2022 Annual Report for Authorization 8808

Atlantic Power - Williams Lake Power Plant

Jacob Steyl

4455 Mackenzie Ave N, Williams Lake, V2G 5E8

Executive Summary

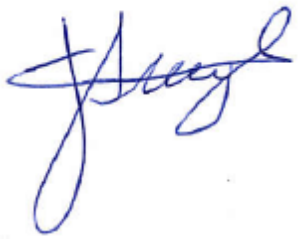
This Report details the Environmental Emissions from January 1, 2022 to December 31, 2022 and fulfils the requirement of section 3.6 of Authorization 8808 [1].

No rail ties or greater than 1% construction and demolition (C&D) waste were used as feedstock during the reporting period. A total of 343,453 wet tonnes of clean biomass was incinerated during 4,053 hours of normal operation.

During this time two discrete monitoring sessions (one for Air Discharge from the Stack and one for Ash Analysis) were performed. The test results were compared against the levels in Permit 8808 and the Hazardous Waste Regulation, and no exceedances of any of the parameters in Schedules A and D of the Permit measured.

Continuous Emissions Monitoring System (CEMS) measurements were also taken as required by the Permit throughout this Period, with no exceedances recorded.

Respectfully,



Jacob Steyl, P.Eng

January 3, 2023

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Nomenclature and Abbreviations

C&D - Construction and Demolition waste
MoE - Ministry of Environment
NO_2 - Nitrogen Dioxide
NO_x - Nitrogen Oxides
O_2 - Molecular Oxygen
TEQ - Toxic Equivalency
USEPA - United States Environmental Protection Agency

hr - Hour
kg/s - Kilograms per Second
lb/hr - Pounds per Hour
m^3/s - Cubic Meter per second
mg/kg – Milligrams per Kilogram (1 ppm)
mg/L - Milligrams per Liter
mg/m^3 - Milligrams per cubic Meter
mt – Metric Tonnes
MW – Megawatt
pg/g – Picogram per Gram (0.001ppb)
ppb - Parts Per Billion
ppm - Parts Per Million (1,000 ppb)

1 Introduction

An amendment was issued for permit 8808 on 18 September 2019 to Atlantic Power Preferred Equity Ltd located at 4455 Mackenzie Ave N, Williams Lake, B.C., V2G 4R7. The revised permit calls for an Annual Report outlined in Section 3.6 of the Permit [1].

Jacob Steyl P.Eng, Maintenance Manager and Chris Turner, Controls Specialist, were responsible for collecting data and compiling this report. A. Lanfranco & Associates Inc. and Bureau Veritas conducted discrete monitoring outlined in sections 3.1.2 Schedule A and 3.1.3 Schedule D of the Permit [1].

The reporting window for this Report is 00:00 on 1 January 2022 to 00:00 1 January 2023. The Plant was curtailed for an extended period during the year, as show in Figure 1-1 and Table 2-1.

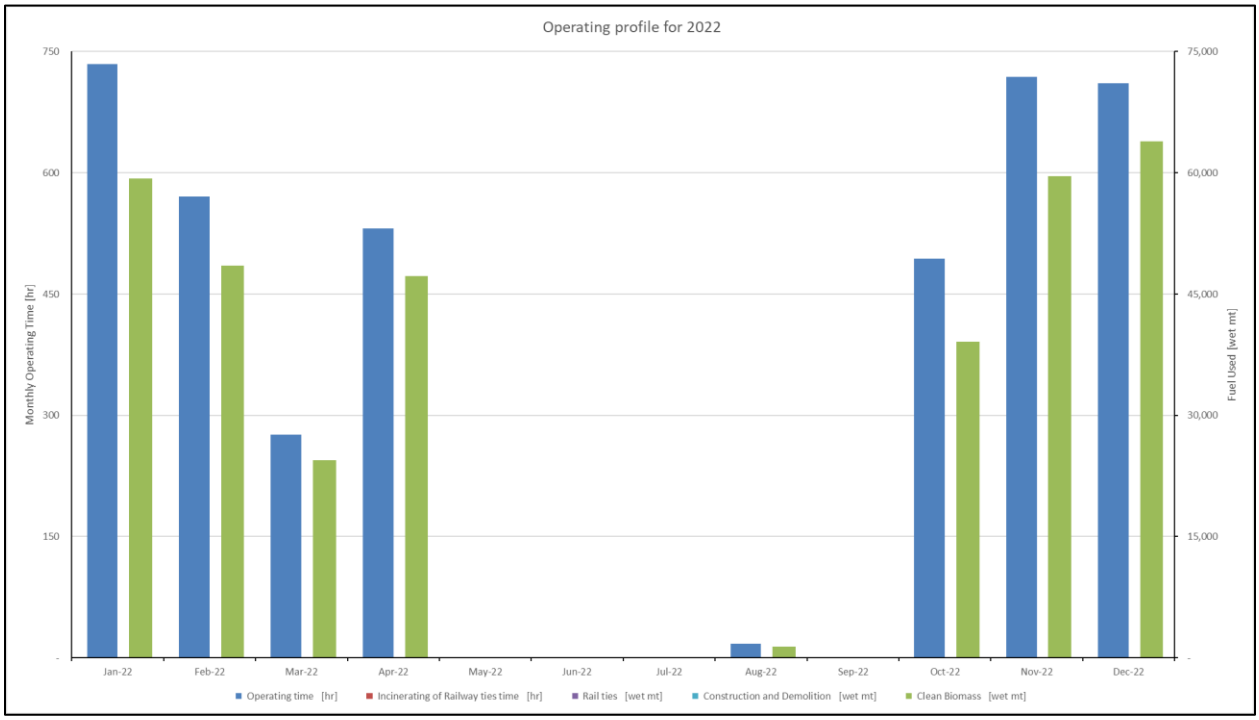

Figure 1-1: Normal Operating time for 2022

As no rail tie material was used as feedstock during the reporting period – Test Regimes Schedule A and D apply.

Corrective and preventative maintenance, as well as calibrations, were performed on the Air Emissions Controls and Continuous Emissions Monitoring System (CEMS) equipment of the Authorized Works during the reporting period.

2 Monthly Operating Hours

Figure 1-1 and Table 2-1 shows the operating time for each month.

Table 2-1: Operating hours per month

	Operating time[1] *hr*	**Incinerating of Railway ties time[2]** *hr*
Jan-2022	734	-
Feb-2022	571	-
Mar-2022	276	-
Apr-2022	531	-
May-2022	-	-
Jun-2022	-	-
Jul-2022	-	-
Aug-2022	18	-
Sep-2022	-	-
Oct-2022	494	-
Nov-2022	718	-
Dec-2022	711	-
2022 Totals	**4,053**	**0**

3 Fuel

The fuel usage for the reporting period is shown in Figure 1-1 and Table 3-1.

Table 3-1: Monthly and Annual Amounts of Fuel

	Rail ties *wet mt*	**Construction and Demolition** *wet mt*	**Clean Biomass** *wet mt*
Jan-2022	0	0	59,327
Feb-2022	0	0	48,487
Mar-2022	0	0	24,442
Apr-2022	0	0	47,238
May-2022	0	0	-
Jun-2022	0	0	-
Jul-2022	0	0	-
Aug-2022	0	0	1,379
Sep-2022	0	0	-
Oct-2022	0	0	39,094
Nov-2022	0	0	59,556
Dec-2022	0	0	63,931
2022 Totals	**0**	**0**	**343,453**

[1] Operating time for Figure 1-1 and Table 2-1 is taken as combusting-biomass and breaker-closed time
[2] Number of hours incinerating rail ties or greater than 1% construction and demolition waste

4 Continuous Emissions Monitoring

4.1 Sulphur Oxides

No rail ties or greater than 1% C&D waste was used as feedstock during the reporting period, therefore no monitoring for Sulphur Oxides was required or conducted.

4.2 Nitrogen Oxides

The maximum hourly Nitrogen Oxides (NO_x) as Nitrogen Dioxide (NO_2) per month and average for the month at 8% O_2 is show Table 4-1. The Permitted hourly average is 320 mg/m³ at 8% O_2 [1].

Table 4-1: Maximum hourly NO_x as NO_2 per month and average for the Month

	Maximum Hourly Average *mg/m³*	**Monthly Average** *mg/m³*
Jan-2022	300	254
Feb-2022	279	238
Mar-2022	281	239
Apr-2022	286	233
May-2022	-	-
Jun-2022	-	-
Jul-2022	-	-
Aug-2022	263	249
Sep-2022	-	-
Oct-2022	271	229
Nov-2022	266	230
Dec-2022	250	221

The average NO_x emissions for the year was 235 mg/m³ at 8% O_2. The maximum hourly average for the year is 300 mg/m³ at 8%O_2.

4.3 Hydrochloric Acid

No rail ties or greater than 1% C&D waste were used as feedstock during the reporting period, therefore no monitoring for Hydrochloric Acid was required or conducted.

4.4 Combustion Temperature

No rail ties or greater than 1% C&D waste were used as feedstock during the reporting period, therefore no monitoring of Combustion Temperature was required or conducted.

5 Discrete Monitoring

5.1 Air Emissions Stack Test

No rail ties or greater than 1% C&D waste were used as feedstock during the reporting period: Only Schedule A applies.

The permitted levels under Schedule A [1] is stated in Table 5-1.

A. Lanfranco & Associates Inc was retained to perform an Emission Compliance Survey and Monitoring Report, as per Schedule A of the Permit. The Triplicate test average results for the listed parameters for the Main Stack on October 12, 2022 are summarised in Table 5-1. The complete report can be found in Appendix A – Stack Particulate Test.

Table 5-1: Schedule A Discrete Monitoring Results

Parameter	Test Average	Permit Limits
Rate of Discharge (m^3/s)	97.7	110
Particulate (mg/m^3 @ 8% O_2)	1.9	20

Both parameters measure is below permitted levels.

The average steam flow during the Stack Test on October 12 was 579 klb/hr (73.0 kg/s). This meets the Operating Conditions requirements stipulated in section 3.3 of the Permit.

5.2 Ash Testing

No rail ties or greater than 1% C&D waste were used as feedstock during the reporting period: Only Schedule D applies.

The permitted levels as per Schedule D [1] is stated in Table 5-2.

Bureau Veritas was commissioned to perform ash analysis on a single ash sample collected before ash conditioning during normal operation. The results from the test is summarised in Table 5-2. The complete reports can be found in Appendix B - Ash Analysis Report.

Table 5-2: Schedule D Discrete Monitoring Results

Parameter	**Average**	**Permitted Limits** [2]
Arsenic (mg/L)	<0.1	2.5
Barium (mg/L)	2.00	100
Boron (mg/L)	1.41	500
Cadmium (mg/L)	<0.1	0.5
Chromium (mg/L)	<0.1	5
Copper (mg/L)	<0.1	100
Lead (mg/L)	<0.1	5
Mercury (mg/L)	<0.0020	0.1
Selenium (mg/L)	<0.1	1
Silver (mg/L)	<0.01	5
Uranium (mg/L)	<0.1	10
Zinc (mg/L)	<0.1	500
Dioxin/Furan TEQ (ppb)	0.182	100
Polycyclic Aromatic Hydrocarbon TEQ (ppm)	0.065	100

Parameter values marked with a less-than sign (<) are below the Reportable Detection Limit.

All the parameters measured were well below the values stipulated in the Hazardous Waste Regulation [2].

The average steam flow when the Ash Test sample was collected on October 12, 2022 was 579 klb/hr (73.0 kg/s). This meets the Operating Conditions requirements stipulated in section 3.3 of the Permit.

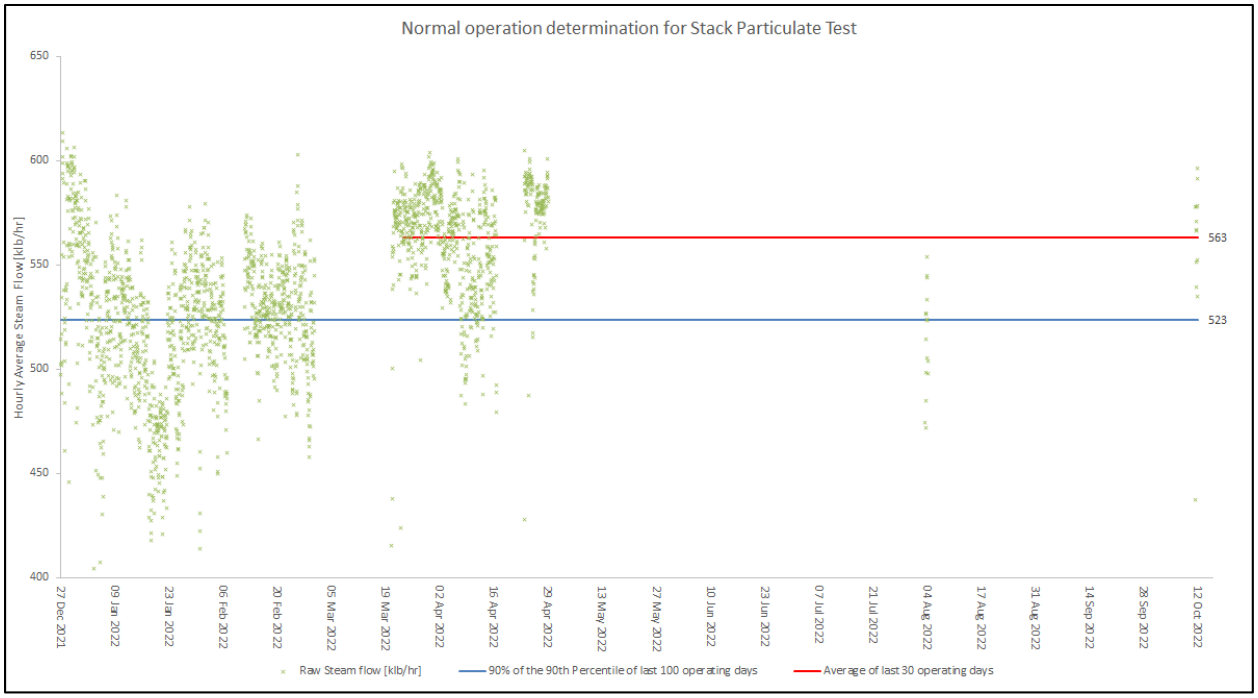

Figure 5-1: Hourly Average Steam Production data for October 12, 2022 Discrete Testing

6 Exceedances

No exceedances were recorded under normal operating conditions during the reporting period.

7 References

[1] Ministry of Environment, "Permit 8808 Amended 18 September 2019," Enviroment Canada, Williams Lake, 2016.

[2] Ministry of Attorney General, Hazardous Waste Regulation BC Reg 63/88, Victoria: Queens Printer, 1988.

Appendices

Appendix A – Stack Particulate Test

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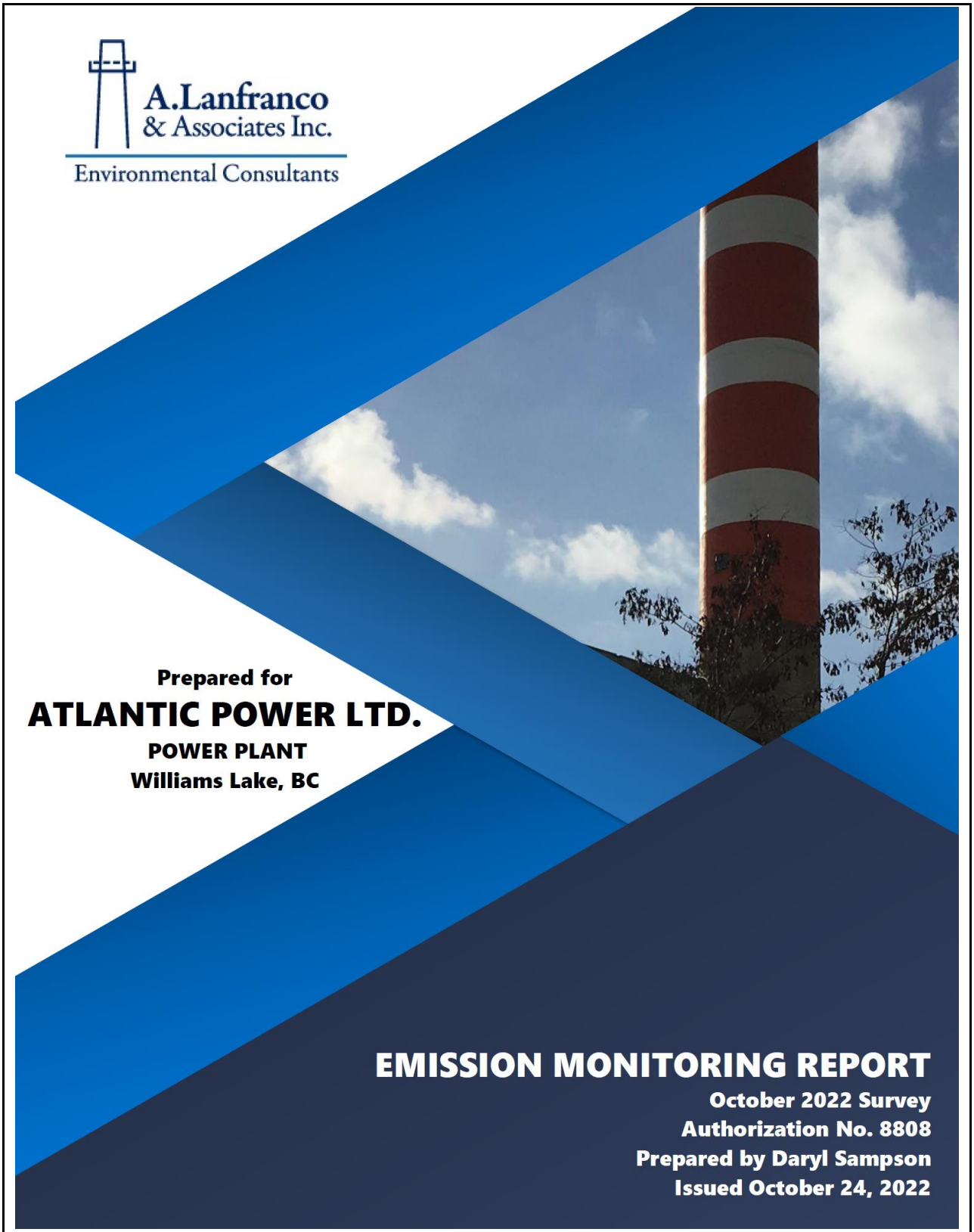

Prepared for

ATLANTIC POWER LTD.

POWER PLANT

Williams Lake, BC

EMISSION MONITORING REPORT

October 2022 Survey

Authorization No. 8808

Prepared by Daryl Sampson

Issued October 24, 2022

A. Lanfranco & Associates Inc.
Environmental Consultants

CERTIFICATION

The field monitoring for this survey was conducted by certified stack test technicians as required by the British Columbia Ministry of Environment (BC MOE) Field Sampling Manual. The field crew consisted of:

Mr. D. Sampson (certified), Mr. J. Gibbs (certified) and Mr. B. Lester.

The report was prepared by Mr. D. Sampson using reporting principles and guidelines generally acceptable to BC MOE.

The field crew and A. Lanfranco and Associates Inc. certify that the test methods used were BC MOE approved reference methods for the parameters investigated.

Report reviewed by:

Mark Lanfranco, CST
President | Owner

A.Lanfranco & Associates Inc.
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APPENDICES

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SUMMARY

The following table presents the triplicate test average results for the listed parameters for the Biomass fuelled boiler stack on October 12, 2022.

Parameter	Average	Permit Limits
Particulate (mg/Sm^3)	2.2	
Particulate (mg/Sm^3 @ 8% O_2)	1.9	20
Particulate (kg/hr)	0.8	
Flowrate (Sm^3/min)	5860	
Flowrate (Sm^3/sec)	97.7	110
O_2 (vol % dry)	5.5	
CO_2 (vol % dry)	15.2	

All results are at standard conditions of 20 °C and 101.325 kPa (dry)

The 3-run average boiler stack results for total particulate (1.9 mg/Sm^3 @ 8% O_2) is marginally less than the previous result from October 2021 (2.9 mg/Sm^3 @ 8% O_2). The 3-run average flowrate on the boiler stack for this survey is slightly higher than October 2021 (97.7 compared to 93.0 m^3/min) and is below the permitted limit. The variability year to year is not significant and well within the range of outcomes during representative operating conditions.

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1 TEST PROGRAM ORGANIZATION and INTRODUCTION

Plant Testing Coordinator:	Mr. Jacob Steyl Maintenance Manager 4455 Mackenzie Avenue North Williams Lake, B.C. Canada V2G 5E8 Tel: (250) 267-2281 Email: steyl@atlanticpower.com
Project Manager/Sampling Contractor:	Mr. Mark Lanfranco President | Owner A. Lanfranco and Associates Inc. 101-9488 189 St Surrey, B.C. Canada V4N 4W7 Tel: (604) 881-2582 Email: mark.lanfranco@alanfranco.com
Sampling Crew:	Mr. D. Sampson - A. Lanfranco and Associates Inc. Mr. J. Gibbs - A. Lanfranco and Associates Inc. Mr. B. Lester - A. Lanfranco and Associates Inc.

Atlantic Power Corporation commissioned A. Lanfranco & Associates Inc. to conduct an emission survey at their Power Plant in Williams Lake, BC. Emission tests were conducted on a waste-wood fired co-generation power plant authorized by British Columbia Ministry of Environment (BC MOE) Permit PA-8808.

On October 12, 2022, triplicate emission tests were performed for the following parameters:

- particulate concentration and emission rate
- discharge rate (flow rate)
- gas composition (CO_2, O_2 and moisture)

A. Lanfranco and Associates was responsible for the gravimetric analysis for this survey. Justin Ching, the lab manager for ALAA can be reached at 604-881-2582.

This report contains details of the test results and methodologies utilized.

2 PROCESS DESCRIPTION

The process under investigation during this survey is a wood fuelled Boiler (E218415) discharging through a 3.5-meter stack. The process discharges to atmosphere following emission control by multi-clones, and a five-field electrostatic precipitator.

On October 12, 2022 the facility was operating at greater than 90% capacity relative to the previous 100 days. Operational data can be found in Table 3 of the results section.

3 METHODOLOGY

The sampling and analytical methods used throughout this survey conform to the procedures outlined in the BC source testing code and the BC air analytical manual. The following table shows the methodology followed.

Parameter	Reference Method
Sample and Velocity traverse points	EPS 1/RM/8 A Determination of Sampling Site and Traverse Points
Velocity and flowrate	EPS 1/RM/8 B Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Gas molecular weight (O_2/CO_2)	EPA Method 3 Gas Analysis for the Determination of Dry Molecular Weight
Flue gas Moisture	EPS 1/RM/8 D Determination of Moisture Content
Particulate Matter	EPA Method 5 Determination of Particulate Matter Emissions from Stationary Sources

3.1 Sampling Techniques

Sampling of particulate (EPA Method 5) from the Main Stack was conducted using CAE and Apex sampling trains equipped with heated filter assemblies and a heated four-foot probe (Fig. 1). The impinger sections of the sampling trains were charged with de-ionized water for moisture determination. Cyclones were not used as part of the sampling apparatus.

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The stack was checked for cyclonic flow using methods outlined in the source test code. No cyclonic flow condition existed.

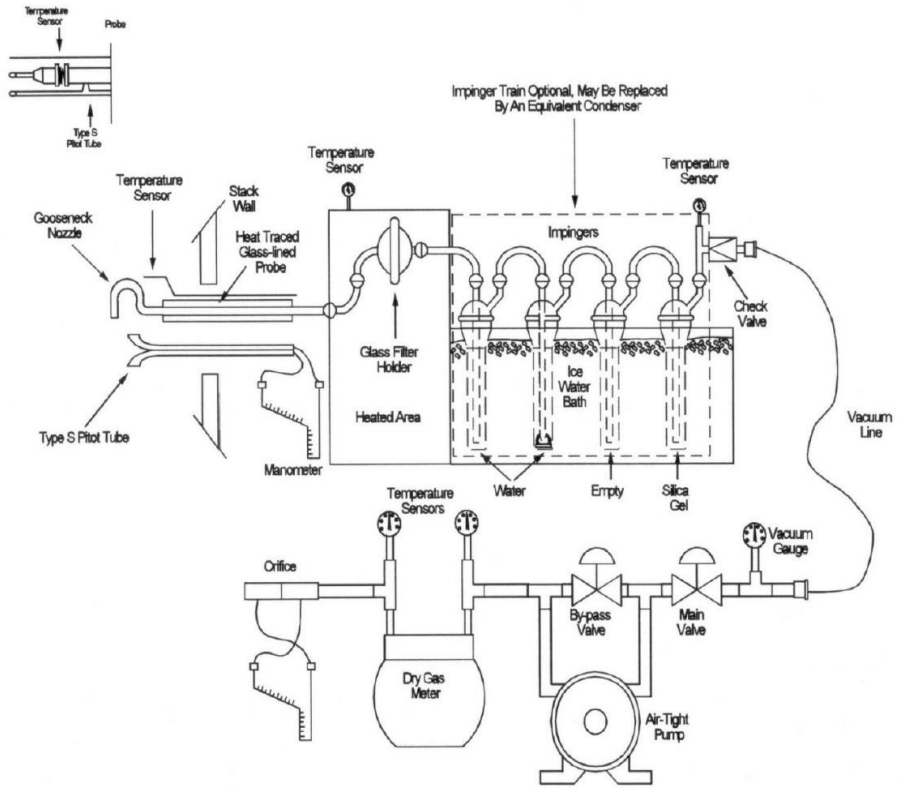

Figure 1: Method 5 Particulate Train

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Sampling Site and Traverse Points — Primary: EPA Method 1

This method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source. A measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. Traverse points are then located within each of these equal areas. At Williams Lake, four traverses of 3 points for a total of 12 points were measured per test.

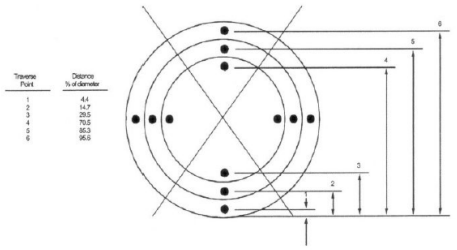

Figure 2. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

Each point (equal area method) was sampled for 5 minutes (figure 4/4a) resulting in final sample volumes of about 1.2 cubic meters.

Stack Gas Velocity and Volumetric Flow Rate — Primary: EPA Method 2

The average gas velocity in a stack or duct is determined from the gas density and from the measurement of velocity pressure with an S-type pitot tube. A standard pitot tube may be used where plugging of the tube openings due to particulate matter and/or moisture is not likely to occur. Stack gas volumetric flow rate is determined from measurements of stack gas velocity, temperature, absolute pressure, dry gas composition, moisture content, and stack diameter.

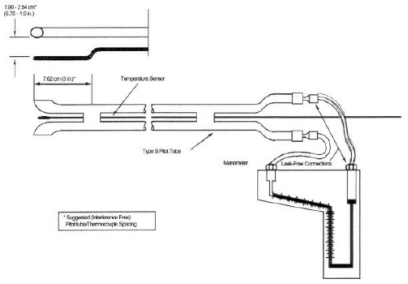

Figure 3. Type S Pitot Tube Manometer Assembly

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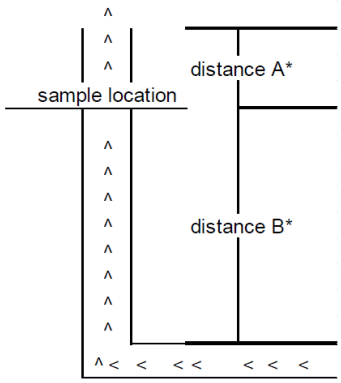
Figure - 4 **Location of Traverse Points in Circular Stacks**

(inches from inside w all to traverse point)

Client Stack I.D.: Atlantic Power

Diameter (inches)	138	
Total Points	12	Diameters Upstream: > 2
# of Ports Used	4	
Points / Traverse	3	Diameters Downstream: > 8

Point	Distance from Wall
1	6.1
2	20.1
3	40.8



* distance A : duct diameters upstream from flow disturbance
* distance B : duct diameters downstream from flow disturbance
< < < < : flow direction

Figure 4a **Location of Traverse Points in Circular Stacks**

(percent of diameter from inside w all to traverse point)

Traverse Point Number on a Diameter	Number of Traverse Points on a Diameter					
	2	4	6	8	10	12
1	14.6%	6.7%	4.4%	3.2%	2.6%	2.1%
2	85.4%	25.0%	14.6%	10.5%	8.2%	6.7%
3		75.0%	29.6%	19.4%	14.6%	11.8%
4		93.3%	70.4%	32.3%	22.6%	17.7%
5			85.4%	67.7%	34.2%	25.0%
6			95.6%	80.6%	65.8%	35.6%
7				89.5%	77.4%	64.4%
8				96.8%	85.4%	75.0%
9					91.8%	82.3%
10					97.4%	88.2%
11						93.3%
12						97.9%

Molecular Weight by Gas Analysis	Primary:	EPA Method 3/3a

An integrated or grab sample is extracted from a single point in the gas stream and analyzed for its components using a Fyrite analyzer, a gas chromatograph, or calibrated continuous analyzers.

Moisture Content	Primary:	EPA Method 4

A gas sample is extracted from a single point in the enclosed gas stream being sampled. The moisture is condensed and its weight measured. This weight, together with the volume of gas sampled, enables the stack gas moisture content to be calculated.

3.2 Analytical Techniques

Gravimetric analysis of the particulate samples was conducted by A. Lanfranco and Associates Inc. at their Surrey laboratory. All filters were conditioned by 105 °C drying, desiccation for 24 hours, and weighing of the particulate.

Probe washings were evaporated to dryness in porcelain dishes, desiccated for 24 hours and weighed. Blanks were carried through all procedures.

4 RESULTS

The results of the particulate and stack parameters were calculated using a computer program consistent with reporting requirements of BC MOE. Standard conditions used were 20 °C and 101.325 kPa (dry). Particulate concentrations were corrected to 8% O_2.

The "actual" flowrates results are volumetric flowrates at stack conditions. Detailed test results are presented in Table 1. Supporting data is presented in Table 2 and the Appendices. Calculations are presented in Appendix 2.

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TABLE 1: MAIN STACK EMISSION RESULTS

Parameter	Test 1	Test 2	Test 3	Average
Test Date	12-Oct-22	12-Oct-22	12-Oct-22	
Test Time	10:50 - 11:53	12:05 - 13:08	13:16 - 14:20	
Duration (minutes)	60	60	60	60
Particulate (mg/Sm^3)	1.0	4.6	0.9	2.2
Particulate (mg/Sm^3 @ 8% O_2)	0.8	4.0	0.7	1.9
Particulate (kg/hr)	0.4	1.6	0.3	0.8
Particulate (kg/day)	8.6	39.1	7.4	18.4
Flowrate (Sm^3/min)	6006	5899	5675	5860
Flowrate (Sm^3/sec)	100.1	98.3	94.6	97.7
Flowrate (Am^3/min)	10856	10607	10349	10604
Temperature (°C)	154	156	160	157
O_2 (vol% dry)	5.3	6.1	5.0	5.5
CO_2 (vol% dry)	15.3	14.6	15.8	15.2
H_2O (vol%)	16.3	15.5	15.9	15.9
Isokinetic Variation (%)	98.8	100	104	101

All results are at standard conditions of 20 °C and 101.325 kPa (dry)

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TABLE 2: OPERATING CONDITIONS

	Steam Flow 12-Oct-22 (K lbs./hour)	Steam Flow Prev. 100 days (K lbs./hour)	Steam Flow % of Average (%)
Boiler Stack	579	632	91.6

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5 DISCUSSION OF RESULTS

The average particulate result for this survey was 1.9 mg/Sm^3 @ 8% O_2 and is well below the permitted level of 20 mg/Sm^3 @ 8% O_2. The results for particulate matter are quite comparable to previous results from this source. The results do not include condensable particulate matter.

The average flow rate measurement of 97.7 Sm^3/sec was also within the allowable limit of 110.0 Sm^3/sec.

On the test day the weather was warm and dry. Winds were calm. There were no environmental factors which impacted the testing.

There were no technical problems encountered in sample collection or analysis. Samples were collected isokinetically at all points and sampling equipment was operated in a normal steady manner during testing. The test results, therefore, are considered to be an accurate representation of emission characteristics for the process conditions maintained on the test date.

APPENDIX 1

COMPUTER OUTPUTS OF MEASURED AND CALCULATED DATA

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	1 - Particulate
Source:	Main Stack	**Run Time:**	10:50 - 11:53

Particulate Concentration:		**1.0**	**mg/dscm**	0.0004 gr/dscf
		0.5	mg/Acm	0.0002 gr/Acf
		0.8	mg/dscm (@ 8% O2)	0.0004 gr/dscf (@ 8% O2)
Emission Rate:		0.36	Kg/hr	0.789 lb/hr
Sample Gas Volume:		1.1586	dscm	40.915 dscf
Total Sample Time:		60.0	minutes	
Average Isokineticity:		98.8	%	
Flue Gas Characteristics				
	Moisture:	16.29	%	
	Temperature	154.4	°C	310.0 °F
	Flow	6005.9	dscm/min	212099 dscf/min
		100.10	dscm/sec	3535.0 dscf/sec
		10855.8	Acm/min	383372 Acf/min
	Velocity	18.750	m/sec	61.52 f/sec
	Gas Analysis	5.30	% O_2	15.30 % CO_2
		30.660	Mol. Wt (g/gmole) Dry	28.598 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	1 - Particulate
Source:	Main Stack	**Run Time:**	10:50 - 11:53

Control Unit (Y)	1.0207
Nozzle Diameter (in.)	0.2490
Pitot Factor	0.8422
Baro. Press. (in. Hg)	28.88
Static Press. (in. H_2O)	-0.52
Stack Height (ft)	200
Stack Diameter (in.)	138.0
Stack Area (sq.ft.)	103.869
Minutes Per Reading	5.0
Minutes Per Point	5.0
Port Length (inches)	8.0

Gas Analysis (Vol. %):

CO_2	O_2
16.00	4.70
16.20	4.50
14.50	6.00
14.50	6.00
Average = **15.30**	**5.30**

Condensate Collection:

Impinger 1 (grams)	125.0
Impinger 2 (grams)	30.0
Impinger 3 (grams)	5.0
Impinger 4 (grams)	9.1
Total Gain (grams)	**169.1**

Collection:

Filter (grams)	**0.0001**
Washings (grams)	**0.0011**
Impinger (grams)	**0.0000**
Total (grams)	**0.0011**

Traverse	Point	Time (min.)	Dry Gas Meter (ft^3)	Pitot ^P (in. H_2O)	Orifice ^H (in. H_2O)	Dry Gas Temperature Inlet (°F)	Dry Gas Temperature Outlet (°F)	Stack (°F)	Wall Dist. (in.)	Isokin. (%)
		0.0	877.573							
1	1	5.0	881.170	0.820	1.96	76	76	304	6.1	98.9
	2	10.0	884.960	0.920	2.18	75	75	309	20.1	98.9
	3	15.0	888.450	0.780	1.85	76	76	310	40.8	98.7
		0.0	888.450							
2	1	5.0	892.020	0.810	1.93	78	78	310	6.1	98.7
	2	10.0	895.860	0.930	2.22	80	80	310	20.1	98.8
	3	15.0	899.360	0.770	1.84	81	81	311	40.8	98.8
		0.0	899.360							
3	1	5.0	902.210	0.500	1.21	86	86	311	6.1	98.7
	2	10.0	905.380	0.620	1.49	86	86	311	20.1	98.7
	3	15.0	908.770	0.710	1.71	86	86	311	40.8	98.7
		0.0	908.770							
4	1	5.0	912.550	0.880	2.12	86	86	310	6.1	98.9
	2	10.0	916.350	0.890	2.15	87	87	311	20.1	98.7
	3	15.0	920.000	0.820	1.98	87	87	312	40.8	98.8
			Average:	0.788	1.887	82.0	82.0	310.0		98.8

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	2 - Particulate
Source:	Main Stack	**Run Time:**	12:05 - 13:08

Particulate Concentration:	**35.8 mg/dscm**	0.0157	gr/dscf
	19.9 mg/Acm	0.0087	gr/Acf
	31.1 mg/dscm (@ 8% O2)	0.0136	gr/dscf (@ 8% O2)
Emission Rate:	12.69 Kg/hr	27.972	lb/hr
Sample Gas Volume:	1.1520 dscm	40.684	dscf
Total Sample Time:	60.0 minutes		
Average Isokineticity:	100.0 %		

Flue Gas Characteristics

Moisture:	15.50 %		
Temperature	156.2 °C	313.2	°F
Flow	5898.7 dscm/min	208313	dscf/min
	98.31 dscm/sec	3471.9	dscf/sec
	10606.9 Acm/min	374582	Acf/min
Velocity	18.320 m/sec	60.10	f/sec
Gas Analysis	6.05 % O_2	14.58	% CO_2
	30.574 Mol. Wt (g/gmole) Dry	28.624	Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	2 - Particulate
Source:	Main Stack	**Run Time:**	12:05 - 13:08

Control Unit (Y)	1.0207
Nozzle Diameter (in.)	0.2490
Pitot Factor	0.8422
Baro. Press. (in. Hg)	28.88
Static Press. (in. H_2O)	-0.52
Stack Height (ft)	200
Stack Diameter (in.)	138.0
Stack Area (sq.ft.)	103.869
Minutes Per Reading	5.0
Minutes Per Point	5.0
Port Length (inches)	8.0

Gas Analysis (Vol. %):

CO_2	O_2
14.80	6.20
14.50	6.00
14.50	6.00
14.50	6.00
Average = **14.58**	**6.05**

Condensate Collection:

Impinger 1 (grams)	120.0
Impinger 2 (grams)	24.0
Impinger 3 (grams)	6.0
Impinger 4 (grams)	8.6
Total Gain (grams)	**158.6**

Collection:

Filter (grams)	**0.0022**
Washings (grams)	**0.0391**
Impinger (grams)	**0.0000**
Total (grams)	**0.0413**

Traverse	Point	Time (min.)	Dry Gas Meter (ft^3)	Pitot ^P (in. H_2O)	Orifice ^H (in. H_2O)	Dry Gas Temperature Inlet (°F)	Dry Gas Temperature Outlet (°F)	Stack (°F)	Wall Dist. (in.)	Isokin. (%)
		0.0	921.393							
1	1	5.0	925.280	0.880	2.23	92	92	314	6.1	100.0
	2	10.0	929.200	0.890	2.26	93	93	314	20.1	100.1
	3	15.0	933.220	0.920	2.35	97	97	313	40.8	100.2
		0.0	933.220							
2	1	5.0	936.190	0.500	1.28	98	98	313	6.1	99.9
	2	10.0	939.520	0.630	1.62	98	98	313	20.1	99.9
	3	15.0	943.060	0.710	1.82	98	98	313	40.8	100.1
		0.0	943.060							
3	1	5.0	946.850	0.810	2.08	100	100	313	6.1	100.0
	2	10.0	950.900	0.930	2.39	99	99	313	20.1	100.0
	3	15.0	954.560	0.760	1.95	99	99	313	40.8	99.9
		0.0	954.560							
4	1	5.0	957.710	0.560	1.44	99	99	313	6.1	100.0
	2	10.0	961.200	0.690	1.77	99	99	313	20.1	99.9
	3	15.0	964.790	0.730	1.87	99	99	313	40.8	99.9
			Average:	0.751	1.922	97.6	97.6	313.2		100.0

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	3 - Particulate
Source:	Main Stack	**Run Time:**	13:16 - 14:20

Particulate Concentration:		**0.9**	**mg/dscm**	0.0004 gr/dscf
		0.5	mg/Acm	0.0002 gr/Acf
		0.7	mg/dscm (@ 8% O2)	0.0003 gr/dscf (@ 8% O2)
Emission Rate:		0.31	Kg/hr	0.683 lb/hr
Sample Gas Volume:		1.1539	dscm	40.750 dscf
Total Sample Time:		60.0	minutes	
Average Isokineticity:		104.1	%	
Flue Gas Characteristics				
	Moisture:	15.88	%	
	Temperature	160.3	°C	320.6 °F
	Flow	5675.2	dscm/min	200420 dscf/min
		94.59	dscm/sec	3340.3 dscf/sec
		10348.6	Acm/min	365462 Acf/min
	Velocity	17.874	m/sec	58.64 f/sec
	Gas Analysis	5.03	% O_2	15.75 % CO_2
		30.721	Mol. Wt (g/gmole) Dry	28.701 Mol. Wt (g/gmole) Wet

*** Standard Conditions:** Metric: 20 deg C, 101.325 kPa
Imperial: 68 deg F, 29.92 in.Hg

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	12-Oct-22
Jobsite:	Williams Lake, B.C.	**Run:**	3 - Particulate
Source:	Main Stack	**Run Time:**	13:16 - 14:20

Control Unit (Y)	1.0207
Nozzle Diameter (in.)	0.2490
Pitot Factor	0.8422
Baro. Press. (in. Hg)	28.88
Static Press. (in. H_2O)	-0.52
Stack Height (ft)	200
Stack Diameter (in.)	138.0
Stack Area (sq.ft.)	103.869
Minutes Per Reading	5.0
Minutes Per Point	5.0
Port Length (inches)	8.0

Gas Analysis (Vol. %):

CO_2	O_2
15.50	5.50
16.00	4.80
15.50	5.00
16.00	4.80
Average = **15.75**	**5.03**

Condensate Collection:

Impinger 1 (grams)	128.0
Impinger 2 (grams)	22.0
Impinger 3 (grams)	5.0
Impinger 4 (grams)	8.4
Total Gain (grams)	**163.4**

Collection:

Filter (grams)	**0.0001**
Washings (grams)	**0.0010**
Impinger (grams)	**0.0000**
Total (grams)	**0.0010**

Traverse	Point	Time (min.)	Dry Gas Meter (ft^3)	Pitot ^P (in. H_2O)	Orifice ^H (in. H_2O)	Dry Gas Temperature Inlet (°F)	Dry Gas Temperature Outlet (°F)	Stack (°F)	Wall Dist. (in.)	Isokin. (%)
		0.0	965.460							
1	1	5.0	969.480	0.870	2.36	97	97	321	6.1	104.2
	2	10.0	973.530	0.890	2.41	95	95	321	20.1	104.1
	3	15.0	977.670	0.930	2.51	95	95	320	40.8	104.1
		0.0	977.670							
2	1	5.0	980.790	0.530	1.43	93	93	320	6.1	104.0
	2	10.0	984.220	0.640	1.73	93	93	319	20.1	104.1
	3	15.0	987.850	0.720	1.94	93	93	319	40.8	103.9
		0.0	987.850							
3	1	5.0	991.040	0.560	1.50	91	91	321	6.1	103.9
	2	10.0	994.530	0.670	1.80	91	91	321	20.1	104.0
	3	15.0	998.170	0.730	1.96	91	91	321	40.8	104.0
		0.0	998.170							
4	1	5.0	1001.430	0.580	1.56	92	92	321	6.1	104.2
	2	10.0	1004.930	0.670	1.80	92	92	321	20.1	104.1
	3	15.0	1008.563	0.720	1.94	92	92	322	40.8	104.4
			Average:	0.709	1.912	92.9	92.9	320.6		104.1

APPENDIX 2

CALCULATIONS

The following sections show the equations and define the variables that were used for this survey. The equations are organized in three sections. Equations 1-12 were used to calculate particulate concentration at standard conditions on a dry basis. Equations 13-27 were used to sample within the 100 ± 10% isokinetic variation and to confirm that sampling meets this isokinetic variation threshold. Equations 28-30 were used to calculate the volumetric flowrate of the stack flue gas.

A2.1 Contaminant Concentration Calculations

$$c = \frac{m}{V_{std}} \quad \textbf{Equation 1}$$

$$m_{part} = m_{filter} + m_{pw} \quad \textbf{Equation 2}$$

$$m_i = m_{ana,i} - m_{blank} \quad \textbf{Equation 3}$$

$$V_{std} = \frac{V_{std(imp)}}{35.315} \quad \textbf{Equation 4}$$

$$V_{std(imp)} = \frac{V_{samp} \times y \times P_m \times (T_{std} + 459.67)}{P_{std} \times (T_{m(ave)} + 459.67)} \quad \textbf{Equation 5}$$

$$V_{samp} = V_{final} - V_{init} \quad \textbf{Equation 6}$$

$$P_m = P_B + \frac{\Delta H_{ave}}{13.6} \quad \textbf{Equation 7}$$

$$\Delta H_{ave} = \frac{1}{n}\sum_{i=1}^{n} \Delta H_{i(act)}, where\ n = the\ number\ of\ points \quad \textbf{Equation 8}$$

$$OC = \frac{20.9 - \%O_{2c}}{20.9 - \%O_{2m}} \quad \textbf{Equation 9}$$

$$CO2C = \frac{\%CO_{2c}}{\%CO_{2m}} \quad \textbf{Equation 10}$$

$$\%O_{2m} = \frac{1}{n}\sum_{i=1}^{n} \%O_{2i}, where\ n = the\ number\ of\ O_2\ measurements \quad \textbf{Equation 11}$$

$$\%CO_{2m} = \frac{1}{n}\sum_{i=1}^{n} \%CO_{2i}, where\ n = the\ number\ of\ CO_2\ measurements \quad \textbf{Equation 12}$$

Where,

c	= Contaminant concentration
m	= Contaminant mass
m_i	= Net analytical mass (mg, ng, or µg)
$m_{ana,i}$	= Analytical mass (mg, ng, or µg)
m_{blank}	= Blank analytical mass (mg, ng, or µg)
m_{part}	= Total particulate mass (mg)
m_{filter}	= Net particulate gain from filter (mg)
m_{pw}	= Net particulate gain from probe wash (mg)
$V_{std(imp)}$	= Sample volume at standard conditions (ft^3)
V_{std}	= Sample volume at standard conditions (m^3)
V_{samp}	= Sample volume at actual conditions (ft^3)
V_{final}	= Final gas meter reading (ft^3)
V_{init}	= Initial gas meter reading (ft^3)
T_{std}	= Standard temperature (68 °F)
T_m	= Gas meter temperature (°F)
$T_{m(ave)}$	= Average gas meter temperature (°F)
P_m	= Absolute meter pressure (inches of Hg)
P_B	= Barometric pressure (inches of Hg)
ΔH_{ave}	= Average of individual point orifice pressures (inches of H_2O)
$\Delta H_{i(act)}$	= Individual recorded point orifice pressures (inches of H_2O)
OC	= Oxygen correction factor (dimensionless)
$CO2C$	= Carbon dioxide correction factor (dimensionless)
$\%O_{2c}$	= Oxygen concentration to correct to (% dry basis)
$\%O_{2m}$	= Average measured stack gas oxygen concentration (% dry basis)
$\%CO_{2c}$	= Carbon dioxide concentration to correct to (% dry basis)
$\%CO_{2m}$	= Average measured stack gas oxygen concentration (% dry basis)

Equation 1 is the general concentration calculation used for all contaminants. The contaminant mass, m, is the net analytic mass for the given contaminant. For particulate, m is the sum of the mass contributed from probe washing and filter particulate.

A2.2 Isokinetic Variation Calculations

$$\Delta H_i = \frac{2.62 \times 10^7 \times c_p \times A_n \times (1 - B_{wo}) \times M_D \times (T_m + 459.67) \times \Delta p_i}{k_o \times M_w \times (T_{Stk} + 459.67)}$$ **Equation 13**

$$R_m = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{stk_i} + 459.67)}{M_w \times P_B}} \times 60 \times A_n \times \frac{(T_{m_i} + 459.67) \times (1 - B_{wo})}{(T_{stk_i} + 459.67) \times y}$$ **Equation 14**

$$A_n = \pi \left(\frac{d_n}{24}\right)^2$$ **Equation 15**

$$M_w = M_D \times (1 - B_{wo}) + 18 \times B_{wo}$$ **Equation 16**

$$M_D = 0.44 \times \%CO_2 + 0.32 \times \%O_2 + 0.28 \times (100 - \%CO_2 - \%O_2)$$ **Equation 17**

$$T_{Stk} = \frac{1}{n}\sum_{i=1}^{n} T_{Stk_i}, where\ n = the\ number\ of\ points$$ **Equation 18**

$$B_{wo} = \frac{V_{cond}}{V_{cond} + V_{std(imp)}}$$ **Equation 19**

$$V_{cond} = 0.04707 \times V_{gain}$$ **Equation 20**

$$Iso = \frac{1}{n}\sum_{i=1}^{n} Iso_i, where\ n = the\ number\ of\ points$$ **Equation 21**

$$Iso_i = \frac{v_{nzi}}{v_i}$$ **Equation 22**

$$v_i = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{Stk_i} + 459.67)}{(P_{Stk} \times M_W)}}$$ **Equation 23**

$$v_{nzi} = \frac{(V_i - V_{i-1}) \times y \times (T_{Stk_i} + 459.67) \times (P_B + \frac{\Delta H_{i(act)}}{13.6})}{A_n \times t_i \times 60 \times (T_{m(i)} + 459.67) \times P_{stk} \times (1 - B_{wo})}$$ **Equation 24**

$$P_{stk} = P_B + \frac{P_g}{13.6}$$ **Equation 25**

Equation 26

$$v_{stk} = \frac{1}{n}\sum_{i=1}^{n} v_i \text{ , where } n = \text{the number of points}$$

Equation 27

$$v_{nz} = \frac{1}{n}\sum_{i=1}^{n} v_{nzi} \text{ , where } n = \text{the number of points}$$

Where,

A_n	= Nozzle area (ft^2)
d_n	= Diameter of nozzle (inches)
c_p	= Pitot coefficient (dimensionless)
Δp_i	= Individual point differential pressures (inches of H_2O)
T_{Stk}	= Average flue gas temperature (°F), second subscript i, indicates individual point measurements
$\Delta H_{i(act)}$	= Calculated individual point orifice pressures (inches of H_2O)
P_g	= Stack Static pressure (inches of H_2O)
P_{stk}	= Absolute stack pressure (inches of Hg)
M_w	= Wet gas molecular weight (g/gmol)
M_D	= Dry gas molecular weight (g/gmol)
$\%CO_2$	= Stack gas carbon dioxide concentration (% dry basis)
$\%O_2$	= Stack gas oxygen concentration (% dry basis)
B_{wo}	= Stack gas water vapour, proportion by volume
V_{cond}	= Total volume of water vapor collected, corrected to standard conditions (ft^3)
V_{gain}	= Condensate gain of impinger contents (mL)
P_{std}	= Standard pressure (29.92 inches of Hg)
v_{stk}	= Average flue gas velocity (ft/sec)
v_i	= Individual point flue gas velocity (ft/sec)
v_{nz}	= Average velocity at nozzle(ft/sec)
v_{nzi}	= Individual point velocity at nozzle(ft/sec)
Iso_i	= Individual point isokinetic variation (%)
Iso	= Average isokinetic variation (%)
R_m	= Isokinetic sampling rate (ft^3/min)

A2.3 Volumetric Flowrate Calculations

$$Q_S = Q_A \times \frac{(T_{Std} + 459.67)}{(T_{Stk} + 459.67)} \times \frac{P_{Stk}}{P_{Std}}$$ **Equation 28**

$$Q_A = \frac{v_{stk} \times 60 \times A_{stk}}{35.315}$$ **Equation 29**

$$A_{stk} = \pi \left(\frac{d}{24}\right)^2$$ **Equation 30**

Where,

Q_A = *Actual flowrate (Am³/min)*
Q_S = *Flowrate (m³/min) at standard conditions on a dry basis*
A_{stk} = *Area of stack (ft²)*
d = *Diameter of stack (inches)*

APPENDIX 3

FIELD DATA SHEETS

A. Lanfranco and Associates Inc.

CLIENT	Atlantic Power	NOZZLE	.430
SOURCE	Main Stack	DIAMETER, IN.	.2490
PARAMETER / RUN No	partic / R1	PROBE	SA-4
DATE	10-12-2022	Cp	.84122
OPERATOR:	JG + BL	PORT LENGTH	8.0
CONTROL UNIT	2414	STATIC PRESSURE, IN. H2O	-.52
Y	1.0207	STACK DIAMETER	138.0
ΔH@	2.029	STACK HEIGHT	200
BAROMETRIC PRESSURE, IN. Hg	28.88	INITIAL LEAK TEST	.001@15"
ASSUMED MOISTURE, Bw	18%	FINAL LEAK TEST	.001@15"

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	100	225	125
Imp. #2	100	130	30
Imp. #3	0	5	5
Imp. #4	(SG)		
Imp. #5			
Imp. #6			
Upstream Diameters			
Downstream Diameters			

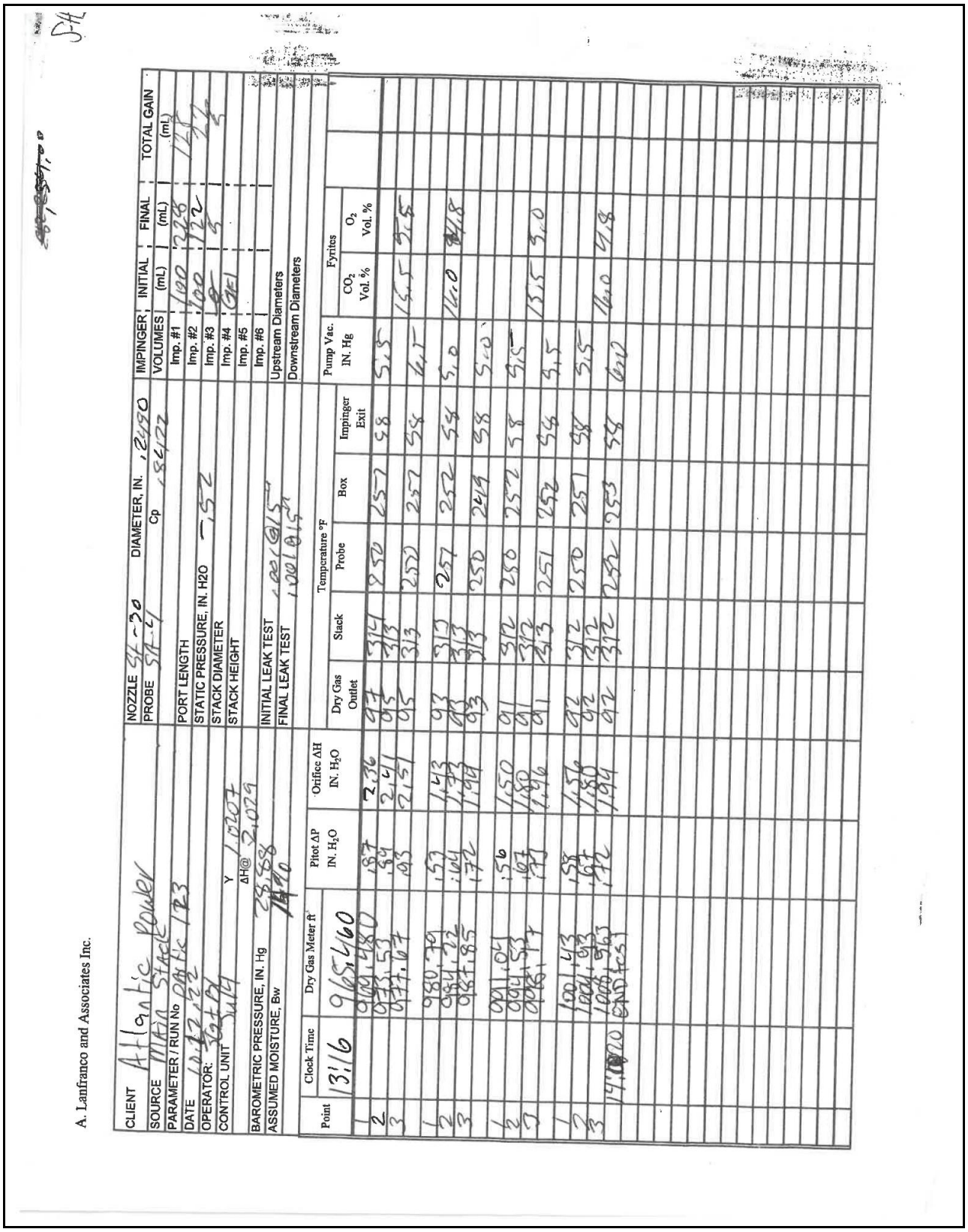
Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	O_2 Vol. %
	10:50	877.573										
1		881.17	.82	1.96	76	304	250	251	59	6.0		
2		884.96	.92	2.18	75	309						
3		888.45	.78	1.85	76	310	251	252	59	6.5	16.0	4.7
1		892.02	.81	1.93	78	310	257	250	59	7.0		
2		895.86	.93	2.22	80	310						
3		899.36	.77	1.84	81	311	252	250	59	7.0	16.2	4.5
1		902.21	.50	1.21	86	311	250	251	59	5.5		
2		905.38	.62	1.49	86	311						
3		908.77	.71	1.71	86	311	257	252	59	5.0	14.5	6.0
1		912.55	.84	2.12	86	310	257	249	59	5.0		
2		916.33	.89	2.15	87	311						
3		920.000	.82	1.98	87	312	251	250	59	5.0	14.5	6.0
	11:53	END test										

SA

A. Lanfranco and Associates Inc.

CLIENT	Atlantic Power			NOZZLE	S1-36	DIAMETER, IN.	.2490	IMPINGER	INITIAL	FINAL	TOTAL GAIN						
SOURCE	Main Stack			PROBE	S1.4	Cp	.8422	VOLUMES	(mL)	(mL)	(mL)						
PARAMETER / RUN No	Particl 1 2 2							Imp. #1	100	220	120						
DATE	10.17.2022			PORT LENGTH		8.0		Imp. #2	100	124	24						
OPERATOR:	SG + BL			STATIC PRESSURE, IN. H2O		-.52		Imp. #3	[illegible]0	6	6						
CONTROL UNIT	Dual	Y	1.[illegible]0207	STACK DIAMETER		138.0		Imp. #4	(GEL)								
		ΔH@	2.029	STACK HEIGHT		200.		Imp. #5									
BAROMETRIC PRESSURE, IN. Hg		28.88						Imp. #6									
ASSUMED MOISTURE, Bw		16%		INITIAL LEAK TEST		.000 @ 15"		Upstream Diameters									
				FINAL LEAK TEST		.000 @ 15"		Downstream Diameters									

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites			
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %		
	12:05	921.393												
1		925.28	.88	2.23	92	314	250	257	97	5.0				
2		929.28	.89	2.36	93	314					14.8	6.2		
3		933.22	.82	2.35	97	313	250	251	59	5.0				
1		936.19	.50	1.24	98	313	250	257	97	4.0				
2		939.52	.63	1.62	98	313					14.5	6.0		
3		943.06	.71	1.82	98	313	251	257	58	5.0				
1		946.85	.81	2.08	100	313	250	250	58	5.0				
2		950.90	.93	2.39	99	317					14.5	6.0		
3		954.56	.76	1.95	99	313	251	250	58	5.5				
1		957.71	.56	1.44	99	313	251	252	57	2.5	14.3	6.0		
2		961.40	.69	1.77	99	313								
3		964.790	.73	1.87	99	313	251	252	57	2.0				
	13:08	END Test												



CLIENT Atlantic Powder
SOURCE Main Stack
PARAMETER / RUN No Particle 123
DATE 12/12/23
OPERATOR: [illegible]
CONTROL UNIT [illegible]
BAROMETRIC PRESSURE, IN. Hg 28.58
ASSUMED MOISTURE, Bw 10%

NOZZLE SF-20 DIAMETER, IN. .2450
PROBE SF-27 Cp .8422
PORT LENGTH
STATIC PRESSURE, IN. H2O -.552
STACK DIAMETER
STACK HEIGHT
Y 1.0207
ΔH@ 2.1029
INITIAL LEAK TEST .022 @ 15"
FINAL LEAK TEST .020 @ 15"

IMPINGER VOLUMES: Imp. #1 100 (mL); Imp. #2 100 (mL); Imp. #3 0 (mL); Imp. #4 Gel (mL); Imp. #5 (mL); Imp. #6 (mL)
INITIAL (mL): 100 100 0 Gel
FINAL (mL): 328 432 4 [illegible]
TOTAL GAIN (mL): 228 332 4 [illegible]
Upstream Diameters
Downstream Diameters

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %	
1	13:16	9/65/60											
2		980.480	.187	2.336	97	314	250	252	58	5.5			
3		983.53	.184	2.261	95	313					16.5	2.5	
		987.67	.103	2.151	95	313	252	257	58	4.5			
1		980.70	.153	1.673	93	313	257	252	54	5.0	14.0	4.8	
2		984.22	.164	1.773	93	313							
3		987.85	.172	1.948	93	313	250	249	58	5.0			
1		991.05	.156	1.650	91	312	250	252	58	5.5	13.5	5.0	
2		994.53	.163	1.780	91	312							
3		998.14	.171	1.896	91	313	251	252	54	4.5			
1		100.43	.158	1.656	92	312	250	251	58	5.5			
2		1004.03	.167	1.780	92	312							
3		1008.963	.172	1.904	92	312	252	253	58	6.0	14.0	4.8	
	14:08:20	END 1013.1											

A. Lanfranco and Associates Inc.

Steam Flow
(klbs / hr)

Minute data	Window	Test 1	Test 2	Test 3
12 Oct 2022 10:00	597	-	-	-
12 Oct 2022 10:01	581	-	-	-
12 Oct 2022 10:02	568	-	-	-
12 Oct 2022 10:03	565	-	-	-
12 Oct 2022 10:04	572	-	-	-
12 Oct 2022 10:05	582	-	-	-
12 Oct 2022 10:06	584	-	-	-
12 Oct 2022 10:07	582	-	-	-
12 Oct 2022 10:08	581	-	-	-
12 Oct 2022 10:09	577	-	-	-
12 Oct 2022 10:10	571	-	-	-
12 Oct 2022 10:11	569	-	-	-
12 Oct 2022 10:12	579	-	-	-
12 Oct 2022 10:13	582	-	-	-
12 Oct 2022 10:14	589	-	-	-
12 Oct 2022 10:15	598	-	-	-
12 Oct 2022 10:16	592	-	-	-
12 Oct 2022 10:17	577	-	-	-
12 Oct 2022 10:18	579	-	-	-
12 Oct 2022 10:19	591	-	-	-
12 Oct 2022 10:20	598	-	-	-
12 Oct 2022 10:21	590	-	-	-
12 Oct 2022 10:22	566	-	-	-
12 Oct 2022 10:23	562	-	-	-
12 Oct 2022 10:24	570	-	-	-
12 Oct 2022 10:25	587	-	-	-
12 Oct 2022 10:26	585	-	-	-
12 Oct 2022 10:27	577	-	-	-
12 Oct 2022 10:28	571	-	-	-
12 Oct 2022 10:29	573	-	-	-
12 Oct 2022 10:30	584	-	-	-
12 Oct 2022 10:31	570	-	-	-
12 Oct 2022 10:32	561	-	-	-
12 Oct 2022 10:33	567	-	-	-
12 Oct 2022 10:34	574	-	-	-
12 Oct 2022 10:35	586	-	-	-
12 Oct 2022 10:36	590	-	-	-
12 Oct 2022 10:37	584	-	-	-
12 Oct 2022 10:38	574	-	-	-
12 Oct 2022 10:39	569	-	-	-
12 Oct 2022 10:40	572	-	-	-
12 Oct 2022 10:41	570	-	-	-
12 Oct 2022 10:42	559	-	-	-
12 Oct 2022 10:43	558	-	-	-
12 Oct 2022 10:44	557	-	-	-
12 Oct 2022 10:45	577	-	-	-
12 Oct 2022 10:46	586	-	-	-
12 Oct 2022 10:47	570	-	-	-
12 Oct 2022 10:48	549	-	-	-
12 Oct 2022 10:49	527	-	-	-
12 Oct 2022 10:50	515	515	-	-
12 Oct 2022 10:51	533	533	-	-
12 Oct 2022 10:52	558	558	-	-
12 Oct 2022 10:53	564	564	-	-
12 Oct 2022 10:54	569	569	-	-
12 Oct 2022 10:55	581	581	-	-
12 Oct 2022 10:56	592	592	-	-
12 Oct 2022 10:57	585	585	-	-
12 Oct 2022 10:58	572	572	-	-
12 Oct 2022 10:59	573	573	-	-
12 Oct 2022 11:00	579	579	-	-
12 Oct 2022 11:01	577	577	-	-
12 Oct 2022 11:02	564	564	-	-
12 Oct 2022 11:03	565	565	-	-
12 Oct 2022 11:04	569	569	-	-
12 Oct 2022 11:05	581	581	-	-
12 Oct 2022 11:06	591	591	-	-
12 Oct 2022 11:07	569	569	-	-
12 Oct 2022 11:08	558	558	-	-
12 Oct 2022 11:09	569	569	-	-
12 Oct 2022 11:10	573	573	-	-

12 Oct 2022 11:11	580	580	-	-
12 Oct 2022 11:12	583	583	-	-
12 Oct 2022 11:13	581	581	-	-
12 Oct 2022 11:14	574	574	-	-
12 Oct 2022 11:15	573	573	-	-
12 Oct 2022 11:16	581	581	-	-
12 Oct 2022 11:17	571	571	-	-
12 Oct 2022 11:18	554	554	-	-
12 Oct 2022 11:19	560	560	-	-
12 Oct 2022 11:20	573	573	-	-
12 Oct 2022 11:21	583	583	-	-
12 Oct 2022 11:22	576	576	-	-
12 Oct 2022 11:23	565	565	-	-
12 Oct 2022 11:24	557	557	-	-
12 Oct 2022 11:25	561	561	-	-
12 Oct 2022 11:26	579	579	-	-
12 Oct 2022 11:27	567	567	-	-
12 Oct 2022 11:28	550	550	-	-
12 Oct 2022 11:29	549	549	-	-
12 Oct 2022 11:30	543	543	-	-
12 Oct 2022 11:31	535	535	-	-
12 Oct 2022 11:32	541	541	-	-
12 Oct 2022 11:33	544	544	-	-
12 Oct 2022 11:34	540	540	-	-
12 Oct 2022 11:35	548	548	-	-
12 Oct 2022 11:36	554	554	-	-
12 Oct 2022 11:37	558	558	-	-
12 Oct 2022 11:38	555	555	-	-
12 Oct 2022 11:39	555	555	-	-
12 Oct 2022 11:40	554	554	-	-
12 Oct 2022 11:41	547	547	-	-
12 Oct 2022 11:42	556	556	-	-
12 Oct 2022 11:43	558	558	-	-
12 Oct 2022 11:44	561	561	-	-
12 Oct 2022 11:45	571	571	-	-
12 Oct 2022 11:46	565	565	-	-
12 Oct 2022 11:47	552	552	-	-
12 Oct 2022 11:48	534	534	-	-
12 Oct 2022 11:49	524	524	-	-
12 Oct 2022 11:50	529	529	-	-
12 Oct 2022 11:51	553	553	-	-
12 Oct 2022 11:52	573	573	-	-
12 Oct 2022 11:53	573	-	-	-
12 Oct 2022 11:54	546	-	-	-
12 Oct 2022 11:55	526	-	-	-
12 Oct 2022 11:56	529	-	-	-
12 Oct 2022 11:57	558	-	-	-
12 Oct 2022 11:58	576	-	-	-
12 Oct 2022 11:59	579	-	-	-
12 Oct 2022 12:00	578	-	-	-
12 Oct 2022 12:01	575	-	-	-
12 Oct 2022 12:02	573	-	-	-
12 Oct 2022 12:03	562	-	-	-
12 Oct 2022 12:04	556	-	-	-
12 Oct 2022 12:05	577	-	577	-
12 Oct 2022 12:06	596	-	596	-
12 Oct 2022 12:07	612	-	612	-
12 Oct 2022 12:08	607	-	607	-
12 Oct 2022 12:09	583	-	583	-
12 Oct 2022 12:10	573	-	573	-
12 Oct 2022 12:11	580	-	580	-
12 Oct 2022 12:12	581	-	581	-
12 Oct 2022 12:13	572	-	572	-
12 Oct 2022 12:14	545	-	545	-
12 Oct 2022 12:15	538	-	538	-
12 Oct 2022 12:16	553	-	553	-
12 Oct 2022 12:17	571	-	571	-
12 Oct 2022 12:18	590	-	590	-
12 Oct 2022 12:19	595	-	595	-
12 Oct 2022 12:20	582	-	582	-
12 Oct 2022 12:21	579	-	579	-
12 Oct 2022 12:22	587	-	587	-
12 Oct 2022 12:23	605	-	605	-
12 Oct 2022 12:24	608	-	608	-
12 Oct 2022 12:25	593	-	593	-
12 Oct 2022 12:26	589	-	589	-
12 Oct 2022 12:27	592	-	592	-
12 Oct 2022 12:28	599	-	599	-
12 Oct 2022 12:29	601	-	601	-
12 Oct 2022 12:30	600	-	600	-
12 Oct 2022 12:31	606	-	606	-
12 Oct 2022 12:32	605	-	605	-
12 Oct 2022 12:33	609	-	609	-
12 Oct 2022 12:34	611	-	611	-
12 Oct 2022 12:35	601	-	601	-
12 Oct 2022 12:36	587	-	587	-
12 Oct 2022 12:37	593	-	593	-

12 Oct 2022 12:38	607	-	607	-
12 Oct 2022 12:39	612	-	612	-
12 Oct 2022 12:40	609	-	609	-
12 Oct 2022 12:41	605	-	605	-
12 Oct 2022 12:42	610	-	610	-
12 Oct 2022 12:43	614	-	614	-
12 Oct 2022 12:44	612	-	612	-
12 Oct 2022 12:45	599	-	599	-
12 Oct 2022 12:46	592	-	592	-
12 Oct 2022 12:47	600	-	600	-
12 Oct 2022 12:48	605	-	605	-
12 Oct 2022 12:49	611	-	611	-
12 Oct 2022 12:50	608	-	608	-
12 Oct 2022 12:51	599	-	599	-
12 Oct 2022 12:52	581	-	581	-
12 Oct 2022 12:53	571	-	571	-
12 Oct 2022 12:54	588	-	588	-
12 Oct 2022 12:55	586	-	586	-
12 Oct 2022 12:56	578	-	578	-
12 Oct 2022 12:57	589	-	589	-
12 Oct 2022 12:58	596	-	596	-
12 Oct 2022 12:59	603	-	603	-
12 Oct 2022 13:00	609	-	609	-
12 Oct 2022 13:01	610	-	610	-
12 Oct 2022 13:02	602	-	602	-
12 Oct 2022 13:03	583	-	583	-
12 Oct 2022 13:04	574	-	574	-
12 Oct 2022 13:05	574	-	574	-
12 Oct 2022 13:06	569	-	569	-
12 Oct 2022 13:07	577	-	-	-
12 Oct 2022 13:08	570	-	-	-
12 Oct 2022 13:09	531	-	-	-
12 Oct 2022 13:10	521	-	-	-
12 Oct 2022 13:11	541	-	-	-
12 Oct 2022 13:12	569	-	-	-
12 Oct 2022 13:13	586	-	-	-
12 Oct 2022 13:14	602	-	-	-
12 Oct 2022 13:15	613	-	-	-
12 Oct 2022 13:16	610	-	-	610
12 Oct 2022 13:17	601	-	-	601
12 Oct 2022 13:18	587	-	-	587
12 Oct 2022 13:19	571	-	-	571
12 Oct 2022 13:20	568	-	-	568
12 Oct 2022 13:21	559	-	-	559
12 Oct 2022 13:22	563	-	-	563
12 Oct 2022 13:23	573	-	-	573
12 Oct 2022 13:24	583	-	-	583
12 Oct 2022 13:25	589	-	-	589
12 Oct 2022 13:26	566	-	-	566
12 Oct 2022 13:27	560	-	-	560
12 Oct 2022 13:28	568	-	-	568
12 Oct 2022 13:29	585	-	-	585
12 Oct 2022 13:30	610	-	-	610
12 Oct 2022 13:31	615	-	-	615
12 Oct 2022 13:32	609	-	-	609
12 Oct 2022 13:33	596	-	-	596
12 Oct 2022 13:34	591	-	-	591
12 Oct 2022 13:35	594	-	-	594
12 Oct 2022 13:36	572	-	-	572
12 Oct 2022 13:37	543	-	-	543
12 Oct 2022 13:38	554	-	-	554
12 Oct 2022 13:39	582	-	-	582
12 Oct 2022 13:40	599	-	-	599
12 Oct 2022 13:41	586	-	-	586
12 Oct 2022 13:42	562	-	-	562
12 Oct 2022 13:43	556	-	-	556
12 Oct 2022 13:44	565	-	-	565
12 Oct 2022 13:45	579	-	-	579
12 Oct 2022 13:46	586	-	-	586
12 Oct 2022 13:47	587	-	-	587
12 Oct 2022 13:48	591	-	-	591
12 Oct 2022 13:49	590	-	-	590
12 Oct 2022 13:50	597	-	-	597
12 Oct 2022 13:51	602	-	-	602
12 Oct 2022 13:52	583	-	-	583
12 Oct 2022 13:53	577	-	-	577
12 Oct 2022 13:54	590	-	-	590
12 Oct 2022 13:55	598	-	-	598
12 Oct 2022 13:56	605	-	-	605
12 Oct 2022 13:57	593	-	-	593
12 Oct 2022 13:58	580	-	-	580
12 Oct 2022 13:59	569	-	-	569
12 Oct 2022 14:00	574	-	-	574
12 Oct 2022 14:01	595	-	-	595
12 Oct 2022 14:02	587	-	-	587
12 Oct 2022 14:03	577	-	-	577
12 Oct 2022 14:04	573	-	-	573

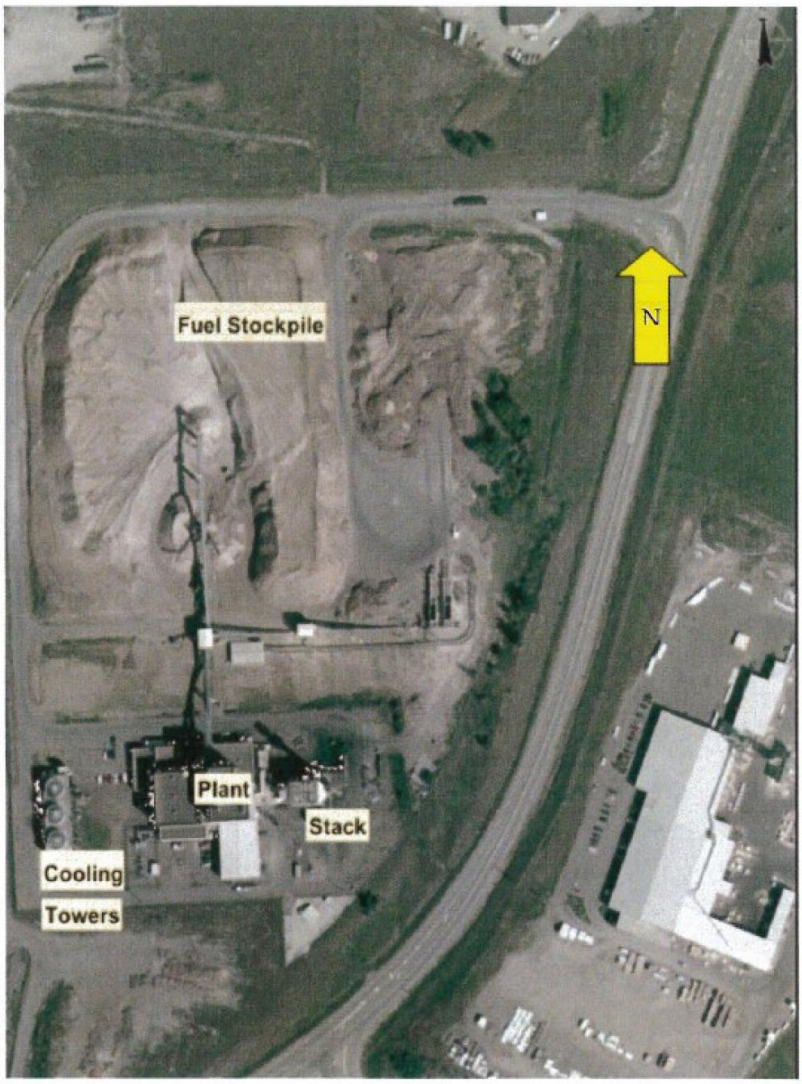
12 Oct 2022 14:05	582	-	-	582
12 Oct 2022 14:06	603	-	-	603
12 Oct 2022 14:07	599	-	-	599
12 Oct 2022 14:08	592	-	-	592
12 Oct 2022 14:09	592	-	-	592
12 Oct 2022 14:10	593	-	-	593
12 Oct 2022 14:11	602	-	-	602
12 Oct 2022 14:12	592	-	-	592
12 Oct 2022 14:13	574	-	-	574
12 Oct 2022 14:14	567	-	-	567
12 Oct 2022 14:15	568	-	-	568
12 Oct 2022 14:16	591	-	-	591
12 Oct 2022 14:17	591	-	-	591
12 Oct 2022 14:18	574	-	-	-
12 Oct 2022 14:19	574	-	-	-
12 Oct 2022 14:20	580	-	-	-
12 Oct 2022 14:21	595	-	-	-
12 Oct 2022 14:22	592	-	-	-
12 Oct 2022 14:23	577	-	-	-
12 Oct 2022 14:24	590	-	-	-
12 Oct 2022 14:25	600	-	-	-
12 Oct 2022 14:26	594	-	-	-
12 Oct 2022 14:27	591	-	-	-
12 Oct 2022 14:28	579	-	-	-
12 Oct 2022 14:29	564	-	-	-
12 Oct 2022 14:30	558	-	-	-
12 Oct 2022 14:31	582	-	-	-
12 Oct 2022 14:32	605	-	-	-
12 Oct 2022 14:33	605	-	-	-
12 Oct 2022 14:34	599	-	-	-
12 Oct 2022 14:35	593	-	-	-
12 Oct 2022 14:36	581	-	-	-
12 Oct 2022 14:37	576	-	-	-
12 Oct 2022 14:38	571	-	-	-
12 Oct 2022 14:39	582	-	-	-
12 Oct 2022 14:40	593	-	-	-
12 Oct 2022 14:41	605	-	-	-
12 Oct 2022 14:42	612	-	-	-
12 Oct 2022 14:43	605	-	-	-
12 Oct 2022 14:44	585	-	-	-
12 Oct 2022 14:45	564	-	-	-
12 Oct 2022 14:46	567	-	-	-
12 Oct 2022 14:47	578	-	-	-
12 Oct 2022 14:48	563	-	-	-
12 Oct 2022 14:49	574	-	-	-
12 Oct 2022 14:50	589	-	-	-
12 Oct 2022 14:51	606	-	-	-
12 Oct 2022 14:52	616	-	-	-
12 Oct 2022 14:53	615	-	-	-
12 Oct 2022 14:54	613	-	-	-
12 Oct 2022 14:55	609	-	-	-
12 Oct 2022 14:56	602	-	-	-
12 Oct 2022 14:57	603	-	-	-
12 Oct 2022 14:58	603	-	-	-
12 Oct 2022 14:59	589	-	-	-
12 Oct 2022 15:00	587	-	-	-

	Average	
Test 1 Avr Steam Flow		561.9102861
		561.9102861
	Average	
Test 2 Avr Steam Flow		592.1782406
		592.1782406
	Average	
Test 3 Avr Steam Flow		583.8004694
		583.8004694
	Average	
90th percentile for 100 days		581.6568813
90% of the 90th percentile		523.4911932
	Average	
Average for 30 days		562.9053403

APPENDIX 4

SITE MAP

SITE PLAN



APPENDIX 5

CALIBRATION DATA AND CERTIFICATIONS

BAROMETER CALIBRATION FORM

Device	Cal Date	Pbar Env Canada (kPa)	Pbar Env Canada (inches of Hg)	Device (inches of Hg) Reading	Device (inches of Hg) Elevation Corrected	Difference (Env Can - Elv Corr)
LA	1-Jul-22	102.1	30.16	30.06	30.13	0.02
DS	1-Jul-22	102.1	30.16	30.04	30.11	0.04
CL	1-Jul-22	102.1	30.16	30.03	30.10	0.05
ML	1-Jul-22	102.1	30.16	30.14	30.21	-0.06
SB	1-Jul-22	102.1	30.16	30.15	30.22	-0.07
SH	1-Jul-22	102.1	30.16	30.15	30.22	-0.07
MG	1-Jul-22	102.1	30.16	30.15	30.22	-0.07
SF	1-Jul-22	102.1	30.16	30.16	30.23	-0.08
JG	1-Jul-22	102.1	30.16	30.12	30.19	-0.04
JC	1-Jul-22	102.1	30.16	30.15	30.22	-0.07
LF	1-Jul-22	102.1	30.16	30.15	30.22	-0.07

Calibrated by: Jeremy Gibbs Signature: Jeremy Gibbs Date: 01-Jul-22

Performance Specification is
Device Corrected for Elevation must be +/- 0.1 " Hg of ENV CANADA SEA-LEVEL Pbar
Enter Environment canada Pressure from their website for Vancouver (link below)
and the reading from your barometer on the ground floor of the office.

https://weather.gc.ca/city/pages/bc-74_metric_e.html

A.Lanfranco & Associates inc.

EPA Method 5
Meter Box Calibration
English Meter Box Units, English K' Factor

Model #: JU 14
Serial #: 0028-030615-1

Date: 18-Aug-22
Barometric Pressure: 29.84 (in. Hg)
Theoretical Critical Vacuum: 14.08 (in. Hg)

!!!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!!

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-					
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)
4.10	15.00	517.634	533.562	15.928	86.0	84.0	94.0	85.0	73	0.8185	14.0	81.0	82.0	81.5
2.10	15.00	485.513	497.025	11.512	84.0	82.0	87.0	82.0	63	0.5956	17.0	73.0	80.0	76.5
1.32	15.00	503.875	512.900	9.025	84.0	83.0	86.0	84.0	55	0.4606	18.0	80.0	81.0	80.5
0.77	15.00	497.025	503.875	6.850	84.0	82.0	85.0	83.0	48	0.3560	20.0	79.0	79.0	79.0
0.37	15.00	512.900	517.634	4.734	86.0	83.0	86.0	84.0	40	0.2408	21.0	79.0	80.0	79.5

********** RESULTS **********

--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------			
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	CALIBRATION FACTOR dH@ Value (mm H2O)	CALIBRATION FACTOR dH@ Variation (in H2O)	Ko (value)
15.475	438.3	15.744	445.9	16.196	1.017	-0.003	2.025	51.42	-0.005	0.678
11.202	317.2	11.510	326.0	11.731	1.027	0.007	1.949	49.51	-0.080	0.684
8.757	248.0	8.868	251.1	9.106	1.013	-0.008	2.058	52.28	0.029	0.675
6.647	188.2	6.864	194.4	7.028	1.033	0.012	2.008	51.00	-0.021	0.671
4.579	129.7	4.640	131.4	4.756	1.014	-0.007	2.107	53.52	0.078	0.668
					Average Y---------->	**1.0207**	**Average dH@----->**	**2.029**	**51.5**	**Average Ko----->** **0.675**

TEMPERATURE CALIBRATION

Calibration Standard -------> Omega Model CL23A S/N:T-218768

Reference Temperature Set-Point (deg F)	Temperature Device Reading (deg F)	Results Variation (degF)	Results Percent of Absolute
32	32	0	0.00%
100	100	0	0.00%
300	300	0	0.00%
500	500	0	0.00%
1000	1000	0	0.00%

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.
For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.
For Temperature Devicee, the reading must be within 1.5% of certified calibration standard (absolute temperature) to be acceptable.

Calibrated by: Liam Forrer Signature:  Date: August 18, 2022

Pitot Tube Calibration

Date: 5-Jul-22
Pbar (in.Hg): 29.91

Temp (R): 539
Dn (in.): 0.25

Pitot ID: **5A-1**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0008
0.170	0.230	27.5	0.8511	0.0026
0.250	0.345	33.4	0.8427	0.0058
0.490	0.665	46.7	0.8498	0.0012
0.710	0.960	56.3	0.8514	0.0028
		Average :	0.8486	0.0026

Pitot ID: **5A-2**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0035
0.095	0.130	20.6	0.8463	0.0050
0.195	0.265	29.5	0.8492	0.0021
0.420	0.560	43.3	0.8574	0.0061
0.710	0.950	56.3	0.8559	0.0045
		Average :	0.8513	0.0042

Pitot ID: **ST 5A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.025	0.035	10.6	0.8367	0.0045
0.120	0.165	23.1	0.8443	0.0031
0.270	0.370	34.7	0.8457	0.0045
0.600	0.830	51.7	0.8417	0.0005
0.730	1.020	57.1	0.8375	0.0037
		Average :	0.8412	0.0033

Pitot ID: **ST 5B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0012
0.125	0.180	23.6	0.8250	0.0216
0.200	0.280	29.9	0.8367	0.0099
0.360	0.500	40.1	0.8400	0.0066
0.680	0.840	55.1	0.8907	0.0441
		Average :	0.8466	0.0167

Pitot ID: **5A-3**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0010
0.145	0.200	25.4	0.8430	0.0038
0.265	0.365	34.4	0.8436	0.0032
0.610	0.840	52.2	0.8436	0.0031
0.710	0.950	56.3	0.8559	0.0091
		Average :	0.8468	0.0041

Pitot ID: **5A4**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0056
0.090	0.125	20.0	0.8400	0.0022
0.155	0.215	26.3	0.8406	0.0016
0.470	0.645	45.8	0.8451	0.0029
0.730	1.020	57.1	0.8375	0.0047
		Average :	0.8422	0.0034

Pitot ID: **5A5**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.035	0.050	12.5	0.8283	0.0042
0.120	0.170	23.1	0.8318	0.0008
0.260	0.365	34.0	0.8356	0.0030
0.560	0.790	50.0	0.8335	0.0010
0.730	1.030	57.1	0.8334	0.0009
		Average :	0.8325	0.0020

Pitot ID:

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
		Average :		

* Average absolute deviation must not exceed 0.01.

Calibrated by: Justin Ching Signature: Justin Ching Date: July 5, 2022

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Mark Lanfranco
Date: July 4, 2022

Signature:

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
ST01	0.1170	0.1160	0.1190	0.0030	0.1173	0.0000751
ST05	0.1670	0.1680	0.1690	0.0020	0.1680	0.0001539
SS-1	0.1710	0.1720	0.1730	0.0020	0.1720	0.0001614
SS-7	0.1700	0.1710	0.1730	0.0030	0.1713	0.0001601
SS-8	0.2070	0.2080	0.2080	0.0010	0.2077	0.0002352
ST10	0.2130	0.2120	0.2130	0.0010	0.2127	0.0002467
SS-18	0.2320	0.2330	0.2340	0.0020	0.2330	0.0002961
ST15	0.2420	0.2420	0.2410	0.0010	0.2417	0.0003185
SS-2	0.2410	0.2420	0.2430	0.0020	0.2420	0.0003194
SS-3	0.2440	0.2440	0.2450	0.0010	0.2443	0.0003256
SS-24	0.2410	0.2420	0.2440	0.0030	0.2423	0.0003203
B	0.2430	0.2440	0.2420	0.0020	0.2430	0.0003221
SS-14	0.2470	0.2480	0.2480	0.0010	0.2477	0.0003346
ST30	0.2480	0.2490	0.2500	0.0020	0.2490	0.0003382
ST20				0.0000		
A	0.2650	0.2610	0.2610	0.0040	0.2623	0.0003753
SS-9	0.2710	0.2720	0.2740	0.0030	0.2723	0.0004045
ST40	0.2840	0.2840	0.2840	0.0000	0.2840	0.0004399
SS-30	0.2980	0.2990	0.2990	0.0010	0.2987	0.0004865
SS-13	0.3010	0.3030	0.3050	0.0040	0.3030	0.0005007
ST60	0.3050	0.3050	0.3050	0.0000	0.3050	0.0005074
ST50	0.3020	0.3060	0.3060	0.0040	0.3047	0.0005063
SS-10	0.3100	0.3100	0.3110	0.0010	0.3103	0.0005253
SS-327	0.3240	0.3250	0.3240	0.0010	0.3243	0.0005737
ST65	0.3350	0.3340	0.3360	0.0020	0.3350	0.0006121
ST66				0.0000		
ST80	0.3630	0.3670	0.3630	0.0040	0.3643	0.0007240
ST75	0.3670	0.3690	0.3660	0.0030	0.3673	0.0007359
SS-5	0.3650	0.3670	0.3660	0.0020	0.3660	0.0007306
SS-16	0.3730	0.3730	0.3730	0.0000	0.3730	0.0007588
ST76	0.3750	0.3730	0.3770	0.0040	0.3750	0.0007670
ST85	0.3980	0.3990	0.3980	0.0010	0.3983	0.0008654
SS-15				0.0000		
DD	0.4100	0.4060	0.4070	0.0040	0.4077	0.0009064
ST70	0.4150	0.4190	0.4190	0.0040	0.4177	0.0009515
SS-11	0.4170	0.4180	0.4190	0.0020	0.4180	0.0009530
ST86	0.4560	0.4540	0.4520	0.0040	0.4540	0.0011242
C	0.4850	0.4880	0.4890	0.0040	0.4873	0.0012953
SS-491	0.4990	0.4950	0.4990	0.0040	0.4977	0.0013508
SS-49	0.4940	0.4950	0.4960	0.0020	0.4950	0.0013364
SS-6	0.4890	0.4900	0.4920	0.0030	0.4903	0.0013113
SS-492	0.4900	0.4910	0.4920	0.0020	0.4910	0.0013149
ST90	0.4990	0.4980	0.4950	0.0040	0.4973	0.0013490
ST92	0.5130	0.5100	0.5140	0.0040	0.5123	0.0014316
SS-558	0.5540	0.5560	0.5570	0.0030	0.5557	0.0016841
ST96	0.5570	0.5590	0.5600	0.0030	0.5587	0.0017023
SS-635	0.6360	0.6380	0.6390	0.0030	0.6377	0.0022178
SS-12	0.7420	0.7430	0.7450	0.0030	0.7433	0.0030137
ST11				0.0000		

Where:

(a) D1, D2, D3 = three different nozzle diameters; each diameter must be measured to within (0.025mm) 0.001 in.

(b) Difference = maximum difference between any two diameters; must be less than or equal to (0.1mm) 0.004 in.

(c) Average = average of D1, D2 and D3

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

A qualified professional [1] providing services to either the Ministry of Environment and Climate Change Strategy ("ministry"), or to a regulated person for the purpose of obtaining an authorization from the ministry, or pursuant to a requirement imposed under the *Environmental Management Act,* the *Integrated Pest Management Act* or the *Park Act* has a real or perceived conflict of interest when the qualified professional, or their relatives, close associates or personal friends have a financial or other interest in the outcome of the work being performed.

A real or perceived conflict of interest occurs when a qualified professional has

a) an ownership interest in the regulated person's business;

b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);

c) a personal or professional interest in a specific outcome;

d) the promise of a long term or ongoing business relationship with the regulated person, that is contingent upon a specific outcome of work;

e) a spouse or other family member who will benefit from a specific outcome; or

f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who work under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

Declaration

I Daryl Sampson, as a member of Air and Waste Management Association declare

Select one of the following:

☒ Absence from conflict of interest

Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this project. I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to Mr. Sajid Barlas, erring on the side of caution.

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.

In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:

Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.

This conflict of interest disclosure statement is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Signature:

X Daryl Sampson

Print name: Daryl Sampson

Witnessed by:

X

Print name: Mark Lanfranco

Date: Dec.18, 2020

[1]*Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

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A real or perceived conflict of interest occurs when a qualified professional has

a) an ownership interest in the regulated person's business;

b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);

c) a personal or professional interest in a specific outcome;

d) the promise of a long term or ongoing business relationship with the regulated person, that is contingent upon a specific outcome of work;

e) a spouse or other family member who will benefit from a specific outcome; or

f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who work under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

Declaration

I Mark Lanfranco, as a member of Air and Waste Management Association declare

Select one of the following:

☒ Absence from conflict of interest

Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this project. I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to Mr. Sajid Barlas, erring on the side of caution.

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.

In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:

_____

_____

_____

Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.

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Signature:

X _____

Print name: Mark Lanfranco

Witnessed by:

X _____

Print name: Carter Lanfranco

Date: Dec. 16, 2020

[1]*Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional Daryl Sampson

   Title Senior Environmental Technician/Project Manager

2. Are you a registered member of a professional association in B.C.? ☐ Yes ☒ No

   Name of Association: _____ Registration # _____

3. Brief description of professional services:

   Environmental consulting, specializing in air and atmospheric sciences

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature: Witnessed by:

x Daryl Sampson x

Print Name: Daryl Sampson Print Name: Louis Agassiz

Date signed: November 23, 2020

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) *is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and*

b) *through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.*

July 2019

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals[1], under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

1. Name of Qualified Professional: Mark Lanfranco

   Title: President | Owner

2. Are you a registered member of a professional association in B.C.? ☐ Yes ☒ No

   Name of Association: _____ Registration # _____

3. Brief description of professional services:
   Environmental consulting, specializing in air and atmospheric sciences

This declaration of competency is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Strategy Headquarters Office at 1-800-663-7867.

Declaration

I am a qualified professional with the knowledge, skills and experience to provide expert information, advice and/or recommendations in relation to the specific work described above.

Signature: Witnessed by:

X _____ X _____

Print Name: Mark Lanfranco Print Name: Melissa Watkins

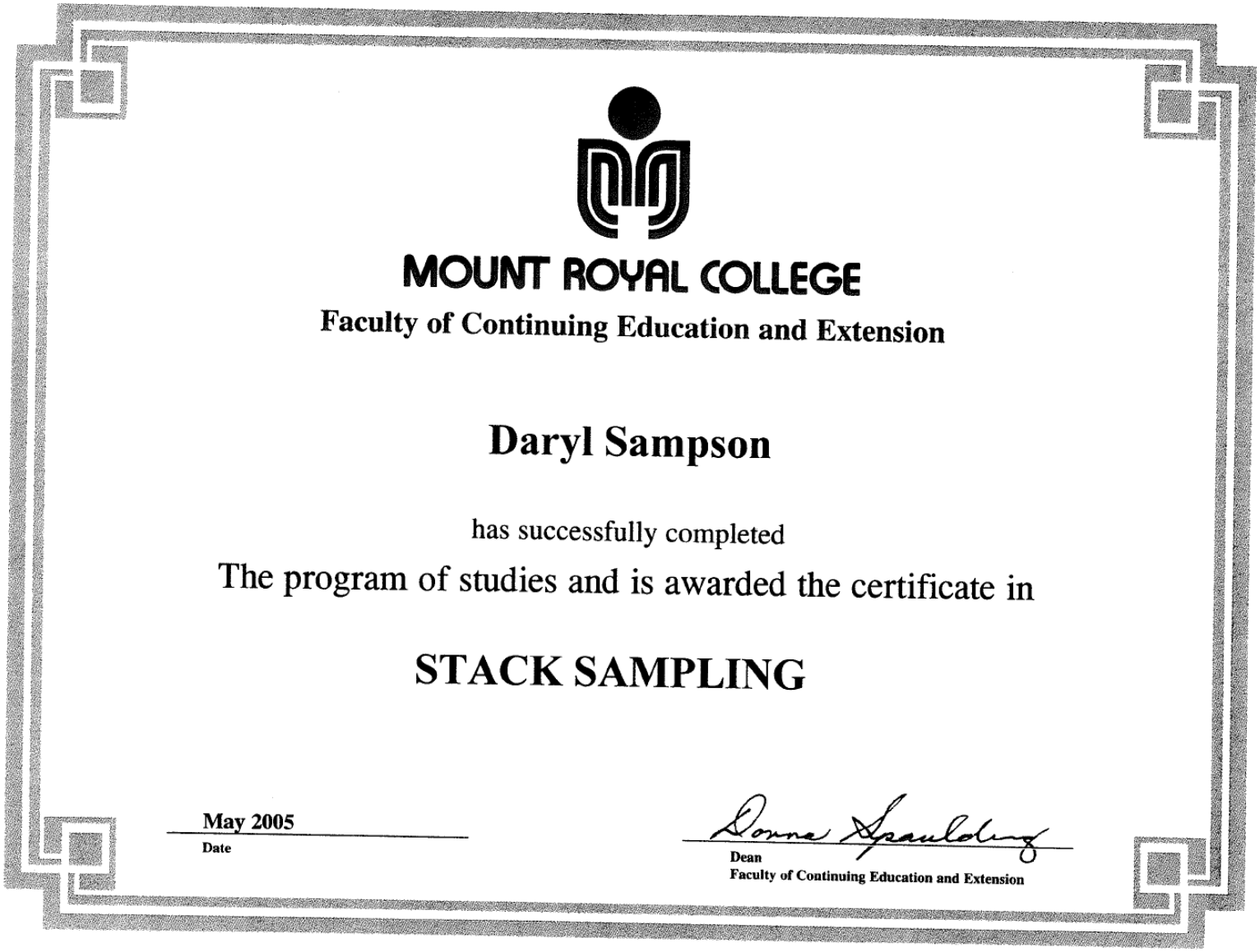
Date signed: Nov.16, 2020

[1] *Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who*

a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and

b) through suitable education, experience, accreditation and knowledge, may reasonably be relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.

July 2019



MOUNT ROYAL COLLEGE

Faculty of Continuing Education and Extension

Daryl Sampson

has successfully completed

The program of studies and is awarded the certificate in

STACK SAMPLING

May 2005
Date

Donna Spaulding
Dean
Faculty of Continuing Education and Extension

Canadian Association for Laboratory Accreditation Inc.

CALA

Certificate of Accreditation

A. Lanfranco and Associates Inc.
101 - 9488 - 189th Street
Surrey, British Columbia

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Accreditation No.: A4232
Issued On: February 5, 2021
Accreditation Date: February 5, 2021
Expiry Date: August 6, 2023

Andrew M. Adams
President & CEO

ILAC-MRA CALA

Appendix B - Ash Analysis Report

Your Project #: ANNUAL ASH SAMPLE
Your C.O.C. #: 678259-01-01

Attention: Jacob Steyl

ATLANTIC POWER (WILLIAMS LAKE) LTD.
4465 MACKENZIE AVENUE NORTH
WILLIAMS LAKE, BC
CANADA V2G 5E8

Report Date: 2022/11/16
Report #: R3264859
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C281011
Received: 2022/10/17, 08:40

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals - TCLP	1	2022/10/20	2022/10/20	BBY7SOP-00001	EPA 1311, 6020bR2 m
Moisture	1	2022/10/18	2022/10/19	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	1	2022/10/20	2022/10/24	BBY8SOP-00022	BCMOE BCLM Jul2017m
PAH TEQ Calculation, BC Reg. 132/92 (2)	1	N/A	2022/10/24	BBY WI-00033	Auto Calc
Total PAH and B(a)P Calculation (3)	1	N/A	2022/10/24	BBY WI-00033	Auto Calc
TCLP pH Measurements	1	N/A	2022/10/20	BBY7SOP-00005	EPA 1311
Dioxins/Furans in Soil (1613B) (1, 4)	1	2022/10/25	2022/11/03	BRL SOP-00406 (mod)	EPS 1/RM/23 m
2378TCDF Confirmation (M8290A/M1613) (1)	1	2022/10/27	2022/11/10	BRL SOP-00406	EPA M8290A / M1613

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Campobello, 6740 Campobello Road , Mississauga, ON, L5N 2L8
(2) PAH TEQ = 0.1*benzo(a)anthracene + 1.0*benzo(a)pyrene + 0.1*benzo(b)fluoranthene + 0.1*benzo(k)fluoranthene + 1.1*dibenzo(a,h)anthracene + 0.2*indeno(1,2,3-cd)pyrene
(3) Total PAHs in Soil include: Quinoline, Naphthalene, 1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Acridine, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b&j)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene,

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: ANNUAL ASH SAMPLE
Your C.O.C. #: 678259-01-01

Attention: Jacob Steyl

ATLANTIC POWER (WILLIAMS LAKE) LTD.
4465 MACKENZIE AVENUE NORTH
WILLIAMS LAKE, BC
CANADA V2G 5E8

Report Date: 2022/11/16
Report #: R3264859
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C281011
Received: 2022/10/17, 08:40

and Benzo(g,h,i)perylene.

Total PAHs in Sediment include (B.C. Reg. 116/2018, Schedule 3.4): Naphthalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenz(a,h)anthracene.
(4) Soils are reported on a dry weight basis unless otherwise specified.

Confirmatory runs for 2,3,7,8-TCDF are performed only if the primary result is greater than the RDL.

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
16 Nov 2022 19:14:22

Please direct all questions regarding this Certificate of Analysis to:
Customer Solutions, Western Canada Customer Experience Team
Email: customersolutionswest@bureauveritas.com
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C281011
Report Date: 2022/11/16

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

PHYSICAL TESTING (SOIL)

Bureau Veritas ID		BEO811		
Sampling Date		2022/10/13 14:00		
COC Number		678259-01-01		
	UNITS	AC 11 BEFORE RSU	RDL	QC Batch
Physical Properties				
Moisture	%	0.90	0.30	A762698
RDL = Reportable Detection Limit				

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C281011
Report Date: 2022/11/16

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Bureau Veritas ID		BEO811		
Sampling Date		2022/10/13 14:00		
COC Number		678259-01-01		
	UNITS	AC 11 BEFORE RSU	RDL	QC Batch
Calculated Parameters				
PAH Toxicity Equivalency	mg/kg	0.065	0.050	A760687
RDL = Reportable Detection Limit				

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C281011
Report Date: 2022/11/16

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Bureau Veritas ID		BEO811	
Sampling Date		2022/10/13 14:00	
COC Number		678259-01-01	
	UNITS	AC 11 BEFORE RSU	QC Batch
TCLP Extraction Procedure			
Initial pH of Sample	pH	12.3	A763583
pH after HCl	pH	8.95	A763583
Final pH of Leachate	pH	7.78	A763583
pH of Leaching Fluid	pH	2.87	A763583

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

SUBCONTRACTED ANALYSIS (SOIL)

Bureau Veritas ID		BEO811						
Sampling Date		2022/10/13 14:00						
COC Number		678259-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	AC 11 BEFORE RSU	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
TCDF Confirmation								
Confirmation 2,3,7,8-Tetra CDF **	pg/g	213	0.65	5.0	0.100	21.3		A799553
TOTAL TOXIC EQUIVALENCY	pg/g					21.3		
Surrogate Recovery (%)								
Confirmation C13-2378 TetraCDF **	%	114						A799553

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
** CDF = Chloro Dibenzo-p-Furan

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

DIOXIN AND FURANS BY HRMS (SOIL)

Bureau Veritas ID		BEO811						
Sampling Date		2022/10/13 14:00						
COC Number		678259-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	AC 11 BEFORE RSU	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
DIOXINS								
1,2,3,4,6,7,8-Hepta CDD *	pg/g	22.0	0.604	25.0	0.0100	0.220	1	A799552
1,2,3,4,7,8-Hexa CDD *	pg/g	11.4	0.567	25.0	0.100	1.14	1	A799552
1,2,3,6,7,8-Hexa CDD *	pg/g	11.6	0.532	25.0	0.100	1.16	1	A799552
1,2,3,7,8,9-Hexa CDD *	pg/g	21.0	0.575	25.0	0.100	2.10	1	A799552
1,2,3,7,8-Penta CDD *	pg/g	40.3	0.635	25.0	1.00	40.3	1	A799552
2,3,7,8-Tetra CDD *	pg/g	37.7	0.665	4.99	1.00	37.7	1	A799552
Octa CDD *	pg/g	16.4	0.594	49.9	0.000300	0.00492	1	A799552
Total Hepta CDD *	pg/g	39.8	0.604	25.0			2	A799552
Total Hexa CDD *	pg/g	135	0.557	25.0			7	A799552
Total Penta CDD *	pg/g	315	0.635	25.0			12	A799552
Total Tetra CDD *	pg/g	592	0.665	4.99			15	A799552
FURANS								
1,2,3,4,6,7,8-Hepta CDF **	pg/g	18.5	0.533	25.0	0.0100	0.185	1	A799552
1,2,3,4,7,8,9-Hepta CDF **	pg/g	<2.35 (1)	2.35	25.0	0.0100	0.0235	0	A799552
1,2,3,4,7,8-Hexa CDF **	pg/g	44.2	0.524	25.0	0.100	4.42	1	A799552
1,2,3,6,7,8-Hexa CDF **	pg/g	28.4	0.495	25.0	0.100	2.84	1	A799552
1,2,3,7,8,9-Hexa CDF **	pg/g	4.37	0.651	25.0	0.100	0.437	1	A799552
1,2,3,7,8-Penta CDF **	pg/g	82.5	0.663	25.0	0.0300	2.48	1	A799552
2,3,4,6,7,8-Hexa CDF **	pg/g	21.5	0.476	25.0	0.100	2.15	1	A799552
2,3,4,7,8-Penta CDF **	pg/g	113	0.585	25.0	0.300	33.9	1	A799552

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

* CDD = Chloro Dibenzo-p-Dioxin

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

DIOXIN AND FURANS BY HRMS (SOIL)

Bureau Veritas ID		BEO811						
Sampling Date		2022/10/13 14:00						
COC Number		678259-01-01			TOXIC EQUIVALENCY		# of	
	UNITS	AC 11 BEFORE RSU	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDF **	pg/g	<530 (1)	530	4.99	0.100	53.0	0	A799552
Octa CDF **	pg/g	2.08	0.617	49.9	0.000300	0.000624	1	A799552
Total Hepta CDF **	pg/g	26.1	0.585	25.0			3	A799552
Total Hexa CDF **	pg/g	238	0.530	25.0			13	A799552
Total Penta CDF **	pg/g	1070	0.622	25.0			16	A799552
Total Tetra CDF **	pg/g	3340	0.581	4.99			18	A799552
TOTAL TOXIC EQUIVALENCY	pg/g					182		
Surrogate Recovery (%)								
37CL4 2378 Tetra CDD *	%	114						A799552
C13-1234678 HeptaCDD *	%	130						A799552
C13-1234678 HeptaCDF **	%	113						A799552
C13-123478 HexaCDD *	%	118						A799552
C13-123478 HexaCDF **	%	116						A799552
C13-1234789 HeptaCDF **	%	117						A799552
C13-123678 HexaCDD *	%	113						A799552
C13-123678 HexaCDF **	%	107						A799552
C13-12378 PentaCDD *	%	130						A799552
C13-12378 PentaCDF **	%	109						A799552
C13-123789 HexaCDF **	%	106						A799552
C13-234678 HexaCDF **	%	125						A799552
C13-23478 PentaCDF **	%	114						A799552
C13-2378 TetraCDD *	%	101						A799552
C13-2378 TetraCDF **	%	97						A799552
C13-OCDD *	%	108						A799552

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.

WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds

** CDF = Chloro Dibenzo-p-Furan

* CDD = Chloro Dibenzo-p-Dioxin

(1) RT > 3 seconds - PCDD/DF analysis - Peak detected exceeds expected retention time (from internal standard) by greater than 3 seconds.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

TCLP METALS (SOIL)

Bureau Veritas ID		BEO811		
Sampling Date		2022/10/13 14:00		
COC Number		678259-01-01		
	UNITS	AC 11 BEFORE RSU	RDL	QC Batch
TCLP Extraction Procedure				
Leachate Antimony (Sb)	mg/L	<0.10	0.10	A764957
Leachate Arsenic (As)	mg/L	<0.10	0.10	A764957
Leachate Barium (Ba)	mg/L	2.00	0.10	A764957
Leachate Beryllium (Be)	mg/L	<0.10	0.10	A764957
Leachate Boron (B)	mg/L	1.41	0.10	A764957
Leachate Cadmium (Cd)	mg/L	<0.10	0.10	A764957
Leachate Chromium (Cr)	mg/L	<0.10	0.10	A764957
Leachate Cobalt (Co)	mg/L	<0.10	0.10	A764957
Leachate Copper (Cu)	mg/L	<0.10	0.10	A764957
Leachate Iron (Fe)	mg/L	<0.50	0.50	A764957
Leachate Lead (Pb)	mg/L	<0.10	0.10	A764957
Leachate Mercury (Hg)	mg/L	<0.0020	0.0020	A764957
Leachate Molybdenum (Mo)	mg/L	0.14	0.10	A764957
Leachate Nickel (Ni)	mg/L	<0.10	0.10	A764957
Leachate Selenium (Se)	mg/L	<0.10	0.10	A764957
Leachate Silver (Ag)	mg/L	<0.010	0.010	A764957
Leachate Thallium (Tl)	mg/L	<0.10	0.10	A764957
Leachate Uranium (U)	mg/L	<0.10	0.10	A764957
Leachate Vanadium (V)	mg/L	<0.10	0.10	A764957
Leachate Zinc (Zn)	mg/L	<0.10	0.10	A764957
Leachate Zirconium (Zr)	mg/L	<0.10	0.10	A764957
RDL = Reportable Detection Limit				

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

CSR PAH IN SOIL BY GC-MS (SOIL)

Bureau Veritas ID		BEO811		
Sampling Date		2022/10/13 14:00		
COC Number		678259-01-01		
	UNITS	AC 11 BEFORE RSU	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	mg/kg	<0.12	0.12	A760638
High Molecular Weight PAH`s	mg/kg	<0.12	0.12	A760638
Total PAH	mg/kg	<0.12	0.12	A760638
B[a]P TPE Total Potency Equivalents	mg/kg	0.061	0.010	A760638
Polycyclic Aromatics				
Naphthalene	mg/kg	<0.025 (1)	0.025	A765801
2-Methylnaphthalene	mg/kg	<0.050 (1)	0.050	A765801
Acenaphthylene	mg/kg	<0.012 (1)	0.012	A765801
Acenaphthene	mg/kg	<0.012 (1)	0.012	A765801
Fluorene	mg/kg	<0.050 (1)	0.050	A765801
Phenanthrene	mg/kg	<0.025 (1)	0.025	A765801
Anthracene	mg/kg	<0.010 (1)	0.010	A765801
Fluoranthene	mg/kg	<0.050 (1)	0.050	A765801
Pyrene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(a)anthracene	mg/kg	<0.050 (1)	0.050	A765801
Chrysene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(b&j)fluoranthene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(b)fluoranthene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(k)fluoranthene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(a)pyrene	mg/kg	<0.050 (1)	0.050	A765801
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050 (1)	0.050	A765801
Dibenz(a,h)anthracene	mg/kg	<0.050 (1)	0.050	A765801
Benzo(g,h,i)perylene	mg/kg	<0.12 (1)	0.12	A765801
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	0 (2)		A765801
D8-ACENAPHTHYLENE (sur.)	%	0 (2)		A765801
D8-NAPHTHALENE (sur.)	%	0 (3)		A765801

RDL = Reportable Detection Limit

(1) Detection limits raised based on sample weight or volume used for analysis.

(2) Surrogate recovery belowacceptance criteria due to matrix interference. Re-analysis yields similar results.

(3) Surrogate recovery below acceptance criteria due to matrix interference. Re-analysis yields similar results.

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Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

CSR PAH IN SOIL BY GC-MS (SOIL)

Bureau Veritas ID		BEO811		
Sampling Date		2022/10/13 14:00		
COC Number		678259-01-01		
	UNITS	AC 11 BEFORE RSU	RDL	QC Batch
TERPHENYL-D14 (sur.)	%	0 (1)		A765801

RDL = Reportable Detection Limit
(1) Surrogate recovery belowacceptance criteria due to matrix interference. Re-analysis yields similar results.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
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GENERAL COMMENTS

Results relate only to the items tested.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A762698	IP1	Method Blank	Moisture	2022/10/20	<0.30		%	
A762698	IP1	RPD	Moisture	2022/10/20	0.49		%	20
A763583	NGE	Method Blank	Initial pH of Sample	2022/10/20	4.89		pH	
			Final pH of Leachate	2022/10/20	4.91		pH	
			pH of Leaching Fluid	2022/10/20	4.89		pH	
A763583	NGE	RPD	Initial pH of Sample	2022/10/20	1.5		%	N/A
			pH after HCl	2022/10/20	0.60		%	N/A
			Final pH of Leachate	2022/10/20	0.48		%	N/A
			pH of Leaching Fluid	2022/10/20	0		%	N/A
A764957	LWA	Matrix Spike	Leachate Antimony (Sb)	2022/10/20		99	%	75 - 125
			Leachate Arsenic (As)	2022/10/20		98	%	75 - 125
			Leachate Barium (Ba)	2022/10/20		94	%	75 - 125
			Leachate Beryllium (Be)	2022/10/20		93	%	75 - 125
			Leachate Boron (B)	2022/10/20		94	%	75 - 125
			Leachate Cadmium (Cd)	2022/10/20		96	%	75 - 125
			Leachate Chromium (Cr)	2022/10/20		97	%	75 - 125
			Leachate Cobalt (Co)	2022/10/20		95	%	75 - 125
			Leachate Copper (Cu)	2022/10/20		100	%	75 - 125
			Leachate Iron (Fe)	2022/10/20		98	%	75 - 125
			Leachate Lead (Pb)	2022/10/20		98	%	75 - 125
			Leachate Mercury (Hg)	2022/10/20		97	%	75 - 125
			Leachate Molybdenum (Mo)	2022/10/20		98	%	75 - 125
			Leachate Selenium (Se)	2022/10/20		97	%	75 - 125
			Leachate Silver (Ag)	2022/10/20		94	%	75 - 125
			Leachate Thallium (Tl)	2022/10/20		93	%	75 - 125
			Leachate Uranium (U)	2022/10/20		97	%	75 - 125
			Leachate Vanadium (V)	2022/10/20		97	%	75 - 125
			Leachate Zinc (Zn)	2022/10/20		93	%	75 - 125
			Leachate Zirconium (Zr)	2022/10/20		99	%	75 - 125
A764957	LWA	Spiked Blank	Leachate Antimony (Sb)	2022/10/20		100	%	75 - 125
			Leachate Arsenic (As)	2022/10/20		100	%	75 - 125
			Leachate Barium (Ba)	2022/10/20		95	%	75 - 125
			Leachate Beryllium (Be)	2022/10/20		95	%	75 - 125
			Leachate Boron (B)	2022/10/20		97	%	75 - 125
			Leachate Cadmium (Cd)	2022/10/20		95	%	75 - 125
			Leachate Chromium (Cr)	2022/10/20		96	%	75 - 125
			Leachate Cobalt (Co)	2022/10/20		95	%	75 - 125
			Leachate Copper (Cu)	2022/10/20		94	%	75 - 125
			Leachate Iron (Fe)	2022/10/20		98	%	75 - 125
			Leachate Lead (Pb)	2022/10/20		99	%	75 - 125
			Leachate Mercury (Hg)	2022/10/20		98	%	75 - 125
			Leachate Molybdenum (Mo)	2022/10/20		98	%	75 - 125
			Leachate Nickel (Ni)	2022/10/20		92	%	75 - 125
			Leachate Selenium (Se)	2022/10/20		97	%	75 - 125
			Leachate Silver (Ag)	2022/10/20		94	%	75 - 125
			Leachate Thallium (Tl)	2022/10/20		94	%	75 - 125
			Leachate Uranium (U)	2022/10/20		97	%	75 - 125
			Leachate Vanadium (V)	2022/10/20		96	%	75 - 125
			Leachate Zinc (Zn)	2022/10/20		95	%	75 - 125
			Leachate Zirconium (Zr)	2022/10/20		99	%	75 - 125
A764957	LWA	Method Blank	Leachate Antimony (Sb)	2022/10/20	<0.10		mg/L	
			Leachate Arsenic (As)	2022/10/20	<0.10		mg/L	
			Leachate Barium (Ba)	2022/10/20	<0.10		mg/L	
			Leachate Beryllium (Be)	2022/10/20	<0.10		mg/L	

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachate Boron (B)	2022/10/20	<0.10		mg/L	
			Leachate Cadmium (Cd)	2022/10/20	<0.10		mg/L	
			Leachate Chromium (Cr)	2022/10/20	<0.10		mg/L	
			Leachate Cobalt (Co)	2022/10/20	<0.10		mg/L	
			Leachate Copper (Cu)	2022/10/20	<0.10		mg/L	
			Leachate Iron (Fe)	2022/10/20	<0.50		mg/L	
			Leachate Lead (Pb)	2022/10/20	<0.10		mg/L	
			Leachate Mercury (Hg)	2022/10/20	<0.0020		mg/L	
			Leachate Molybdenum (Mo)	2022/10/20	<0.10		mg/L	
			Leachate Nickel (Ni)	2022/10/20	<0.10		mg/L	
			Leachate Selenium (Se)	2022/10/20	<0.10		mg/L	
			Leachate Silver (Ag)	2022/10/20	<0.010		mg/L	
			Leachate Thallium (Tl)	2022/10/20	<0.10		mg/L	
			Leachate Uranium (U)	2022/10/20	<0.10		mg/L	
			Leachate Vanadium (V)	2022/10/20	<0.10		mg/L	
			Leachate Zinc (Zn)	2022/10/20	<0.10		mg/L	
			Leachate Zirconium (Zr)	2022/10/20	<0.10		mg/L	
A765801	JP1	Matrix Spike	D10-ANTHRACENE (sur.)	2022/10/21		84	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2022/10/21		84	%	50 - 140
			D8-NAPHTHALENE (sur.)	2022/10/21		78	%	50 - 140
			TERPHENYL-D14 (sur.)	2022/10/21		91	%	50 - 140
			Naphthalene	2022/10/21		72	%	50 - 140
			2-Methylnaphthalene	2022/10/21		79	%	50 - 140
			Acenaphthylene	2022/10/21		80	%	50 - 140
			Acenaphthene	2022/10/21		72	%	50 - 140
			Fluorene	2022/10/21		74	%	50 - 140
			Phenanthrene	2022/10/21		74	%	50 - 140
			Anthracene	2022/10/21		74	%	50 - 140
			Fluoranthene	2022/10/21		82	%	50 - 140
			Pyrene	2022/10/21		80	%	50 - 140
			Benzo(a)anthracene	2022/10/21		76	%	50 - 140
			Chrysene	2022/10/21		76	%	50 - 140
			Benzo(b&j)fluoranthene	2022/10/21		72	%	50 - 140
			Benzo(b)fluoranthene	2022/10/21		78	%	50 - 140
			Benzo(k)fluoranthene	2022/10/21		76	%	50 - 140
			Benzo(a)pyrene	2022/10/21		86	%	50 - 140
			Indeno(1,2,3-cd)pyrene	2022/10/21		76	%	50 - 140
			Dibenz(a,h)anthracene	2022/10/21		78	%	50 - 140
			Benzo(g,h,i)perylene	2022/10/21		73	%	50 - 140
A765801	JP1	Spiked Blank	D10-ANTHRACENE (sur.)	2022/10/21		80	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2022/10/21		74	%	50 - 140
			D8-NAPHTHALENE (sur.)	2022/10/21		73	%	50 - 140
			TERPHENYL-D14 (sur.)	2022/10/21		88	%	50 - 140
			Naphthalene	2022/10/21		71	%	50 - 140
			2-Methylnaphthalene	2022/10/21		77	%	50 - 140
			Acenaphthylene	2022/10/21		70	%	50 - 140
			Acenaphthene	2022/10/21		74	%	50 - 140
			Fluorene	2022/10/21		72	%	50 - 140
			Phenanthrene	2022/10/21		73	%	50 - 140
			Anthracene	2022/10/21		71	%	50 - 140
			Fluoranthene	2022/10/21		78	%	50 - 140
			Pyrene	2022/10/21		77	%	50 - 140
			Benzo(a)anthracene	2022/10/21		75	%	50 - 140
			Chrysene	2022/10/21		76	%	50 - 140

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(b&j)fluoranthene	2022/10/21		74	%	50 - 140
			Benzo(b)fluoranthene	2022/10/21		76	%	50 - 140
			Benzo(k)fluoranthene	2022/10/21		75	%	50 - 140
			Benzo(a)pyrene	2022/10/21		84	%	50 - 140
			Indeno(1,2,3-cd)pyrene	2022/10/21		74	%	50 - 140
			Dibenz(a,h)anthracene	2022/10/21		75	%	50 - 140
			Benzo(g,h,i)perylene	2022/10/21		72	%	50 - 140
A765801	JP1	Method Blank	D10-ANTHRACENE (sur.)	2022/10/21		76	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2022/10/21		68	%	50 - 140
			D8-NAPHTHALENE (sur.)	2022/10/21		77	%	50 - 140
			TERPHENYL-D14 (sur.)	2022/10/21		93	%	50 - 140
			Naphthalene	2022/10/21	<0.010		mg/kg	
			2-Methylnaphthalene	2022/10/21	<0.020		mg/kg	
			Acenaphthylene	2022/10/21	<0.0050		mg/kg	
			Acenaphthene	2022/10/21	<0.0050		mg/kg	
			Fluorene	2022/10/21	<0.020		mg/kg	
			Phenanthrene	2022/10/21	<0.010		mg/kg	
			Anthracene	2022/10/21	<0.0040		mg/kg	
			Fluoranthene	2022/10/21	<0.020		mg/kg	
			Pyrene	2022/10/21	<0.020		mg/kg	
			Benzo(a)anthracene	2022/10/21	<0.020		mg/kg	
			Chrysene	2022/10/21	<0.020		mg/kg	
			Benzo(b&j)fluoranthene	2022/10/21	<0.020		mg/kg	
			Benzo(b)fluoranthene	2022/10/21	<0.020		mg/kg	
			Benzo(k)fluoranthene	2022/10/21	<0.020		mg/kg	
			Benzo(a)pyrene	2022/10/21	<0.020		mg/kg	
			Indeno(1,2,3-cd)pyrene	2022/10/21	<0.020		mg/kg	
			Dibenz(a,h)anthracene	2022/10/21	<0.020		mg/kg	
			Benzo(g,h,i)perylene	2022/10/21	<0.050		mg/kg	
A765801	JP1	RPD	Naphthalene	2022/10/21	NC		%	50
			2-Methylnaphthalene	2022/10/21	NC		%	50
			Acenaphthylene	2022/10/21	NC		%	50
			Acenaphthene	2022/10/21	NC		%	50
			Fluorene	2022/10/21	NC		%	50
			Phenanthrene	2022/10/21	NC		%	50
			Anthracene	2022/10/21	NC		%	50
			Fluoranthene	2022/10/21	NC		%	50
			Pyrene	2022/10/21	NC		%	50
			Benzo(a)anthracene	2022/10/21	NC		%	50
			Chrysene	2022/10/21	NC		%	50
			Benzo(b&j)fluoranthene	2022/10/21	NC		%	50
			Benzo(b)fluoranthene	2022/10/21	NC		%	50
			Benzo(k)fluoranthene	2022/10/21	NC		%	50
			Benzo(a)pyrene	2022/10/21	NC		%	50
			Indeno(1,2,3-cd)pyrene	2022/10/21	NC		%	50
			Dibenz(a,h)anthracene	2022/10/21	NC		%	50
			Benzo(g,h,i)perylene	2022/10/21	NC		%	50
A799552	NTS	Matrix Spike [BEO811-03]	37CL4 2378 Tetra CDD	2022/11/03		79	%	35 - 197
			C13-123478 HexaCDD	2022/11/03		84	%	32 - 141
			C13-123478 HexaCDF	2022/11/03		82	%	26 - 152
			C13-1234789 HeptaCDF	2022/11/03		79	%	26 - 138
			C13-123789 HexaCDF	2022/11/03		77	%	29 - 147
			C13-234678 HexaCDF	2022/11/03		87	%	28 - 136
			C13-23478 PentaCDF	2022/11/03		81	%	21 - 178

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			C13-1234678 HeptaCDD	2022/11/03		88	%	23 - 140
			C13-1234678 HeptaCDF	2022/11/03		75	%	28 - 143
			C13-123678 HexaCDD	2022/11/03		78	%	28 - 130
			C13-123678 HexaCDF	2022/11/03		75	%	26 - 123
			C13-12378 PentaCDD	2022/11/03		89	%	25 - 181
			C13-12378 PentaCDF	2022/11/03		77	%	24 - 185
			C13-2378 TetraCDD	2022/11/03		71	%	25 - 164
			C13-2378 TetraCDF	2022/11/03		68	%	24 - 169
			C13-OCDD	2022/11/03		74	%	17 - 157
			1,2,3,4,6,7,8-Hepta CDD	2022/11/03		98	%	70 - 140
			1,2,3,4,7,8-Hexa CDD	2022/11/03		101	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2022/11/03		100	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2022/11/03		100	%	64 - 162
			1,2,3,7,8-Penta CDD	2022/11/03		93	%	25 - 181
			2,3,7,8-Tetra CDD	2022/11/03		98	%	67 - 158
			Octa CDD	2022/11/03		95	%	78 - 144
			1,2,3,4,6,7,8-Hepta CDF	2022/11/03		102	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2022/11/03		104	%	78 - 138
			1,2,3,4,7,8-Hexa CDF	2022/11/03		101	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2022/11/03		100	%	84 - 130
			1,2,3,7,8,9-Hexa CDF	2022/11/03		101	%	78 - 130
			1,2,3,7,8-Penta CDF	2022/11/03		98	%	80 - 134
			2,3,4,6,7,8-Hexa CDF	2022/11/03		91	%	70 - 156
			2,3,4,7,8-Penta CDF	2022/11/03		90	%	68 - 160
			2,3,7,8-Tetra CDF	2022/11/03		67 (1)	%	75 - 158
			Octa CDF	2022/11/03		92	%	63 - 170
A799552	NTS	Spiked Blank	37CL4 2378 Tetra CDD	2022/11/03		107	%	35 - 197
			C13-123478 HexaCDD	2022/11/03		114	%	32 - 141
			C13-123478 HexaCDF	2022/11/03		115	%	26 - 152
			C13-1234789 HeptaCDF	2022/11/03		114	%	26 - 138
			C13-123789 HexaCDF	2022/11/03		108	%	29 - 147
			C13-234678 HexaCDF	2022/11/03		123	%	28 - 136
			C13-23478 PentaCDF	2022/11/03		107	%	21 - 178
			C13-1234678 HeptaCDD	2022/11/03		124	%	23 - 140
			C13-1234678 HeptaCDF	2022/11/03		104	%	28 - 143
			C13-123678 HexaCDD	2022/11/03		112	%	28 - 130
			C13-123678 HexaCDF	2022/11/03		108	%	26 - 123
			C13-12378 PentaCDD	2022/11/03		119	%	25 - 181
			C13-12378 PentaCDF	2022/11/03		105	%	24 - 185
			C13-2378 TetraCDD	2022/11/03		98	%	25 - 164
			C13-2378 TetraCDF	2022/11/03		92	%	24 - 169
			C13-OCDD	2022/11/03		110	%	17 - 157
			1,2,3,4,6,7,8-Hepta CDD	2022/11/03		99	%	70 - 140
			1,2,3,4,7,8-Hexa CDD	2022/11/03		100	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2022/11/03		100	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2022/11/03		102	%	64 - 162
			1,2,3,7,8-Penta CDD	2022/11/03		93	%	25 - 181
			2,3,7,8-Tetra CDD	2022/11/03		102	%	67 - 158
			Octa CDD	2022/11/03		101	%	78 - 144
			1,2,3,4,6,7,8-Hepta CDF	2022/11/03		104	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2022/11/03		104	%	78 - 138
			1,2,3,4,7,8-Hexa CDF	2022/11/03		101	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2022/11/03		100	%	84 - 130
			1,2,3,7,8,9-Hexa CDF	2022/11/03		102	%	78 - 130

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,2,3,7,8-Penta CDF	2022/11/03		98	%	80 - 134
			2,3,4,6,7,8-Hexa CDF	2022/11/03		92	%	70 - 156
			2,3,4,7,8-Penta CDF	2022/11/03		96	%	68 - 160
			2,3,7,8-Tetra CDF	2022/11/03		104	%	75 - 158
			Octa CDF	2022/11/03		95	%	63 - 170
A799552	NTS	RPD	1,2,3,4,6,7,8-Hepta CDD	2022/11/03	1.0		%	25
			1,2,3,4,7,8-Hexa CDD	2022/11/03	2.0		%	25
			1,2,3,6,7,8-Hexa CDD	2022/11/03	2.0		%	25
			1,2,3,7,8,9-Hexa CDD	2022/11/03	3.0		%	25
			1,2,3,7,8-Penta CDD	2022/11/03	0		%	25
			2,3,7,8-Tetra CDD	2022/11/03	1.9		%	25
			Octa CDD	2022/11/03	2.0		%	25
			1,2,3,4,6,7,8-Hepta CDF	2022/11/03	0		%	25
			1,2,3,4,7,8,9-Hepta CDF	2022/11/03	0.97		%	25
			1,2,3,4,7,8-Hexa CDF	2022/11/03	1.0		%	25
			1,2,3,6,7,8-Hexa CDF	2022/11/03	1.0		%	25
			1,2,3,7,8,9-Hexa CDF	2022/11/03	2.0		%	25
			1,2,3,7,8-Penta CDF	2022/11/03	1.0		%	25
			2,3,4,6,7,8-Hexa CDF	2022/11/03	3.3		%	25
			2,3,4,7,8-Penta CDF	2022/11/03	0		%	25
			2,3,7,8-Tetra CDF	2022/11/03	0.96		%	25
			Octa CDF	2022/11/03	3.2		%	25
A799552	NTS	Method Blank	37CL4 2378 Tetra CDD	2022/11/03		120	%	35 - 197
			C13-123478 HexaCDD	2022/11/03		123	%	32 - 141
			C13-123478 HexaCDF	2022/11/03		126	%	26 - 152
			C13-1234789 HeptaCDF	2022/11/03		124	%	26 - 138
			C13-123789 HexaCDF	2022/11/03		114	%	29 - 147
			C13-234678 HexaCDF	2022/11/03		130	%	28 - 136
			C13-23478 PentaCDF	2022/11/03		124	%	21 - 178
			C13-1234678 HeptaCDD	2022/11/03		137	%	23 - 140
			C13-1234678 HeptaCDF	2022/11/03		109	%	28 - 143
			C13-123678 HexaCDD	2022/11/03		120	%	28 - 130
			C13-123678 HexaCDF	2022/11/03		117	%	26 - 123
			C13-12378 PentaCDD	2022/11/03		141	%	25 - 181
			C13-12378 PentaCDF	2022/11/03		120	%	24 - 185
			C13-2378 TetraCDD	2022/11/03		105	%	25 - 164
			C13-2378 TetraCDF	2022/11/03		98	%	24 - 169
			C13-OCDD	2022/11/03		125	%	17 - 157
			1,2,3,4,6,7,8-Hepta CDD	2022/11/03	<0.798, EDL=0.798		pg/g	
			1,2,3,4,7,8-Hexa CDD	2022/11/03	<0.568, EDL=0.568		pg/g	
			1,2,3,6,7,8-Hexa CDD	2022/11/03	<0.524, EDL=0.524		pg/g	
			1,2,3,7,8,9-Hexa CDD	2022/11/03	<0.742, EDL=0.742		pg/g	
			1,2,3,7,8-Penta CDD	2022/11/03	<0.589, EDL=0.589		pg/g	
			2,3,7,8-Tetra CDD	2022/11/03	<0.589, EDL=0.589		pg/g	
			Octa CDD	2022/11/03	2.32, EDL=0.568		pg/g	
			Total Hepta CDD	2022/11/03	0.824, EDL=0.575		pg/g	

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Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Hexa CDD	2022/11/03	<0.553, EDL=0.553		pg/g	
			Total Penta CDD	2022/11/03	<0.589, EDL=0.589		pg/g	
			Total Tetra CDD	2022/11/03	<0.589, EDL=0.589		pg/g	
			1,2,3,4,6,7,8-Hepta CDF	2022/11/03	<0.663, EDL=0.663		pg/g	
			1,2,3,4,7,8,9-Hepta CDF	2022/11/03	<0.752, EDL=0.752		pg/g	
			1,2,3,4,7,8-Hexa CDF	2022/11/03	<0.577, EDL=0.577		pg/g	
			1,2,3,6,7,8-Hexa CDF	2022/11/03	<0.528, EDL=0.528		pg/g	
			1,2,3,7,8,9-Hexa CDF	2022/11/03	<0.706, EDL=0.706		pg/g	
			1,2,3,7,8-Penta CDF	2022/11/03	<0.762, EDL=0.762		pg/g	
			2,3,4,6,7,8-Hexa CDF	2022/11/03	<0.465, EDL=0.465		pg/g	
			2,3,4,7,8-Penta CDF	2022/11/03	<0.534, EDL=0.534		pg/g	
			2,3,7,8-Tetra CDF	2022/11/03	<0.581, EDL=0.581		pg/g	
			Octa CDF	2022/11/03	1.04, EDL=0.612		pg/g	
			Total Hepta CDF	2022/11/03	<0.713, EDL=0.713		pg/g	
			Total Hexa CDF	2022/11/03	<0.593, EDL=0.593		pg/g	
			Total Penta CDF	2022/11/03	<0.719, EDL=0.719		pg/g	
			Total Tetra CDF	2022/11/03	<0.581, EDL=0.581		pg/g	
A799553	RAK	Method Blank	Confirmation C13-2378 TetraCDF	2022/11/09		85	%	40 - 135
			Confirmation 2,3,7,8-Tetra CDF	2022/11/09	<0.090		pg/g	

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery of the matrix spike was below the lower control limit. Laboratory spiked or soil resulted in satisfactory recovery of the compound of interest. When considered together, these QC data suggest that matrix interferences may be biasing the data low.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Client Project #: ANNUAL ASH SAMPLE
Sampler Initials: JS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Angel Guerrero, Supervisor, Ultra Trace Analysis, HRMS

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

M Di Grazia

Melissa DiGrazia, Supervisor – Environmental Customer Service

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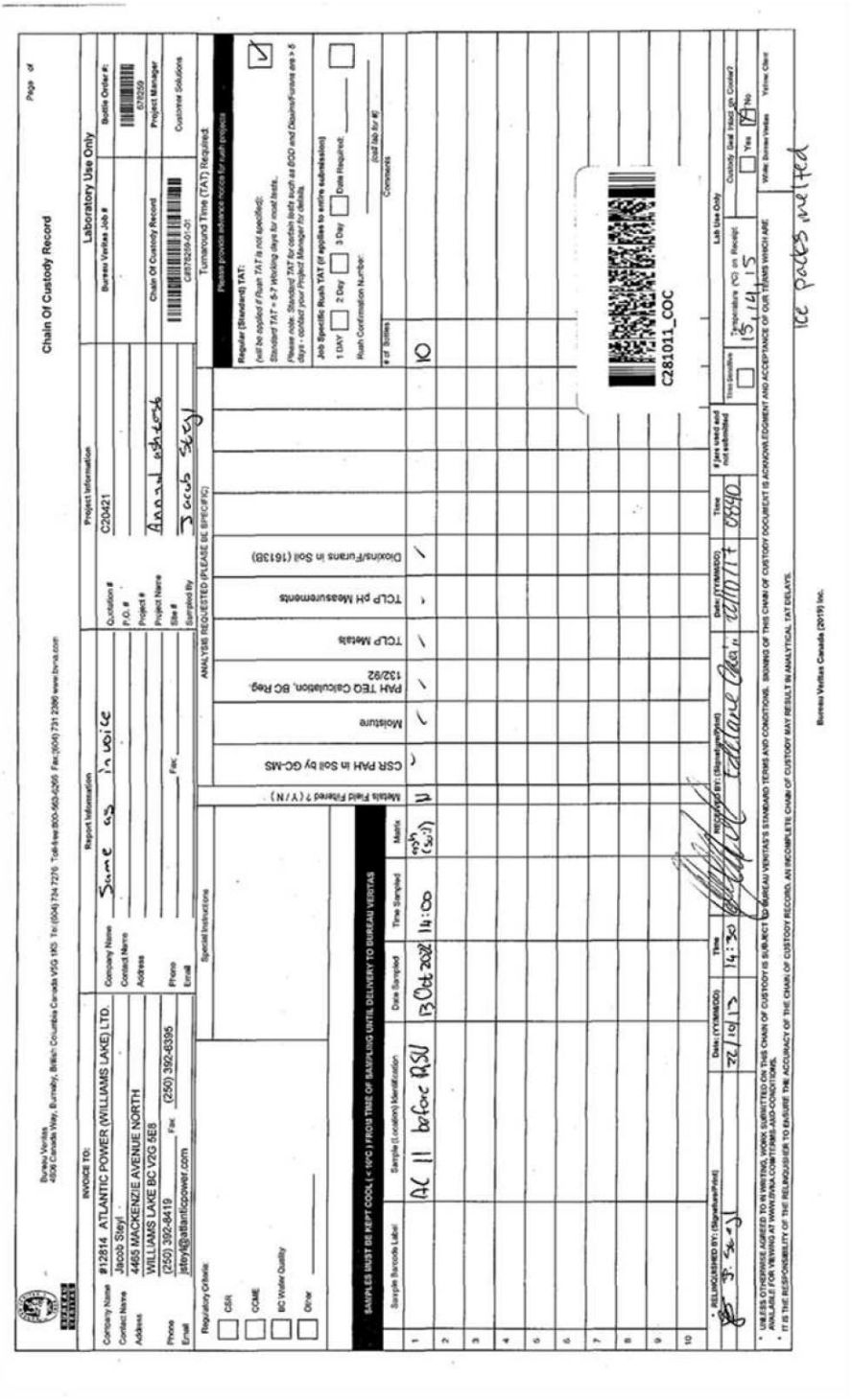

Chain Of Custody Record

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734-7276 Toll-free 800-563-6266 Fax (604) 731-2386 www.bvna.com

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INVOICE TO:
Company Name: #12814 ATLANTIC POWER (WILLIAMS LAKE) LTD.
Contact Name: Jacob Sleyt
Address: 4465 MACKENZIE AVENUE NORTH
WILLIAMS LAKE BC V2G 6E8
Phone: (250) 392-6419 Fax: (250) 392-6395
Email: jsley@atlanticpower.com

Report Information
Company Name: Same as invoice
Contact Name:
Address:
Phone: Fax:
Email:

Project Information
Quotation #: C20421
P.O. #:
Project #:
Project Name: Annual ash sends
Site #:
Sampled By: Jacob Sleyt

Laboratory Use Only
Bureau Veritas Job #: C281011
Bottle Order #: 670259
Chain Of Custody Record:
Project Manager:
Customer Solutions
C281011-01-01
Turnaround Time (TAT) Required

Regulatory Criteria: CSR, COME, BC Water Quality, Other
Special Instructions

Please provide advance notice for rush projects
Regular (Standard) TAT: (will be applied if Rush TAT is not specified): ☑
Standard TAT = 5-7 working days for most tests.
Please note: Standard TAT for certain tests such as BOD and DissolvedFurans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission): 1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ____
Rush Confirmation Number: ____

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Matrix Field Filtered ? (Y / N)	CSR PAH in Soil by GC-MS	Moisture	PAH TEQ Calculation, BC Reg. 132/92	TCLP Metals	TCLP pH Measurements	Dioxins/Furans in Soil (1613B)	# of Bottles	Comments
1		AC 11 before ASH	13 Oct 2012	14:00	soil (so)	N	✓	✓	✓	✓	✓		10	
2														
3														
4														
5														
6														
7														
8														
9														
10														

Lab Use Only: Time Sensitive ☐ Temperature (°C) on Receipt: 15, 14, 15 ☐ Yes ☐ No

* RELINQUISHED BY: (Signature/Print) Date (YY/MM/DD): 12/10/13 Time: 14:30
RECEIVED BY: (Signature/Print) Date (YY/MM/DD): 12/10/14 Time: 08:40
jars used and not submitted
Custody Seal Intact (ph Cooler)? ☐ Yes ☐ No
Cooling Water Temperature (°C) on Receipt
Custody Seal Intact (ph Cooler)?
Water Bureau Veritas
Water Client

C281011_COC

Ice packs melted

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.
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