

Source Emissions Testing – Summer 2014 Report



## Prepared for:

Northern Pulp Nova Scotia Corporation P.O. Box 549, Station Main New Glasgow, NS B2H 5E8

## Prepared by:

Stantec Consulting Ltd. 102-40 Highfield Park Drive Dartmouth, NS B3A 0A3

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## **TABLE OF CONTENTS**

EXEC	VE SUMMARY
1.0	ITRODUCTION
2.0 2.1 2.2 2.3 2.4	VERALL APPROACH  JBMISSION OF PRE-TEST PLAN
3.0 3.1 3.2	ST METHODS, EQUIPMENT, AND CALIBRATIONS.  AMPLING PROCEDURES AND EQUIPMENT.  1.1 Total Particulate Matter.  1.2 Combustion Gases.  1.3 Total Reduced Sulphur.  UALITY ASSURANCE AND QUALITY CONTROL
4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7	SULTS AND DISCUSSION  (HAUST STACK SAMPLE LOCATION DETAILS  ME KILN  ECOVERY BOILER  MELT DISSOLVING TANK  DWER BOILER  GH LEVEL ROOF VENT  JAMMARY OF RESULTS
5.0	LOSURE
LIST (	TABLES
Table	Source Emissions Testing Matrix
Table Table	



# List of Figures

Figure 3.1 Particulate Matter Sampling Train Schematic Diagram	5
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# **List of Appendices**

Appendix A	Certificate of Approval to Operate
	Pre-test Plan
Appendix C	Calibration Data
Appendix D	Field Data Sheets
Appendix E	Calculations
Appendix F	Operational Data



#### **EXECUTIVE SUMMARY**

Northern Pulp Nova Scotia Corporation, referred to herein as Northern Pulp, retained Stantec Consulting Ltd. to conduct source emissions testing at the Kraft pulp mill in New Glasgow, Nova Scotia. Source emissions testing was conducted on the Recovery Boller, the Lime Klin, the Smelt Dissolving Tank, the Power Boiler, and the High Level Roof Vent to fulfill the conditions specified in the current Certificate of Approval to Operate (CoA) 2011-076657-R02. The source emissions testing campaign was performed according to the pre-test plan submitted to the Nova Scotia Department of Environment, the United States Environmental Protection Agency Test Method 16B, under the Codes of Regulations (CFR) Part 60 Appendix A, Environment Canada's EPS 1/RM/8, and EPS 1/RM/15. The testing was conducted during the period of August 19 – 22, 2014 and August 25 – 26, 2014.

In this report, source emissions testing data are presented for measurements which include combustion gases, total particulate matter (PM), total reduced sulphur (TRS) as well as exhaust gas temperature, exhaust flow rate, moisture content, velocity, and volumetric flow rate. The scope of work for the testing campaign is summarized in Table 1.1.

Table 1.1 Source Emissions Testing Matrix

Idnie III 9	Jonice Elitaziolis lexitlià Midilly							
Zahice	Number of Southles per South	Approva Condition	Partmelgr	Sampling Milmod				
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8				
Lime Kiln	1	6. b)	Total Reduced Sulphur (TRS)	US EPA Method 16B/C				
	3	-	Combustion Gases	EPS 1/RM/15				
D	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/B				
Recovery Boiler	3	-	Combustion Gases	EPS 1/RM/15				
Smelt Dissolving	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8				
Tank	3	•	Combustion Gases	EPS 1/RM/15				
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8				
Power 3oiler	3	-	Combustion Gases	EPS 1/RM/15				
	1	6. b)	Total Reduced Sulphur (TRS)	US EPA Method 16B/C				
	3	-	NOx	EPS 1/RM/15				
High Level Roof	3		\$O <sub>2</sub>	US EPA Method 3A				
Vent	3	-	СО	US EPA Method 10				
	3	-	CO <sub>2</sub> and O <sub>2</sub>	US EPA Method 6C				

Currently there are specified regulatory limits in the facility's CoA for emissions of PM and/or TRS from four of the five exhaust stacks listed. The measured concentration of PM from the Lime Kiln and Smelt Dissolving Tank were below their respective regulatory stack limits. The measured concentration of PM from the Recovery Boller and Power Boller were above the regulatory limit. The maximum 4-hour rolling average concentration of TRS from the Lime Kiln was below the regulatory limit. No limit for TRS is specified for the High Level Roof Vent in the facility's approval.



### 1.0 INTRODUCTION

Northern Pulp Nova Scotia Corporation, referred to herein as Northern Pulp, retained Stantec Consulting Ltd. (Stantec) to conduct source emissions testing at the Kraft pulp mill in New Glasgow, Nova Scotia. Source emissions testing was conducted on the Recovery Boiler, the Lime Kiln, the Smelt Dissolving Tank, the Power Boiler, and the High Level Roof Vent to fulfill the conditions specified in the current Certificate of Approval to Operate (CoA) 2011-076657-R02. The source emissions testing campaign was performed according the pre-test plan submitted to the Nova Scotia Department of Environment, the United States Environmental Protection Agency Test Method 16B, under the Codes of Regulations (CFR) Part 60 Appencix A, and the Environment Canada methods EPS 1/RM/8 and EPS 1/RM/15. The particulate matter and total reduced sulphur testing was conducted during the period of August 19 – 22, 2014 and August 25 – 26, 2014.

In this report, source emissions testing data are presented for combustion gases (oxygen, carbon dioxide, nitrogen oxides, sulphur dioxide, and carbon monoxide), total particulate matter (PM), total reduced sulphur (TRS), exhaust gas temperature, exhaust flow rate, moisture content, velocity, and volumetric flow rate. Source emissions testing were conducted on the following sources:

- Lime Kiln;
- Recovery Boiler;
- Smelt Dissolving Tank;
- Power Boiler; and
- · High Level Roof Vent.

This report is in five sections. Section 1 contains the introduction and the scope of work for the project. The study approach and a brief description of the various parts of the project are in Section 2. Section 3 contains a brief description of the testing methodologies, equipment, and calibration techniques used during the source emissions testing program. In section 4, the results of the source emissions testing are presented and discussed, and concluding remarks are presented in Section 5. Appendices A through E contain supporting information for the report, and Appendix F contains operational data from Northern Pulp during the testing periods.



## 2.0 OVERALL APPROACH

The project consisted of five parts:

- 1. Submission of the Pre-test Plan;
- 2. Site Preparation and Preliminary Survey;
- On-site Source Emissions Testing;
- 4. Laboratory Analysis; and
- 5. Information Review and Reporting.

Each of these parts is described below.

#### 2.1 SUBMISSION OF PRE-TEST PLAN

The on-site testing was conducted in accordance with the Pre-Test Plan submitted on May 6, 2014 to Nova Scotia Environment (NSE). The Pre-Test Plan outlined the contaminants to be tested, as well as the methodologies proposed for conducting the source testing on the exhaust stacks.

#### 2.2 ON-SITE SOURCE EMISSIONS TESTING

Stantec set up the source emissions testing equipment and conducted a preliminary survey to measure the exhaust gas temperature, velocity, and flue gas composition in the five exhaust points. The data from this survey was used to determine the appropriate nozzle size to conduct isokinetic sampling (where the velocity of the gas entering the nozzle is equal to the gas velocity in the stack) for particulate matter during the source emissions testing part of the work.

Three (3) tests for total particulate matter were conducted at defined sampling locations on the exhaust stacks of the Recovery Boller, the Lime Kiln, the Smelt Dissolving Tank, and the Power Boller. Three tests for combustion gases were also conducted, near the centre of the exhaust stacks of the Recovery Boller, the Lime Kiln, the Smelt Dissolving Tank, the Power Boller and the High Level Roof Vent. All testing was completed in compliance with the sampling methods presented in Table 2.1, in accordance with the Air Quality Regulation, under the Environment Act, Section 112 issued by Nova Scotla Environment (NSE) and the requirements of the facility's approval (2011-076657-R02) issued by the NSE.

The source emissions testing of the Lime Kiln and the High Level Roof Vent for total reduced sulphur (TRS) was conducted in accordance with US EPA Method 16B and the requirements of the facility's approval (2011-076657-R02) issued by NSE.



The methodologies used for testing the emissions from each exhaust stack are summarized in Table 2.1.

Table 2.1 Source Emissions Testing Matrix

Table 2.1 Source	B FWRZIOUZ I AZII	ilg Mullix		STATE OF THE OWNER OWNER OF THE OWNER
Soute	Number of Samples per Source	Approval Condition	Favorne feu	Sampling Method
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
1i Kin	1	6. b)	Total Reduced Sulphur (TRS)	US EPA Method 16B/C
Lime Kīn	3	-	Combustion Gases	EPS 1/RM/15
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
Recovery Boiler	3	<u> </u>	Combustion Gases	EPS 1/RM/15
		6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
Smelt Dissolving Tank	3	0.0,	Combustion Gases	EPS 1/RM/15
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
Power 3oiler	<u> </u>	0. uj	Combustion Gases	EPS 1/RM/15
	. 3	6. b)	Total Reduced Sulphur (TRS)	US EPA Method 16B/0
			NOx	EPS 1/RM/15
	3	<del></del>	SO <sub>2</sub>	US EPA Method 3A
High Level Roof Vent	3	-	CO	US EPA Method 10
	3	<u> </u>	CO <sub>2</sub> and O <sub>2</sub>	US EPA Method 6C
	3		CO2 dild O2	

In addition to the above testing (as required to meet the Approval conditions), the exhaust flow rate was determined for the High Level Roof Vent.

## 2.3 LABORATORY ANALYSIS

Prior to the particulate matter testing, several filters were conditioned and pre-weighed. Following the testing, particulate matter was recovered from the nozzle, the sampling probe and the in-line filter. Following testing the filter, containing the particulate sample, was conditioned and weighed, and the net weight of the collected particulate matter was determined. After each test, the probe and nozzle were rinsed with acetone and this acetone was collected, placed into a pre-weighed container and evaporated until dry. The amount of particulate for each part of the sample was determined gravimetrically, and the mass of particulate matter collected for each test was calculated as the sum of the particulate matter collected in the filter, probe, and nozzle rinse. The contents of the impingers were also recovered gravimetrically for particulate matter and reported separately. These recoveries were performed at Stantec's laboratory in Fredericton, New Brunswick.

## 2.4 INFORMATION REVIEW AND REPORTING

The data collected in the field, along with data from the laboratory analyses, were entered into the Stantec's source emissions testing spreadsheets for analysis. Emissions calculations were then performed to produce the detailed source emissions testing information. Spreadsheet calculations were verified by hand, and numerous spot checks of spreadsheet formulas were conducted to ensure the accuracy of data. Summary tables were prepared and incorporated into this report for submission to Northern Pulp.



## 3.0 TEST METHODS, EQUIPMENT, AND CALIBRATIONS

This section contains a description of the methods and equipment used to conduct the source emissions testing campaign. The calibration procedures used to ensure the quality of the source emissions testing data are also summarized in this section.

#### 3.1 SAMPLING PROCEDURES AND EQUIPMENT

The following sub-sections contain brief descriptions of the sampling equipment and methodologies used during the source emissions testing campaign.

#### 3.1.1 Total Particulate Matter

Particulate matter emissions from the four exhaust stacks (Recovery Boiler, Lime Kiln, Smelt Dissolving Tank, and Power Boiler) were measured in accordance with the Environment Canada Reference Method EPS 1/RM/B, entitled Reference Methods for Source Testing: Measurement of Releases of Particulate from Stationary Sources.

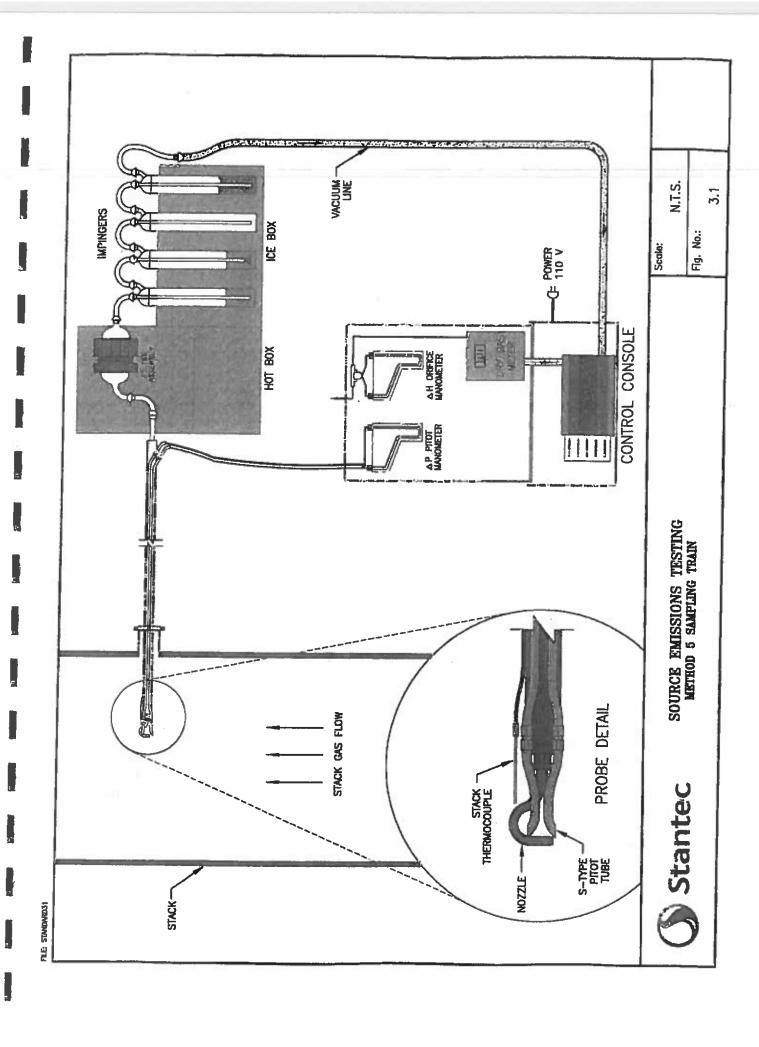
The sampling train, used specifically for isokinetic sampling of particulate matter, is described in detail in EPS 1/RM/8, and is generally referred to as the 'Method 5' sampling train for particulate matter, named after the United States Environmental Protection Agency (US EPA) protocol. The sampling train consists of several different components which include: a heated sampling probe (a nozzle, stainless steel liner, thermocouple, and pitot tube assembly), a heated sample case containing a filter, an ice box containing impinger glassware, and an umbilical cord leading to the pump and control console. A schematic of the sampling system is shown in Figure 3.1. The operation of the Method 5 sampling train can be generally described as follows.

Exhaust gases are drawn through the probe nozzle at or near isokinetic conditions (i.e., where the gas velocity in the nozzle is at the same velocity as the gas in the stack). The gases are then drawn through the inner stainless steel liner of the electrically heated sampling probe to the other components of the sampling train.

A pitot tube assembly is attached to the probe next to the nozzle to measure the exhaust gas velocity in the area of the probe nozzle. Using the differential pressure reading on the control console, the desired nozzle flow rate is determined from the differential pressure across a calibrated orifice.

The exhaust gases are drawn from the probe liner through a pre-weighed glass fiber filter, in the hot side of the sampling unit, and then through pre-weighed impingers in an ice bath to cool the gases and condense the moisture in the gas, before the gas enters the umbilical cord.

The umbilical cord carries the filtered, cooled exhaust gases from the sampling site to the control console. The control console contains a fiber vane vacuum pump, which is used to draw the exhaust gases through the sampling train. A calibrated dry gas meter records the volume of gas sampled.





After completion of testing, the impingers are re-weighed, with the difference in mass corresponding to the mass of water collected. This measurement is used to calculate the moisture content of the exhaust gas.

Total particulate matter is determined gravimetrically at Stantec's laboratory in Fredericton, New Brunswick.

Appendix C contains the calibration data.

#### 3.1.2 Combustion Gases

The combustion gases (O2, CO2, CO, NOx, and SO2) were sampled according to the Environment Canada reference method EPS 1/RM/15, entitled Reference Method for the Monitoring of Gaseous Emissions from Fossil Fuel-fired Burners. In this method, samples of flue gas are drawn through a probe, non-isokinetically, from a single point near the centre of the stack. An ENERAC Model 500 Micro-Emission Analyzer, manufactured by ENERAC Inc., was used to conduct the sampling. The Model 500 is equipped with a flue gas probe that has an integrated filter trap and condensate trap, and a housing unit that contains the pump and the electrochemical cells which are used to measure concentrations of sulphur dioxide, nitrogen oxides, carbon menoxide, carbon dioxide, and oxygen.

The ENERAC Model 500 Micro-Emission Analyzer is manufactured and calibrated to confirm accuracy. Calibration data is included in Appendix C.

The concentrations and emission rates of oxygen, carbon dioxide, carbon monoxide, and sulphur dioxide were measured continuously from the High Level Roof Vent during total reduced sulphur measurements in accordance with the following US EPA protocols for source emissions testing.

Carbon Dioxide (CO<sub>2</sub>) and Oxygen (O<sub>2</sub>): Carbon dioxide and oxygen are analyzed according to the US EFA Method 3A, entitled Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure). In this method, a sample of stack gas is continuously extracted from the effluent stream at a single point near the centre of the stack through a heated filter and sample line. A portion of the sample is distributed to a paramagnetic analyzer for the determination of oxygen concentration, and to a Luft-type non-dispersive infrared (NDIR) analyzer or equivalent for the determination of carbon dioxide concentration.

Carbon Monoxide (CO): Carbon monoxide emissions were determined according to the US EPA Method 10, Determination of Carbon Monoxide Emissions from Stationary Sources. In this method, a sample of stack gas is continuously extracted from the exhaust stream at a single point near the centre of the stack through a heated filter and sample line. The sample is then analyzed for carbon monoxide content using a Luft-type non-dispersive infrared (NDIR) analyzer or equivalent.

Sulphur Dioxide (SO<sub>2</sub>): Sulphur dioxide is analyzed according to the US EPA Method 6C, entitled Determination of Sulphur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure). In this method, a sample of stack gas is continuously extracted from the effluent stream at a single point near the centre of the stack through a heated filter and sample line. A portion of the sample is distributed to an instrumental ultraviolet (UV) analyzer for the determination of SO<sub>2</sub> concentration.



#### 3.1.3 Total Reduced Sulphur

The source emissions testing of the Lime Kiln and the High Level Roof Vent for total reduced sulphur was conducted in accordance with US EPA Method 16B, entitled Determination of Total Reduced Sulfur Emissions from Stationary Sources and US EPA Method 16C (real-time data).

Method 16C uses the sampling procedures of Method 16A/B and the analytical procedures of Method 6C (for SO<sub>2</sub> analysis) to measure TRS. Total reduced sulfur is defined as hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide (reported as H<sub>2</sub>S). As in Method 16A and B, the sample is collected from the source through a heated probe. Stantec modified Method 16 by omitting the citrate buffer scrubber. The citrate buffer scrubber is used to remove SO<sub>2</sub> from the gas stream prior to the oxidizing oven. This modification was done to facilitate 24-hour sampling as removal of SO<sub>2</sub> using the scrubber requires frequent stops and starts and checks on the buffer to ensure the buffer does not become saturated. This modification thus improves the accuracy of sampling over using the buffer.

The sample is extracted from the exhaust gas of the stack through a heated Teflon line and directed through a first SO<sub>2</sub> analyzer (non-dispersive ultra-violet (NDUV) continuous analyzer) to confirm SO<sub>2</sub> present prior to the oven. The sample is then directed through an oven to thermally oxidize any reduced sulphur compounds to SO<sub>2</sub>. Following oxidation of the sample, the exhaust gas from the oven is drawn through a second SO<sub>2</sub> non-dispersive ultra-violet (NDUV) continuous analyzer to analyze the gas for SO<sub>2</sub>. The concentration of Total Reduced Sulphur (TRS) is then calculated by subtracting any SO<sub>2</sub> measured in the gas prior to oxidation (measured via the first SO<sub>2</sub> analyzer prior to the oven) from the total SO<sub>2</sub> present after the oxidation oven. Monitoring was conducted continuously over a 24-hour period on each source.

#### 3.2 QUALITY ASSURANCE AND QUALITY CONTROL

Throughout the source emissions testing program, quality assurance and quality control procedures were applied to ensure the collection of reliable and accurate emissions data. Quality control checks were performed at several stages during the testing program to ensure the collection of representative samples and the generation of valid results.

The Quality Control (QC) checks included the following:

- use of standardized checklists and field notebooks to ensure completeness, traceability, and comparability of the process information and samples;
- fleld checking of standardized forms by a second person to ensure accuracy and completeness;
- strict adherence to sample chain-of-custody procedures;
- testing for cyclonic or reverse flow, as well as stratified flow conditions; and
- leak checks of sampling train.

Equipment was calibrated according to the protocols and schedule as prescribed by NSE, Environment Canada, and the US EPA. These calibrations include the following:

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Append

Section

Pitots: Calibrated in a wind tunnel with probe and nozzles attached.

Gas meters: Calibrated using a critical orifice calibration set.

Nozzle: Four diameter measurements made using a micrometer across the sharpened edges.

Thermocouples: Calibrated using a potentiometric technique.

Gas Analyzers: Calibrated against reference gases using standard calibration gases within the expected range of concentrations from the source.

Calibration data are in Appendix C of this report.



## 4.0 RESULTS AND DISCUSSION

The results of the source emissions testing campaigns are provided and discussed in this section.

Appendices C through E contain supporting information including calibration information, field data sheets, and calculations.

#### 4.1 EXHAUST STACK SAMPLE LOCATION DETAILS

Table 4.1 provides a summary of the sample location details for each exhaust stack sampled.

Table 4.1 Sample Location Details

Potametel	Recovery	time Kilo	Smoll Disselving	Power	High Tevel
Stack Height – Above Grade (m)	69	37	51	51	65
Diameter / Equivalent Diameter (m)	3,51	1.22	1.22	1.93	1.83
Stack/Duct Description	Circular	Circular	Circular	Circular,	Circular
Stack Orientation	Vertical	Vertical	Vertical	Verlical	Vertical
Number of Sample Ports	4	2	2	2	1
Sample Port Diameter (m)	0.1	0.15	0.1	0.1	0.1
Location Upstream from any Disturbance,	>2	. 2	>2	>2	-
ocation Downstream from any Disturbance,	1,45	8	6	>4	-
deal or Non Ideal Row Characteristics at The Sample ocation <sup>1</sup>	Not Ideal	Not Ideal <sup>2</sup>	Not Ideal	Not Ideal	-
otal Number of Sample Points for PM	24	24	20	24	1
Number of Sample Points per iraverse for PM	12	12	10	12	NA
cample Time per Point for PM (min)	5	5	5	5	NA
cample time per Test for PM (min)	120	120	100	120	NA
ample time per Test for TRS (min)	NA	1,440	NA	NA	1,440
cample time per Test for gases (min)	30	30	30	30	30

#### Notes:

#### 4.2 LIME KILN

The results of the source emissions testing for total particulate matter from the Lime Kiln exhaust stack are in Table 4.2. The results of the source emissions testing for combustion gases and total reduced sulphur are in Tables 4.3 and 4.4, respectively.

The exhaust gas flow characteristics at the sampling location are referred to as being "Ideal" if the sample ports are located in a straight section of stack at least eight stack diameters downstream and two stack diameters upstream of any flow disturbance.

The Lime Kiin sampling location is not ideal due to the cyclonic flow.



Table 4.2 Source Testing Results - Lime Klin - Particulate Matter

Fordmeter	[ext #]	Test #2	tesl eð	Avetage	Stock Ensisted Limit (Toole 1 of Apployal)
Test Date	August 21, 2014	August 22, 2014	August 22, 2014	-	-
Test Start time	08:15	09:20	11:48	-	-
Test Duration (min)	120 .	120	120	120	-
Volume of Gas Sampled (Rm³)	0.89	0.89	0.86	0.88	-
Average Isokineticity (%)	105	105	103	104	-
Total Volume of Moisture Collected in Impingers (mL)	336	375	337	349	-
Particulate Matter From Filter and Probe Wash (mg)	213	213	171	199	. ~
Particulate Matter From Impingers (mg)	7.03	5.73	0.87	4,54	-
Plant Production (adubmt/day)	690	831	831	784	
Phoop Gas Factorillers			7.50		
Exhaust Gas Temperature (°C)	74 -	72	73	73	-
Exhaust Gas Moisture Content (%)	33.8	36.5	34.7	35.0	-
Exhaust Gas Velocity (m/s)	12.7	12.8	12.8	12.8	-
Exhaust Gas Volumetric Flow Rate (Rm <sup>3</sup> /s)	8.49	8.25	8.44	8.40	•
Oxygen - O2 (%)	5.81	5.80	5.71	5.78	-
Carbon Dioxide - CO2 (%)	11.3	8.3	8.4	9.4	-
iotal Particulate Matter - PM Concentration (mg/Rm³) Emission Rate (kg/hr)	239 7,30	240 7.12	198 6.01	225 6.81	
Emission metric (kg/adubmt)	0.25	0.21	0.17	0,21	0.50

#### Legend:

°C Degrees Celsius.

m/s Metres per second.

Rm<sup>3</sup>/s Dry cubic metres per second at reference conditions (25°C and 101.3 kPa), mg/Rm<sup>3</sup> Miligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

kg/hr Kilograms per hour.

adubmt Reference production rate in air dried unbleached metric tonnes.

The average measured emission rate of particulate matter was 0.21 kg/adubmt, which is below the stack emission limit of 0.50 kg/adubmt presented in Table 1 of the facility's Approval (No. 2011-076657-R02).

It should be noted that, as with previous testing, cyclonic flow is present at the sampling location for this source. Sampling was conducted following the angle adjustment approach with the cosine correction applied, as per the US EPA Guidance Document – GD-008.



Table 4.3 Source Testing Results - Lime Kiln - Combustion Gases

Parameter	Test 17	Yest #2	Lest #3	Avelope
Test Date	August 21, 2014	August 22, 2014	August 22, 2014	-
Test Duration (min)	60	60	60	. 60
Exhaust Gas Volumetric Flow				
Rate (Rm³/s)	8.49	8.25	8.44	8.40
Sulphur Dioxide - SO2				
Concentration (ppm)	ND	ND	ND	ND
Concentration (mg/Rm³)	ND	ND	ND	ND
Emissions Rate (kg/hr)	ND	ND	ND	ND
Nitrogen Oxides - NOx*		,		
Concentration (ppm)	106	111	84.7	101
Concentration (mg/Rm³)	200	208	159	189
Emissions Rate (kg/hr)	6.12	6.19	4.B5	5.72
Carbon Monoxide - CO			· .	
Concentration (ppm)	ND	ND	ND	ND
Concentration (mg/Rm³)	ND :	ND	ND	ND
Emissions Rate (kg/hr)	ND	ND	. ND	ND
send:				110

Legend:

Rm³/s Dry cubic metres per second at reference conditions (25°C and 101.3 kPa) based on average of PM test

measurements.

mg/Rm3 Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

kg/hr Kilograms per hour.

NC Not detected.

NOx concentration was measured during the particulate matter testing while other gases were measured during the TRS sampling period.

The average emission rate for NO $_{\rm X}$  for the Lime Kiln was 5.72 kg/hr. SO $_{\rm 2}$  and CO were not detected during the combustion gas sampling.

Table 4.4 Source Testing Results – Lime Klin – Total Reduced Sulphur

Parameter	24 ypur TRS Monitoring	Stack Emission Limit. (Table 1 of Ariproval)
Test Start	August 25, 2014 14:35	-
Test Finish	August 26, 2014 14:35	•
Average exhaust gas concentration (ppm dv)	0.73	
Maximum 4-hour rolling average exhaust gas concentration (ppm dv)	2,45	20
legend: ppm: dv Parls per million, dry volume.		

The maximum 4-hour rolling average observed during the testing was 2.45 ppm (dry basis), which is below the stack emission limit of 20 ppm presented in Table 1 of the facility's Approval (No. 2011-076657-R02).



#### 4.3 **RECOVERY BOILER**

The results of the source emissions testing for total particulate matter and combustion gases from the Recovery Boiler exhaust stack are in Tables 4.5 and 4.6, respectively.

Table 4.5 Source Testing Results - Recovery Boiler - Particulate Matter

Porgmeter		Tost #2	lest =3	Average	Mack Emigler Umit (Totale 1 of Appray at)
Test Date	August 19, 2014	August 19, 2014	August 20, 2014	-	•
Test Start	11:10	15:00	13:10	-	-
Test Duration (min)	120	120	120	120	
Valume of Gas Sampled (Rm³)	1.81	1.77	1.74	1.77	-
Average Isokineticity (%)	97.7	98.6	96.0	97.4	-
Total Volume of Moisture Collected in Impingers (mL)	582	600	622	601	-
Particulate Matter From Filter and Probe Wash (mg)	1,249	1,262	2,001	1,504	-
Particulate Matter From Impingers (mg)	5.23	3.44	3.72	4.13	-
Extraord Contractions			1	Paralle State	
Exhaust Gas Temperature (°C)	70	70	70	70	-
Exhaust Gas Moisture Content (%)	30.4	31.5	32.7	31.5	-
Exhaust Gas Velocity (m/s)	15.4	15.1	15.4	15.3	-
Ethaust Gas Volumetric Flow Rate (Rm³/s)	90.2	87.6	87.0	88.3	,
Oxygen - O <sub>2</sub> (%)	6.14	4.50	5.5	5.37	-
Carbon Dioxide - CO2 (%)	11.0	12.1	13.5	12.2	-
Total Particulate Matter - PM  Concentration at 11% O₂ (mg/Rm³)  Emission Rate (kg/hr)	462 224	430 225	739 361	544 270	375

°C Degrees Celsius.

m/s Metres per secondi.

Rm³/s Dry cubic metres per second at reference conditions (25°C and 101.3 kPa).

mg/Rm³ Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

Kilograms per hour.

The average measured concentration of particulate matter was 562 mg/Rm³ (corrected to 11% O2), which is above the stack emission limit of 375 mg/Rm³ presented in Table 1 of the facility's Approval.



Source Testing Results - Recovery Boiler - Combustion Gases Table 4.6

	Results - Recovery	700100	Total	Avelope
florantie!	Test (1)	August 19, 2014	August 20, 2014	
Test Date	August 19, 2014		30	30
Test Duration (min)	30	30		
Exhaust Gas Volumetric Flow Rate (Rm³/s)	90.2	87.6	87.0	88.3
Sulphur Dioxide - SO2 Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	18.7 49.0 15.9	60.3 158 49.8	7.14 18.7 5.86	28.7 75.2 23.9
Nitrogen Oxides - NOx Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	51.7 97.3 31.6	. 65.6 123 38.9	34.9 65.6 20.5	50.7 95.4 30.4
Carbon Monoxide - CO Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	1,479 1,694 550	131 150 47.2	212 243 76.0	607 695 224

Dry cubic metres per second at reference conditions (25°C and 101.3 kPa). Legend:

mg/Rm3 Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

Kilograms per hour. kg/hr

The emission rates for  $SO_2$ ,  $NO_x$  and CO for the Recovery Boller were 23.9 kg/hr, 30.5 kg/hr and 225 kg/hr, respectively.

#### SMELT DISSOLVING TANK 4.4

The results of the source emissions testing for total particulate matter and combustion gases from the Smelt Dissolving Tank exhaust stack are in Tables 4.7 and 4.8, respectively.

Source Testing Results - Smelt Dissolving Tank - Particulate Matter

Table 4.7 Source Testing Results - Smelt Dissolving Tank - Furnication Management							
eprometer	(m) (i)	best #2	Test #2	Average	Limit Linike Lat Approvali		
Test Date	August 20, 2014	August 21, 2014	August 22, 2014		*		
Test Start	14:50	08:20	08:10	<del>  -  </del>			
Test Duration (min)	100	100	100		-		
Volume of Gas Sampled (Rm³)	1.01	1.08	0.98	1.02	•		
Average Isokineticity (%)	102.2	106.4	107	105			
Total Volume of Moisture Collected in Impingers (mL)	809	802	944	851	-		
Particulate Matter From Filter and Probe Wash (mg)	886	776	687	783	•		
Particulate Matter From Implingers (mg)	85.2	65.5	74.4	75.0			

September 17, 2014

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Table 4.7 Source Testing Results - Smelt Dissolving Tank - Particulate Matter

Farameter	Test #1	Test 47	Teaf #3	Average	Stack Emission Limit (Table 1 of Approval)
Pulp Production (adubmt/day)	968	690	831	830	-
Publish Con Principality					拉花
Exhaust Gas Temperature (°C)	96	95	95	95	-
Exhaust Gas Moisture Content (%)	52.1	50.2	56.7	53.0	-
Exhaust Gas Velocity (m/s)	8.69	8.51	8.87	8.69	
Exhaust Gas Volumetric Flow Rate (Rm³/s)	3.94	4.02	3.64	3.86	•
Oxygen - O <sub>2</sub> (%)	20.9	20.9	20.9	20.9	
Carbon Dioxide - CO2 (%)	0	. 0	0	0	
otal Particulate Matter - PM			· · · · · · · · · · · · · · · · · · ·	-	
Concentration (mg/Rm³) mission Rate (kg/hr)	874 12.41	719 10.40	702 9.19	765 10.67	-
mission metric (kg/adubmt)	0.31	70.36	0.27	0.31	0.50

Degrees Celsius.

m/s Metres per second.

Dry cubic metres per second at reference conditions (25°C and 101.3 kPa).

mg/Rm³ Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

Kliograms per hour. kg/hr

adubmt. Reference production rate in air dried unbleached metric tonnes.

The average measured emission rate of particulate matter was 0.31 kg/adubmt, which is below the stack emission limit of 0.50 kg/adubmt presented in Table 1 of the facility's Approval (No. 2011-076657-R02).

Table 4.8 Source Testing Results - Smelt Dissolving Tank - Combustion Gases

Pulameler	(estat)	1est 12	Text#3	Average
Test Date	August 20, 2014	August 21, 2014	August 22, 2014	-
Test Duration (min)	30	30	30	30
Exhaust Gas Volumetric Flow Rate (Rm³/s)	3.14	3.26	3.57	3.33
Sulphur Dioxide - SO <sub>2</sub> Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	ND ND ND	ND ND ND	ND ND ND	ND ND ND
Nitrogen Oxides - NO <sub>x</sub> Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	ND ND ND	ND ND ND	ND ND ND	ND ND ND



Table 4.8 Source Testing Results - Smelt Dissolving Tank - Combustion Gases

Parainide:	Tester	Tell 12	Ton 43	Аунаре
Carbon Monoxide - CO				-
Concentration (ppm)	ND	ND	ND	ND
Concentration (mg/Rm³)	ND	ND	ND	ND
Emissions Rate (kg/hr)	ND	ND	ND	ND
Legend:  Rm³/s Dry cubic metres per second at reference comg/Rm³ Milligrams per dry cubic metre at reference colleg/hr Kilograms per hour.  Not detected.				

Sulphur dioxide, nitrogen oxides, and carbon manoxide were not detected from the smelt dissolving tank.

#### 4.5 POWER BOILER

The results of the source emissions testing for total particulate matter and combustion gases from the Power Boiler exhaust stack are in Tables 4.9 and 4.10, respectively.

Table 4.9 Source Testing Results - Power Boller - Particulate Matter

Forometer	to # of	1641 12	Test #3	Average	Stock Emission Conf (Toble 3 of Approval)
Tạst Date	August 19, 2014	August 19, 2014	August 20, 2014	-	-
Test Start	11:00	15:00	09:12	-	-
Test Duration (min)	120	120	120	120	· -
Volume of Gas Sampled (Rm²)	1.57	1.44	1.42	1.48	-
Average Isokineticity (%)	109	108	108	108	-
Total Volume of Moisture Collected in Impingers (mL)	272	263	235	257	-
Particulate Matter From Filter and Probe Wash (mg)	230	294	268	264	-
Particulate Matter From Impingers (mg)	5.57	4.29	6,34	5.40	
Exhaust & us Parair : \$44					109 S. P. S. K.
Exhaust Gas Temperature (°C)	61	63	62	62	-
Exhaust Gas Moisture Content (%)	19.0	19.9	18.4	19.1	-
Exhaust Gas Velocity (m/s)	18.3	17.2	16.6	17.4	-
Exhaust Gas Volumetric Flow Rate (Rm³/s)	34.9	32.3	31.6	32.9	-
Cxygen - O <sub>2</sub> (%)	12.1	13.8	13.7	13.2	-
Carbon Dioxide - CO₂ (%)	6.5	5.4	5.3	5.7_	-



Table 4.9 Source Testing Results - Power Boiler - Particulate Matter

Paramitte	fast #1	1000-45	Text #7	Average	Itack Endravo Limit (Table 1 of Approval)
<u>Total Particulate Matter - PM</u> Concentration at 11% O₂ (mg/Rm³) Emission Rate (kg/hr)	164 18.3	283 23.7	260 21.5	236 21.2	150

Legend:

°C Degrees Celsius.

m/s Metres per second.

Rm³/s Dry cubic metres per second at reference conditions (25°C and 101.3 kPa).

mg/Rm³ Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

kg/hr Kilograms per hour.

The average measured concentration of particulate matter (corrected to 11% O<sub>2</sub>) was 236 mg/Rm<sup>3</sup>, which is above the stack emission limit of 150 mg/Rm<sup>3</sup> presented in Table 1 of the facility's Approval (No. 2011-076657-R02).

Table 4.10 Source Testing Results - Power Bailer - Combustion Gases

Eglaméler	Yest #1	Tett P	Ten is	Average
Test Date	August 19, 2014	August 19, 2014	August 20, 2014	
Test Duration (min)	30	30	30	30
Exhaust Gas Volumetric Flow Rate (Rm³/s)	34.9	32.3	31.6	32.9
Sulphur Dioxide - SO2 Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr) Nitrogen Oxides - NOx Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	ND ND ND 39.0 73.4 9.21	ND ND ND 30.4 57.3 6.65	ND ND ND 28.7 54.0 6.15	ND ND ND 32.7 61.6 7.34
Carbon Monoxide - CO Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	584 669 83.9	936 1,072 125	882 1,010 115	901 917 108

Legend:

Rm²/s Dry cubic metres per second at reference conditions (25°C and 101.3 kPa).

rng/Rm3 Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

kg/hr Kilograms per hour.

The emission rates of NOx and CO from the Power Boiler were estimated to be 7.34 kg/hr and 108 kg/hr, respectively. No  $SO_2$  was detected.

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#### HIGH LEVEL ROOF VENT 4.6

The results of the source emissions testing for combustion gases and total reduced sulphur from the High Level Roof Vent exhaust stack are in Tables 4.11 and 4.12, respectively.

Source Testing Results - HLRV - Combustion Gases

Table 4.11 Source Testing Results - HLRV - Combustion Gases				
Stomolog	August 19, 2014	August 19. 2014	August 19. 2014 14:30	-
est Date  Test start	13:30	14:00	30	30 28.3
est Duration (min) Exhaust Gas Volumetric Flow Rate (Rm³/s)	28.3	28.3	28.3	
Sulphur Dioxide SO2 Concentration (ppm) Concentration (mg/Rm³)	4.45 11.7 1.19	3.32 8.69 0.89	3.02 7.92 0.81	3.60 9.42 0.96
Emissions Rate (kg/hr) <u>Nitrogen Oxides - NOx*</u> Concentration (ppm)  Concentration (mg/Rm³)	ND ND ND	ND ND ND	ND ND ND	ND ND ND
Emissions Rate (kg/hr) Carbon Monoxide – CO Concentration (ppm) Concentration (mg/Rm³) Emissions Rate (kg/hr)	137 157 16.0	138 159 16.2	140 160 16.3	138 159 16.2

Dry cubic metres per second at reference conditions (25°C and 101.3 kPa). Legend:

Parts per million by volume at reference conditions. Rm³/s

mg/Rm3 Milligrams per dry cubic metre at reference conditions (25°C and 101.3 kPa).

kg/hr

NOx concentration was measured via EPS 1/RM/15 while other gases were measured during the TRS sampling period using US EPA methods.

The emission rates for SO2 and CO from the High Level Roof Vent were estimated to be 0.96 kg/hr and 16.2 kg/hr, respectively. Nitrogen oxides were not detected during testing.

Source Testing Results - High Level Root Vent - Total Reduced Sulphur **Table 4.12** 

Table 4.12 Source Testing Results - High	Level Roof Vent - Total Reauc	ed 20thur
<b>建筑建筑的设施的</b>	24 hour 181 Medianing	(Table 1 of Approval)
Parameter	August 19, 2014 13:30	
Test Start	August 20, 2014 13:30	-
Test Finish	67	n!
Average exhaust gas concentration (ppm	<u></u>	-
dv) Maximum 4-hour rolling average exhaust gas	93	n
concentration (ppm dv)		
legend:		
ppm dv Parts per millian, dry volume.  ni No limit established.		

The maximum 4-hour rolling average observed during the testing was 93 ppm (dry basis). There is no stack emission limit specified in the facility's Approval (No. 2011-076657-R02).



## 4.7 SUMMARY OF RESULTS

Currently there are specified regulatory limits in the facility's approval (2011-076657-R02) for emissions of PM and/or TRS from four of the five exhaust stacks listed. The measured concentration of PM from the Lime Kiln and the Smelt Dissolving Tank were below their respective regulatory stack limits. The measured concentration of PM from the Recovery Boiler and the Power Boiler were above the regulatory limit. The maximum 4-hour rolling average concentration of TRS from the Lime Kiln was below the regulatory limit. No limit for TRS is specified for the High Level Roof Vent in the facility's approval.



## 5.0 CLOSURE

This report has been prepared for the sole benefit of Northern Pulp Nova Scotia Corporation. This report may not be relied upon by any other person or entity without the express written consent of Stantec and Northern Pulp Nova Scotia Corporation. Any use of this report by a third party, or any reliance on decisions made based upon this report, are the responsibility of the third party. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Stantec makes no representation or warranty with respect to this report, other than the work was undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. Any information or facts provided by others and referred to or utilized in the preparation of this report was assumed by Stantec to be accurate.

This study was undertaken exclusively for the purpose outlined herein and was limited to those contaminants and sources specifically referenced in this report. It should be noted that the measurements were taken over a relatively short, time period on-site, and the emissions results may be considered representative only for the conditions present at the time of testing. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations.

This report was developed by Christina Varner, P.Eng. and Vickl Corning, P.Eng. and reviewed by Mark Scaplen, P.Eng.

If you have any questions regarding the contents of this report, or require any additional information, please do not hesitate to contact the undersigned.

Christia Vagner

Christina Varner, P.Eng. Environmental Services Tel: (506) 452-7000 ( Course

Vicki Corning, P.Eng. Associate, Environmental Services Tel: (506) 452-7000



# Appendix A

Certificate of approval to operate



## **Environment**

20 Pumphouse Road R.R.#3 New Glasgow, Nova Scotia B2H 5C6

Tel: 396-4194 Fax: 396-4765

April 17, 2014

Northern Pulp Nova Scotia Corporation PO Box 549, Station Main New Glasgow, NS B2H 5E8

Dear

RE: Approval No. 2011-076657-R02 - Approval to Operate Bleached Kraft Mill and Effluent Treatment System

Attached is Approval No. 2011-076657-R02 to operate a Bleached Kraft Mill and associated works, at or near 260 Granton Abercrombie Road, Abercrombie Point, Abercrombie, and operate an Effluent Treatment System and associated works at or near 340 and 580 Simpson Lane, Pictou Landing, Pictou County, NS.

Please note that Nova Scotia Environment requires a consultative process before the next approval renewal is issued. The consultative process is pursuant to Section 8 (3) of the Approval Notification and Procedures Regulations which states: "Before approving an application, the Minister may require that the applicant provide a consultative process in the area where the activity or the proposed activity is or may be located".

At a minimum, the consultation process shall include a notification to Pictou County residents requesting comments regarding the Bloached Kraft Mill and Effluent Treatment System. A reasonable amount of time must be given for the public to respond with their concerns. You may wish to consider public meetings or a public workshop to explain the operation of the facility.

A report detailing the type of consultation that has been completed, a summary of the concerns from respondents and proposed solutions to the concerns shall be submitted to the Department on or before October 30, 2014.

Should you have any questions regarding this information, please do not he sitate to contact myself or Marc Theriault at (902) 396-4194.

Yours truly,

CC:

Penny McLeod District Manager

Terry 411 Level

Jay Brenton, Regional Director

Kathleen Johnson, Engineering Specialist

Marc Theriault, Inspector



**Environment Environnement** 

## APPROVAL

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

APPROVAL HOLDER:

Northern Pulp Nova Scotia Corporation

APPROVAL NO:

2011-076657-R02

**EFFECTIVE DATE:** 

May 10, 2011

-7

**EXPIRY DATE:** 

January 30, 2015

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

Operation of a Bleached Kraft Pulp Mill and associated works, at or near 260 Granton Abercrombie Road, Abercrombie Point, Abercrombie, and operation of an Effluent Treatment System and associated works at or near 340 and 580 Simpson Lane, Pictou Landing, Pictou County, PID(s) 00864538 and 00801191, respectively, in the Province of Nova Scotia.

Administrator For M. God Date Signed

april 17,2014

The Minister has delegated his powers and responsibilities under the Act with respect to this Approval to the Administrator named above. Therefore any information or notifications required to be provided to the Minister under this Approval can be provided to the Administrator unless otherwise advised in writing.

# TERMS AND CONDITIONS OF APPROVAL Nova Scotia Environment

Project:

Northern Pulp Nova Scotia Corporation

Bleached Kraft Pulp Mill

260 Granton Abercrombie Road Abercrombie Point, Abercrombie, and

Effluent Treatment System 340 and 580 Simpson Lane

Pictou Landing Pictou County

Approval No:

2011-076657-R02

File No:

92100-30/PIC-06

PIDs:

00864538, 00801191

Reference Documents:

Applications dated September 30, 2006, August 8, 2012 and January 8, 2014, and supporting documentation as outlined in Appendix B.

#### 1. Definitions

- a) "Act" means the Environment Act S.N.S. 1994-1995, c.1, as amended from time to time and includes all regulations made pursuant to the Act.
- b) "Administrator" means a person appointed by the Minister for the purpose of this Act, and includes an acting administrator.
- c) "Adverse Effect" means an effect that impairs or damages the environment or changes the environment in a manner that negatively affects aspects of human health.
- d) "Approval" means an Approval issued pursuant to subsection 56(2) of the Act.
- e) "Associated works" means any building, structure, processing facility, pollution abatement system or stockpiles associated with the Facility.
- f) "Biomass" means a renewable energy source comprised of biological material derived from living or recently living organisms, and for the purpose of this Approval, is limited to natural, untreated and uncoated wood and wood waste in the form of whole chips, chip fines, sawdust and bark. It also includes wood debris from the multiclones of the power boiler and the radiclone rejects and knots from pulping and does not include solid wastes from the effluent treatment system.

- g) "Brown Stock Washer" means an installation that removes spent cooking liquor from raw pulp to maximize chemical recovery and minimize carry over of cooking liquor into the bleaching plant.
- h) "Black Liquor" means a combination of spent "cooking liquor" (water solution of sodium sulfate and sodium hydroxide) and pulp wash water containing dissolved wood compounds which is the byproduct of cooking the wood chips at an elevated temperature and pressure.
- i) "Concentrated non condensable gases" (CNCG) means for the purpose of this Approval, a group of concentrated non condensable process gases that are high in concentrations of TRS and are collected from the digester and evaporator areas of the process, and incinerated in the recovery boiler. Generally, concentrated non condensable gases are high in concentration but low in volume.
- j) "Condensate Steam Stripper" means a multi-stage distillation unit that uses steam to remove organics and TRS compounds from process condensate streams.

- k) "Controlled Shutdown" means a systematic continuous shutdown of equipment over a scheduled period of up to six (6) hours, which eventually results in no production of pulp.
- 1) "Dangerous Goods" has the meaning assigned thereto in the Dangerous Goods Management Regulations (Nova Scotia), current edition.
- m) "Department" means the Northern Region, Pictou Office, of Nova Scotia Environment located at the following address:

Nova Scotia Environment Environmental Monitoring and Compliance Division Northern Region, Pictou Office, RR#3,

New Glasgow, Nova Scotia, B2H 5C6

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

"Dilute Non Condensable Gas" (DNCG) means for the purpose of this Approval, a group of dilute non condensable process gases that are lower in concentrations of TRS, methanol and terpenes than CNCG and originate from the digester area, brownstock washers, filtrate tanks, knotters, liquor storage tanks and black liquor oxidation systems within the Facility. Generally, dilute non condensable gases are low in concentration but high in volume.

- o) "Domestic Solid Waste" means municipal type solid waste that originates in the Facility through office and cafeteria operations and includes waste types that are commonly accepted at municipal solid waste management facilities. Domestic solid waste does not include waste originating from industrial processes.
- p) "Effluent Treatment System" means a facility designed to remove impurities which have a detrimental effect on water quality by a combination of physical, chemical and biological processes.
- q) "Exceedence" means a breach of a regulatory requirement outlined in the Act, the Regulations made pursuant to the Act and/ or this Approval.
- r) "Facility" means the property, any building, structure, processing facility, pollution abatement system or stockpiles necessary in the operation and manufacture of 800 air dried tonnes per day (plus maximum ten percent) of Kraft Pulp, as produced by the digester, located at 260 Granton Abercrombie Branch Road, Abercromble Point, Abercrombie, as well as the Effluent Treatment System (known as Boat Harbour effluent treatment system) located at 340 and 580 Simpson Lane, Pictou Landing, Pictou County.
- s) "Industrial Landfill" means the currently-used facility designed to receive the industrial solid wastes from the Facility associated with wood processing, pulping, pulp drying, recausticizing, utilities and the effluent treatment system. These wastes include bark, gravel, dirt, sawdust, wood slivers, tramp metal, boiler bottom and fly ash, clarifier dregs, settled lime and slaker rejects, lime grit and line mud impurities and effluent treatment System sludge.
- t) "Inspector" means any person who is appointed as an inspector by the Minister and includes any municipal or town police officer and any member of the Royal Canadian Mounted Police...
- u) "Minister" means the Minister of Environment.
- v) "Non Condensable Gas" means gases that cannot be liquefied, and for the purposes of this Approval, are comprised mainly of total reduced sulphur (TRS) compounds along with entrained levels of turpentine, methanol and other organic compounds. Non condensable gases are divided in to two categories: concentrated non condensable gases (CNCG) and dilute non condensable gases (DNCG).
- w) "NSE" means Nova Scotia Environment.

- x) Opacity Charts" means a series of illustrations ranging from light gray to black used to visually determine the plume opacity of emissions emitted from stationary sources. The shades of gray simulate various emission densities and are assigned numbers ranging from one to five. No. 1 is equivalent to 20 percent density; No. 5 is 100 percent density. Opacity charts are used in the establishment and enforcement of emission standards.
- y) "Point 'A" means the point identified as 'A' on diagram located in Appendix C.
- z) "Point 'C" means the point identified as 'C' on diagram located in Appendix C.
- aa) "Point 'D" means the point identified as 'D' on diagram located in Appendix C.
- ab) "Pre-test plan" means a summary of the sampling protocols and testing to be employed by the Approval Holder during emission source testing.
- ac) "Reference Production Rate" means the daily production of finished product of a mill defined by the Federal Pulp and Paper Effluent Regulations (SOR/92-269), as amended from time to time.
- ad) "Recovery Boiler" means an enclosed combustion device in which concentrated spent liquor is burned to recover sodium and sulfides, dispose of unwanted dissolved wood components and generate steam.
- ae) "Scheduled Total Mill Shutdown" means the period of time in which the Facility is not operating due to regularly scheduled maintenance.

- af) "Site" means the lands owned and/or occupied by Northern Pulp Nova Scotia Corporation where the kraft pulp mill and effluent treatment system and associated works are located.
- ag) "Stripper off gases" (SOG) means for the purpose of this Approval, the gases that are produced by the condensate steam stripper which are incinerated in the lime kiln.
- ah) "Source Testing Event for Particulate Matter" means a phase of performance testing activities that involves the site set-up and the actual testing. For each source the test consists of a preliminary survey, and at least three repetitions of appropriate source testing methodologies.
- ai) "Total Reduced Sulfur" (TRS) means any compound of sulfur in a reduced state discharged from a Kraft Pulp Mill consisting primarily of hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide.

aj) "Waste Dangerous Goods" means dangerous goods that are no longer in use for their original purpose or materials which have become waste dangerous goods through handling including dangerous goods intended for treatment, disposal or recycling, but does not include dangerous goods returned directly to the manufacturer or supplier of the dangerous goods for reprocessing, repacking or resale and does not include consumer paint products as defined in the Solid Waste Resource Management Regulations.

# 2. Scope of Approval

- This Approval (the "Approval") relates to the Approval Holder and their applications and supporting documentation, as listed in the reference documents above, to operate the Facility, situated at or near PID(s) # 00864538 and 00801191 situated at 260 Granton Abercrombie Road, Abercrombie Point, Abercrombie, and 340 and 580 Simpson Road, Pictou Landing, Pictou County (the "Site").
- b) The Facility and Site shall not exceed the area as outlined in the application and supporting documentation.
- c) The Approval Holder shall operate the Facility in accordance with the terms and conditions of this Approval.

# 3. General Terms and Conditions

- a) The Approval Holder shall operate and reclaim the Facility in accordance with provisions of the most recent version of:
  - i) Environment Act S.N.S. 1994-1995, c.1, as amended from time to time; and
  - il) Regulations pursuant to the above Act.
- No authority is granted by this Approval to enable the Approval Holder to construct or operate the Facility on lands which are not in the control or ownership of the Approval Holder. It is the responsibility of the Approval Holder to ensure that such a contravention does not occur. The Approval Holder shall provide, to the Department, proof of such control or ownership upon expiry of any relevant lease or agreement. Failure to retain said authorization will result in this Approval being null and void.
- c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.

- d) The Minister may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 (2) of the Act.
- e) This Approval is not transferable without the written consent of the Minister.
- f) (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58A (1) and 58A (2) of the Act, until such time as the Minister is satisfied that all terms and conditions have been met.
  - (ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.
- g) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Facility, including the active area, process changes or waste disposal practices which are not granted under this Approval. An amendment to this Approval may be required before implementing any change. Extensions or modifications to the Facility may be subject to the Environmental Assessment Regulations.
- h) Pursuant to Section 60 of the Act, the Approval Holder shall submit to the Minister any new and relevant information respecting any adverse effect that actually results, or may result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.
- i) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.
- j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analyzed, by qualified personnel, in accordance with recognized industry standards and procedures.
- Unless written approval is received otherwise from the Minister, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- m) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, all monitoring results shall be submitted within 30 days following the month of monitoring.

- n) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.
- o) All equipment shall be installed, operated, maintained and calibrated as specified by the manufacturer's instructions.

## 4. Effluent Generation/Collection/Transmission

#### I. Effluent Generation

- a) The Approval Holder shall undertake a wastewater characterization study to assess the physical and chemical characteristics of the wastewater currently being discharged to the effluent treatment system. The wastewater shall be analyzed for the parameters listed in Table 2 and Table 2A of Appendix A.
- b) The Approval Holder shall undertake a water and wastewater optimization study that extends to the whole Facility to assess the reduction of process effluent to sewer arising from water uncontaminated by process effluents and water use resulting in surplus process effluent. The study will include but not be limited to:
  - i) An updated diagram showing water flow in and all effluent discharged from the Facility by department;
  - ii) Assessment of water use, both intake and resulting effluent per department within the Facility and whether the optimum use of water is being undertaken for cooling, cleaning, and mixing within each department;
  - iii) A summary of potential options to prevent uncontaminated water from departments within the Facility being discharged to sewer, including any benefits through resultant reduction and cost effective savings;
  - iv) The predicted wastewater quality at Point 'A', as identified in Appendix C, based on options outlined in Condition 4 (b) (iii). The Approval Holder shall submit the predicted wastewater quality to the Department for review prior to modeling.
  - vii) Timetable to implement any options identified in Conditions 4 (b) (iii) above.

The water and wastewater optimization study shall be submitted by no later than June 1<sup>st</sup>, 2012.

## II. Effluent Collection and Pumping Station

- The Approval Holder shall retain the services of a qualified engineer licensed to Practice in the Province of Nova Scotia to assess the industrial effluent collection and pumping systems at the Mill site. This shall include, but not be limited to, leachate, process effluents, sanitary and storm water effluent collection systems. This study shall include, but not be limited to, an assessment of the current infrastructure integrity and expected life span. The results of this assessment shall be provided to the Department by no later than June 1st, 2012.
- d) Based on the results of the assessment required in Condition 4 (c), if necessary, the Approval Holder shall develop a plan to upgrade any deficiencies in the collection and storage system. This plan shall include timelines for implementation. The plan shall be submitted to the Department with the report by no later than June 1st, 2012.
- e) The Approval Holder shall develop a black liquor spill collection and recovery management program to minimize losses to the effluent treatment system. This program shall be submitted to the Department by no later than June 1st, 2012.
- f) The Approval Holder shall install and implement the emergency black liquor storage tank as outlined in the report entitled Improvements to the Recovery Cycle, Northern Pulp, Nova Scotia, dated August 17, 2010, prepared by KSH. This shall be completed by September 30, 2011.

## III. Effluent Transmission Pipeline

g) The Approval Holder shall provide the Department with a plan for integrity inspection/testing of the pipeline between the mill site and Effluent Treatment System. This plan shall propose a schedule for testing every three years, beginning in 2014. The plan shall also include provision for the results of the inspection/testing to be submitted to the Department within 90 days of each inspection/test. The Approval Holder shall submit the plan by no later than March 1, 2013.

## 5. Effluent Treatment System

#### I. Effluent Treatment

- a) The effluent treatment System has been classified as a Class III wastewater treatment System. The day-to-day operations of the effluent treatment System shall be supervised directly by a certified operator who holds an equivalent certification under the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations.
- b) The Approval Holder shall model the wastewater quality predicted in Condition 4 (b) (iv) to determine the final effluent discharge quality at Point C. Modeling shall include, but not be limited to:
  - (i) modeling of a number of treatment technology options
  - (ii) wastewater quality at a number of strategic locations where the quality varies including but not limited to where the force main connects with the gravity sewer (standpipe) and Point A as identified in Appendix C.
  - (iii) consideration for wastewater from the landfill located at effluent treatment system
  - (iv) consideration for opportunities to reduce odour from the effluent treatment system.
  - (v) options for modifications to the Effluent Treatment System, if necessary, to ensure the discharge criteria identified in Table 2 and Table 2A are met.

The model shall be submitted by no later than June 1s, 2012.

- c) The Approval Holder shall undertake an evaluation of the Effluent Treatment System.

  Based on current operations as well as wastewater quality predicted in Condition 4 (b)

  (iv). This shall include but not be limited to:
  - (i) an assessment of the efficiency of the system to effectively treat the effluent from the Mill to meet the criteria set out in Table 2 and Table 2A of Appendix A,
  - (ii) an assessment of the quantity and quality of the effluent being treated, an assessment of any in-efficiencies in the System which may be affecting the treatment efficiency of the Effluent Treatment System,
  - (iii) assessment of percentage of solids and black liquor being wasted to the Effluent Treatment System,
  - (iv) recommendations for how any in-efficiencies can be corrected.
  - (v) a plan for timelines for implementation of recommendations in 5(b)

## and 5(c) and a timetable to implement.

This evaluation shall be submitted to the Department for approval by no later than December 31, 2012.

## II. Effluent Monitoring & Reporting

- d) Effluent discharged from the final aeration basin, identified as Point C, shall be monitored continuously for flow, pH and conductivity.
- e) The Approval Holder shall ensure all monitoring equipment is calibrated and maintained in accordance with manufactures specifications. Records of calibration and maintenance performed shall be maintained for not less than three (3) years and shall be made available upon request to the Department.
- f) The Approval Holder shall analyze samples of the effluent discharged from the System at Point C, to the environment for the parameters outlined in Table 2 and Table 2A of Appendix A. The Approval Holder shall comply with the monitoring frequency and discharge limits as outlined in Table 2 and Table 2A of Appendix A. Should the effluent discharged from the System not comply with the criteria outlined in Table 2 and Table 2A, the Approval Holder shall follow the approved plan under Condition 5 (c). Results of the effluent monitoring at Point C shall be submitted to the Department on a monthly basis.
- g) The Approval Holder shall develop and implement a schedule for regular dredging of the aerated settling basin and the settling ponds to minimize odour generation at the effluent treatment System. This plan shall be submitted to the Department for approval by July 1, 2011.
- h) The Approval Holder shall submit monthly reports which contain the following information:
  - Total quantity of BOD, in kilograms, discharged for the days testing was conducted.

- ii) Total quantity of BOD discharged for each month, as tested, this information shall be compared to applicable discharge limits.
- iii) Total quantity of Suspended Solids, in kilograms, discharged from the System.
- iv) Total quantity of Suspended Solids discharged each month, this information shall be compared to applicable discharge limits.
- v) Results of acute toxicity testing.

- vi) Daily flow, reported in cubic meters.
- vii) Daily production of finished product, reported in tonnes.
- viii) Results of dioxins and furans testing.

#### III. Stabilization Basin

- i) The Approval Holder shall develop a plan for long term environmental management or rehabilitation of the area formerly utilized as a stabilization basin for the Effluent Treatment System known as Boat Harbour. This plan shall be submitted to the Department for approval by no later than December 31, 2011.
- j) The Approval Holder shall continue to monitor Point D for the parameters outlined in Table 2, Appendix A, unless otherwise authorized in writing by the Minister. The results of this monitoring shall be submitted to the Department on a monthly basis.

#### 6. Ambient Air Emissions

- I. Compliance with Air Quality Regulations
- a) The Approval Holder shall ensure that emissions from the facility do not contribute to an exceedence of the maximum permissible ground level concentrations specified in Schedule "A" of the Air Quality Regulations.
- b) For the purpose of determining compliance with Schedule AA" of the Air Quality Regulations, the measurement of Total Reduced Sulphur (TRS) at the ambient monitoring station(s) shall be considered to be a measurement of hydrogen sulphide.
- c) The Approval Holder must be able to demonstrate compliance with condition 6 (a) through the development, implementation and maintenance of an ambient air monitoring and reporting program. The air monitoring and reporting program may include, but is not limited to:
  - (i) Ambient air monitoring;
  - (ii) Continuous Emissions monitoring;
  - (iii) Source testing; and
  - (iv) Dispersion modelling.

#### II. Air Dispersion Modeling

d) The Approval Holder shall conduct an air quality dispersion modeling study to estimate the maximum ground level concentrations with frequency analysis at discrete receptor locations outside the boundaries of the facility for each of the air contaminants emitted from the Facility during routine operations. The emission sources to be evaluated in the study include any stationary vent, stack, and area at the facility that release or have the potential to release air contaminants to the environment. The air contaminants that are to be considered in the study and could be released to the air are fine particulate (including PM<sub>10</sub> and PM<sub>25</sub>) and the air contaminants listed in Table 5 of this Approval. This study shall utilize a multi-source model that is sensitive to the terrain and building downwash effects and is acceptable to the Department. As a minimum, the model shall include inputs of the local topography, five years of hourly meteorological data from the nearest meteorological station, emission source characterization including mass emission rates, and discrete receptor locations within a ten kilometer radius of the Facility. Measured emission rates shall be used where available. Where measured emission rates are not available, the emission rates are to be estimated using recognized emission factor equations. The model shall utilize a scenario that uses actual operating data from the facility for the occasion when the highest concentration of the air contaminant at ground level would occur. The operating condition that corresponds to the maximum ground level concentration may occur when the facility is at the maximum production level or running at a lower level or when the process is in transition. The study shall include a description of the operating conditions of the significant sources that result in the maximum ground level concentration of a contaminant. The model shall provide an estimate of the maximum ground level concentrations for the averaging periods associated with the air contaminants listed in Table 5 and fine particulate (including PM<sub>10</sub> and PM<sub>2.5</sub>) with an averaging period of 24 hours. The results of the study shall be compared to the maximum ground level concentrations of contaminants provided in Table 5. The study shall include mapping identifying receptors and the location and magnitude of ground level concentrations. If the modelling results predict concentrations of air contaminants that exceed the maximum ground level concentrations of air contaminants in Table 5, then the study shall specify the frequency and duration over the modelling period in which these exceedences are predicted. The Air Quality Dispersion Modeling Study shall be submitted to the Department by September 1st, 2012.

#### III. Ambient Air Monitoring Network

e) The Approval Holder shall use results from the air dispersion modeling conducted under Condition 6 (d) of this Approval and from modeling conducted under Approval Number 2006-054333 to evaluate the effectiveness of the ambient air quality network to measure the impact of air emissions from the Facility. This assessment shall be submitted to the Department by September 1st, 2012 and include but not be limited to

interpretation of the modeling data, relative to the existing stations and provide recommendations on the location and quantity of ambient air quality monitors necessary to provide effective representative ambient air quality data that measures the impact associated with facility activities. The study shall recommend an ambient network consisting of ambient air quality monitors capable of providing:

- (i) 1-hour and 24-hour rolling average concentration of Total Reduced Sulphur (TRS) in parts per billion by volume
- (ii) 24 hour average concentration in micrograms per cubic metre
   (μg/m³) of total suspended particulates;
- (iii) Continuous fine particulate (PM<sub>2.5</sub>) data in micrograms per cubic metre (μg/m³); and
- (iv) Meteorological data: wind speed, wind direction, ambient temperature, barometric pressure and humidity.
- f) The final study report shall include a map identifying the recommended sites and the specified data to be collected at each location. An implementation schedule for the installation of additional ambient air monitors shall be included in the report. All recommended ambient air monitor installations shall be completed by November 30th, 2012.
- g) The monitor(s) shall be located, maintained, and operated in a manner and schedule acceptable to the Department. A monitoring equipment protocol shall be submitted to the Department by November 30th, 2012.

#### IV. Emissions

- h) The Approval Holder shall submit the reference production rates and daily production rates based on pulp production by the digester for each calendar year by no later than January 31st of the following year.
- i) The Approval Holder shall update the Source Emissions Inventory Report, prepared by Jacques Whitford Environmental, dated December 31<sup>st</sup>, 2008. This updated Report shall be submitted by September 30, 2011.
- j) The Approval Holder shall ensure that major point sources are operated such that stack emissions from the Recovery Boiler, Lime Kiln, Smelt Dissolving Tank and Power Boiler shall comply with the limiting criteria set out in Table 1.

- k) The Approval Holder shall submit the engineering design documentation to rebuild or upgrade the air pollution control equipment on the power boiler by July 31st, 2011. The engineering predesign shall include but not be limited to: details of any proposed modifications to the combustion system, equipment included in the rebuild or upgrade, anticipated equipment performance criteria for air contaminants, proposed stack data, proposed combustion residue management and a schedule of implementation.
- Construction or installation of the power boiler air pollution control equipment shall be complete by January 30, 2012. The commissioning period of the power boiler air pollution control equipment shall not exceed six months unless written authorization is given from the Minister. The Approval Holder shall notify the Department upon commencement of commissioning and the six month commissioning period shall commence on the notification date.
- m) Until the power boiler air pollution control equipment is rebuilt or upgraded, the Approval Holder shall ensure that the multiclones are functioning at all times, while the power boiler is operational.
- n) The Approval Holder shall submit the engineering design documents for the dilute noncondensable gas (DNCG) collection and incineration system to the Department by June 30, 2011.
- o) The Approval Holder shall conduct a study of the Facility to determine the necessary equipment upgrades to comply with the following proposed Facility Emissions Objectives:

PM - 2.0 kg/tonne production

SO<sub>2</sub> - 4.0 kg/tonne production

This study shall at a minimum include proposed equipment performance criteria and estimated emission reductions for each process unit as well as a proposed plan for implementation. This study shall be submitted to the Department by no later than July 1, 2012.

#### V. Continuous Emission Monitors

p) The Approval Holder shall operate a continuous emission monitor (CEM), that will monitor, on an hourly basis, the Total Reduced Sulphur (TRS) concentration in parts per million by volume being released from the Recovery Boiler exhaust gas stack to the atmosphere.

- q) The Approval Holder shall provide the Department with a plan to install a continuous emission monitor (CEM), that will monitor, on an hourly basis, the Total Reduced Sulphur (TRS) concentration in parts per million by volume being released from the Lime Kiln exhaust gas stack to the atmosphere. The plan shall be submitted for approval by the end of the Approval term.
- r) The Approval Holder shall ensure that the continuous emission monitor(s) for Total Reduced Sulphur (TRS) are calibrated, maintained and operated in accordance to manufacturers specifications.

Table 1
Stack Emission Limits

POINT SOURCE	AIR CONTAMINA	AIR CONTAMINANT		
	PARTICULATE	TOTAL REDUCED SULPHUR (TRS)		
Recovery Boiler	375 mg/Rm³	15 ppm dv (any 4 hour rolling average)*		
Lime Kiln	0.50 kg/adubmt	20 ppm dv (any 4 hour rolling average)**		
Smelt Dissolving Tank	0.50 kg/adubmt			
Power Boiler	150 mg/Rm <sup>3+++</sup>			
REFERENCE SAMPLING METHOD	Environment Canada EPS 1/RM/8	'sUS EPA Method 16/16A/16B		

mg - milligrams

Rm<sup>3</sup> - reference cubic meter (ie. The volume of gas at 25 degrees celsius (°C) and 101.3 kilopascals (kpa) corrected to 11% Oxygen)

ppm dv - parts per million dry volume

kg - kilograms

adubmt - reference production rate in air dried unbleached metric tonnes

- \* The Approval Holder shall achieve this established stack limit for TRS by January 29, 2013. In the interim, the Approval Holder shall operate the recovery boiler in conjunction with the direct contact evaporators to minimize emissions of TRS to the extent possible.
- \*\* TRS limit to be confirmed through source testing, conducted twice per annum, on a continuous basis over a 24-hour period on a day acceptable to the Department. Testing shall be done during normal lime kiln operation and data confirming this shall be submitted along with the TRS test results.
- \*\*\* The Approval Holder shall comply with the established stack limit by July 30, 2012. If

the Power Boiler air pollution control equipment requires any upgrades under Condition k, the design shall be based on a particulate matter, in stack objective of less than 90 mg/Rm<sup>3</sup>.

- s) The Approval Holder shall ensure that the continuous emission monitor(s) used to monitor the concentration of the Total Reduced Sulphur (TRS) released from the Recovery Boiler exhaust stack and the Lime Kiln exhaust stack(when installed), are equipped with sufficient data logging capabilities to provide a 4-hour rolling average.
- t) The monitoring results from the CEMs shall be recorded and maintained on file for a period of not less than 2 years and made available to an inspector upon request.

#### VI. Source Testing

u) Each year the Approval Holder shall undertake two source testing events to determine the Particulate Matter (PM) emission rate in grams per second and the concentration released to the atmosphere from the following point source exhaust gas stacks in the following units of concentration:

Exhaust Gas Stack	Concentration Unit	
Recovery Boiler	mg/Rm³	
Lime Kiln	kg/adubmt	
Smelt Dissolving Tank	kg/adubint	
Power Boiler	mg/Rm³	

mg - milligrams

Rm' - reference cubic meter (ie. the volume of gas at 25°C and 101.3 kpa corrected to 11% Oxygen)

kg - kilograms

adubmt - reference production rate in air dried unbleached metric tons

Each year one test shall be conducted during January 1st to June 30th and the second test shall be conducted during July 1st to December 31st with at least 120 days between the first and second source testing event. If the results of the first source testing event each year for the Recovery Boiler are accepted by the Department, and are less than 50% of the limiting criteria as described in Condition 6 (j), the Approval Holder may request in writing to be considered exempt from conducting the second test for the Recovery Boiler. Actual operating data for the Recovery Boiler scrubber for the previous year shall accompany any request for exemption. The relationship between the actual operating data and the predicted emission concentrations shall be provided. Upon review of this information, the Minister may amend this condition for the second test period, July 1st to December 31st, through Letter of Authorization.

- During the first round of source testing for 2013, the Approval Holder shall undertake a Particle Size Distribution Study as an additional requirement to testing conducted under Condition 6 (u) for each of the point sources tested. This study shall determine the concentration in milligrams per cubic meter and emission rate in grams per second of the particulate matter less than or equal to 10 microns in diameter and particulate matter less than or equal to 2.5 microns in diameter that is being released to the environment from each source. The Particulate Size Distribution Study shall be submitted to the Department within 90 days from completion of source testing.
- z) Each year the Approval Holder shall undertake two source testing events to determine Total Reduced Sulphur (TRS) concentrations in parts per million by volume, at stack conditions, released to the atmosphere from the following point source exhaust gas stacks:
  - (i) Lime Kiln (continuous over 24 hour period); and
  - (ii) High Level Roof Vent (continuous over 24 hour period).
- aa) Each year one test shall be conducted during January 1st to June 30st and the second test shall be conducted during July 1st to December 31st with at least 120 days between the first and second source testing event.
- ab) Within 90 days of completion of testing, the Approval Holder shall ensure that a Final Report on Source testing is conducted and submitted in accordance with conditions 6 (u) and 6 (v) of this Approval.

## VII. Opacity Chart

- ac) The Opacity Chart for visual determination of emissions shall be prepared by the recording, in five consecutive areas of the chart, fine black dots evenly spaced on a white background such that:
  - (i) approximately 20 percent of the space in the first area is black and shall be known as density Number 1;
  - (ii) approximately 40 percent of the space in the second area is black and shall be known as density Number 2;
  - (iii) approximately 60 percent of the space in the third area is black and shall be known as density Number 3;
  - (iv) approximately 80 percent of the space in the fourth area is black and shall be known as density Number 4; and
  - (v) approximately 100 percent of the space in the fifth area is black and shall be known as density Number 5.

- At no time shall the Approval Holder, without prior authorization of the Department, permit the release of emissions that, in the opinion of the Inspector, has a density number greater than 1 but not greater than density number 2, for a period totaling not more than 4 minutes during any one half hour.
- ae) At no time shall the Approval Holder, without prior authorization of the Department, permit the release of emissions that, in the opinion of the Inspector, has a density number greater than 2 but not greater than density number 3 for a period totaling not more than 3 minutes during each quarter hour period.
- af) The Approval Holder shall use the Opacity chart as defined in accordance with Condition 6 (ac) to monitor emissions from the Facility in response to public complaints. Complaints shall be recorded and maintained on file for a period of not less than 2 years. All complaints of an opacity nature received by the Facility directly from the public shall be reported to the Department immediately between 08:30 and 16:30 Monday to Friday, excluding Holidays, after stipulated hours 1.800.565.1633, otherwise reporting shall be in accordance with Condition 3 (i) of this Approval.

#### VIII Reporting

- ag) The Approval Holder shall submit semi-annual summary reports containing the following information:
  - (i) a summary of any air quality related emergency and non-emergency incidents pursuant to the Environment Act, the Air Quality Regulations or this Approval, including the date and time of the incident(s).

- (ii) a summary of any operational problems related to the continuous air emission monitoring devices, environmental control equipment and/or the ambient air monitor(s), including the date and time of the incident(s).
- (iii) a summary of the ambient air quality data from the ambient air monitor(s) identifying the one hour average and 24 hour rolling average of total reduced sulphur in parts per billion, the 24 hour average of total suspended particulate in micrograms per cubic meter, the 24 hour average of continuous fine particulate (PM2.5) data in micrograms per cubic meter and a table showing hourly average wind speed and direction, including the dates used to calculate the averages. In addition, the Approval Holder shall submit the average annual geometric mean ground level concentration of total suspended

particulate for the previous year, in the first semi-annual report of each year.

- (iv) a table showing the 4-hour rolling average of total reduced sulphur emissions from the recovery boiler stack, including the date and time covered by the average.
- (v) a summary of any complaints received from the public and how they were responded to by the Approval Holder, including the date and time of the complaint.

Each mid-year report shall be submitted with 90 days of July 1<sup>st</sup> and each year-end report shall be submitted within 90 days of the end of the applicable calendar year.

#### 7. Fuels

#### I, Primary Fuels

a) Fuel for the power boiler is limited to biomass, No. 2 fuel oil, No. 6 fuel oil and propane only.

#### II. Alternate Fuels

- b) Test burns of alternate fuels may be approved by Letter of Authorization on a case-bycase basis provided the following information has been submitted to the Department and deemed acceptable:
  - i) written notification of the intent to test the use of an alternate fuel identifying the type, volume, source and rate of consumption;
  - ii) analytical data identifying trace metals and/or contaminants in the proposed fuel:
  - iii) identification of potential air contaminants resulting from combustion of the fuel and the anticipated change to emissions for the proposed fuel combustion scenario;
  - iv) proposed feed rate and feed method;
  - v) identification of test methods proposed to confirm that air emissions are acceptable;
  - vi) identification of air quality standards proposed for comparison during testing;
  - vii) proposed testing scenarios to demonstrate that testing will be conducted for the cases when the highest concentration of air contaminants would occur.

- c) Should a Letter of Authorization be issued by the Department for a test burn of an alternate fuel, the Approval Holder shall be required to submit:
  - A schedule to conduct the test burn. The maximum duration of the test burn shall be 120 hours (unless otherwise approved in writing by the Department); and
  - Submission of a Final Report outlining the results of the test burn. This report shall include, but not be limited to, the test methods and analytical results, air quality standards used, the feed rates, quantity and quality of fuel used, monitoring data from the CEMs and any other operational data deemed pertinent during the test burn, summary of any equipment problems or failures, and the overall effectiveness of the material as an alternate fuel.

#### 8. Process Control

- a) The Approval Holder shall ensure that all Concentrated Non Condensable Gases (CNCG) are collected and directed to the Recovery Boiler for incineration.
- b) When the Recovery Boiler becomes inoperable, the Approval Holder shall undertake a controlled shutdown of the evaporator(s) and digester(s) to ensure the release of Concentrated Non Condensable Gases (CNCG) is minimized.
- c) The Approval Holder shall prepare and submit an annual report identifying the number of incidents of direct venting to atmosphere of Dilute Non Condensable Gases (DNCG), Concentrated Non Condensable Gases (CNCG), and condensate steam stripper off-gases (SOG). This report shall include the duration of each incident and annual total.

- d) The black liquor oxygen-based polishing stage shall be installed to enhance the existing black liquor oxidation system by October 31, 2011.
- e) Dilute Non Condensable Gases resulting from emissions of the chip bin and the 1st and 2nd filtrate tanks shall be collected and directed to the Recovery Boiler for incineration. This work shall be completed by October 31, 2011.
- f) The Approval Holder shall submit to the Department for approval, a plan to collect and direct to the Recovery Boiler for incineration the Dilute Non Condensable Gases from the brown stock washers, the black liquor oxidizer, the combined seal tank and the

washed stock tank which currently exit through the high level roof vent. This plan shall be submitted by the end of the Approval term.

for incineration. The Approval Holder shall develop and implement an operation and maintenance program within 12 months of the date of this approval to improve operational reliability of the condensate steam stripper and thereby reduce the transmission of untreated condensates to the industrial effluent. This program shall be made available to the Department upon request.

# 9. Groundwater and Surface Water

- I. Hydrogeological and Hydrological Evaluation (Mill Site)
- a) i) The Approval Holder shall undertake an evaluation of the current groundwater monitoring program at the Mill Site, including, but not limited to; the placement of monitoring wells (horizontal and vertical), frequency of sampling, and parameters. This evaluation shall consider all potential sources of contamination on the Mill Site, including, but not limited to, waste disposal areas, fuel and chemical storage areas, and the ash lagoon.
  - ii) The evaluation of the existing groundwater monitoring program referenced in 9 (a) (i) shall make recommendations for upgrades to the program, as required.
  - The evaluation of the existing groundwater monitoring program referenced in 9 (a) (i) shall be conducted by a qualified Hydrogeologist licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS).
  - iv) The evaluation of the existing groundwater monitoring program referenced in 9 (a) (i) shall be submitted to the Department by September 30, 2011.
- b) i) The Approval Holder shall undertake an evaluation of the current surface water monitoring program at the Mill Site, including, but not limited to: the placement of surface water monitoring stations, frequency of sampling, and parameters. This evaluation shall consider all potential sources of contamination on the Mill Site, including, but not limited to, waste disposal areas, fuel and chemical storage areas,

and the ash lagoon.

- ii) The evaluation of the existing surface water monitoring program referenced in 9 (b) (i) shall make recommendations for upgrades to the program, as required.
- iii) The evaluation of the existing surface water monitoring program referenced in 9 (b) (i) shall be conducted by a qualified Hydrologist.
- iv) The evaluation of the existing surface water monitoring program referenced in 9 (b) (i) shall be submitted to the Department by September 30, 2011.
- The Approval Holder shall identify the presence and susceptibility of surface water and groundwater receptors at the Mill Site. This assessment shall be completed by a qualified professional licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS) and shall include recommendations for upgrades to the existing surface water and groundwater monitoring and management programs, with recommended timelines for the upgrades to be completed, as required. This evaluation shall be submitted to the Department on or before September 30, 2011.

# II. Hydrogeological and Hydrological Evaluation (Boat Harbour Treatment System)

d) The Approval Holder shall identify the presence and susceptibility of surface water and groundwater receptors associated with the Effluent Treatment Facility. This assessment shall be completed by a qualified professional licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS) and shall include recommendations for a surface water and groundwater monitoring and/or management program, as required. This evaluation shall be submitted to the Department on or before September 30, 2011.

#### III. Groundwater Monitoring

e) i) The Approval Holder shall maintain the existing twenty-seven (27) groundwater monitoring wells on the Site: 1A, 1B, 1C, 2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 6A, 6B, 7A, 7B, 7C, 8B, 9A, 9C, 09-1A, 96-1B, 96-2B, 09-2C, 09-3B and 96-3C. The location of the twenty-seven (27) groundwater monitoring stations are as identified on the diagram: Surface Water and Monitoring Well Locations and GroundwaterFlow Direction, dated April

2010 included in Dillon Consulting's 2009 Annual Monitoring Report, dated March 2010.

- ii) All monitoring stations shall be visually inspected during each monitoring event and maintained as required.
- iii) Any new or existing well at the Facility that has been damaged or "abandoned" (i.e. is not being used or maintained for present or future use) shall be sealed in a manner acceptable to the Department.
- iv) Additional monitoring wells recommended in the evaluations mentioned in Conditions 9 (c) / 9 (d) and approved by the Department shall be installed in accordance with the approved plan for implementation.
- v) The Approval Holder shall maintain the following production wells: Construction Gate and Scalehouse.
- vi) The Approval Holder shall maintain records for all groundwater monitoring wells and production wells at the Facility.
- f) The Approval Holder shall measure static water levels at all groundwater monitoring wells prior to sample collection.
- g) i) The Approval Holder shall collect groundwater samples from the following monitoring wells and production wells on a semi-annual basis, during spring and fall: 1B, 2A, 2B, 4A, 4B, 09-1A, 96-1B, 96-2B, 09-2C, 09-3B, 96-3C, the Construction Gate Well, and the Scale house Well.
  - ii) The Approval Holder shall collect groundwater samples from the following monitoring wells on an annual basis, during the low flow period: 1A, 1C, 3A, 3B, 3C, 4C, 5A, 5B, 6A, 6B, 7A, 7B, 7C, 8B, 9A and 9C.
  - iii) The Approval Hölder shall collect groundwater samples from additional monitoring wells at frequency and time period recommended in the evaluations mentioned in Conditions 9(c) / 9(d) and approved by the Department.
  - iv) All groundwater samples shall be collected in a consistent manner in accordance with established best practices.
- h) Groundwater samples from all existing monitoring wells shall be analyzed for general inorganic chemistry and metals as listed in Table 4, Appendix 'A'.
  - Groundwater samples collected from four existing monitoring wells (09-1A, 96-1B, 96-2B and 09-2C) and one production well (Scale House Well) shall

be analyzed for volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) on an annual basis, during the low flow period.

- iii) Groundwater samples collected from nine existing monitoring wells (4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B and 7C) shall be analyzed for total petroleum hydrocarbons (TPH) and Benzene, Toluene, Ethyl benzene, and Xylene (BTEX) on an annual basis, during the low flow period.
- iv) Groundwater samples collected from nine existing monitoring wells (09-3B, 96-3C, 09-2C, 96-2B, 09-1A, 96-1B, 7A, 7B and 7C) shall be analyzed for mercury on a bi-annual basis during the low flow period, starting in 2011.
- v) Groundwater samples collected from additional monitoring wells shall be analyzed for parameters recommended in the evaluations mentioned in Sections 9 (c)/ 9 (d) and approved by the Department.
- The groundwater monitoring program as described in 9 (e), 9 (f), 9 (g), and 9 (h) shall be evaluated annually to determine whether modifications to the program are required. Requests to modify the groundwater monitoring program must be submitted to the Department in writing complete with adequate justification prepared by a qualified Hydrogeologist licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS). Any changes to the program must be approved in writing by the Department prior to implementation.
- j) The Approval Holder shall maintain records of the groundwater monitoring program as described in 9 (e), 9 (f), 9 (g), and 9 (h), to be submitted to the Department annually.
- k) The Approval Holder shall review the groundwater quality monitoring data as it is collected in order to identify potential adverse impacts associated with mill activities. Any change in groundwater quality or quantity shall be reported immediately to the Department.
- i) The Approval Holder shall submit an annual report to the Department by April 1<sup>st</sup> of each calendar year.
  - The annual report shall include, but is not limited to, the following information: a review of field methodologies, including sampling techniques; a description of the groundwater monitoring network; a review of the current groundwater monitoring program and recommendations for modifications, as applicable; current and historical static water level data in tabular format; current and historical groundwater quality data in tabular format; laboratory

certificates of analysis; a detailed interpretation of the groundwater quality data including an analysis of spatial and temporal trends; and the identification of any adverse impacts to groundwater as a result of mill activities and associated recommendations, as applicable.

iii) The annual report shall be prepared by or under the direction of a Professional Hydrogeologist licensed to practice in Nova Scotia by the Association of Professional Geoscientists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS).

#### IV. Surface Water Monitoring

m) The Approval Holder shall ensure that the following discharge limits for suspended solids are met for any water which is discharged from the Site to a watercourse or wetland at the Site:

#### Clear Flows (Normal Background Conditions):\*

- i) Maximum increase of 25 milligrams/litre from background levels for any short term exposure (24 hours or less)
- ii) Maximum average increase of 5 milligrams/litre from background levels for longer term exposure (inputs lasting between 24 and 30 days)

#### High Flow (Spring Freshets and Storm Events):\*

- i) Maximum increase of 25 milligrams/litre from background levels at any time when background levels are between 25 milligrams/litre and 250 milligrams/litre
- ii) Shall not increase more than 10% over background levels when background is > 250 milligrams/litre

\*CCME Environmental Quality Guideline for Aquatic Life, 2002.

- n) The Approval Holder shall ensure surface water discharge from the Site meets the limits outlined in Table 3 of Appendix A.
- o) 1) The Approval Holder shall maintain the existing nine (9) surface water monitoring stations at the Site: SW2, SW4. SW5, SW6, SW9, SW10, SW11, SW12, and SW13.
  - ii) The location of the nine (9) surface water monitoring stations are identified

on the diagram: Surface Water and Monitoring Well Locations and Groundwater Flow Direction, dated April 2010 and included in Dillon Consulting's 2009 Annual Monitoring Report, dated March 2010.

- iii) Additional surface water monitoring locations recommended in the evaluations mentioned in Conditions 9 (c)/ 9 (d) and approved by the Department shall be added to the surface water monitoring program and sampled during the next sampling event for the Facility.
- iv) The Approval Holder shall maintain records for all surface water monitoring stations.
- p) i) The Approval Holder shall collect surface water samples from SW5, SW6, SW9 and SW12 on a quarterly basis.
  - ii) The Approval Holder shall collect surface water samples from SW2, SW4, SW10, SW11, and SW13 on a semi-annual basis, during spring and fall.
  - iii) The Approval Holder shall collect surface water samples from additional surface water monitoring locations at frequency and time period recommended in the evaluations mentioned in Conditions 9 (e)/9 (d) and approved by the Department.
  - iv) The Approval Holder shall collect a leachate sample from the leachate collection manhole on a quarterly basis.

- v) All surface water and leachate samples shall be collected in a manner consistent with established industry standards and best practices.
- q)
  i) All surface water and leachate samples shall be analyzed for parameters listed in Table 2 and 3, in Appendix A as well as total suspended solids (TSS), biological oxygen demand (BOD), and chemical oxygen demand (COD).
  - ii) Once per year, during the low flow period, the surface water samples shall be analyzed for mercury (Hg).
  - iii) Surface water samples collected from additional surface water monitoring locations shall be analyzed for parameters recommended in the evaluations mentioned in Conditions 9 (c)/9 (d) and approved by the Department.
- r) The surface water monitoring program as described in 9 (o), 9 (p) and 9 (q) shall be evaluated annually to determine whether modifications to the program are required. Requests to modify the surface water monitoring program must be submitted to the Department in writing complete with adequate justification prepared by a qualified

Hydrologist. Any changes to the program must be approved in writing by the Department prior to implementation.

- s) The Approval Holder shall maintain records of the surface water monitoring program as described in 9 (o), 9 (p) and 9 (q) to be submitted to the Department on an annual basis.
- t) The Approval Holder shall review the surface water quality data as it is collected in order to identify potential adverse impacts associated with mill activities. Any adverse impacts to surface water quality or quantity shall be reported immediately to the Department.
- u) i) The Approval Holder shall submit an annual report to the Department by April 1st of each calendar year.
  - ii) The Annual Report shall include, but is not limited to, the following: a review of field methodologies, including sampling techniques; a description of the surface water monitoring network; a review of the current surface water monitoring program and recommendations for modifications, as applicable; current and historical surface water and leachate quality data in tabular format; laboratory certificates of analysis; a detailed interpretation of the surface water quality and leachate data including an analysis of spatial and temporal trends; the identification of any adverse impacts to surface water as a result of mill activities and associated recommendations, as applicable.
  - iii) The Annual Report shall be prepared by or under the direction of a qualified Hydrologist.

## 10. Registered Public Drinking Water Supply

a) The Approval Holder shall maintain registration as a Public Drinking Water Supply, in accordance with the Guidelines for Monitoring Public Drinking Water Supplies, as required.

## 11. Dangerous Goods

#### I. General

a) In the event of a conflict between the terms and conditions of Condition 11 of this Approval and the Dangerous Goods Management Regulations, the Dangerous Goods Management Regulations will apply.

- b) This Approval allows the Facility to store and handle Dangerous Goods.
- c) The Approval Holder shall compile a complete inventory or all Dangerous Goods handled and stored at the Facility. This inventory shall be provided to the Department by June 30<sup>th</sup>, 2011 and following review by NSE, will be considered the list of authorized Dangerous Goods for the Facility under this Approval.
- d) The Approval Holder shall not accept or handle Dangerous Goods which are not authorized by this Approval. Should the Facility wish to store or handle any dangerous goods not listed on the inventory provided in condition 11 (c), the Approval Holder shall submit the Material Safety Data Sheets (MSDS) to the Department 10 business days in advance for review.
- e) The Approval Holder shall designate Dangerous Goods storage and receiving areas within the Facility and restrict the handling and storage of Dangerous Goods to designated areas.
- f) The Approval Holder shall not knowingly accept Waste Dangerous Goods at the Facility.

#### II. Storage and Handling Facility

- g) All loading and unloading of Dangerous Goods shall be completed within the receiving areas of the Facility.
- h) All Dangerous Goods shall be handled in a manner which safely minimizes generation of vapour to the atmosphere at the Facility and at the Site.
- i) Incompatible Dangerous Goods shall not be loaded or unloaded in the receiving area at the same time.
- j) All floors in the loading/unloading and storage areas shall be constructed of smooth impervious material with secondary containment or sloped to an impermeable enclosed drainage collection sump capable of holding a spill.
- k) Individual Dangerous Goods or groups of compatible Dangerous Goods shall have secondary containment to meet the specifications of condition 11 (p). Secondary containment shall be constructed such that potential spills of Dangerous Goods do not come in contact with or pass under incompatible materials.

- A trained employee of the Facility shall be present during all Dangerous Goods handling operations.
- m) The Dangerous Goods storage and handling areas of the Facility shall have no open floor drains.
- n) All storage racks, vehicles, railcars, ventilation ducts, containers and mix/storage tanks associated with flammable Dangerous Goods shall be electrically grounded to prevent build up of static electric charges.
- O) All Dangerous Goods that are accepted by the Facility shall be stored in drums, containers, totes, tanks or pails composed of materials which are compatible with the goods stored therein.
- p) All containers or tanks shall be completely surrounded by secondary containment sized to contain 110% of the volume of the largest tank or container in the specifically contained area or 100% of the volume of the largest tank or container plus 10% of the aggregate capacity of all other containers or tanks in the contained area, whichever is greater.
- q) All containers shall be stored upright and kept off the floor. All products and Dangerous Goods shall be stored in accordance with manufacturers specifications.
- r) The Approval Holder shall not transfer or repackage flammable liquids inside any building at the Facility without receiving prior approval of the Department.
- s) Door openings shall be provided with sills or ramps of a minimum 3" inches to contain spillage of Dangerous Goods inside the Dangerous Goods storage buildings.
- t) The Dangerous Goods storage building shall be constructed of impervious or liquid tight materials where the outside walls meet the floor.
- u) Sufficient aisle space shall be provided between containers/drums to allow the unobstructed movement of persons, transfer equipment, fire protection equipment, spill control equipment, and decontamination equipment to any part of the Dangerous Goods Storage facility.

- v) The Approval Holder shall ensure that all storage areas, containers, tanks, totes, drums and pails, including railcars and trucks containing products and Dangerous Goods are labelled to clearly identify their contents.
- w) All bulk tank storage vessels shall operate with visual and audible high level alarms.
- x) All transfers of bulk Dangerous Goods shall be conducted using containment pads or drip pans to capture spills or drips during transfer operations to/from railcars and other approved containers.
- y) The bulk storage tanks shall be equipped with emergency shut-off valves or emergency shut-off on transfer pumps to permit the immediate shutdown of transfer operations in the event of an uncontrolled release,
- z) All bulk underground storage tanks at the Dangerous Goods storage facility shall have cathodic protection or sacrificial anode protection systems.
- aa) The Approval Holder shall ensure that all sludges and solid wastes associated with the Facility, including tank bottoms, shall be handled and disposed in a manner authorized by the Department. Discharge or disposal of sludges or solid wastes to the Effluent Treatment Facility is strictly prohibited.
- ab) The Approval Holder shall not transfer Dangerous Goods to/from more than one railcar or tanker truck at a time.
- ac) The Approval Holder shall not store Dangerous Goods in railcar tankers or tanker trucks for a period which exceeds 21 days from arriving on the Site. The Approval Holder shall document exact times of arrival and departure of bulk shipments and make those available to the Department upon request.
- ad) The Approval Holder shall maintain written acceptable standard operating procedures for the handling of Dangerous Goods, including valving and venting procedures. Such procedures shall be readily available to all employees.
- se) Should the Facility not meet the requirements of conditions 11(j),(k), (m), (n), (o), (p), (q), (s), (t), (u), (v), (w), (x), (y), and/or (z), the Approval Holder shall undertake an assessment of the Dangerous Goods handling and storage areas. This assessment shall contain a gap analysis outlining the deficiencies and how the Facility will attain compliance by the end of the Approval term. This assessment shall be submitted to the Department by no later than October 31, 2011.

#### III. Waste Dangerous Goods

af) The disposal of Waste Dangerous Goods, including radioactive sources, shall be at a facility licensed or approved for the disposal of such Waste Dangerous Goods by the applicable regulatory agency having jurisdiction.

#### IV. Dangerous Goods Bulk Storage Tank Maintenance

- ag) The Approval Holder shall conduct Tank Assessment Study to determine the integrity of the dangerous goods bulk storage tanks to store the type and quantity of dangerous goods identified in Condition 11 (c) by no later than December 31, 2011, this study shall include but not be limited to the Standard(s) to which the tanks are being assessed. Subsequently by June 30th on a five (5) year cycle the tank(s) shall be assessed against a Standard(s) acceptable to the Department. The Approval Holder shall submit the proposed Standard(s) to the Department for approval by September 15th, 2011.
- ah) If results of the tests required in Condition 11 (ag) indicate that the Dangerous Goods Bulk Storage Tanks require maintenance or upgrades, then the Approval Holder will:
  - Submit to the Department a copy of the report as well as the planned maintenance or upgrades within 30 days of the testing event if maintenance or upgrades are required.
  - ii) Undertake the necessary maintenance or upgrades within one (1) year of being identified. If these deficiencies cannot be corrected within one (1) year of being identified, then the reasons shall be submitted in writing 60 days prior to the deadline with a proposal for a revised schedule, and a request for an extension.
  - iii) Following completion of the maintenance or upgrades, the tank(s) shall be retested in accordance with Condition 11 (ag) to ensure the maintenance or upgrades were effective.

#### V. Inventory Control

ai) The Approval Holder shall maintain an up-to-date inventory of Dangerous Goods which are stored at the Facility. The inventory shall consist of informational requirements of Section 11 (2) of the Dangerous Goods Management Regulations.

aj) The inventory shall be made available to the Department for inspection upon request.

## 12. Petroleum Management

- a) The Approval Holder shall conduct a Petroleum Storage Tank System Assessment. The petroleum storage tanks and associated works shall be assessed against the "Nova Scotia Standards for Construction and Installation for Petroleum Storage Tank Systems" (Standard), current edition and the Nova Scotia Petroleum Management Regulations, (the Regulations). Any deficiencies shall be outlined and a plan developed for upgrading the System to meet the requirements of the Standard and the Regulations. This Assessment Report shall be submitted to the Department for review and approval by no later than December 31, 2011.
- b) The Approval Holder shall reassess in accordance with Condition 12 (a) on a five (5) year cycle for each tank. The results of this testing shall be submitted within 90 days immediately following the testing.
- c) If results of the assessment required in Condition 12 (a) or (b) indicate that the Petroleum Storage Tanks require maintenance or upgrades, then the Approval Holder will:
  - Submit to the Department a copy of the report as well as the planned maintenance or upgrades within 30 days of the testing event if maintenance or upgrades are required.
  - ii) Undertake the necessary maintenance or upgrades within one (1) year of being identified. If these deficiencies can not be corrected within one (1) year of being identified, then the reasons shall be submitted in writing 60 days prior to the deadline with a proposal for a revised schedule, and a request for an extension.
  - iii) Following completion of the maintenance or upgrades, the tank(s) shall be retested in accordance with Condition 12 (a) to ensure the maintenance or upgrades were effective.

- d) The Approval Holder shall operate and maintain the petroleum storage tanks in accordance with the Nova Scotia Standards for Construction and Installation for Petroleum Storage Tank Systems, dated June 5, 1997, as amended from time to time.
- e) Testing and monitoring of the petroleum storage tanks shall be conducted in accordance with the Nova Scotia Standards for Construction and Installation for Petroleum Storage Tank Systems, dated June 5, 1997, as amended from time to time.

#### 13. Industrial Landfill

- a) The disposal of domestic solid waste shall be conducted at a facility licensed or approved for the recycling, composting or disposal of such solid waste. The Approval Holder shall not dispose of domestic solid waste at the industrial landfill.
- b) The Approval Holder shall dispose of all Effluent Treatment System sludges at the industrial landfill, unless authorization has been obtained from the Department for alternative disposal.
- c) The Approval Holder shall dispose of all combustion residues and solid waste originating from pollution control equipment such as, electrostatic precipitators, scrubbers and demisters at the industrial landfill, unless authorization has been obtained from the Department for alternative disposal. Unless otherwise approved, solid waste from the multiclone must be disposed at the industrial landfill.
- d) The Approval Holder shall dispose of petroleum impacted soil at a facility licensed or approved for the treatment or disposal for such waste. Disposal of petroleum impacted soils at the Facility's industrial landfill is strictly prohibited.
- e) Only industrial waste types for which the industrial landfill was designed and as identified in the Landfill Operations Manual, dated December, 1989 and Solid Waste Management Strategy Background Report, dated November 1989, shall be disposed at the industrial landfill.
- f) The Approval Holder shall conduct a detailed technical review of operations at the industrial landfill and submit a report to the Department by April 30, 2012. This review shall include an evaluation of the surface water and groundwater monitoring network, leachate generation and treatment, soil liner and cover requirements, development of the facility in relation to the original design. The current landfill life span shall be reevaluated. Updated engineering drawings and a landfill operations manual shall be submitted to the Department by April 30, 2012. If the existing facility is intended for closure, a closure plan shall be provided by April 30, 2012.
- g) The Approval Holder shall undertake an assessment of the closed industrial landfills at the Facility (Landfills 1 and 2 as identified in the Annual Ground and Surface Water Reports prepared by Dillon Consulting Ltd.) to be completed by a qualified professional licensed to practice in Nova Scotia by the Association of Professional Geologists of Nova Scotia (APGNS) or the Association of Professional Engineers of Nova Scotia (APENS), to determine whether upgrades to the closed landfills are warranted. This assessment shall be submitted to the Department on or before April 30, 2012.
- h) Solid waste closure plans shall be submitted to the Department for any remaining

inactive disposal sites at the facility, by June 30, 2012.

i) The Approval Holder shall develop and submit an Ash Pond Operations and Maintenance Manual to the Department by September 30, 2011.

#### 14. Asbestos

#### I. Designated Asbestos Disposal Area

- a) Asbestos waste generated from the Facility shall disposed of in the area designated for asbestos disposal on Engineering Plan entitled Industrial Solid Waste Landfill Engineering Drawing Rev. I dated August 1990, Sheet 5 and Sheet 6, prepared by Porter Dillon Consulting Ltd.
- b) A copy of the site plan indicating the location of the asbestos waste disposal area shall be recorded by the Approval Holder in the Registry of Deeds. A copy of the registration is to be submitted to the Department within 90 days of the issuance of this Approval.
- c) The designated asbestos disposal area shall be clearly marked by signage.
- d) The area designated for asbestos waste disposal must be secured from unauthorized access.
- e) The Facility shall not accept asbestos waste from third party generators of the waste.
- f) The Approval Holder shall provide confirmation to the Department that the asbestos disposal area meets the requirements set out in Condition 14 by September 1, 2011.

#### II. Designated Area Cover Limits

g) Upon abandonment or discontinuance of use of the designated asbestos waste disposal area, the Approval Holder shall apply a final capping material having a depth of not less than one hundred twenty five (125) centimetres with a permeability of not greater than 10<sup>-6</sup>.

#### III. Facility Inspection

- h) Upon abandonment or discontinuance of use of the designated asbestos waste disposal area, the Approval Holder shall inspect the area on a monthly basis to ensure that the final capping is intact.
- The Approval Holder shall undertake any repairs that may be required to maintain the cover limits specified in this Approval.

## 15. Spills or Releases

- a) All spills or releases shall be reported in accordance with the Act (Part IV) and the Emergency Spill Regulations.
- b) Spills or releases shall be cleaned up in accordance with the Act, Policies, Standards and/or Procedures, as directed by the Minister.

#### 16. Records Maintenance

- a) The Approval Holder shall keep all chemical and physical analyses reports for 10 years.
- b) The Approval Holder shall keep all calibration and maintenance records for three years.
- c) The Approval Holder shall maintain all other data not mentioned in Conditions 16 a) or 16 b) for a minimum of two (2) years.

## 17. Reporting

#### I. General

- a) All reporting requirements required by this Approval shall be submitted in writing and/or electronically, in a format acceptable to the Administrator.
- b) The Approval Holder shall submit required annual reports within ninety (90) days of the end of the applicable calendar year.

## 18. Community Liaison Committee

- a) The Approval Holder shall establish a Community Liaison Committee in accordance with the Department's Guide for the Formation and Operation of a Community Liaison Committees. The membership of said committee shall consist of at least two representatives of the Pictou Landing First Nation Community, one representative of the Pictou Landing Community, one representative of the Moodie Cove Community, and one representative of the Abercrombie Community, along with participation of one employee of Northern Pulp Nova Scotia Limited.
- b) The Approval Holder shall submit the list of proposed Community Liaison Committee members as well as the terms of reference of the Committee to the Department by

September 30th, 2011.

### 19. Communication Plan

a) The Approval Holder shall develop a Mi'kmaq Communication Plan for the purposes of sharing information between the Approval Holder and the Pictou Landing First Nation on environmental issues. This plan shall be submitted for approval to the Department by no later than September 1", 2011 and shall include but not be limited to the following information:

i) a mechanism for sharing of any information respecting environmental testing and reporting:

ii) a mechanism for PLFN to identify any questions or concerns they may have about the information supplied to them;

iii) a methodology for tracking the information exchange.

# 20. Contingency Plans/Operation and Maintenance Manuals

## I. Contingency Planning

a) The Approval Holder shall submit to the Department a contingency plan to address any potential emergency situation at the Facility. The contingency plan shall be developed and routinely updated in accordance with the Department's Contingency Planning Guidelines dated September 29, 2004, as amended from time to time, and made available to the Department upon request.

- b) The Approval Holder shall ensure that all personnel are trained to address environmental emergencies in a manner consistent with the Facility's approved contingency plan and that the necessary materials and equipment are available at all times for such purpose.
- c) A copy of the contingency plan is to be maintained on site at all times.
- d) A copy of the contingency plan is to be sent to the local fire department.

#### 21. Rehabilitation Plans

a) One (1) year prior to decommissioning/closure of the Facility, or any part thereof, the Approval Holder shall submit a detailed closure plan to the Department for review and approval. The plan shall include but not be limited to, the estimated total cost for labour, equipment, supplies and services of a 3<sup>rd</sup> party contractor to undertake all the

work necessary to decommission the Facility, or any part thereof, as well as a plan for dealing with all of the wastes and residual materials / contamination in accordance with the Act, the Regulations, Policies, Procedures and Guidelines prescribed or adopted by the Department.

- b) The closure plan shall include the method and practices for the handling and disposal of all products and waste materials on Site.
- c) The closure plan shall be implemented in accordance with the approved plan.

## 22. Insurance

a) The Approval Holder shall obtain environmental impairment liability insurance in the amount of \$5,000,000. Insurance shall indicate Nova Scotia Environment as insured. Proof of coverage shall be provided to the Department within sixty (60) days of issuance of the Approval.

## APPENDIX A

TABLE 2: Effluent Monitoring Parameters and Discharge Limits

Parameter	Sample Type	Monitoring Frequency	Location	Discharge Limit
Biochemical Oxygen Demand (BOD <sub>5</sub> )	Continuous	3 days per week	Effluent Monitoring Station Point C	3960 kg max per day 2380 kg max monthly average ****
Suspended Solids	Continuous	Daily	Effluent Monitoring Station Point C	4100 kg max per day+ 2460 kg max monthly average ****
Dissolved Oxygen	Field	Daily	Point B and Effluent Monitoring Station Point C	>6.5 mg O <sub>2</sub> /L at Point D ****+
pΗ	Continuous	Daily	Point B and Effluent Monitoring Station Point C	6-9
Flow rate	Continuous	Daily	Effluent Monitoring Station Point C	71,000 cubic meters
Acute Toxicity- rainbow trout	Grab	once per month*, 21 days between tests	Effluent Monitoring Station Point C	Pass LC50, as per the PPER
Acute Toxicity- Daphnia magna	Grab	once per week**, 21 days between tests	Effluent Monitoring Station Point C	Pass LC50, as per the PPER
Dioxins and Furans	24 hour composite sample	Annually, 350 days between samples	Effluent Monitoring Station Point C	as required by the Pulp and Paper Effluent Chlorinated Dioxins and Furans Regulations***

- \* if LC50 test fails, testing will be increased to weekly until a minimum of three (3) consecutive tests are passed.
- if LC50 test fails, acute toxicity on rainbow trout shall be conducted immediately, testing on Daphnia magna shall be increased to three (3) times per week until a minimum of three (3) consecutive tests are passed.
- \*\*\* if measurable quantities of 2,3,7,8 TCDD (15 ppq) or 2,3,7,8 TCDF (50 ppq) are detected, testing shall be increased to monthly until three (3) consecutive non-detect quarters are achieved.
- \*\*\*\* final treatment objectives will be determined based on the information submitted under condition 4 I (b)(v).
- in the event the Approval Holder can not meet the limits outlined, a plan shall be developed to meet compliance by the end of the Approval term. For Suspended Solids, at no time shall any one result exceed the discharge limit by more than 50%.

TABLE 2A: Effluent Parameters and Discharge Limits

PARAMETER	COMPLIANCE	MONHORING LOCATION	LIMIT
Adsorbable organic	l Day Maximum	Effluent Monitoring Station	0.9 kg/adubmt
halides (AOX)****	Monthly Average	Point C	0.6 kg/adubmt
2,3,7,8 TCDD**	1 Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
2,3,7,8 TCDF**	l Day Maximum	Bleach Plant	31.9 pg/adubmt
Chloroform**	I Day Maximum		6.92 pg/adubmt
	Monthly Average	Bleach Plant	4.14 pg/adubmt
Trichlorosyringol**	i Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
3,4,5 Frichlorocatechol**	I Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
3,4,6 Frichlorocatechol**	l Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
Tetrachlorocatechol**	1 Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
2,4,5 Trichlorophenol**	I Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
2,4,6 Trichlorophenol**	l Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
2,3,4,6- etrachlorophenol**	l Day Maximum *	Bleach Plant	<ml*< td=""></ml*<>
Pentachlorophenol**	1 Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
1,4,5 Tetrachloroguaiacol**	l Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
,4,6 [etrachloroguaiaco]**	1 Day Maximum	Bleach Plant	ML*
,5,6 [etrachloroguaiaco]**	1 Day Maximum	Bleach Plant	AML*
etrachloroguaiacol**	l Day Maximum	Bleach Plant	<ml*< td=""></ml*<>
Vitrites***	Daily	Effluent Monitoring Station Point C	
litrate-Nitrogen***	Daily	Effluent Monitoring Station Point C	2935 μg/L
KN	Daily	Effluent Monitoring Station Point C	
otal Phosphorous***	Daily	Effluent Monitoring Station Point C	20 μg/L
olour***	Daily	Effluent Monitoring Station Point C	20 kg/adubmt
mmonia***	Daily	Effluent Monitoring Station Point C	19 μg/L
ulfates***		Effluent Monitoring Station Point C	
OD		Effluent Monitoring Station Point C	

PARAMETER COMPLIANCE	MONITORING LOCATION LIBERT
Hydragen Sulphide (H <sub>2</sub> S)	Effluent Monitoring Station Point C
Sodium	Effluent Monitoring Station Point C

<sup>\*&</sup>lt;ML means less than the minimum level at which the analytical system gives recognizable signals and an acceptable calibration point. The MLs for each pollutant are specified in USEPA 40 CFR 430

<sup>\*\*</sup>US EPA Guidance Manual for Pulp, Paper and Paperboard and Builders' Paper and Board Mills Pretreatment Standards, US EPA, Effluent Guidelines Division, WH-562, September 1984

<sup>\*\*\*</sup>CCME Canadian Environmental Quality Guidelines Water Quality Guidelines for the Protection of Fresh Water Aquatic Life, current edition

<sup>\*\*\*\*\*</sup>Environmental Management Act, Pulp Mill and Pulp and Paper Mill Liquid Effluent Control Regulations, British Columbia Ministry of Environment, B.C. Reg. 470/90, amendments up to B.C. Reg. 321/2004

TABLE 3: Surface Water Discharge Limits

TABLE 3: Out tace Water Distanting		
PARAMETER	DISCHARGE LIMIT	
pH	6.5 - 9.0	
Total Petroleum Hydrocarbons	3.5 milligrams per litre or Atlantic RBCA*	
Chromium (trivalent)	8.9 micrograms per litre	
Chromium (Hexavalent)	1.0 micrograms per litre	
Copper	2-4 micrograms per litre	
Iron	300 micrograms per litre	
Nickel	25-150 micrograms per litre	
Vanadium	2 milligrams per litre	
Zinc	30 micrograms per litre	

<sup>\*</sup> lowest value after finalization of Atlantic RBCA standard for surface water

TABLE 4: General Inorganic Chemistry and Metals Parameters

Sodium (Na)	Nitrate + Nitrite (N)	Conductivity	Antimony (Sb)
Potassium (K)	Nitrite (N)	pН	Selenium (Se)
Calcium (Ca)	Nitrate (N)	Total Organic Carbon	Tin (Sn)
Magnesium (Mg)	Phosphorus	Total Dissolved Solids	Silver (Ag)
Hardness (CaCO <sub>3</sub> )	Ammonia (N)	Aluminum (Al)	Strontium (Sr)
Alkalinity (CaCO <sub>3</sub> )	Arsenic (As)	Boron (B)	Thallium (Ti)
Carbonate (as CaCO <sub>3</sub> )	Iron (Fe)	Bismuth (Bi)	Titanium (Ti)
Bicarbonate (as CaCO <sub>3</sub> )	Manganese (Mn)	Barium (Ba)	Utanium (U)
Sulfate (SO <sub>4</sub> )	Lead (Pb)	Beryllium (Be)	Varadium (V)
Chloride (CI)	Copper (Cu)	Chromium (Cr)	Cadmium (Cd)
Fluoride (F)	Zinc (Zn)	Cobalt (Co)	Total petroleum Hydrocarbons (TPH)
Silica (SiO <sub>2</sub> )	Colour	Molybdenum (Mo)	BTEX
Ortho-Phosphorus (P)	Turbidity	Nickel (Ni)	

Table 5: Air Contaminants, Maximum Ground Level Concentration

An Contaminant	CAS Number	Unit Hom Stadad	24 Hom Stan Ind
		Concentration (ug m <sup>3</sup> )	Concentration (1921) 12
Acetaldehyde	75-07-0	500	500
Acetone	67-64-1	35640	11880
Acrolien	107-02-8	1.2	0.4
Ammonia	7664-41-7	300	100
Antimony	7440-36-0	75	25
Arsenic	7440-38-2	11	0.3
Barium	7440-39-3	. 30	10
Benzene	71-43-2	**	**
Beryllium	7440-41-7	0.03	0.01
Cadmium	7440-43-9	0.075	0.025
Carbon tetrachloride	56-23-5	7.2	2.4
Chlorine	7782-50-5	30	10
Chlorine Dioxide	10049-04-4	6	2
Chloroform	67-66-3	3	1
Chromium (di- & tri- forms)		5	1.5
Cobalt	7440-48-4	0.3	0.1
Copper	7440-50-8	100	50
resols	1319-77-3	230	75
Dimethyl Disulphide	624-92-0	40	
Dimethyl Sulphide	75-18-3	30	
thylbenzene	100-41-4	1400	1000
luorides	7664-39-3	4.3	0.86
formaldehyde	50-00-0	65	65
ead	7439-92-1	1.5	0.5
/lercaptan		10	
Mercury	7439-97-6	5	2
fethanol	67-56-1	12000	4000
Aethylene Chloride	75-09-02	660	220
lethyl Ethyl Ketone	78-93-3	3000	1000
lethyl Isobutyl Ketone	108-10-1	1200	
/lolybdenum	7439-98-7	100	120
laphthalene	91-20-3	36	22.5
lickel	7440-02-0	5	2
henol	108-95-2	100	30
ropionaldehyde	123-38-06	7	
elenium	7782-49-2	20	10
ulphuric acid	7664-93-9	15	5
oluene	108-88-3	2000	Note the Note to the
ri-Chloroethylene	79-01-6	36	12
anadium	7440-62-2	5	2
(ylene	1330-20-7	2200	730
line	7440-66-6	100	120

\*Summary of Standards and Guidelines to support Ontario Regulation 419:Air Pollution - Local Air Quality, Standards Development Branch, Ontario Ministry of the Environment, February, 2008 (including December 22, 2009 amendment to O.Reg. 419/05) \*\*Carcinogen. There is no assigned standard for this contaminant and emissions to the

environment are to be limited to the greatest extent possible.

# APPENDIX B

Reference Documents

il a si	Data	Descriptor	Prepared By
item	Date	Descriptor B. II. SEG. 11	
1	Aug. 30,	Engineering Drawing - Recovery Boiler SF Scrubber	
	1976	General Arrangement Drawing No. C07969	Ltd.
5	Aug. 31	Engineering Drawing - SF Scrubber Flow And	Flakt SF Prod. Canada
	1976	Instrumentation Diagram Drawing No. C07970	Ltd.
3 3	Jan. 1977	Engineering Drawing - SF MODO Scrubber Inlet	Flakt SF Prod. Canada
		Breeching Arrangement Ducts General Arrangement Drawing No. C08070	Ltd.
4	Feb. 21,	Engineering Drawing - SF Scrubber MODO	Flakt SF Prod. Canada
	1977	System Internal Systems and Piping General	Ltd.
		Arrangement Drawing No. C08175	
5	Rev. April	Engineering Drawing - Assembly of Ducon	Ducon-Mikropul Ltd.
	3, 1985	Oriclone Venturi Scrubber Size 45/96- Type VVO	
L		Drawing No. E25751	
5	Jan. 9,	Engineering Drawing - General Layout of Ducon	Ducon-Mikropul Ltd.
	1985	A-33 Ventri-Rod Scrubber System Size 160	
		Drawing No. E25776	
7		Engineering Drawing - Flow Diagram For Size	
İ	14, 1985	45/96, Type VVO Scrubber Recycled Water Drawing	
	100	No. C-25896	
		- E	<u> </u>
8	Rev.	Engineering Drawing - Water Supply & Distribution	Scott Maritimes Limited
l	July 24,	Mill Water Balance - Treated Water Flow Schematic	
	1988(?)	Drawing No. 0-4561	
9	Rev.	Engineering Drawing - Water Supply & Distribution	Scott Maritimes Limited
	July 10,	Mill Water Balance - Raw Water Flow Schematic	
	1989(?)	Drawing No. 2502-1-0-4560	
16	Nov. 1989	Report - Solid Waste Management Strategy	Porter Dillon Limited
		Background Report	
11	Dec. 8,	Report - Industrial Solid Waste Landfill Operations	Porter Dillon Limited
	1989	Manual	
		,	
12	Rev. Aug.	Engineering Drawings - Industrial Solid Waste	Porter Dillon Limited
	1990	Landfill Engineering Drawings, 1-11	
	[ ] ]		
13	Record	Engineering Drawings - Landfill Leachate Collection	Porter Dillon Limited
Ţ <b>~</b>	Drawing	System Engineering Drawings, 1-13	
	Sept., 10,	L'annue manuel maniment y an	
	1991		
14	April 26,	Engineering Drawing - Landfill Cap Installation	Porter Dillon Limited

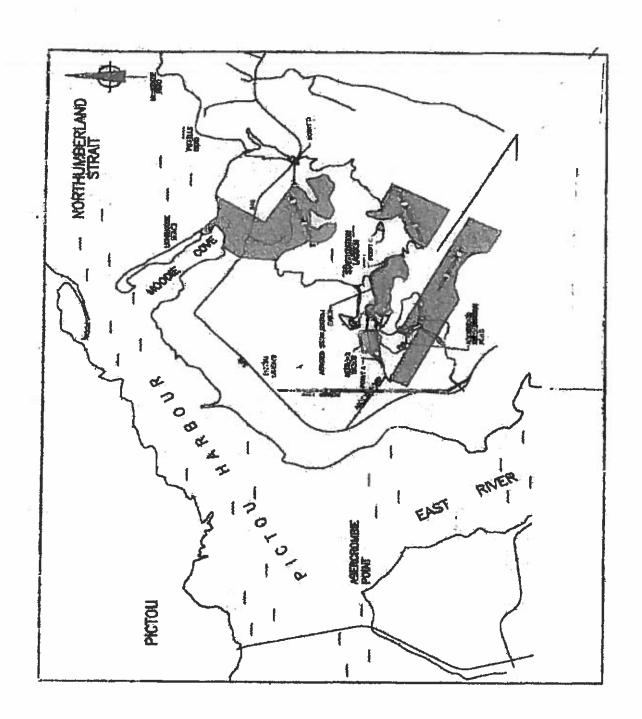
I	h994	Engineering Descring 1	1
	1334	Engineering Drawing 1	44.0
15	April 26, 1994	Engineering Drawings - Landfill Leachate Collection System Extension Engineering Drawings 1-2	Porter Dillon Limited
16	Aug. 15, 1996	Engineering Drawings - Kimberly-Clark Landfill Closures DWG #1160-JW-1-0530, Sheets 1-11	
17	Dec. 19, 1997	Engineering Drawing - Ash Pond Statistics DWG No. 959-KC-9-1007	Kimberly-Clark
18	Dec. 30, 1998	Engineering Drawing - Stack Locations Mill Wide DWG No. 1181-KC-1-1004	Engineering
19	May 7, 1999	Engineering Drawing - Erection Diagram Precipitator KCNS DWG. No. 5631-EEC-5-V53126 SH. 05	Environmental Elements
20	May 19, 1999	Engineering Drawing - General Arrangement KCNS	
21	May 21, 1999	Engineering Drawing - General Arrangement KCNS DWG. No. 5631-EEC-5-V53126 SH. 1	Environmental Elements Corporation
22	May 21, 1999	Engineering Drawing - General Arrangement KCNS DWG. No. 5631-EEC-5-53126 SH. 2	Environmental Elements Corporation
23	Rev. June, 1999	Engineering Drawing - Mill Yard Sewer Layout Dwg. No. 1-E-4499 Rev. 13	
4	Feb 2000	Report entitled Evaluation of Effluent Treatment Alternatives Project J632A	Arga Simons
25	Rev. Jan. 1, 2002	Engineering Drawing - Pulp Mill General Arrangement Dwg. No. 0-D-4993	Scott Maritimes Ltd.
.6	Sept. 2, 2008		Jacques Whitford
27	Sept. 26, 2008	Report - Air Monitoring and Reporting Program Evaluation Report	Jacques Whitford
8		Correspondence - Letter from Northern Pulp to Marc Theriault, Nova Scotia Environment with attached letter report from Jacques Whitford dated December 10, 2008	Vorthern Pulp/ Jacques Whitford
9			Jacques Whitford
0	Jun <del>e</del> 30, 2009	Correspondence - letter from Northern Pulp to Marc Theriault, Nova Scotia Environment	Northern Pulp
1	Sept. 25, 2009	Report - Northern Pulp Nova Scotia Corporation, New Glasgow, Nova Scotia Air Emission Management Plan	
2	Nov. 24,	Correspondence – letter from Sharon Vervaet, P.Eng., Nova Scotia Environment to , Northern Pulp	Nova Scotia Environment
3		Correspondence – Letter from Northern Pulp to Marc Theriault, Nova Scotia	Northern Pulp/Stantec

_		21
	2010	Environment with attached letter report from Stantec dated Jan. 14, 2010
34	Feb. 11, 2010	Correspondence – Letter from "Northern Pulp Northern Pulp to Sharon Vervaet, P.Eng., Nova Scotia Environment with attachments
35	Feb., 2010	Document Package submitted to Nova ScotiaNorthern Pulp Environment to satisfy request for information
36	Mar. 25, 2010	Correspondence - E-mail from , Northern Pulp Northern Pulp to Marc Theriault, Nova Scotia Environment
37	May 29, 2010	Correspondence – E-mail from z., Northern Pulp/Callan & Northern Pulp to Marc Theriault, Nova Scotia with Brooks Incorporated attached letter report prepared by Callan & Brooks Inc., dated May 27, 2010
38	July 19, 2010	Report - Northern Pulp Nova Scotia Corporation - KSH Solutions Inc. Odour Reduction Study Report
39	July 20,	Report - Northern Pulp Abercrombie, NS Greencookengineering Energy Report
40	July 27,	Correspondence – Letter from Sharon Vervaet, Nova Scotia Environment P.Eng., Nova Scotia Environment to Northern Pulp
41	Aug. 17, 2010	Report - Northern Pulp Nova Scotia Corporation SH Solutions Inc. Improvements to the Recovery Cycle Study Report
42	Undated, received April 2011	Process Flow Diagrams titled: 1)Water Treatment Northern Pulp 2)Power Boiler, 3) Regovery Boiler, 4) Services- Condensate, Feed Water, Demineralizers, and Steam and 5) Services – Fuel Oil, Propane, Raw Water and Air

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# Appendix B

Pre-test plan



Stantec Consulting Ltd. 102 - 40 Highfield Park Drive Dartmouth NS B3A 0A3 Tel: (902) 468-7777 Fax: (902) 468-9009

May 6, 2014 File: 121511269

Attention: Mr. Marc Therlault Nova Scotia Environment 20 Pumphouse Road Pictou, NS B2H 5C6

Dear Mr. Theriault,

Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mill - Spring 2014

Please accept this Pre-test Plan for the completion of source emissions testing of the Recovery Boiler, the Lime Kiln, the Smelt Dissolving Tank, the Power Boiler and the High Level Roof Vent at the Pictou Mill in New Glasgow, Nova Scotia. 🕝

### Introduction

Northern Pulp is required to perform source emissions testing on the Recovery Boiler, Lime Kiln, Smelt Dissolving Tank, Power Boiler and the High Level Roof Vent to fulfil the conditions specified in the current Certificate of Approval (CoA) to Operate 2011-076657-R02.

### **Test Program Organization**

The source emissions testing will be performed for:

Company Name:

Northern Pulp

Company Address:

P.O. Box 549, Station Main, New Glasgow, NS, B2H 5E8

Contact Name:

Position:

Environmental/Technical Leader

Telephone Number:

Email:

@northernpulp.com

Sampling Company: Stantec Consulting Ltd.

Project Manager:

**Matt Steeves** 

Telephone Number:

(902) 468-7777

Fax Number: Email:

(902) 468-9009

Sampling Team:

\$Stantec.com



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mili - Spring 2014

# Source Emissions Testing Program

The exhaust gas from the sources will be analyzed for air contaminants as outlined in Table 1 below.

Table 1 Source Emissions Testing Matrix

Source	Number of Samples per Source	Approval Condition	Parameter	Sampling Method
	3	-	Velocity Traverse	EPS 1/RM/8
	3	12	Moisture Content	EPS 1/RM/8
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
Recovery Bolier	3	-	Oxygen (O <sub>2</sub> ), Carbon Dioxide (CO <sub>2</sub> )	EPS 1/RM/15
	3	(#3)	Sulphur Dioxide (SO <sub>2</sub> )	EPS 1/RM/15
	3	3.43	Nitrogen Oxides (NO <sub>x</sub> )	EPS 1/RM/15
	3	120	Carbon Monoxide (CO)	EPS 1/RM/15
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8 (EMC GD-008)
	1	6. b)	Total Reduced Sulphur (TRS)	US EPA Method 16B
	3	-	Velocity Traverse	EPS 1/RM/8
	3	-	Moisture Content	EPS 1/RM/8
Lime Kiln	3	-	Oxygen (O <sub>2</sub> ), Carbon Dioxide (CO <sub>2</sub> )	EPS 1/RM/15
	3	-	Sulphur Dioxide (SO <sub>2</sub> )	EPS 1/RM/15
	3	-	Nitrogen Oxides (NO <sub>x</sub> )	EPS 1/RM/15
	3	140	Carbon Monoxide (CO)	EPS 1/RM/15
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
	3	-	Velocity Traverse	EPS 1/RM/8
	3	-	Moisture Content	EPS 1/RM/8
Smelt Dissolving Tank	3	-	Oxygen (O <sub>2</sub> ), Carbon Dioxide (CO <sub>2</sub> )	EPS 1/RM/15
	3	-	Sulphur Dioxide (SO <sub>2</sub> )	EPS 1/RM/15
	3	-	Nitrogen Oxides (NOx)	EPS 1/RM/15
	3	-	Carbon Monoxide (CO)	EPS 1/RM/15
	3	6. a)	Total Particulate Matter (PM)	EPS 1/RM/8
	3	-	Velocity Traverse	EPS 1/RM/B
	3	-	Moisture Content	EPS 1/RM/8
Power Boiler	3	-	Oxygen (O <sub>2</sub> ), Carbon Dioxide (CO <sub>2</sub> )	EPS 1/RM/15
	3		Sulphur Dioxide (SO <sub>2</sub> )	EPS 1/RM/15
	3	-	Nitrogen Oxides (NO <sub>x</sub> )	EPS 1/RM/15
	3	-	Carbon Monoxide (CO)	EPS 1/RM/15



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mili – Spring 2014

Table 1 Source Emissions Testing Mairix

Source	Number of Samples per Source	Approval Condition	Parameter	Sampling Method
	3	6. b)	. Velocity Traverse	EPS 1/RM/8
	5 I	• (i)	Total Reduced Sulphur (TRS)	US EPA Method 16B
High Level Roof Vent	3	-	Oxygen (O <sub>2</sub> ), Carbon Dioxide (CO <sub>2</sub> )	EPS 1/RM/15
¥ E: 11	3	-	Sulphur Dioxide (SO <sub>2</sub> )	EPS 1/RM/15
	3	-	Nitrogen Oxides (NOx)	EPS 1/RM/15
	3	-	Carbon Monoxide (CO)	EPS 1/RM/15

Details of each of the methods identified in Table 1 are provided in the sections that follow.

**Preliminary Testing:** Upon arrival at each sampling location, Stantec will set up the source emissions testing equipment and conduct a preliminary survey to measure the average velocity, flue gas composition, and moisture content in the stack gases using EPS 1/RM/8 Methods B, C, and D, respectively. The data from this survey will be used to determine the appropriate nozzle size to conduct isokinetic sampling (where the velocity of the gas entering the nozzle is equal to the gas velocity in the stack) for particulate matter during the official testing part of the work. Verification for cyclonic or reverse flow will also be conducted during the preliminary survey, according to procedures outlined in the Environment Canada reference method EPS 1/RM/8.

Should fluctuations in the velocity pressure at a selected traverse point exceed 20% of the average pressure for that point; the diameter of the testing cross section will be reduced to include only those areas along the traverse which meet this requirement (less than 20% of the average). Although the diameter may be reduced, the number of sampling points along each traverse will remain the same as determined from EPS 1/RM/8, Method A, using the equivalent diameter.

Volumetric flow and exhaust gas emissions will be calculated using the full cross sectional area.

**Particulate Matter:** The source emissions testing of the Recovery Boiler, Lime Kiln, Smelt Dissolving Tank, and the Power Boiler for total particulate matter will be conducted in accordance with the Environment Canada reference method EPS 1/RM/8, entitled "Measurement of Releases of Particulate from Stationary Sources". In addition the alignment approach, as specified in the US EPA Guidance Document – GD-008, will be applied when source testing the Lime Kiln due to the cyclonic flow this source exhibits.

The particulate sampling train, used specifically for isokinetic sampling, is described in detail in EPS 1/RM/8, and is generally referred to as the "Method 5" sampling train for particulate matter (after the US EPA protocol). The sampling train has several different components which include: a heated sampling probe (a nozzle, stainless steel liner, thermocouple, and pitot tube assembly), a heated sample case containing a filter, an ice box containing impinger glassware, and an



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mill – Spring 2014

umbilical cord leading to the pump, and control console. A schematic of the sampling system is shown in Figure 1.

For all source tests, leak checks of the sampling train will be performed as per accepted US EPA and Environment Canada methods. For each official test, two (2) traverses with up to twelve (12) sampling points per traverse will be used. Sampling will be conducted for five (5) minutes per sampling point, up to a maximum sampling time of 120 minutes per test.

The amount of material caught in the impingers will be determined gravimetrically and reported separately from the calculated total particulate matter emissions. All particulate matter samples will be recovered and analyzed at the Stantec laboratory in Fredericton, NB.

**Total Reduced Sulphur:** The source emissions testing of the Lime Kiln and the High Level Roof Vent for total reduced sulphur will be conducted in accordance with US EPA Method 16B. In this method, the sample is extracted from the exhaust gas of the stack through a heated Tetlon line. The sample is chilled and then passes through an SO<sub>2</sub> analyzer to measure SO<sub>2</sub> from the source. The sample exits the analyzer and is then passed through a furnace where all sulphur compounds in the gas stream are thermally oxidized to SO<sub>2</sub>, this SO<sub>2</sub> is measured in a second inline analyzer. The difference in the initial SO<sub>2</sub> and the final SO<sub>2</sub> measurement is the total reduced sulphur concentration (reported as  $H_2S$ ). The analyzers are both Western Research SO<sub>2</sub> non-dispersive ultra-violet (NDUV) continuous analyzer. Monitoring will be conducted continuously over a 24 hour period as required by the approval condition.

Combustion Gases: The combustion gases (O2, CO2, CO, NOx, and SO2) will be sampled according to the Environment Canada reference method EPS 1/RM/15, entitled "Reference Method for the Monitoring of Gaseous Emissions from Fossil Fuel-fired Burners". In this method, samples of flue gas are drawn through a probe, non-isokinetically, from a single point near the centre of the stack. A Testo 350 XL Flue Gas Analyzer, manufactured by Testo GmbH and Co., will be used to conduct the sampling. The Testo 350 XL is equipped with a flue gas probe that has an integrated filter trap and condensate trap, and a housing unit that contains the pump and the electrochemical cells which are used to measure concentrations of sulphur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, and oxygen.

The Testo 350 XL Flue Gas Analyzer is manufactured and calibrated to ensure high accuracy.

In accordance with the regulatory requirements for compliance testing, three replicate tests for each contaminant will be conducted on each stack.

### Reporting

As per Approval No. 2011-076657-R02, actual particulate matter emission rates will be reported in units of g/s. The concentration released to the atmosphere will be reported in units of mg/m³ at reference conditions of 25 °C and 101.3 kPa corrected for 11 % oxygen for the Recovery Boiler and Power Boiler and in units of kg/adubmt for the Lime Kiln and the Dissolving Tank. Total reduced sulphur will be reported in units of parts per million by dry volume (ppmdv).



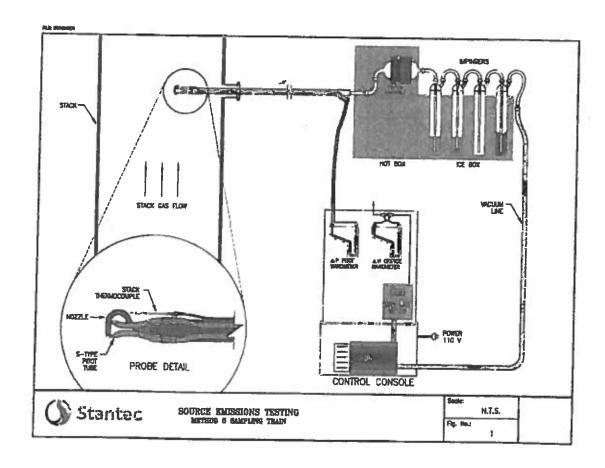
Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mill - Spring 2014

Results of the source emissions testing will be documented in a final report for submission to Nova Scotia Environment (NSE) for review and approval.

## Sampling Locations

The number and location of sample points along each traverse were determined according to EPS 1/RM/8, Method A, using the exhaust stack diameter. A diagram of a typical sample location is provided in Figure 2.

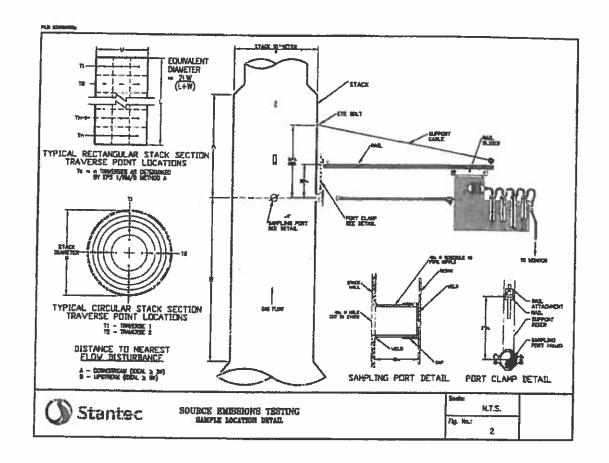
Figure 1 Source Emission Testing, Method 5 Sampling Train





Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictor Mili – Spring 2014

Figure 2 Source Emissions Testing, Sample Location Details





Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mill – Spring 2014

A summary of the sample location details is provided in Table 2.

Table 2 Sample Location Details

Parameter	Recovery Boiler	Lime Kiin	Smelt Dissolving Tank	Power Boiler Scrubber Stack	High Level Roof Vent
Stack Height - Above Grade (m)	69	37	51	51	65
Diameter / Equivalent Diameter (m)	3.51	1.22	1.22	1.93	1.83
Stack/Duct Description	Circular	Circular	Circular	Circular	Circular
Stack Orientation	Vertical	Vertical	Vertical	Vertical	Vertical
Location of Source Testing	In Stack	in Stack	In Stack	In Stack	In Stack
Number of Sample Ports	4	2	2	2	11
Sample Port Diameter (m)	0.1	0.15	0.1	0.1	0.1
Location Upstream from any Disturbance,	>2 ~	2	>2	>2	
Location Downstream from any Disturbance,	1.45	8	6	>4	(5)
Ideal or Non Ideal Flow Characteristics at The Sample Location <sup>1</sup>	Not Ideal	Not Ideal <sup>2</sup>	Not Ideal	Not Ideal	<u>-</u>
Total Number of Sample Points	24	24 (for PM) 1 (for TRS)	20	24	1 (for TRS)
Number of Sample Points per Traverse (PM sampling)	12	12	10	12	NA
Sample Time per Point for PM samples (min)	5	5	5	5	NA
Sample time per Test for PM (min)	120	120	100	120	NA_
Sample time per Test for combustion gas (min)	30	30	30	30	30
Sample time per Test for TRS (min)	NA	1,440	NA NA	NA	1,440

<sup>1</sup> The exhaust gas flow characteristics at the sampling location are referred to as being "Ideal" If the sample ports are located in a straight section of stack at least eight stack diameters downstream and two stack diameters upstream of any flow disturbance.

<sup>2</sup> The lime kiln sampling location has been changed from ideal to not ideal due to the cyclonic flow.

### Quality Assurance / Quality Control

Throughout the stack testing program, rigorous quality assurance and quality control procedures will be applied to ensure the collection of reliable, representative, and reproducible emissions data. All equipment will be calibrated according to the protocols as prescribed by Environment Canada, and the US EPA. These calibrations include the following:

Pitots:

calibrated in a wind tunnel with probe and nozzles attached;

Gas meters:

calibrated against a critical orifice set;

Thermocouples:

calibrated using a potentiometric technique;



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mill - Spring 2014

Nozzle:

four diameter measurements made using a micrometer across the

sharpened edges; and

Combustion Gas Analyser:

2 point calibrations before and after the testing using span gases of

known concentrations.

Calibration data will be provided in the final report.

Quality control checks will be performed at several stages during the testing program to ensure the collection of representative samples and the generation of valid results. These checks are performed by test personnel throughout the program under the guidance of the source testing crew chief. The Quality Control (QC) checks include the following:

Use of standardized checklists and field notebooks to ensure completeness, traceability, and comparability of the process information and samples collected;

Field checking of standardized forms by a second person to ensure accuracy and

Strict adherence to sample chain-of-custody procedures;

Use of appropriate field blanks (e.g., filter and solution samples); and

Leak checks of sample trains.

All internal quality assurance and quality control procedures will be strictly adhered to during all test programs to ensure the production of useful and high quality data throughout the course of the program.

# Qualifications of Source Testing Team

The successful completion of this project requires the skills of competent and experienced professionals who have a strong commitment to complete the project quickly and efficiently and to produce high quality results. The source testing team we have assembled to meet the challenges of this assignment consists of highly trained professionals who bring a broad range of expertise and experience to the project. The following paragraphs provide brief descriptions of the qualifications of the source emissions testing team:

Senior Reviewer:



May 6, 2014 Mr. Marc Theriault Page 9 of 11

Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp. Pictou Mill - Spring 2014

Project Manager and Report Writer:



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictov Mili – Spring 2014

Source Testing Team:



Reference: Pre-Test Plan for Source Emissions Testing Northern Pulp, Pictou Mili – Spring 2014

### Schedule

The field work portion of the project is scheduled to commence during the week of June 9, 2014. Stantec estimates that the field work can be conducted over a period of one week, assuming consistent operation of the facility. From the completion of the field work it will take approximately 60 working days to complete the laboratory analysis and reporting.

Your timely written approval of this pre-test plan is greatly appreciated. If you have any questions, please do not hesitate to contact me directly at (902) 468-7777.

Regards,

STANTEC CONSULTING LTD.

**Matt Steeves** 

Project Manager – Environmental Services

Phone: (902) 468-7777 Fax: (902) 468-9009

**Pstantec.com** 

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# Appendix C

Calibration data

	-733200	Stantec	Consul	ting Ltd	-8 = -8 =	
	Steel	Nozzle (	Calibratio	on Data	Sheet	
NozzielD	No	zzle Diame	eter (inche	s)		W WSHIRE
Set - 2	<1>	<2>	<3>	<4>	Hi-Lo	Avg.
2-4	0.128	0.126	0.128	0.127	0.002	0.127
2-6	0.179	0.175	0.177	0.175	0.004	0.177
2-8	0.230	0.230	0.227	0.228	0.003	0.229
2-10	0.309	0.309	0.313	0.311	0.004	0.311
2-12	0.364	0.366	0.365	0.367	0.003	0.366
2-14	0.438	0.436	0.435	0.437	0.003	0.437
2-16	0.494	0.495	0.498	0.496	0.004	0.496
QA/QC Check						
E	ach Diamet	er Measure	To Within	= 0.001 lnd	hes	
F	ligh - Low </td <td>= 0.004</td> <td></td> <td></td> <td></td> <td></td>	= 0.004				
Prepared By:	AL				Date: JAN.	24, 2014

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Stantec Consulting Ltd.							
	Steel Nozzle Calibration Data Sheet						
NozzielD	No	zzle Diamo	eter (Inche	s)			
Set - 1	<1>	<2>	<3>	<4>	Hi-Lo	Avg.	
1-4	0.125	0.124	0.127	0.125	0.003	0.125	
1-6	0.171	0.175	0.171	0.173	0.004	0.173	
1-8	0.234	0.231	0.233	0.233	0.003	0.233	
1-10	0.305	0.306	0,305	0.304	0.002	0.305	
1-12	0.371	0.373	0.372	0.371	0.002	0.372	
1-14	0.434	0.436	0.437	0.437	0.003	0.436	
1-16	0.500	0.502	0.500	0.499	0.003	0.500	
QA/QC Check							
Each Diameter Measured To Within = 0.001 Inches							
	High - Low = 0.004</td						
Prepared By	Prepared By: AL Date: Feb 10, 2014						

# VALLEY ENVIRONMENTAL CALIBRATION SERVICES PITOT TUBE CALIBRATION REPORT

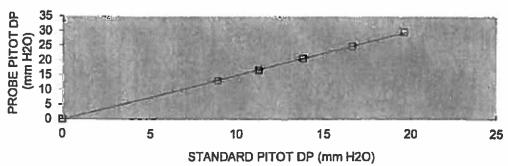
CLIENT - Stantec
PROBE ID - 8-2 FT M5
NOZZLE - #6- 0.1875"
DATE - February 24, 2014

FAN SPEED	STANDARO PITOT	PROBE PITOI
m/s	(mn H2O)	(nun H2O)
0.00	0.00	0.00
12.3	8.90	13.10
13.8	11.30	16.70
15.3	13.80	20.70
16.7	16.60	24.80
18.2	19.60	29.60

PITOT FACTOR Cp = -

0.817

PITOT - 8-2 FT M5 NOZZLE - #6- 0.1875" February 24, 2014



Technician:

T. Ryan

Signature

Thomas &

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VALLEY ENVIRONMENTAL SERVICES	Tunnel	VES
160 Pony Drive #1	Std. Pitot Cp	0.999
Newmarket, Ontario L3Y 7B6	Static	-0.25
PH: (905) 830 0136	Barometric	28.85
FAX: (905) 830 0137	Temperature	65
	Abs Static	28.83

# VALLEY ENVIRONMENTAL CALIBRATION SERVICES PITOT TUBE CALIBRATION REPORT

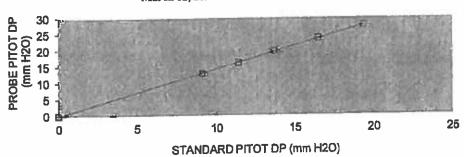
CLIENT - Stantec
PROBE ID - 2FT M5
NOZZLE - #8- 0.250"
DATE - March 01, 2014

PANAPIES Ina	BTANDARD 1970T (mm (ML))	PACING PROT trans. F2C1
0.00	0.00	0.00
12.4	9.10	12.90
13.8	11.40	16.10
15.2	13.70	19.70
16.6	16.50	23.60
18.0	19.40	27.60

PITOT FACTOR Cp =

0.838

PITOT - 2FT M5 NOZZLE - #8- 0.250"
March 01, 2014



Technician:

I. Kyan

Signature

Thomas B

VALLEY ENVIRONMENTAL SERVICES	Tunnel	VES 0.999
160 Pony Drive #1 Newmarket, Ontario L3Y 7B6	Std. Pitot Cp Static	-0.25
PH: (905) 830 0136	Barometric	29
FAX: (905) 830 0137	Temperature Abs Static	65 28.98

# VALLEY ENVIRONMENTAL CALIBRATION SERVICES PITOT TUBE CALIBRATION REPORT

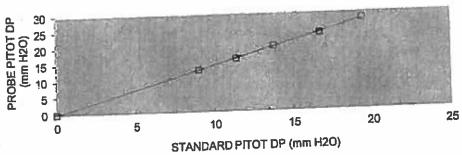
CLIENT - Stantec
PROBE ID - 5FT M5
NOZZLE - #10-0.3125"
DATE - March 01, 2014

PASS BPRED	STAND AND TO THE POPULATION OF	PROPE PEROE (mat. 1820)
0.00	0.00	0.00
12.3	9.00	12,90
13.8	11.40	16.20
15.2	13.80	19.90
16.7	16,70	23.60
18.0	19.40	28.00

PITOT FACTOR Cp =

0.836

PITOT - 5FT M5 NOZZLE - #10- 0.3125"
March 01, 2014



Technician:

T. Ryan

Signature

Thomas &

160 Pony Drive #1 Newmarket, Ontario L3Y 7B6 PH: (905) 830 0136 FAX: (905) 830 0137 Static Barometric Temperature Abs Static 2
--

# METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

- Select three critical orifices to calibrate the select barometric pressure before and:
- 3) Run at tested vacuum (from Orifice Calif
  - recessary to actileve a minimum total ve 7
- Record data and information in the GRE

	\$ 2.00%, 9RATED		<u></u>	VARIATION (N) AH.		177	17.1	1.73	7870	1.72	1.72	17.1	980	1
	F Y VARATION EXCEEDS 2.00%, ONTICE SHOULD BE RECALISHATED		2			1,042	1.047	1,066	1.048	1,016	1,041	1.034	1.032	1.036
	Oforace		[2]	V_ (5TD)		2462	5.4962	\$4962	AVG =	9829	13815	2386.2	- DAY	£.8363
gradin - Vertax - Act ability	~		2	>		2.47.50	6.2480	6.1922		6.2878	5,1664	5.1706		5.6234
Distribution of	AVG (P <sub>m.</sub> )		DGM AH	(In H <sub>2</sub> O)			8	0 BG	-	1/8	178	140	The second	220
M.	FIVAL	ELAPSED	TOUR (MEN)	0			2		4.000 Sept.	8	3.00 %	1	A. Assessed	87.
	ENTTAL PE Z	Γ	DO	AVG	ž	ļ	2	¥ 66.76	912	2	2	2		5
-96u	BAROMETRUC PRESSURE (In 14g):	TEMPERATURES *F	DOMOUTLET	INTIAL FINAL INTIAL FINAL							-		105.50 ct 40	
cas to calibrate the dry gas meter which bracket the expected operating range. such before and after calibration procedure, from Orifice Calibration Report), for a period of time minimum total volume of 5 cubic feet.  aithinum total volume of 5 cubic feet.	KOMETRIC PR	TEMPER	DOM INLET	MITAL FRAL	1							21.5	OTHER DESIGNATION	
the expecte me	<b>I</b>		AMBEENT		) <b>(19</b> )	人		1	1 10		Ī	TOTAL STREET	Section 2	
hich bracket cedure. a period of til X.	ļi		£	NETO	A-180	4 450			200					
One meter with additional programmes of 5 cubic feet of 5 cubi	METER GERAL K		DOM READENES (FT	FINAL	189.00	CS. BE		0.00	100	den 25			200.00	
ces to calibrate the dry gas meter which bracket the exp sure before and after calibration procedure. from Oritice Calibration Reprort), for a period of time minimum total volume of 5 cubic feet. asion in the GREEN cells, YELLOW cells are calculated.	METER BERAL & S		Da	MITTAL	×	2	70.76		188.94		1202		186.31	
cas to ca sure beft from Ordi minimum	, egg			-		(3)	12	1	82	Ċ.	1	1	113	

VACUIM

FACTOR

(AVG)

ORIFICE # RING

2

0.4564

0.4144

10

¥

1787

TESTED

날

DATE: WHATOHA

METER PART &: 184

USNIG THE CRITICAL ORBYCES AS CALIBRATION STAKDARDS: The following equations are used to calculate the standard volumes of all passed through the DCEAL V., (add), and the critical outbos, V., (std), and the DCEA calibration factor, Y. These equations are authoratically calculated in the apmachatest above.

(1) 
$$Vm_{tun} = K_1 \circ Vm \circ \frac{Phar + (\Delta H/13.6)}{Tm}$$

 $\alpha$  Net volume of gas semple peased through DGM, corrected to standard conditions  $\rm M_1=17.84$  \*Rin. Hg (English), 0.3059 \*Rinn Hg (Metric)

T<sub>m</sub> = Absorbet DGM Avg. temperature ("R - English, "K - Metric)

$$V_{GT_{(rel)}} = K^{*o} \frac{Pbar \circ \Theta}{\sqrt{Tamb}}$$

$$Y = \frac{V_{GT_{(rel)}}}{V_{FT_{(rel)}}}$$

9

T

 $\approx$  Volume of gas sample passed through the critical oritice, corrected to standard conditions Twe - Absolute ambient temperature ('R.-English, 'K.-Metrio) K = Average K factor from Officel Orthos Calibration

DGM calibration factor



AVERAGE AHE = 1.77

**# # #** 

E 6234 707.07 6.6774

1.037

1970 £4203

20 M

7.00

ā

17.73 67.5

6.480 8.636

18.2 . 171,0K

Sec. 5

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b-kser

M

N

2

0 9067

#

0 5046

м

4

#

G-Beest

#

0.6005

7

9.0

3 1.038

AVG-

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.040

### Pre-Test Dry Gas Meter - Control Unit Calibration

Date : April 03-14
Barometric Pressure, Pb : 29.1
Model Number : VESM5-002
Calibrated By :

	u	Q,	y		
_	'n	ıh	4	ŀ	

Orifice Manometer	<u> </u>	 Dry Gas M Volume, Vm		-		tures (F) ry Gas Me		Time, theta
Setting, deltaH (in. H2O)	in		Total			Outlet, to	Average, tm	(min)
1.0			2.030			72	72	3
1.5 2.0		 	2.020 2.025			72 72	72 72	3
2.5	3		2.02	2.015	e:1	72 72	72 72	2.2 2.03

Orifice Manometer Setting, dettaH (In. H2O)	Dry Gas Correction Factor, gamma (Tolerance = 0.85 - 1.05, +/-1.5% of avg)	Orifice Pressure Differential (delta H@) yielding 0.75 cfm of air at 68F and 29.92 in.Hg as in. H2O (Tolerance = 4/- 0.15 in.)	Orifice Coefficient Ko
1.0	0.998	1.680	0.743
1.5	1.004	1.675	0 737
2.0	0.999	1.747	0 725
2.5	1.006	1.715	8 728
3.0	1.006	1.724	0.726
Average	1.003	1.704	0.732

# Probe Stack Thermocouple Calibration

Calibration Date: 1-Apr-14

Calibrated By: NGM, DJB

Reference (D Fisher Scientific estatog #150414E



# Stantec

ice	0	0	4h	
ICE	0		ш	

Thermocouple #	Reference Temp (F)	Observed Temp (F)
#1 -2' probe	32	30
#1 -3' probe	32	g 31
#1 -4 probe	32	31
#1 -5' probe	32	30
#1 - 6' probe	_32	31
#1 - 8'-1 probe	32	32
#1 -5'-2 probe	32	32
#1 -10'-1 probe	32	32
#1 -10'-2 probe	.32	32
#8 -1648	32	32
#7 -1848	32	30
#5 -1646	32	31
#7 -1646	32	31

Percent Diffe	rence
(Absolute T	emp)
	0.41%
	0.20%
	0.20%
	0.41%
	0.20%
	0.00%
	0.00%
	0.00%
	0.00%
	0.00%
	0.41%
	0.20%
	0.20%

	Bolling Water	
Thermocouple #	Reference Temp (F)	Observed Temp (F)
#1 -2' probe	202	202
#1 -3' proba	201	199
#1 -4' proba	203	200
#1 -5' probe	203	201
#1 - 6' probe	202	199
#1 - 9'-1 probe	203	200
#1 -8'-2 proba	202	201
#1 -10'-1 probe	200	200
#1 -10'-2 probe	202	199
#6 -1648	202	198
#7 -1848	203	198
#6 -1646	203	197
#7 -1648	201	197

	· 1
Percent Diff (Absolute	
	0.00%
	0.30%
	0.45%
	0.30%
	0.46%
	0.45%
	0,15%
80	0.00%
	0.48%
	0.81%
	0.76%
	0.91%
	0.81%

Error should be < 1.6%



# ENERAC, INC.

# CALIBRATION CERTIFICATE

ALIBRATION DATE: 9/19/20		SERIAL #: 511095				
ESTED BY: KS	<del></del>					
HE ENERAC MODEL P500 VAS SUCCESSFULLY CALIBRATED USING PREASUREMENT OF THE FOLLOWING P	CEPTIFIED 2%	ACCURA	SERIAL NUM ACY SPAN GA	BER LISTED ABOVE, AS FOR THE		
CALIBRATED SENSORS (Elec	trochemical)		SPAN G	AS USED		
1	- 30	X	100 %	NITROGEN		
OXYGEN (Zero):		 [X]	10 %	O2 BALANCE NITROGEN		
OXYGEN:  COMBUSTIBLES:			0.1 <b>%</b> 1.0 <b>%</b>	METHANE BAL. NITROGEN		
CARBON MONOXIDE:	Low Range High Range		200 PPM 2000 PPM	CO BALANCE NITROGEN		
NITRIC OXIDE: (NOX FOR M200	) Low Range High Range		200 PPM 1000 PPM	NO BALANCE NITROGEN		
NITROGEN DIOXIDE :		X	100 PPM	NO2 BALANCE NITROGEN		
SULFUR DIOXIDE:	Low Rauge High Range		200 PPM 1000 PPM	SO2 BALANCE NITROGEN		
CALIBRATED SENSORS (In CARBON MONOXIDE: CARBON DIOXIDE: HYDROCARBONS:	<u>frared)</u>		10 % CO	BALANCE NITROGEN  BALANCE NITROGEN  M PROPANE BAL NITROGEN		
DRAFT: EMISSIONS PROBE TEST:	(M3000/3000E) (2000) (M2000E/M3000/3000E)	—□- ⊠ □		Fuel, 1% Oxygen,DP <spec'd< td=""></spec'd<>		
13	320 Lincoln Av. U TEL: (631) 256	nit 1, H -5903	(800) 693-31	7 11741 637		

FAX: (516) 997-2129

# **CONTINUOUS EMISSION MONITORS** SYSTEM CALIBRATION AND DRIFT

Client:

Plant: Location: Northean Pulp Polish menin

Project No.:

321614069 Personnel:

Test No.:

Date:

Time Start:

2 35 PM Time Finish: 235 24

INSTRUMENT SPAN VALUES					
Oxygen (%):	25	Carbon Dioxide (%):	GOT STATE		
Sulphur Dioxide (ppm):	AND DESCRIPTION OF THE PERSON NAMED IN	Carbon Monoxide (ppm):	300		
	and the same of the same of	TRS (ppm):	kon		

Analyzer Setting Cal. Gas Value	Initial Values			Final Values			
		Analyzer Calibration	System Callbration	System Cal. Blas (<5% Span)	System Calibration	System Cal. Blas (<5% Span)	Drift (<3% Span)
O2 Zero	0.00	0.00	0:00	0.00%	0.56	2.24%	2.24%
O2 Span	21.53	21.53	21.52	-0.04%	21,56	0.12%	0.16%
CO2 Zero	0.00	0.00	0.00	0.00%	0.67	2.68%	2.68%
CO2 Span	20.84	20.87	20.84	-0.12%	20.73	-0.56%	-0.44%
CO Zero	0.00	0.00	0.00	0.00%	-2.0	-0.66%	-0.66%
CO Span	290.0	290.0	289.7	-0.12%	284.7	-1.77%	-1.65%
SO2 Zero	0.00	0.00	0.00	0.00%	0.0	0.00%	0.00%
SO2 Span	490.0	490.2	490.0	-0.04%	473.2	-3.39%	-3.35%
RS Zero	0.00	0.00	0.00	0.00%	-2.8	-0.56%	-0.56%
RS Span	490.0	490.0	490.6	0.12%	487.83	-4.43%	-4.55%

# **CONTINUOUS EMISSION MONITORS** SYSTEM CALIBRATION AND DRIFT

Cllent:

Plant: Location: Marthert Pulp T lotor HLRV

Project No.:

经16[12]中 Host Personnel:

Test No.:

Date:

Time Start:

Time Finish: 134 💥

Aug 19 Aug 20 2014 g 30 PM

INSTRUMENT SPAN VALUES					
Oxygen (%):	.25	Carbon Dioxide (%):	25		
Sulphur Dioxide (ppm):	500	Carbon Monoxide (ppm):	300		
		TRS (ppm):	500		

		initial Values			Final Values		
Analyzer Setting	Cal. Gas	Analyzer Callbration	System  Calibration	System Cal. Bias (<5% Span)	System Calibration	System Cal. Blas (<5% Span)	Drift (<3% Span)
O2 Zero	0.00	0.00	0.00	0.00%	-0.14	-0.56%	-0.56%
O2 Span	21.53	21.54	21.53	-0.04%	21.67	0.52%	0.56%
CO2 Zero	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
CO2 Span	20.84	20.87	20.84	-0.12%	21.35	1.92%	2.04%
CO Zero	0.00	0.00	0.00	0.00%	0.0	0.00%	0.00%
СО Ѕрал	290.0	290.0	289.7	-0.12%	288.1	-0.64%	-0.52%
SO2 Zero	0.00	0.00	0.00	0.00%	-11.8	-2.36%	-2.35%
SO2 8pan	490.0	490.2	490.0	-0.04%	470.4	-3.96%	-3.93%
TRS Zero	0.00	0.00	0.00	0.00%	26.67	5.33%	5.33%
TRS Span	490.0	490.1	490	-0.03%	503.53	2.68%	2.71%