%), with the remainder comprising clay (15 – 20%) and sand (<1%). Sediment quality was compared to CCME CSQG (CCME 2021b) and the *CEPA Disposal at Sea Regulations* screening criteria, with the following results:

- TOC ranged from 4.7 g/kg to 69 g/kg;

- Total PAH concentration exceeded the CEPA Disposal at Sea regulation screening criteria at VC-50C-1, which was the sample taken near the southern portion of the Pictou Causeway and represented a depth of the upper 0.2 m;
- 2-Methylnaphthalene (1.8 mg/kg), acenaphthene (0.69 mg/kg), fluorene (0.36 mg/kg), and naphthalene (6.8 mg/kg) each exceeded the CSQG probable effects level (PEL) at VC-50C-1;
- 2-Methylnaphthalene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene all had concentrations that exceeded their respective CSQG PELs at VC-50C at multiple depth strata;
- Only one sample (0.64 mg/kg at VC-53-3) exceeded the sediment screening criteria for cadmium (0.60 mg/kg) under the *CEPA Disposal at Sea Regulations*;
- Arsenic concentrations in samples taken at all locations and associated depths exceeded the CSQG PEL (7.24 mg/kg) and ranged from 8.3 mg/kg to 12 mg/kg;
- Copper marginally exceeded the CSQG PEL (18.7 mg/kg) at several locations both near substrate surface (0 - 0.5 m) as well as at greater depths (2 -3 m). Concentrations ranged from 19 to 21 mg/kg;
- Lead marginally exceeded the CSQG PEL (30.2 mg/kg) at VC-50C-1 (33 mg/kg) and VC-50C-3 (33 mg/kg), which was the sample taken near the southern portion of the Pictou Causeway and represented depths of 0 - 0.2 m and 1.2 - 2.2 m, respectively.

Figure 5.11: Sediment Sample Locations in Pictou Harbour.

5.6.2 Marine Biota

The following sections describe marine plants, plankton, invertebrates, and marine fish species with potential to occur in Pictou Harbour, based on its location as part of the Northumberland Strait ecosystem. In May 2019 an underwater benthic survey was completed in Pictou Harbour along the pipeline route for the *Replacement ETF Project*, to identify the habitat and benthic communities present (Dillon 2019b).

5.6.2.1 Marine Plants

Sea grasses are found in coastal, shoreline, and intertidal areas in the Northumberland Strait, mostly in marine wetlands, salt marshes, and shallow-water eelgrass beds (AMEC 2007). The main species of sea grass in the Northumberland Strait is eelgrass, which plays an important role in stabilizing sediments, and in providing habitat and protection for a variety of marine organisms (AMEC 2007). The most dominant seaweed in the coastal and nearshore areas of the Northumberland Strait is sea lettuce (*Ulva* sp.) (AMEC 2007). Other species in the nearshore and portions of the inshore include kelp (*Laminaria* sp.) and the red alga *Phyllophora* sp., while genera such as *Polyides*, *Desmarestia* and *Palmaria* occur in smaller amounts.

During the 2019 field survey (Dillon 2019b), video footage indicated that much of the area along the causeway was covered in silt, making identification of marine plants difficult. Species included *Cystoseira* sp., *Chorda* sp., *Fucus* sp., *Laminaria* sp. and *Ascophyllum* sp. in low densities near shore and even sparser elsewhere, and no eelgrass was observed (Dillon 2019b).

5.6.2.2 Plankton

The Northumberland Strait is a region of high primary productivity during the summer, but relatively low productivity during the winter. The most complete recent identification of phytoplankton species in the Northumberland Strait was conducted on a representative sampling of 14 water samples taken during the plankton component of a marine environmental effects monitoring study conducted in 1993 (JWEL 1994). The samples were rich in diatoms, a common group of marine phytoplankton (JWEL 1994).

There have been limited studies on the estuarine and nearshore plankton communities of the Northumberland Strait. Much of the available information on zooplankton in the Strait comes from a study related to the Confederation Bridge Project. Hurley Fisheries Consulting Ltd. (1989) describe samples taken in the summer of 1988 that show a dominance of calanoid copepod, mostly medium-sized, warm water, and coastal genera such as *Oithona*, *Acartia*, *Temora*, and to a lesser extent *Eurytemora* and *Pseudocalanus*.

5.6.2.3 Benthic Invertebrates

Benthic Invertebrates in the Northumberland Strait

The benthic biota found in the Northumberland Strait inshore areas provide a good indication of the fauna likely to be found in Pictou Harbour. Benthic infauna (living within the bottom sediments) in the Northumberland Strait has been described by JWEL (1993, 1994, 1995). In general communities in the region are diverse. **Table 5.11** provides a summary of infauna in monitoring samples from 1993-1995.

Table 5.11: Summary of Benthic Infauna in Samples from 1993 to 1995

Taxa	Comments
Polychaetes	Most common group, 54 genera and/or species identified
Other Vermiformes	Nematodes were abundant and present in most samples
Crustaceans	13 species including amphipods, copepods and Gammarus sp.
Marine Spiders	Three unspecified Pycnogonid species
Molluscs	Common, particularly Tellina sp.; two unspecified nudibranch species also present
Echinoderms	Observed occasionally
Source: JWEL (1993), (1994), (1995); AMEC (2007).	

Epifauna are animals living on the surface of the seabed, or attached to submerged objects, aquatic animals or plants. **Table 5.12** provides a list of epifaunal species that have been observed during several research or monitoring surveys at various locations in the Northumberland Strait. These included surveys in Shediac Bay, Bedeque Bay, Richibucto, and Baie Verte (LeBlanc *et al.* 2009, Turcotte-Lanteigne and Ferguson 2008); Abegweit Passage (Hurley Fisheries Consulting Ltd. 1989), and the Northumberland Strait (east and west) (Benoit *et al.* 2012). The fauna of these areas is likely typical of what would be found throughout nearshore regions of Northumberland Strait (AMEC 2007), including Pictou Harbour.

Table 5.12: Epifauna Occurring in the Northumberland Strait

Common Name	Scientific Name
Bivalve Molluscs	
Sea scallop	*Placopecten magellenicus*
Iceland scallop	*Chlamys islandicus*
Razor clam	*Ensis directus*
Bar clam	*Spisula solidissima*
American oyster	*Crassostrea viriginica*
Softshell clam	*Mya arenaria*
Northern quahog	*Mercenaria mercenaria*
Blue mussel	*Mytilus edulis*
Creeper	*Stophitus undulates*
Gastropod Molluscs	
Whelk	*Buccinum sp.*
Moon snail	*Lunatia sp.*
Channelled barrel-bubble	*Retusa canaliculata*
Slipper limpet	*Crepidula fornicata*
Horse mussel	*Modiolus modiolus*
Crustaceans	
Decapod shrimp (various)	
Pandalid shrimp (various)	

Common Name	Scientific Name
Grass shrimp	*Palaemonetes vulgaris*
Sand shrimp	*Crangon septemspinosa*
Rock crab	*Cancer irroratus*
Mud crab	*Neopanopeus sayi*
Toad crab	*Hyas* sp.
Lobster	*Homarus americanus*
Sponges	
Mermaid's glove	*Haliclona oculata*
Boring sponge	*Cliona* spp.
Echinoderms	
Sunstar	*Solaster* sp.
Mud star	*Ctenodiscus crispatus*
Northern sea star	*Asterias vulgaris*
Sea star spp.	*Asterias* spp.
Blood star	*Henricia snaguinolenta*
Sea urchin	*Strongylocentrotus* sp.
Sand dollar	*Echinarachnius parma*
Cnidaria	
Sea anemone (various)	
Jellyfish (various)	
Sources: Hurley Fisheries Consulting Ltd. (1989), Benoit *et al.* (2003), Turcotte-Lanteigne and Ferguson (2006), AMEC (2007).	

2019 Benthic Habitat Survey in Pictou Harbour

The May 2019 benthic habitat video survey along the pipeline route at the causeway indicated that the substrate in that area was predominantly silt and mixed sediment (silty sand, shell hash and gravel), with silt being the most prevalent (Dillon 2019b). Pockets of other substrate were noted, including cobble/gravel near the causeway opening. Sea stars (*A. forbesi*) and rock crabs were the most common benthic organisms found on the silty habitat. Near the causeway, blue mussel beds were observed. Holes in the sediment dug by other benthic organisms were also commonly observed (Dillon 2019b).

5.6.2.4 Marine Fish

The Northumberland Strait hosts a diverse fish population. It is a known migration corridor for many fish species (Rondeau *et al.* 2016). American eel, alewife, butterfish and spiny dogfish are all thought to migrate along the coasts in the Northumberland Strait to western Cape Breton (Rondeau *et al.* 2016), and a similar migration pattern in and out of the southern Gulf of St. Lawrence is used by Atlantic cod (Hanson 1996; Campana *et al.* 1999; Comeau *et al.* 2001).

The estuarine environment of Pictou Harbour has value as a transitional zone between the riverine environment of the East, West and Middle rivers, and the marine environment of the Northumberland Strait. In general, the estuary is dominated by species that reflect the transitionary and lower energy/sheltered nature. Estuaries are generally considered highly ecologically productive environments,

and it is anticipated that the subtidal and intertidal areas within the waters adjacent to Abercrombie Point are occasionally frequented by migratory juvenile and adult marine fish including Atlantic salmon.

Marine fish species that have the potential to occur in the area are listed (with scientific names) in **Appendix G**. Commercially important species and species of conservation concern are described below.

5.6.2.5 Commercially Important Species

Commercially important species with potential to occur in and adjacent to Pictou Harbour include rock crab, lobster, sea scallop, herring, mackerel and bluefin tuna. Information on catches within Pictou Harbour are not readily available, and the study team had access only to coarse-scale fisheries catch data available from DFO and other historical information to identify commercial fisheries species and their habitats in the vicinity of the project (Dillon 2019a). Species-specific fisheries maps based on DFO fisheries data and prepared by Dillon (2019a) are provided in **Appendix G**.

While much of the commercial fishery for **rock crab** occurs in the central and western portions of the Northumberland Strait, there are areas in the eastern portion where rock crab is caught (i.e., DFO Lobster Fishing Area, LFA, 26A). **Lobster** is caught throughout the central and eastern portions of the Northumberland Strait. Near Pictou Harbour, they are mainly harvested along the coast to the east.

Scallops are a significant commercial species for the fishers in the Pictou area. They are harvested to the north of the Pictou Harbour entrance in the Northumberland Strait, with some fishing occurring at the entrance. A Scallop Buffer Zone in Scallop Fishing Area (SFA) 24 was established in 2012 (see **Section 5.6.2.7** below) preventing scallop fishing in this area.

Herring is caught all along the shoreline of New Brunswick and Nova Scotia, including the entrance to Pictou Harbour. Herring stocks are currently of concern to DFO, and attempts are being made to manage this fishery to avoid becoming at risk in the area (DFO 2018a). Herring spawn between August and October in the southern Gulf of St. Lawrence and DFO has identified fall spawning grounds for herring in the eastern Northumberland Strait, near Cape George (DFO 2018a). **Mackerel** is also caught along the coast of Pictou County to the north of Pictou Harbour, westwards, although most fishing occurs in the central and western portions of the Northumberland Strait.

Fishing for **tuna** occurs primarily on the north coast of PEI and southwest Cape Breton. Fishing for bluefin tuna occurs in the eastern Northumberland Strait, but the location of fishing in this area is not defined due to privacy screening of the data by DFO (Butler and Coffen-Smout 2017).

Tissue Quality in Commercial Species

As part of the sediment characterization study undertaken in 2018 and 2019, Chaudhary *et al.* (2020) also evaluated the tissue quality of rock crab, American lobster and blue mussel in Pictou Harbour and the Northumberland Strait. Tissue samples were analyzed for metals, dioxins and furans, and methyl mercury, and compared to the available Canadian Food Inspection Agency (CFIA) guidelines (i.e., for arsenic, lead and methyl mercury). There were arsenic exceedances in lobsters and crab, likely due to the underlying bedrock geology resulting in naturally high arsenic levels in water, sediments and soil across Nova Scotia (Chaudhary *et al.* 2020).

In 2018, Maltby (2019) studied the tissue quality of American lobsters (adults, subadults and juveniles) at three locations at varying distances from the Boat Harbour outfall: Pictou Road (>1 km), Merigomish (~15 km) and Ballantynes Cove (~45 km). Samples were tested for heavy metals and metalloids, methyl-

mercury, PAHs, and dioxins and furans. Most metal concentrations did not exceed regulatory guidelines with a few exceptions. However, the average arsenic levels in all lobster samples exceeded CFIA guideline levels at all sites.

Methyl mercury measured in whole-body samples was detected in all lobsters, with mean concentrations below the CFIA guideline for human consumption (0.5 ppm) at all sites (Maltby 2019). Lobster hepatopancreas tissue was tested for PAHs, with fluoranthene and pyrene detected in adult lobsters from Pictou Road. Pooled hepatopancreas tissues were also analyzed for dioxins and furans; all lobster tissue samples had concentrations well below the CFIA guideline value (20 ppt) (Maltby 2019).

5.6.2.6 Species at Risk and Species of Conservation Concern

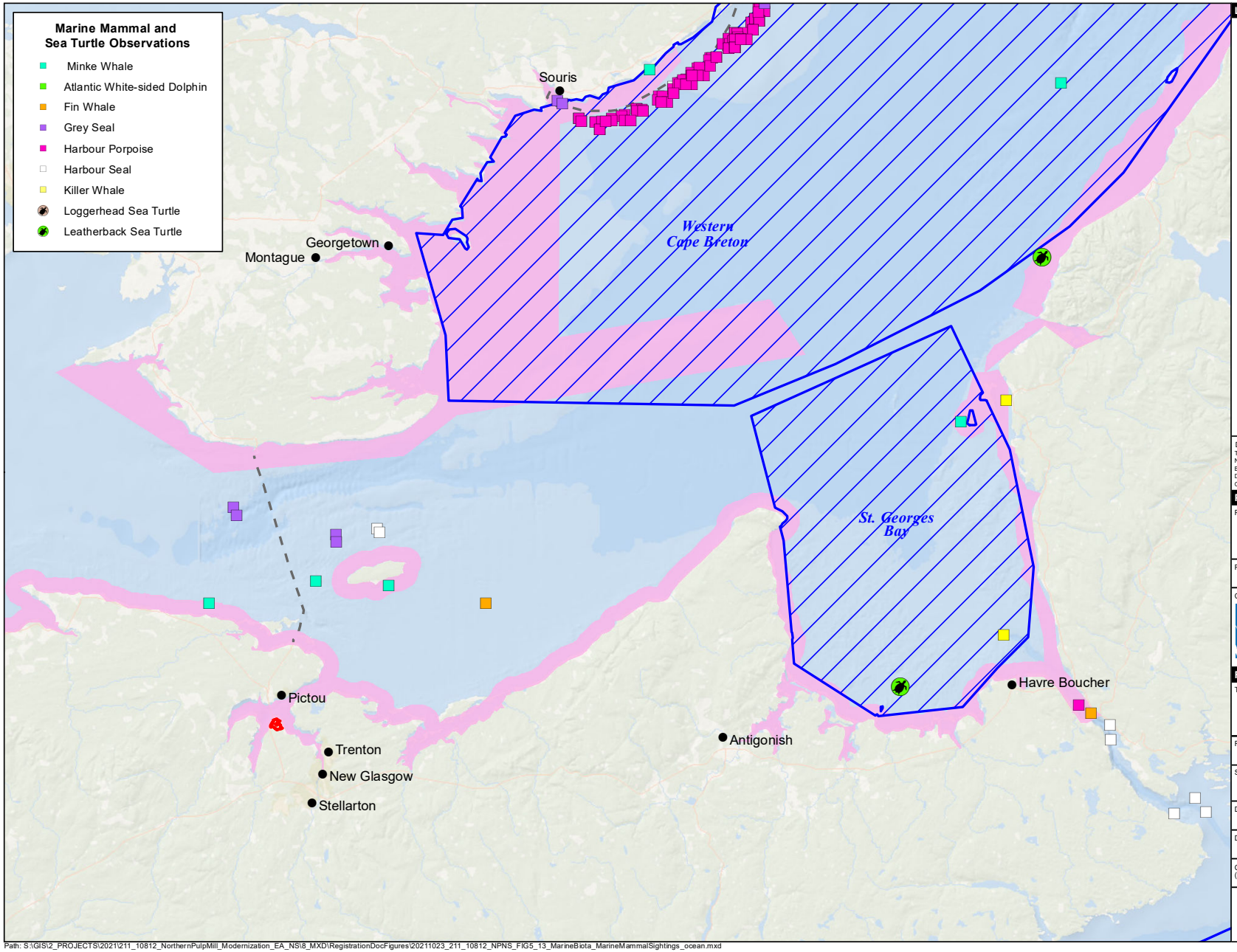
There are no known marine fish species at risk listed under *SARA* or the NS *ESA* with potential to occur in Pictou Harbour. However, there are ten species of conservation concern listed by COSEWIC with potential to occur (**Table 5.13**).

Table 5.13: Potential Marine Fish Species of Conservation Concern Within or Near the Project Area

Common Name	Scientific Name	NSESA Status	SARA Schedule 1 Status	COSEWIC Status
American eel	*Anguilla rostrata*	No Status	No Status	Threatened
American plaice (Maritime population)	*Hippogloissoides platessoides*	No Status	No Status	Threatened
Atlantic bluefin tuna	*Thunnus thynnus*	No Status	No Status	Endangered
Atlantic cod (Laurentian South population)	*Gadus morhua*	No Status	No Status	Endangered
Atlantic salmon (Gaspé-Southern Gulf of St. Lawrence population)	*Salmo salar*	No Status	No Status	Special Concern
Lumpfish	*Cyclopterus lumpus*	No Status	No Status	Threatened
Porbeagle	*Lamna nasus*	No Status	No Status	Endangered
Spiny dogfish (Atlantic population)	*Squalus acanthias*	No Status	No Status	Special Concern
Striped bass (Southern Gulf of St. Lawrence population)	*Morone saxatilis*	No Status	No Status	Special Concern
White hake (Southern Gulf of St. Lawrence population)	*Urophycis tenuis*	No Status	No Status	Endangered

5.6.2.7 Special Areas

Special areas with relevance to marine fish are shown in **Figure 5.12**. The only one that is likely to be a significant area for marine fish within the project area is the Scallop Buffer Zone in SFA 24. Scallop Buffer Zone SFA 24 is part of a system of scallop buffer zones in SFA 21, 22, and 24 that covers a total area of 5,835 km^2 (DFO 2017). They were established to protect juvenile American lobster as they are known to contain lobster nursery habitat (DFO 2017). Scallop Buffer Zone SFA 24 is in the eastern Northumberland Strait, and includes the mouth of Pictou Harbour.



LEGEND:

Ecologically and Biologically Significant Areas (EBSAs)

Scallop Buffer Zone (SFA 24)

NPNS Property

SOURCE: Dillon 2019
Environmental Assessment Registration Document Replacement Effluent Treatment Facility

N
W E
S

PROJECT:

PROJECT:
NPNS MILL TRANSFORMATION PROJECT

PROJECT NO.:
211-10812

CLIENT:
NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

FIGURE:

TITLE:
SPECIAL AREAS OF IMPORTANCE FOR MARINE BIOTA AND HISTORICAL MARINE MAMMAL SIGHTINGS

FIGURE NO.:	REVISION NO.:
5.12	0

SCALE: 0 2 4 8 12 16 20 24 Kilometres

DATUM:	PROJECTION:
NAD 83 CSRS	UTM ZONE 20 NORTH
DRAWN BY:	CHECKED BY:
T. MOREHOUSE	J. WALMSLEY
CREATED DATE: (YYYY-MM-DD) 2021-10-13	REVISION DATE: (YYYY-MM-DD) 2021-11-07

WSP Canada Inc.
1 Spectacle Lake Drive,
Dartmouth, Nova Scotia
www.wsp.com

Path: S:\GIS\2_PROJECTS\2021\211_10812_NorthernPulpMill_Modernization_EA_NS\8_MXD\RegistrationDocFigures\20211023_211_10812_NPNS_FIG5_13_MarineBiota_MarineMammalSightings_ocean.mxd

5.6.3 Marine Mammals and Sea Turtles

The description of existing conditions for marine mammals, sea turtles and marine birds in the Northumberland Strait is based on the results of previous research and existing scientific literature and environmental assessments.

5.6.3.1 Marine Mammals

The Gulf of St. Lawrence provides habitat for several marine mammal species, including 13 recorded species of whales and four species of seals (DFO 2005). Ten species of marine mammals have been recorded within the Northumberland Strait (**Table 5.14**). Several of the marine mammal species identified in **Table 5.14** have been historically observed in the eastern Northumberland Strait near Pictou (see **Figure 5.12)**.

Table 5.14: Marine Mammal Species Known to Occur in the Northumberland Strait (from Dillon 2019)

Common Name	Scientific Name	NS ESA Status	SARA Status (Schedule 1)	COSEWIC Status	AC CDC Rank	Occurrence in Northumberland Strait
Pinnipeds						
Grey Seal	*Halichoerus grypus*	–	–	Not at Risk	SNR	Frequent
Harbour Seal (Atlantic subspecies)	*Phoca vituline*	–	–	Not at Risk	SNR	Frequent (spring, summer and fall); year-round resident in the Gulf of St. Lawrence
Harp Seal	*Phoca greenlandica*	–	–	–	SNR	Occasional
Hooded Seal	*Cystophora cristata*	–	–	Not at Risk	SNR	Occasional
Cetaceans						
Atlantic White-sided Dolphin (Gulf of St. Lawrence pop.)	*Lagenorhynchus acutus*	–	–	Not at Risk	S4	Frequent (summer and fall)
Fin Whale (Atlantic pop.)	*Balaenoptera physalus*	–	Special Concern	Special Concern	S2S3	Occasional
Harbour Porpoise* (Northwest Atlantic pop.)	*Phocoena phocoena*	–	–	Special Concern	S4	Frequent (summer & fall)
Long-finned Pilot Whale	*Globicephala melaena*	–	–	Not at Risk	S2S3	Rare
Minke Whale (Atlantic subspecies)	*Balaenoptera acutorostrata acutorostrata*	–	–	Not at Risk	S4	Occasional
Sperm Whale	*Physeter macrocephalus*	–	–	Not at Risk	SNA	Rare

Notes:
* = Listed as Threatened on Schedule 2 of SARA.
SNR = Not yet assessed in Nova Scotia; SNA = Ranking not applicable in Nova Scotia.
Sources: AMEC (2007), NS ESA (2010), Government of Canada (2021b), AC CDC (2017), UNESCO (2021)

Of the ten marine mammal species that have been known to occur in the Northumberland Strait, one is a listed species at risk (fin whale) and two are species of conservation concern (harbour porpoise and long-finned pilot whale). Of these, only the harbour porpoise is likely to enter Pictou Harbour.

5.6.3.2 Sea Turtles

The only marine reptile that is known to visit the Northumberland Strait is the leatherback sea turtle (AMEC 2007). This is the most widely distributed and largest of all marine turtle species. The leatherback sea turtle undertakes annual migrations into Atlantic Canadian waters during the summer months, to feed on jellyfish, which are seasonally abundant in temperate shelf and slope waters of Eastern Canada. The Atlantic population of leatherback sea turtle is listed as Endangered under Schedule 1 of *SARA*.

The southeastern portion of the Gulf of St. Lawrence has been identified as a primary area of important habitat for leatherback sea turtles (DFO 2011). Peak use occurs in the summer and fall; this area is likely important for leatherback sea turtles because it serves as foraging habitat (DFO 2011). Opportunistic sightings of leatherback sea turtles have occurred in the Strait, but such records are rare relative to those corresponding to the high-use areas identified via satellite telemetry (DFO 2011). Although no concentration of leatherback sea turtles has been documented directly in the Northumberland Strait, this species is known to occur in the Abegweit Passage (AMEC 2007). No historical AC CDC observations of leatherback sea turtle (or any other sea turtle species) have been recorded near the project area.

5.6.3.3 Special Areas for Marine Mammals and Sea Turtles

The locations of special areas in the eastern Northumberland Strait that are important for marine mammals and sea turtles, are illustrated on **Figure 5.12** including two Ecologically and Biologically Significant Areas (EBSAs), Western Cape Breton and St. George's Bay. Their relevance to marine mammals and distance from the project area are described in **Table 5.15**; there is limited information available regarding their importance for sea turtles.

Table 5.15: EBSAs in the Eastern Northumberland Strait (DFO 2007)

EBSA	Total Area	Relevance to Marine Mammals	Approximate Distance
Western Cape Breton	8,198 km^2	Data on marine mammals are incomplete for this area even though it represents a well-known area of importance for the reproduction of grey, hooded and harp seals. There are only two or three known reproductive areas for these species in the Northwest Atlantic, including the ice in the southern gulf where	32 km
St. George's Bay	1,216 km^2	The area is known to provide important habitat for marine mammals in general. In particular, the Gulf ice in this area represents an important reproductive area in the Northwest Atlantic for grey, hooded and harp seals.	59 km

DFO has also identified an additional candidate winter EBSA, referred to as the Southern Gulf Shelf, which is comprised of the southern Northumberland Strait, St. Georges Bay, Cape Breton, western Cape Breton, and the waters surrounding the Îles-de-la-Madeleine (Lesage *et al.* 2007). The Southern Gulf Shelf represents a whelping and breeding area for three species of pinnipeds. Grey seals reproduce on small islands in this area and on the pack ice between PEI and Cape Breton, including the southern Northumberland Strait. Harp seals whelp on ice in this candidate winter EBSA, including in the eastern Northumberland Strait, from January through to April. Hooded seals also whelp in the same general area as harp seals. This area is considered highly important for aggregation as it supports for thousands of individuals of each of the three species and, in some cases (e.g., possibly hooded seal), a totally independent population (Lesage *et al.* 2017).

5.7 SOCIO-ECONOMIC CONDITIONS

5.7.1 Economy and Land Use

The mill is located within the Municipality of Pictou County. Land use surrounding the project area includes industrial (existing pulp mill and Canso Chemicals properties), rural residential, forested and agricultural lands. The nearest residential property is approximately 700 m southeast of the project area. The Abercrombie volunteer fire department is approximately 980 m south of the proposed project site.

5.7.1.1 Municipal and Regional Infrastructure

Municipal and regional infrastructure surrounds and intersects the project area including rail, local and regional roads, and public utilities. Important nearby municipal and regional infrastructure includes:

- The Cape Breton and Central Nova Scotia Railway – Stellarton to Abercrombie Spur provides a rail link onto the NPNS property. The project components have been located so that this rail spur does not interact with them;
- Highway 106, designated part of the Trans-Canada Highway, is a two-lane undivided highway to the west of the project area, and
- Additional transportation infrastructure, including the surrounding road network that may be used for transportation of construction materials.

5.7.1.2 Recreation and Landscapes

Pictou County is celebrated and valued for its varied and scenic landscapes. These landscapes are accessed for recreational purposes, including swimming, boating, fishing, walking and bird watching etc. The Jitney Trail (part of the Trans Canada Trail network) passes under Highway 106 near the north end of the Pictou Causeway. Hunting is common in the county, as is harvesting edible plants such as berries.

Managed areas within 5 km of the project include Haliburton Provincial Park, Harris Provincial Park, McCulloch House Provincial Heritage Site, Pictou Spur Rail Corridor, Scotia Spur Rail Corridor, and the Abercrombie Wildlife Management Area (see **Appendix D**). Other significant areas for birds and wildlife have been described in **Sections 5.4.2 and 5.4.3** respectively.

5.7.1.3 Recreational and Indigenous Fisheries

The fish of the Northumberland Strait and Pictou Harbour support recreational and Indigenous fisheries in the area, and affect economic well-being for many individuals and coastal communities. Successful recreational and Indigenous fisheries are directly tied to a healthy marine ecosystem and abundant marine fish species (see **Section 5.6.2**)

The waters that surround Abercombie Point (West, Middle, and East Rivers) are actively fished for American eel, smelt and gaspereau and, in the past (currently closed), blue mussel and softshell clam. Recreational fishing of Atlantic salmon, striped bass, brown trout, and brook trout may occur as well. Fish within the project area are described in **Section 5.5.2**.

5.7.1.4 Employment and Economy

A total of ~43,750 people make their home in Pictou County, a 4.2% decrease from 2011 (Statistics Canada 2016). There is a 12.5% unemployment rate, higher than the provincial average of 10% (Statistics Canada 2016). The three largest employment classifications by North American Industry Classification System are

retail trade (18%), health care and social assistance (14%), and manufacturing (10%) (Statistics Canada 2016). Agriculture, forestry, fishing and hunting combined provide 4% of jobs for the County (Statistics Canada, 2016).

Several sizable employers in the area are consistent with the Statistics Canada profile information, including Empire Company (i.e., Sobeys, Crombie REIT), Michelin Tire Canada, NPNS, Nova Scotia Health Authority, Nova Scotia Power Incorporated, MacGregor's Industrial Group, MacKay Meters, Advocate Printing & Publishing, Northumberland Ferries Limited, Aecon Fabco, and others. Important sectors include commercial fisheries, manufacturing and tourism.

5.7.1.5 Commercial Fisheries

The Northumberland Strait commercial fishing areas are part of the larger DFO Gulf Region. This area has significant commercial fishing activities. Species landed at the harbour include herring, lobster, rock crab, and scallop. The total value of landings in the Nova Scotia Gulf Region was $166 million in 2019 (DFO 2021). The top three landings by value were queen crab (~51%), lobster (~46%), and herring (2%) (DFO 2021). DFO estimates that approximately 7,000 people participate in the commercial lobster harvest in the overall Gulf Region (DFO 2008).

5.7.1.6 Manufacturing (NPNS)

Several manufacturing-based employers are in the area. Given the nature of the project, interaction with other manufacturers is not anticipated beyond the function of NPNS itself. NPNS directly employs 330 workers and provides an additional 2,679 indirect jobs in the forestry sector. It provides ~$128 million in worker income gained throughout the economy;

NPNS is uniquely connected with many partners in the forest industry, for example, by both producing materials for and purchasing materials from sawmills across the province. 1,379 companies support mill operations, with 943 suppliers in Nova Scotia. Together with its supply chain companies, NPNS produced a total annual value output of $479.5 million in 2015 (Gardner Pinfold 2019). NPNS exports over $200 million worth of goods annually, which constitutes a significant portion of the province's total forestry exports.

5.7.1.7 Tourism

Tourism along the Northumberland Strait (including but not limited to the shoreline within Pictou County) generates an estimated $215 million dollars in total revenue, or approximately 8.3% of the total provincial tourism revenue (Tourism Nova Scotia 2017, cited by Dillon 2019a). As further illustration, accommodation and food services provides 7% of the county's employment.

Tourism relies on a strong socio-economic environment including active recreation, aesthetic landscapes, and the maintenance of strong transportation routes to bring tourists into the area.

5.7.2 Indigenous Peoples' Use of Land and Resources

Nova Scotia is part of Mi'kma'ki, the land of the Mi'kmaq, long inhabited before European arrival. The land within the study area was once part of the greater Mi'kmaq territory known as *Agg Piktuk* in Mi'kmaw language, meaning "The Explosive Place" (CRM 29017). The numerous lakes and watercourses would have been important transportation and trade corridors, providing a resource base for the Mi'kmaq and their ancestors. Pictou Harbour is called *Puknipkejk* in Mi'kmaw language, which translates to "narrow

harbour" and the East River is called *Amasipukwejk*, which means "long river" (CRM 2017). The three rivers at Pictou would have served as important transportation routes and a significant source of salmon and other fish species. The communities in the area are rich in heritage and their members hold significant relationship to the land, waters, and seasons.

5.7.2.1 Historical Context

An early map of the area depicts the location of a Mi'kmaw village site near the mouth of the East River (Patterson 1877, cited in CRM 2017). An area situated further up the river was identified as a burying place (Dawson 1988, cited in CRM 2017) and, at the time of English settlement, was marked by a large iron cross standing approximately 10 feet high on the eastern coast of East River, referred to as Indian Cross Point. Furthermore, farming activities along the three rivers has unearthed evidence of pre-Contact habitation throughout the area.

Peace was made between the Mi'kmaq and British with the burying of the hatchet and gun in Halifax in 1761. Beginning in 1820, the Mi'kmaq petitioned the government for lands for their exclusive use. Fifty acres at Fisher's Grant were acquired in 1864 for the Mi'kmaq of the Pictou area. The Fisher Grant Reserve was eventually expanded over the years for additional food and fuel supply by acquiring near and adjacent parcels. Today PLFN have Fisher Grant Indian Reserve (IR) 24 (142.7 hectares), Fisher Grant IR 24G (60 hectares), and Boat Harbour West IR 37 (98.2 hectares). PLFN also share the Franklin Manor I. 22 and Merigomish Island IR 31 with other First Nations (CRM 2017).

Today, PLFN is the closest Indigenous community to the project area. There are approximately 673 members of PLFN (Office of L'nu Affairs 2021). One of PLFN's main industries is fishing, employing approximately 100 people each year with community/core licenses in lobster, rock crab, snow crab, mackerel, herring and tuna (KMKNO 2018).

5.7.2.2 Treaty Rights

The Mi'kmaq are the Indigenous rights holders of Nova Scotia. When the Mi'kmaq first encountered Europeans, their territory stretched from the southern portions of the Gaspé Peninsula eastward to most of modern-day New Brunswick, and all of Nova Scotia and Prince Edward Island. The Mi'kmaq assert Aboriginal and treaty rights protected by Section 35(1) of the *Constitution Act, 1982*. The Supreme Court of Canada has held in several important decisions that the Crown (federal and provincial) has a duty to consult with potentially affected First Nations in respect of decisions made by the Crown that might adversely affect these constitutionally protected Aboriginal or treaty rights, and accommodate them as necessary for infringements of those rights, including particularly those that might relate to their use of the land and resources for traditional purposes.

A MEKS was undertaken in 2018 and updated in 2019, following the *Mi'kmaq Ecological Knowledge Study Protocol 2nd Edition* (Assembly of Nova Scotia Mi'kmaq Chiefs (no date). Engagement activities are described in **Section 3.3**. A field visit to the NPNS property including the ETF footprint area and spill basin area was completed, as well as interviews to collect information on past and present traditional use activities. Most interviewees were from the community of PLFN, with some information also provided by Paq'tnkek and Millbrook community members.

Documented details on how and where traditional activities have been or are taking place exist, but are normally held confidentially by First Nations and their representative organizations. A high-level summary of the information gathered to date for the MEKS is provided. The details of the study are not yet available

for release, as the report is currently under review with the KMKNO. The final report has also been provided to PLFN.

5.7.2.3 Use of Land, Water, and Resources

It is understood that there is a close relationship between the Northumberland Strait fishery and the Mi'kmaq communities in the region. The fishery and coastal resources have provided a source of employment and income, as well as an important source of food and medicines. Harvesting for subsistence is a common activity in the region. In interviews completed for the MEKS, subsistence harvesting was reported as more frequent than commercial and recreational fishing activities combined.

Salmon, bass, trout, mackerel, smelt, lobster, and eel are understood to be the most reported fishing activity by the informants. Atlantic salmon, American eel, and striped bass are considered Endangered, Threatened, or species of Special Concern in Canada and the Mi'kmaq still rely on these species for sustenance and cultural ceremonies. Any disturbances to these resources or their habitats could have an impact on Mi'kmaq use.

Historically and currently, the Mi'kmaq utilize the surrounding area to fish, hunt, trap, and gather. Hunting for deer and rabbit are understood to be common current activities. Berry gathering was reported as the most common plant gathered for food. The NPNS property is understood to not be used currently by the Mi'kmaq for traditional activities.

Traditional recreational use of land and water reported during the MEKS interviews centred on swimming and canoeing near PLFN, such as Boat Harbour and Lighthouse Beach. Full use of these resources has been either removed or significantly limited due to the operation of the Boat Harbour ETF. Interviewees noted that arrow heads had been found in the past along the shore of Moodie Cove and Lighthouse Beach.

5.7.3 Archaeology and Heritage Resources

5.7.3.1 Archaeological Resources

Cultural Resource Management (CRM) Group, Nova Scotia, was retained to undertake an archaeological resource impact assessment (ARIA) for the *Replacement ETF Project* (CRM 2017). The ARIA consisted of background research to identify known sites and preliminary field investigation to identify features of the landscape that could indicate past uses and to confirm locations of known sites.

Based on its proximity to a significant water source, previously identified archaeological sites near the project area and on Indigenous land use, the area of Abercrombie Point was ascribed an elevated potential for encountering pre-Contact and/or early historic Native archaeological resources.

An ARIA conducted on NPNS property and ETF layout revealed archaeological resources and a registered archaeological site at Abercrombie Point on NPNS property, in immediate proximity to the initially planned location of the proposed spill basin site. A 200 m archaeological "buffer" has been established around this site where ground disturbance should be avoided. The spill basin has subsequently been redesigned for the current layout to avoid adverse impacts to those resources.

5.7.3.2 Marine Archaeology

The assessment of effects on marine archaeological resources is based on background research and analysis of relevant geophysical and remote sensing data. An ARIA of the marine environment in Pictou

Harbour was completed in September 2019 as part of the Focus Report for the *Replacement ETF Project* (Dillon 2019b, Stantec 2019).

Paleo-Archaeology and Paleontology

Research shows that large swaths of the Atlantic coastline in North America were exposed and inundated during various times since deglaciation (ca. 12,000 years ago). Known terrestrial sites on the current coastlines of Nova Scotia and New Brunswick (JWEL 2001) show that coastal habitation has occurred in these areas for thousands of years. More recent work demonstrates that people lived on the Atlantic coastline much earlier than previously realized, and there is a gap in the archaeological record in Atlantic Canada which correlates to the periods of time that now inundated areas were above water (Bell and Renouf 2011).

Research on the post-glacial landscape of the Atlantic shows a large glacial paleochannel that runs between Newfoundland and Nova Scotia (Shaw *et al.* 2006). By 11,000 years ago, next to this large river channel, additional land emerged along the coast of Nova Scotia, plus additional lands to the north and south adjacent to the river channel. At 9,000 years ago, Nova Scotia and Prince Edward Island were one landmass and remained so until 6,000 years ago. This land bridge between the two provinces would have been available for human occupation for 5,000 years (Keenlyside 1999). Protected areas, such as estuaries, low-gradient beaches, or rocky islands are most likely to preserve archaeological or paleontological materials (Lacroix *et al.* 2014). Given that the proposed marine project area is within a protected basin the potential for submerged landscapes is high.

The ARIA undertaken for the *Replacement ETF Project* (Stantec 2019) investigated the potential for preserved paleo-landscapes through a series of vibracores taken alongside the causeway as part of the sediment sampling program (see **Figure 5.11**). None of the cores provided direct evidence of archaeological sites, such as lithics, charcoal, botanicals, or faunal material.

Pre-Contact and Historical Cultural Resource Assessment

The potential for submerged pre-contact and historical cultural resources was determined through a review of the data from the geophysical survey undertaken along the causeway (Stantec 2019). This resulted in the identification of 43 sidescan targets and 31 magnetic anomalies. Stantec's archaeological review of the geophysical data identified one potential target that may represent submerged cultural heritage resources, C42 (**Figure 5.13**). Stantec recommends avoidance of this target, in conjunction with a 20 m buffer zone, or else further investigation may be required.

The Maritime Museum of the Atlantic's (2021) *On the Rocks* shipwreck database indicates there are at least 29 known wrecked vessels in the vicinity of Pictou Harbour. In 2015, during a bathymetric survey to update nautical charts, the Canadian Hydrographic Service identified a wreck in Pictou Harbour, ~1 km east of the causeway from Abercrombie Point. The wreck was described as sitting upright, embedded in silt, and largely intact. Subsequent investigations by local divers revealed evidence that the wreck is most likely the *Dieuze*, a steamship that caught fire while loading coal in Pictou Harbour in 1925. The Maritime Archaeological Resource Inventory (MARI) lists this as registered site BkCq-22.

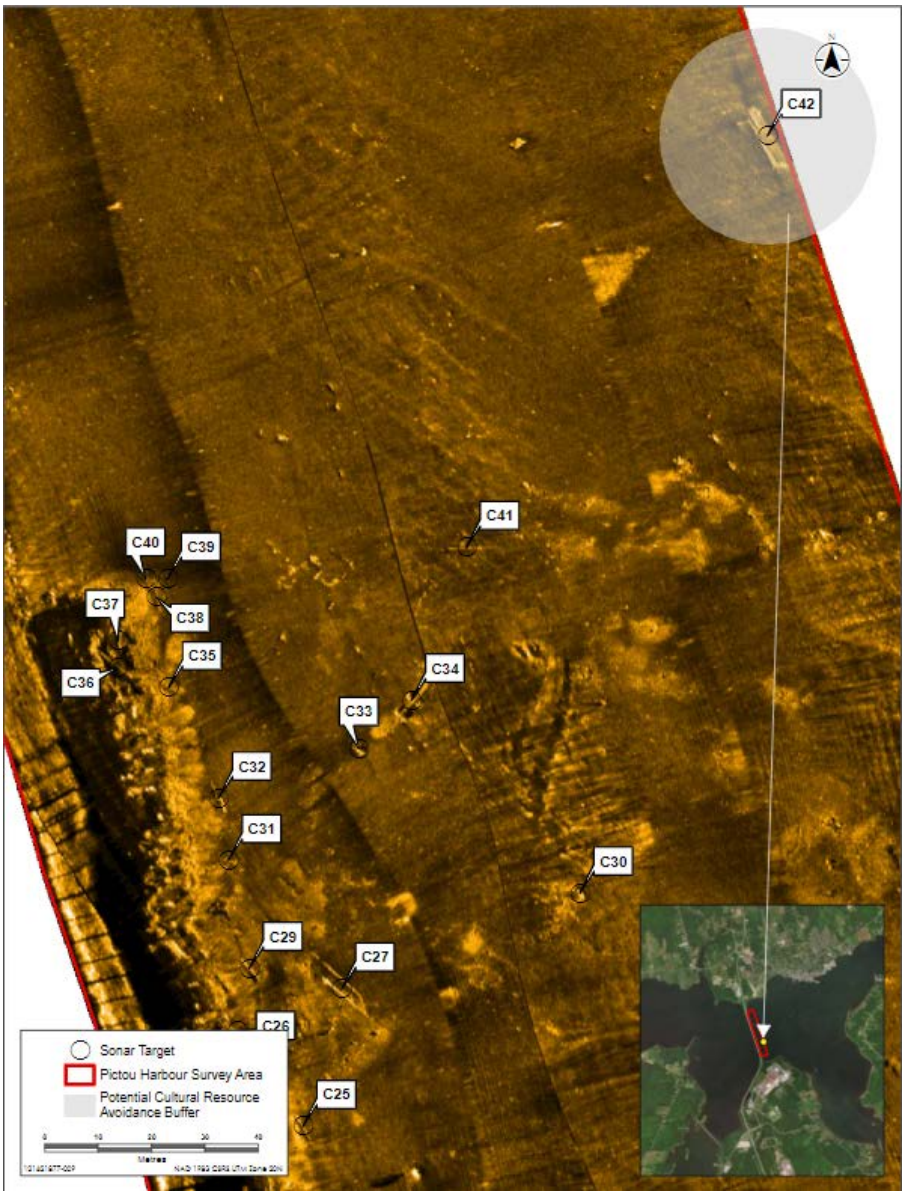


Figure 5.13: Potential Cultural Heritage Resources Alongside the Causeway in Pictou Harbour.

Built Heritage

There are no built heritage sites close to the project area (Canadian Register of Historic Places 2018). The closest site is the McCulloch House located on Halliburton Road in Pictou.

6.0 ASSESSMENT PROCESS AND ANTICIPATED IMPACTS

6.1 GENERAL APPROACH

The proposed project is a Class II undertaking pursuant to the *Environmental Assessment Regulations* of the Nova Scotia *Environment Act*, that requires an EA to be completed prior to approval by the Minister. The approach to the EA has evolved from methods proposed by Beanlands and Duinker (1983), who stressed the importance of focusing the assessment on environmental components of greatest concern to society or as indicators of environmental health. In general, the methodology is designed to produce an EA that:

- Focuses on issues of greatest concern;
- Addresses regulatory requirements;
- Addresses issues raised by the public and other stakeholders;
- Integrates engineering design and mitigation and monitoring programs into a comprehensive environmental management planning process, and
- Integrates cumulative effects assessment into the overall assessment of residual environmental effects.

The EA for this project will include an evaluation of the potential effects, including cumulative effects, of each project phase, as well as malfunctions and accidents, with regard to each valued environmental component and valued socio-economic component (collectively referred to as VECs). Project-related effects will be assessed within the context of boundaries established for the assessment.

6.2 POTENTIAL INTERACTIONS AND IMPACTS

6.2.1 Preliminary Screening

The *NPNS Mill Transformation Project* is expected to have some interaction with a range of VECs. **Table 6.1** presents a preliminary assessment of potential interactions. It is envisaged that these will be considered in the upcoming EA (subject to the Terms of Reference for the EA that is to be issued by NSECC). The potential interactions identified are considered preliminary and are based partially on the assessment presented in the previous EA Registration Document for the *Replacement ETF Project* (Dillon 2019a) and the EA study team's experience with similar projects.

Table 6.1: Potential Project Interactions with Valued Environmental Components (VECs)

PROJECT ACTIVITIES	POTENTIAL VECs																			
	Atmospheric Environment			Terrestrial Environment				Freshwater Environment				Marine Environment				Socio-Economic Environment				
	Air Quality (CACs)	Climate Change (GHGs)	Acoustic Environment	Geology and Soils	Vegetation	Avian Fauna	Wildlife	Groundwater	Surface Water	Wetlands	Freshwater Fish & Fish Habitat	Marine Physical Environment	Marine Benthos	Marine Fish and Fish Habitat	Marine Mammals and Sea Turtles	Infrastructure and Land Use	Economic Resource Use	Indigenous People's Use of Land & Resources	Human Health & Well-Being	Archaeology and Heritage Resources
Construction Phase																				
Engineering survey and utility location									✓	✓		✓	✓	✓						
Vegetation clearing, grubbing and grading	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓									✓
Machinery operation and transportation (incl. marine)	✓	✓	✓			✓	✓					✓						✓	✓	
Temporary facilities, laydown areas and access roads				✓	✓	✓	✓		✓		✓									✓
Mill component construction and repurposing	✓	✓	✓			✓			✓	✓	✓						✓			
ETF construction	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓	✓		✓
Spill basin construction	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓		✓
Pipeline construction	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓		✓
Site cleanup and stabilization				✓	✓	✓	✓		✓	✓	✓	✓	✓	✓				✓		
Commissioning	✓	✓	✓																	
Operation and Maintenance Phase																				
Mill operation and production	✓	✓	✓			✓	✓	✓	✓							✓	✓		✓	
ETF operation	✓	✓	✓			✓						✓	✓	✓	✓	✓	✓		✓	
Material handling and logistics (incl. transportation)	✓	✓	✓			✓	✓	✓				✓	✓	✓	✓	✓	✓		✓	
Annual maintenance shutdown	✓	✓	✓									✓	✓	✓	✓		✓		✓	
General maintenance activities		✓		✓					✓	✓	✓	✓	✓	✓	✓	✓	✓			

PROJECT ACTIVITIES	POTENTIAL VECs																			
	Atmospheric Environment			Terrestrial Environment				Freshwater Environment				Marine Environment				Socio-Economic Environment				
	Air Quality (CACs)	Climate Change (GHGs)	Acoustic Environment	Geology and Soils	Vegetation	Avian Fauna	Wildlife	Groundwater	Surface Water	Wetlands	Freshwater Fish & Fish Habitat	Marine Physical Environment	Marine Benthos	Marine Fish and Fish Habitat	Marine Mammals and Sea Turtles	Infrastructure and Land Use	Economic Resource Use	Indigenous People's Use of Land & Resources	Human Health & Well-Being	Archaeology and Heritage Resources
Accidents and Malfunctions																				
Accidental release of a hazardous material (e.g., spills)	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	
Failure of erosion and sediment control measures				✓	✓	✓	✓	✓	✓	✓	✓									
Accidental release of effluent from ETF or pipeline				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	
Accidental release of off-specification effluent						✓						✓	✓	✓	✓			✓	✓	
Marine outfall damage or fouling						✓						✓	✓	✓	✓			✓	✓	
Berm failure				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
Vehicle accident	✓		✓		✓		✓									✓			✓	
Discovery of a heritage resource																				✓

6.2.2 Cumulative Effects

Cumulative environmental effects are the residual environmental effects that are likely to result from an activity in combination with the environmental effects of other projects or activities that have been or will be carried out (also referred to as past, present, and reasonably foreseeable future projects or activities) (CEA Agency 2018). Individual projects and/or project components may produce residual environmental effects that are not significant, but when combined with the effects of other project components or other projects and activities, these may become significant.

In general, the cumulative environmental effects of past and present activities are apparent in the description of the existing environment and the impact assessment for the project. The focus of the cumulative effects assessment is on future projects that are in advanced planning stages, or existing ones that may be subject to modifications or expansion. A review of the EA registries of NSECC and the Impact Assessment Agency was undertaken in October 2021. A tentative list of potentially relevant future projects and activities that might interact in a cumulative fashion with the project (within 20 km of the site) include:

- **Boat Harbour Remediation Project** (Distance to project: ~5 km)- Nova Scotia Lands Inc. is proposing the remediation of Boat Harbour and nearby lands, located next to Pictou Landing First Nation. The project is currently under federal review under the *Canadian Environmental Assessment Act* 2012.
- **Pictou Landing New Subdivision Development** (Distance to project: ~5 km) - Construction of a new 38 lot subdivision with a total project footprint of 1.8 ha. The project is currently under federal review under the *IAA*.
- **Highway 104 Twinning Project** (Distance to project: ~20 km) – Twinning of Highway 104 from Sutherlands River to Antigonish (28 km). Project is approved under the NS *Environment Act*, and is undergoing construction, to be completed in 2023.
- **MacLellans Mountain Quarry Expansion** (Distance to project: ~15 km) – Expansion of the existing quarry by 32.8 ha over a 50-year period. Approval under the NS *Environment Act* received in 2019.

Other developments in the area that will be taken into consideration are any regional developments of oil and facilities, mining ventures, renewable energy facilities (e.g., wind farms, solar farms), forestry activities, port and harbour developments and residential developments.

6.2.3 Climate Change Implications

Climate change mitigation and adaptation are both relevant to the project. Climate mitigation includes the actions taken to limit global warming and its related effects, by reducing emissions of GHGs. The mill has made significant progress in this regard, with its 2019 emissions 40% below its 1990 discharges. The mill transformation will see further decreases of an additional 9%, equating to a reduction of 4,500 tonnes CO_2eq annually. The total GHG emissions from the mill were, and will continue to be, less than 0.5% of Nova Scotia's total GHG emissions.

Climate adaptation involves adjusting to actual or expected future climate, to minimize vulnerability and increase resiliency of infrastructure to the harmful effects of climate change. The design of the project will take into consideration the likely expected changes in climate over the life of the mill. These could include increased temperatures and forest fires, changes in seasonal precipitation, increased water

temperatures (including Middle River), increased frequency and intensity of storms, and increased sea level rise and storm surges.

6.2.4 Socio-Economic Benefits

The socio-economic benefits of the mill will be included in the impact assessment for the project. The continued operation of the NPNS mill will ensure that it meets global market demands and supports the local and provincial forestry sector. The forestry sector in Nova Scotia is a major contributor to the GDP of the province, ranking 5th in the Goods Producing Sector for the province and ranking 3rd in job provision (Gardner Pinfold 2016). In 2016, it had a $2.1 Billion in total economic impact ($1.5 Billion in 2012) and contributed $800 million to provincial GDP ($575 million in 2012) (Gardner Pinfold 2016).

The mill itself provides significant benefits to the Province of Nova Scotia. It is a key driver of the economy of rural Nova Scotia, creating well-paying jobs in typically high unemployment areas (Gardner Pinfold 2019). Its unique partnerships with sawmills, forestry contractors and private woodlot owners are critical to the forestry sector and the rural economy. The economic benefits include (Gardner Pinfold 2019):

- 330 direct and 2,679 indirect jobs, and $128 million in worker income gained throughout the economy;
- 1,379 companies supporting mill operations, with 943 suppliers in Nova Scotia, and
- $279 million annual spending with most spent in Nova Scotia.

6.2.5 Anticipated Mitigation and Monitoring

NPNS is committed to avoiding and minimizing adverse effects, maximizing project benefits, and complying with all applicable approvals, standards, and guidelines. In order to achieve this, a comprehensive set of mitigation measures, monitoring programs and contingency planning will be implemented (to be described in the EA). A preliminary list of anticipated key mitigation plans includes:

- Environmental Management Plan, and associated environmental protection plans (e.g., erosion and sedimentation control);
- Contingency Plan for emergencies such as unexpected shutdowns, discharges, emissions or spills;
- Wetland Compensation Plan, to offset any habitat impacts to on-site wetlands, and
- Fish Habitat Compensation Plan, if it is determined that there will be harmful alteration, disturbance or destruction of fish habitat.

Monitoring of environmental impacts will be undertaken during the operational phase of the project through the following programs:

- Air Quality Monitoring Program;
- Environmental Effects Monitoring for discharges under *PPER*;
- Surface Water Monitoring Program;
- Groundwater Monitoring Program;
- GHG Monitoring and Reduction Program, and
- Any monitoring required under approvals for the project, including the Industrial Approval.

The details of the above will be a focal point of the EA. NPNS is committed to lasting and open dialogue with local communities, Mi'kmaq communities, regulators, and residents to solicit input and to address specific needs and preferences on all issues related to effects management. It is envisaged that the communication and engagement will be ongoing during the planning and EA phase and extend beyond construction into the operating phase.

6.3 ANTICIPATED STUDIES

A significant amount of baseline information is available from studies undertaken at the site for the previous *Replacement ETF Project* as described in the EA Registration Document (Dillon 2019a) and Focus Report (Dillon 2019b). Given that there has been little change at the site since then it is expected that additional field investigations will not be required for the atmospheric (air and noise), terrestrial (vegetation and birds) or freshwater (wetlands and watercourses) environment, and that baseline information collected to date will be sufficient. However, there is currently a gap in information on the marine environment in Pictou Harbour.

6.3.1 Receiving Water Study

A receiving water study is planned with the following objectives: 1) to provide input to the engineering design and siting of the effluent treatment outlet (pipeline and diffuser), and 2) to provide information on effluent dispersion that will be used in the human health and ecological risk assessment and environmental assessment of the project.

When effluent is discharged into a waterbody it does not completely and instantaneously mix with the receiving water. Instead, an effluent plume forms, starting at the outfall. The initial dilution zone (i.e., mixing zone) is a transitional area within a waterbody in which an effluent discharge is gradually assimilated into the receiving water. At some point downstream of the outfall, the physical process of mixing will be complete; this is defined as the area up to the point where there is virtually no measurable difference between unaffected receiving water and receiving water mixed with the effluent. At this point, the effluent is considered fully mixed with the receiving water. A mixing zone is specific to a site and chemical parameter. Dimensions allocated to an initial dilution zone will vary on a case-by-case basis depending on site-specific factors. The extent of an initial dilution zone requires justification based on the environmental impact assessment and dispersion modeling.

Effluent discharged via a submarine diffuser undergoes two distinct transport regimes; an initial so called near-field regime in which the behaviour of the effluent is governed by the method of its discharge and its initial physical properties, and a so called far-field regime in which the behaviour of the partially mixed effluent is governed by the ambient water body. A combination of near-field modelling using CORMIX and far field modelling using the three-dimensional hydrodynamic model Delft3D will be used to characterize the behaviour and fate of effluent discharged by NPNS.

Following calibration and validation of the Delft3D model, an initial model run will be conducted for a period expected to produce the reasonable worst-case effluent dilution, likely neap-tide condition in winter with ice coverage. Temperature, salinity, currents and water levels will be exported from the three-dimensional numerical model and used to drive a series of CORMIX simulations to develop an optimal concept design for the diffuser.

Based on the optimized diffuser parameters, far-field simulations will be conducted seasonally to capture the range of potential effluent behaviours and the influence of fluvial discharge, ice cover, and

ambient meteorological conditions at potential diffuser locations. For each seasonal simulation the operating and emergency (if applicable) range of effluent properties and discharges will be tested to determine the range of potential concentrations in the receiving water.

Clearly defined effluent limits are necessary inputs for the RWS, and for the design of the new tertiary treatment stage of the ETF. Effluent discharge will meet the federal *PPER*. NPNS will assume that the draft *PPER* (currently in the process of being finalized by ECCC) will become the future legal enforcement limits and that these will be applied in Nova Scotia, as is done in most jurisdictions in Canada, including all Atlantic Canada. These will be used as the worst-case effluent quality inputs in the RWS. If the results of the RWS and risk analysis indicate potential detrimental effects to human health or the environment, these will be mitigated through design to improve effluent quality.

As part of the receiving water study, marine field studies will be undertaken to understand baseline conditions within Pictou Harbour, and to provide input into the modelling component of the receiving water study, including:

Data collection for effluent dispersion modelling:

- **Water levels** will be measured by installing one gauge in Pictou Harbour seaward and one gauge inland of the Harvey A. Venoit Causeway. These gauges will be installed for a period not less than 29 days to record a minimum of two spring-neap tidal cycles.
- **Water quality** will be sampled at pre-determined water quality monitoring stations during rising (flood) and falling (ebb) tides during high and low discharge conditions in the East River of Pictou. Samples will be taken at the surface of the water column and close to the bottom of the water column. The samples will be sent to a certified laboratory for analysis for nutrients (N, P) and inorganic parameters (metals, major ions, TSS).
- **Turbidity (CTD-Tu) casts** will be taken at the water quality locations**,** once during a rising tide (flood) and once during a falling tide (ebb) while the water level gauges are installed.
- **Water quality profiles** for salinity, temperature, turbidity, dissolved oxygen and pH will be conducted at the same stations to describe water masses in the study area.
- **Acoustic Doppler Current Profiler (ADCP)** transects will be required during the period when the water level gauge is installed, at six transects within the far field. One survey will be required on the rising tide, and one survey on a falling tide.
- **Discharge** of water through the Harvey A. Veniot Causeway will be measured, concurrent with the CTD-Tu data.

Marine baseline data collection:

- A **marine benthic survey** will be undertaken using an underwater video camera to characterize the marine habitat in the study area and to identify key benthic species. The following will be noted: plant/algal species present and the percentage of overlap of each; substrate present, percent overlay by size class, and identification and enumeration or abundance class of epibenthic organisms.
- **Sediment sampling** stations will be identified based on the potential diffuser location(s). The intention will be to determine the nature (full particle size distribution, percentage of total organic carbon, etc.) of the sediment and assess the physico-chemical quality of the sediments prior to construction.

- **Benthic invertebrates** will be collected from the sediment grab samples for analysis by a benthic specialist, to establish the diversity, density, and relative abundance of the different species in the study area.

6.3.2 Other Studies

It is expected that the analysis of impacts on the environment will require certain specialist analytical studies:

- **Air Quality Modelling** - Air emissions will decrease once the mill has been upgraded; thus, the emissions inventory for the air modelling will be revised. The modelling will be updated using the AERMOD dispersion model and include deposition modelling to be incorporated into the risk assessment for the EA.
- **Noise Modelling** - The Project has the potential to change the acoustic environment within the study area for the duration of the project, and to temporarily influence the acoustic environment during construction. A noise source inventory will be developed, and the acoustic impact determined through noise modelling for construction and operation.
- **Human Health and Ecological Risk Assessment** – The assessment of the impact of the project on human health and ecological functioning will require an HHERA. A weight-of-evidence approach will be taken, assuming a combination of qualitative and quantitative assessment, including quantitative exposure modelling for any contaminants of concern. Input will be required from the air dispersion and deposition modelling and the receiving water study.

  The HHERA can be used to calculate site specific target levels (SSTLs) for human and ecological health based on established criteria for acceptable risk (see Health Canada 2010; CCME 2020).
- **Archaeology** – A marine ARIA will be required to assess the potential for marine heritage resources in and around the project footprint within Pictou Harbour.

Other studies may be required, depending on the regulatory review of this Registration Document and the EA Terms of Reference for the project.

6.4 CONCLUSION

NPNS is proposing to transform the mill to an environmentally best in class facility by redesigning mill operations using BAT, and constructing and operating a new advanced ETF on-site. This document is being submitted to NSECC to register the project as a Nova Scotia Class II undertaking under the Nova Scotia *Environmental Assessment Regulations*.

NPNS plans to meet or exceed regulatory limits for the site (e.g., NS *Air Quality Regulations*, current and future *PPER*, and limits established for the Industrial Approval) and to ensure that any emissions are below risk thresholds for human and ecological health. To achieve this, clear targets for emissions need to be established for the site by NSECC prior to engineering design for the project.

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