2024 Annual Report for Authorization 8808

Atlantic Power - Williams Lake Power Plant

Jacob Steyl

4455 Mackenzie Ave N, Williams Lake, V2G 5E8

Executive Summary

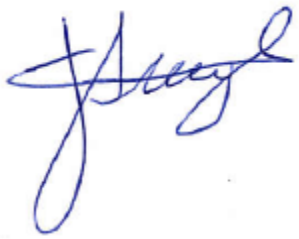
This Report details the Environmental Emissions from January 1, 2024 to December 31, 2024 and fulfils the requirement of section 3.6 of Authorization 8808 [1].

No rail ties or greater than 1% construction and demolition (C&D) waste were used as feedstock during the reporting period. A total of 284,462 wet tonnes of clean biomass was incinerated during 4,179 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 2, 2025

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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
PAH - Polycyclic Aromatic Hydrocarbons
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
pg/g – Picogram per Gram (0.001ppb)
ppb - Parts Per Billion
ppm - Parts Per Million (1,000 ppb)
ton/hr - Imperial Ton per Hour
tonnes/hr - Metric Tonnes per Hour

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 2024 to 00:00 1 January 2025. The Plant was curtailed for extended periods during the year, as show in Figure 1-1 and Table 2-1.

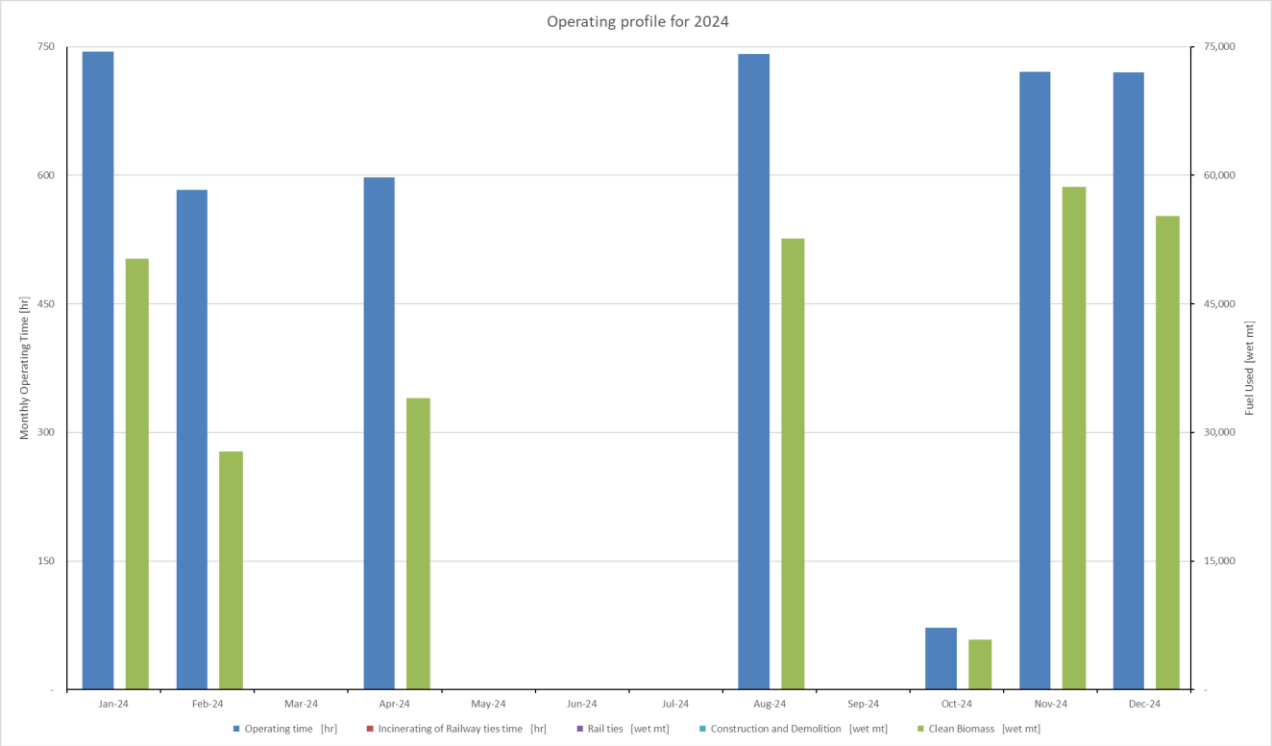

Figure 1-1: Normal Operating Profile for 2024

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

Table 2-1 shows the operating time and time incinerating railway ties for each month.

Table 2-1: Operating hours per month

	Operating time[1] *hr*	**Incinerating of Railway ties time[2]** *hr*
Jan-2024	744	0
Feb-2024	583	0
Mar-2024	0	0
Apr-2024	633	0
May-2024	0	0
Jun-2024	0	0
Jul-2024	0	0
Aug-2024	742	0
Sep-2024	0	0
Oct-2024	72	0
Nov-2024	721	0
Dec-2024	720	0
2024 Totals	**4,179**	**0**

3 Fuel

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

Table 3-1: Monthly and Annual Amounts of Fuel

	Rail ties *wet tonnes*	**Construction and Demolition** *wet tonnes*	**Clean Biomass** *wet tonnes*
Jan-2024	0	0	50,278
Feb-2024	0	0	27,789
Mar-2024	0	0	0
Apr-2024	0	0	35,860
May-2024	0	0	0
Jun-2024	0	0	0
Jul-2024	0	0	0
Aug-2024	0	0	52,611
Sep-2024	0	0	0
Oct-2024	0	0	5,855
Nov-2024	0	0	58,659
Dec-2024	0	0	55,231
2024 Totals	**0**	**0**	**284,462**

[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-2024	250	212
Feb-2024	233	197
Mar-2024	-	-
Apr-2024	269	209
May-2024	-	-
Jun-2024	-	-
Jul-2024	-	-
Aug-2024	309	268
Sep-2024	-	-
Oct-2024	305	280
Nov-2024	279	260
Dec-2024	303	264

The average NO_x emissions for the year was 238 mg/m³ at 8% O_2. The maximum hourly average for the year is 309 mg/m³ at 8%O_2, below the Permitted level.

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 April 10, 2024 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)	81.5	110
Particulate (mg/m^3 @ 8% O_2)	3.32	20

Both parameter measures are below permitted levels.

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] are 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 original ash sample taken on 10 April, 2024 contained too much Carbon for an effective extraction of Polycyclic Aromatic Hydrocarbons (PAH) and Dioxin/Furan testing. A repeat sample was taken on 22 April, 2024. Both reports are in Appendix B - Ash Analysis Reports.

The results from the test are summarised in Table 5-2.

Table 5-2: Schedule D Discrete Monitoring Results

Parameter	**10 Apr 2024**	**22 Apr 2024**	**Permitted Limits** [2]
Arsenic (mg/L)	<	<	2.5
Barium (mg/L)	2.32	1.88	100
Boron (mg/L)	1.87	2.34	500
Cadmium (mg/L)	<	<	0.5
Chromium (mg/L)	<	<	5
Copper (mg/L)	<	<	100
Lead (mg/L)	<	<	5
Mercury (mg/L)	<	<	0.1
Selenium (mg/L)	<	<	1
Silver (mg/L)	<	<	5
Uranium (mg/L)	<	<	10
Zinc (mg/L)	0.22	<	500
Dioxin/Furan TEQ (ppb)	No sample	0.197	100
PAH TEQ (ppm)	No sample	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] and within the expected range (smaller than +1σ) from historical ash testing results.

5.3 Discrete testing conditions

The average steam flow when the Ash Test sample was collected on April 10, 2024 was 558.1 klb/hr (70.3 kg/s). This meets the Operating Conditions requirements stipulated in section 3.3 of the Permit.

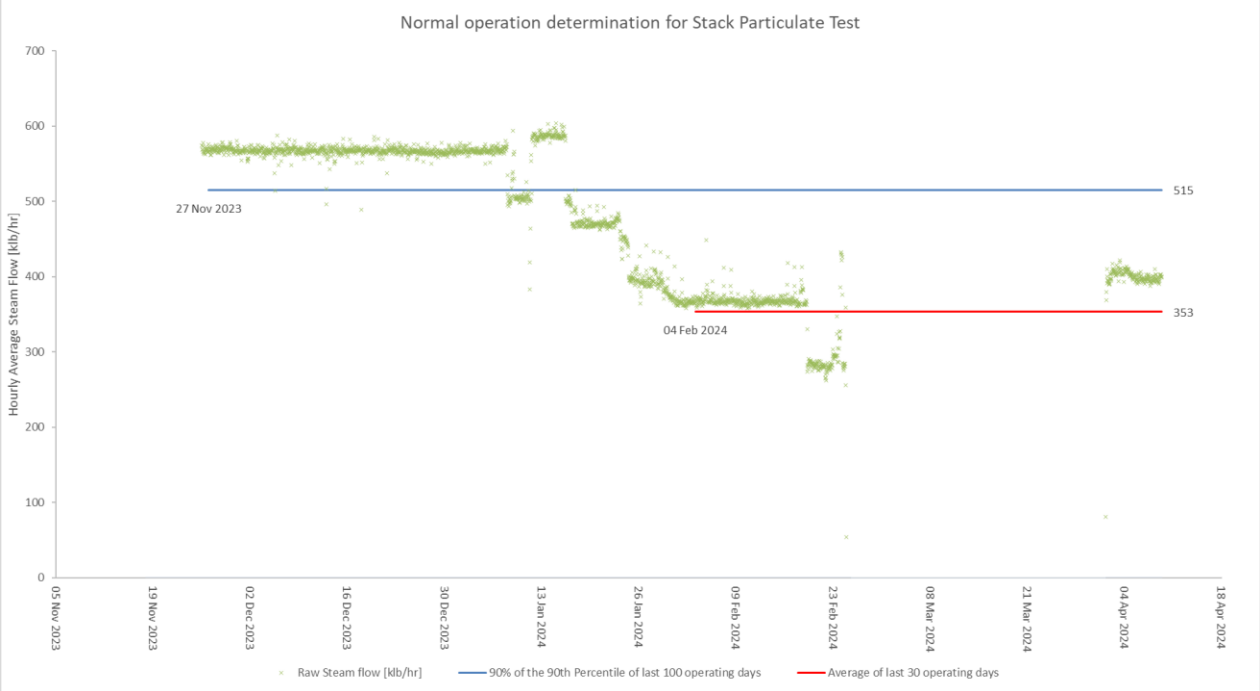

Figure 5-1: Hourly Average Steam Production data for April 10, 2024 Discrete Testing

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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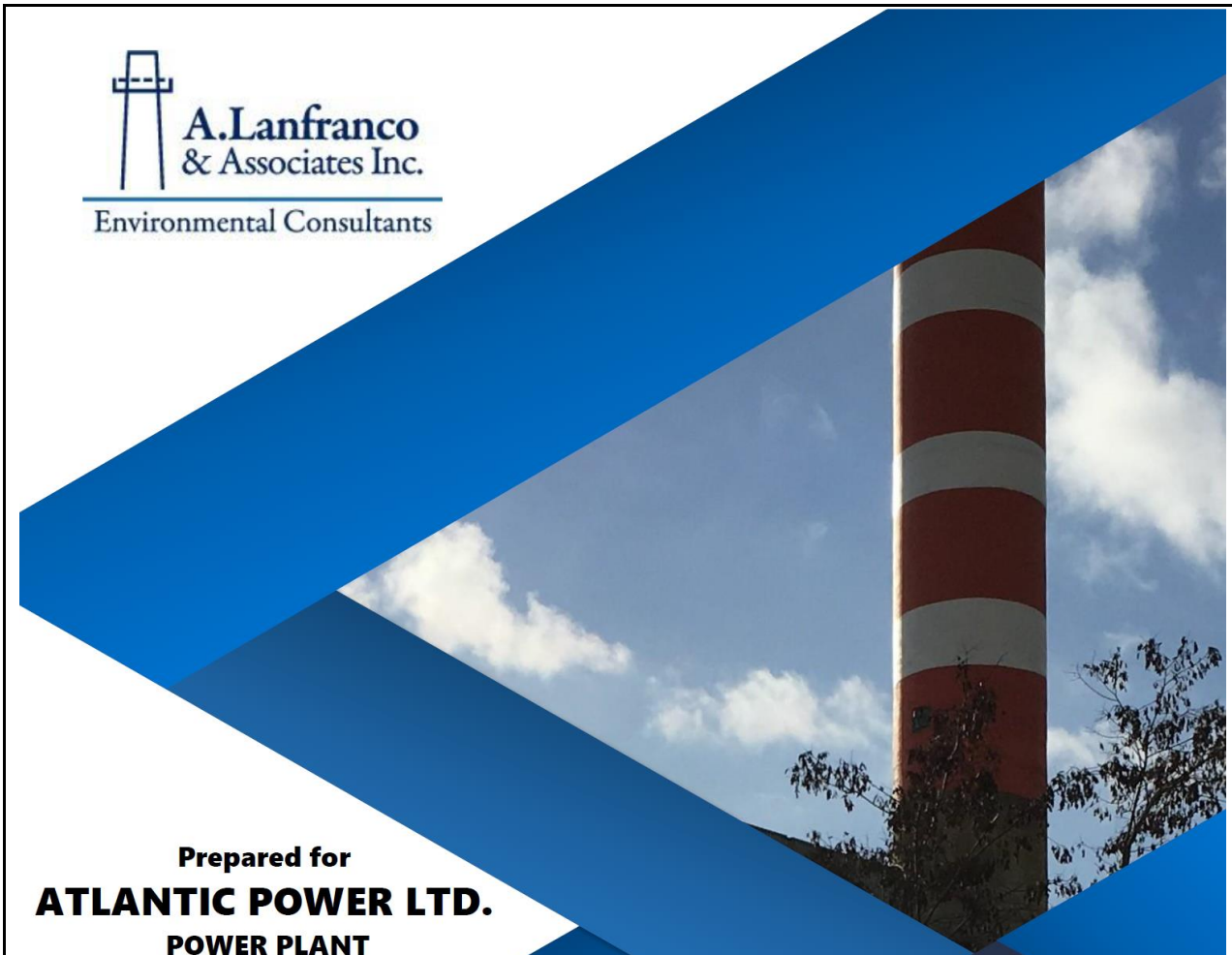

Prepared for
ATLANTIC POWER LTD.
POWER PLANT
Williams Lake, BC

EMISSION MONITORING REPORT

April 10, 2024 Survey
Authorization No. 8808
Prepared by Louis Agassiz
Issued April 23, 2024

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. J. Ching (certified) and Mr. J. Dennis.

The report was prepared by Mr. L. Agassiz 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 on April 18, 2024 by:

Mr. Mark Lanfranco, CST
President | Owner

A.Lanfranco & Associates Inc.
Environmental Consultants

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APPENDICES

A.Lanfranco & Associates Inc.
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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 April 10, 2024.

Parameter	Average	Permit Limits
Particulate (mg/Sm^3)	3.87	
Particulate (mg/Sm^3 @ 8% O_2)	3.32	20
Particulate (kg/hr)	1.13	
Flowrate (Sm^3/min)	4890	
Flowrate (Sm^3/sec)	81.5	110
O_2 (vol % dry)	5.81	
CO_2 (vol % dry)	15.3	

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

The 3-run average boiler stack results for particulate matter (3.32 mg/Sm^3 @ 8% O_2) is slightly higher than the previous results from August 2023 (2.97 mg/Sm^3 @ 8% O_2).

The 3-run average flowrate on the boiler stack for this survey is less than August 2023 (81.5 compared to 94.3 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.

Data page 1: Particulate and Flowrate for 10 Apr 2024

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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. J. Ching - A. Lanfranco and Associates Inc. Mr. J. Dennis - 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 April 10, 2024, 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 April 10, 2024, the facility was operating close to the 90th percentile capacity relative to the previous 100 days. Operational data can be found in Table 2 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.

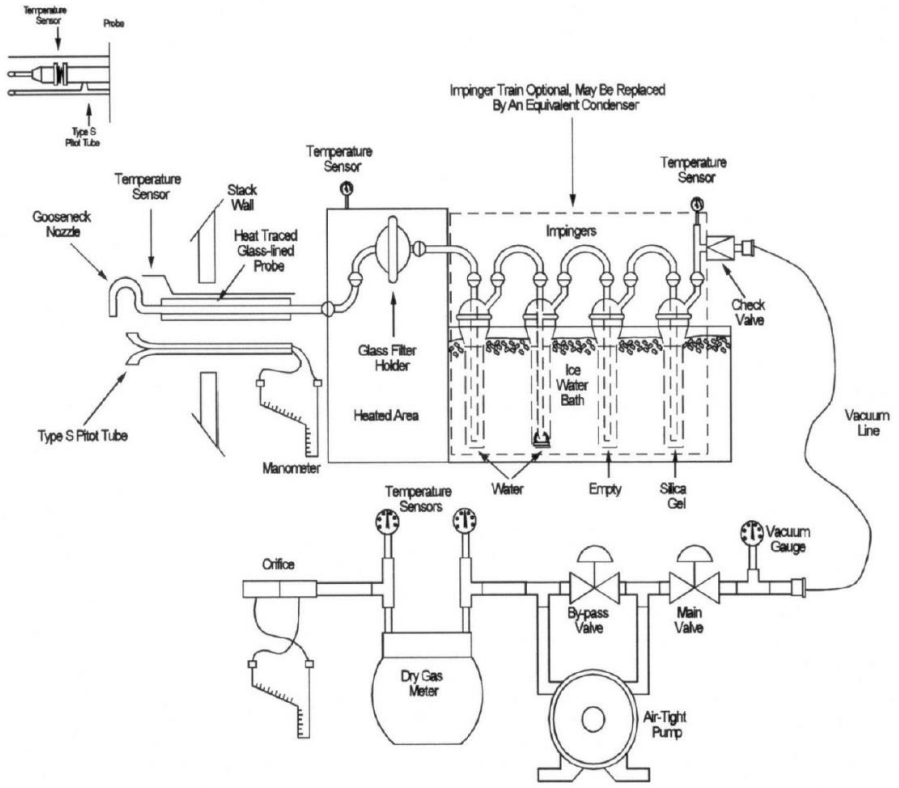

Figure 1: Method 5 Particulate Train

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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.

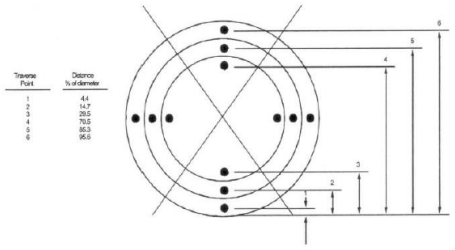

Figure 2. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

Each point (equal area method) was sampled for 5 minutes (figure 4/4a) resulting in final sample volumes of about 1.0 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.

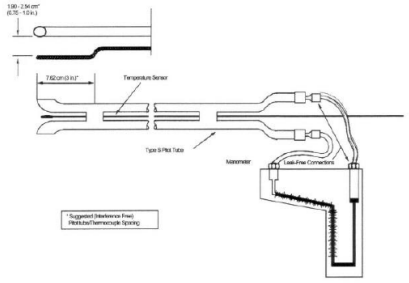

Figure 3. Type S Pitot Tube Manometer Assembly

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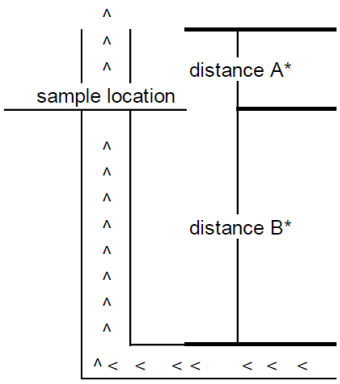
Figure - 4 **Location of Traverse Points in Circular Stacks**

(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. Table 2 shows the operating conditions. Supporting data is presented in 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	10-Apr-24	10-Apr-24	10-Apr-24	
Test Time	10:03 - 11:25	11:42 - 12:48	13:01 - 14:06	
Duration (minutes)	60	60	60	60
Particulate (mg/Sm^3)	4.60	4.96	2.06	3.87
Particulate (mg/Sm^3 @ 8% O_2)	3.93	4.28	1.75	3.32
Particulate (kg/hr)	1.34	1.46	0.61	1.13
Particulate (kg/day)	32.2	34.9	14.5	27.2
Flowrate (Sm^3/min)	4862	4895	4901	4886
Flowrate (Sm^3/sec)	81.0	81.6	81.7	81.4
Flowrate (Am^3/min)	9231	9192	9288	9237
Temperature (°C)	147	148	148	147
O_2 (vol % dry)	5.78	5.98	5.68	5.81
CO_2 (vol % dry)	15.1	15.0	15.9	15.3
H_2O (vol %)	18.6	17.5	18.3	18.1
Isokinetic Variation (%)	101	99	100	100

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

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TABLE 2: OPERATING CONDITIONS

	Steam Flow 10-Apr-24 (K lbs./hour)	90th percentile of Steam Flow Prev. 100 days (K lbs./hour)	Steam Flow Prev. 30 days (K lbs./hour)
Boiler Stack	557	572	353

The average steam flow for the tests was 557.3 klb/hr, which is 97% of the 90th percentile of the last 100 operating days and 158% of the average steam flow for the last 30 full operating days.

According to authorization number 8808, the sampling must be conducted when the operating conditions are as close as reasonably practical to the 90th percentile for the previous 100 operating days and greater than the average for the previous 30 full operating days.

Data page 2: Steam Flow for 10 Apr 2024

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5 DISCUSSION OF RESULTS

The average particulate result for this survey was 3.32 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 81.5 Sm^3/sec was also within the allowable limit of 110 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:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	1 - Particulate
Source:	Main Stack	**Run Time:**	10:03 - 11:25

Particulate Concentration:		**4.6**	**mg/dscm**	0.0020 gr/dscf
		2.4	mg/Acm	0.0011 gr/Acf
		3.9	mg/dscm (@ 8% O2)	0.0017 gr/dscf (@ 8% O2)
Emission Rate:		1.34	Kg/hr	2.960 lb/hr
Sample Gas Volume:		1.0211	dscm	36.059 dscf
Total Sample Time:		60.0	minutes	
Average Isokineticity:		100.9	%	
Flue Gas Characteristics				
	Moisture:	18.60	%	
	Temperature	146.9	°C	296.3 °F
	Flow	4862.2	dscm/min	171708 dscf/min
		81.04	dscm/sec	2861.8 dscf/sec
		9231.2	Acm/min	325999 Acf/min
	Velocity	15.944	m/sec	52.31 f/sec
	Gas Analysis	5.78	% O_2	15.13 % CO_2
		30.651	Mol. Wt (g/gmole) Dry	28.298 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:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	1 - Particulate
Source:	Main Stack	**Run Time:**	10:03 - 11:25

Control Unit (Y)	0.9793
Nozzle Diameter (in.)	0.2570
Pitot Factor	0.8412
Baro. Press. (in. Hg)	27.76
Static Press. (in. H_2O)	-0.32
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	4.90
15.00	5.80
14.50	6.50
15.00	5.90
Average = 15.13	**5.78**

Condensate Collection:

Impinger 1 (grams)	138.0
Impinger 2 (grams)	28.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	9.0
Total Gain (grams)	**175.0**

Collection:

Filter (grams)	**0.0006**
Washings (grams)	**0.0041**
Impinger (grams)	**0.0000**
Total (grams)	**0.0047**

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	8.000							
1	1	5.0	11.360	0.590	1.43	60	60	297	6.1	100.9
	2	10.0	14.630	0.550	1.34	63	63	296	20.1	101.0
	3	15.0	17.670	0.470	1.16	65	65	290	40.8	100.7
		0.0	17.670							
2	1	5.0	21.110	0.600	1.48	68	68	297	6.1	100.9
	2	10.0	24.480	0.570	1.41	70	70	298	20.1	101.1
	3	15.0	27.520	0.460	1.14	71	71	293	40.8	100.9
		0.0	27.520							
3	1	5.0	31.070	0.620	1.55	76	76	298	6.1	101.0
	2	10.0	34.520	0.580	1.45	78	78	299	20.1	101.1
	3	15.0	37.690	0.490	1.23	78	78	296	40.8	100.8
		0.0	37.690							
4	1	5.0	41.270	0.620	1.56	81	81	299	6.1	100.9
	2	10.0	44.770	0.590	1.49	82	82	299	20.1	101.0
	3	15.0	47.905	0.470	1.19	82	82	294	40.8	100.9
			Average:	0.551	1.369	72.8	72.8	296.3		100.9

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	2 - Particulate
Source:	Main Stack	**Run Time:**	11:42 - 12:48

Particulate Concentration:	**5.0 mg/dscm**	0.0022 gr/dscf
	2.6 mg/Acm	0.0012 gr/Acf
	4.3 mg/dscm (@ 8% O2)	0.0019 gr/dscf (@ 8% O2)
Emission Rate:	1.46 Kg/hr	3.209 lb/hr
Sample Gas Volume:	1.0088 dscm	35.626 dscf
Total Sample Time:	60.0 minutes	
Average Isokineticity:	99.1 %	

Flue Gas Characteristics

Moisture:	17.54 %	
Temperature	147.7 °C	297.8 °F
Flow	4894.7 dscm/min	172858 dscf/min
	81.58 dscm/sec	2881.0 dscf/sec
	9192.3 Acm/min	324625 Acf/min
Velocity	15.877 m/sec	52.09 f/sec
Gas Analysis	5.98 % O_2	15.00 % CO_2
	30.639 Mol. Wt (g/gmole) Dry	28.422 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:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	2 - Particulate
Source:	Main Stack	**Run Time:**	11:42 - 12:48

Control Unit (Y)	0.9793
Nozzle Diameter (in.)	0.2570
Pitot Factor	0.8412
Baro. Press. (in. Hg)	27.76
Static Press. (in. H_2O)	-0.32
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
15.00	6.00
15.00	6.10
15.00	6.00
15.00	5.80
Average = 15.00	**5.98**

Condensate Collection:

Impinger 1 (grams)	143.0
Impinger 2 (grams)	10.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	8.0
Total Gain (grams)	**161.0**

Collection:

Filter (grams)	**0.0009**
Washings (grams)	**0.0041**
Impinger (grams)	**0.0000**
Total (grams)	**0.0050**

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	48.191							
1	1	5.0	51.740	0.620	1.53	80	80	298	6.1	99.1
	2	10.0	55.200	0.590	1.46	81	81	300	20.1	99.0
	3	15.0	58.320	0.480	1.19	78	78	293	40.8	99.0
		0.0	58.320							
2	1	5.0	61.820	0.610	1.50	78	78	300	6.1	99.0
	2	10.0	65.210	0.570	1.40	79	79	300	20.1	99.0
	3	15.0	68.330	0.480	1.19	79	79	295	40.8	98.9
		0.0	68.330							
3	1	5.0	71.810	0.600	1.48	79	79	299	6.1	99.0
	2	10.0	75.180	0.560	1.38	80	80	300	20.1	99.1
	3	15.0	78.280	0.470	1.17	80	80	295	40.8	99.1
		0.0	78.280							
4	1	5.0	81.740	0.590	1.45	80	80	300	6.1	99.2
	2	10.0	85.080	0.550	1.36	81	81	300	20.1	98.9
	3	15.0	88.124	0.450	1.12	81	81	294	40.8	99.2
			Average:	0.548	1.353	79.7	79.7	297.8		99.1

A. Lanfranco and Associates Inc. - Emission Report

Client:	Atlantic Power	**Date:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	3 - Particulate
Source:	Main Stack	**Run Time:**	13:01 - 14:06

Particulate Concentration:		**2.1**	**mg/dscm**	0.0009 gr/dscf
		1.1	mg/Acm	0.0005 gr/Acf
		1.7	mg/dscm (@ 8% O2)	0.0008 gr/dscf (@ 8% O2)
Emission Rate:		0.61	Kg/hr	1.335 lb/hr
Sample Gas Volume:		1.0194	dscm	36.001 dscf
Total Sample Time:		60.0	minutes	
Average Isokineticity:		100.0	%	
Flue Gas Characteristics				
	Moisture:	18.27	%	
	Temperature	147.8	°C	298.0 °F
	Flow	4900.8	dscm/min	173070 dscf/min
		81.68	dscm/sec	2884.5 dscf/sec
		9288.0	Acm/min	328006 Acf/min
	Velocity	16.042	m/sec	52.63 f/sec
	Gas Analysis	5.68	% O_2	15.88 % CO_2
		30.767	Mol. Wt (g/gmole) Dry	28.434 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:**	10-Apr-24
Jobsite:	Williams Lake, B.C.	**Run:**	3 - Particulate
Source:	Main Stack	**Run Time:**	13:01 - 14:06

Control Unit (Y)	0.9793
Nozzle Diameter (in.)	0.2570
Pitot Factor	0.8412
Baro. Press. (in. Hg)	27.76
Static Press. (in. H_2O)	-0.32
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	5.80
16.00	5.80
16.00	5.40
15.50	5.70
Average = 15.88	**5.68**

Condensate Collection:

Impinger 1 (grams)	150.0
Impinger 2 (grams)	12.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	9.0
Total Gain (grams)	**171.0**

Collection:

Filter (grams)	**0.0002**
Washings (grams)	**0.0019**
Impinger (grams)	**0.0000**
Total (grams)	**0.0021**

Traverse	Point	Time (min.)	Dry Gas Meter (ft³)	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	88.398							
1	1	5.0	91.900	0.600	1.49	82	82	297	6.1	99.9
	2	10.0	95.310	0.570	1.41	82	82	299	20.1	99.9
	3	15.0	98.420	0.470	1.17	83	83	296	40.8	99.9
		0.0	98.420							
2	1	5.0	101.900	0.590	1.47	84	84	299	6.1	99.9
	2	10.0	105.330	0.570	1.42	85	85	300	20.1	100.0
	3	15.0	108.480	0.480	1.20	85	85	297	40.8	99.8
		0.0	108.480							
3	1	5.0	112.140	0.640	1.60	88	88	299	6.1	100.1
	2	10.0	115.710	0.610	1.53	88	88	300	20.1	100.1
	3	15.0	118.930	0.490	1.24	89	89	294	40.8	100.1
		0.0	118.930							
4	1	5.0	122.540	0.620	1.56	90	90	300	6.1	100.0
	2	10.0	126.090	0.600	1.51	90	90	300	20.1	100.0
	3	15.0	129.246	0.470	1.19	90	90	295	40.8	100.0
			Average:	0.559	1.399	86.3	86.3	298.0		100.0

APPENDIX 2

CALCULATIONS

Appendix 2 Calculations

A.Lanfranco & Associates Inc.
Environmental Consultants

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**

Appendix 2 Calculations

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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

ANALYTICAL DATA

A.Lanfranco & Associates Inc. Environmental Consultants

GRAVIMETRIC ANALYTICAL RESULTS

Client:	Atlantic Power	**Sample Date:**	10-Apr-24
Source:	Main Stack	**Location:**	Williams Lake, B.C

A. Lanfranco & Associates Standard Operating Procedure:
SOP 1.2.1 Gravimetric determination of total particulate matter

	Initial (g)	Final (g)	Net (g)	Blank Corrected Net (g)
Filters				
Run 1	0.3608	0.3613	0.0005	0.0006
Run 2	0.3621	0.3629	0.0008	0.0009
Run 3	0.3612	0.3613	0.0001	0.0002
Blank	0.3582	0.3581	-0.0001	
Probe Washes				
Run 1	120.9023	120.9060	0.0037	0.0041
Run 2	110.6549	110.6586	0.0037	0.0041
Run 3	123.3067	123.3082	0.0015	0.0019
Blank	99.4994	99.4990	-0.0004	
	Run 1	**Run 2**	**Run 3**	
Silica Gels	9.0	8.0	9.0	

Task	**Personnel**	**Date**	**Quality Control**	**Y/N**
Fiter Recovery:	J. Ching	12-Apr-24	Adequate PW volume:	Y
PW Initial Analysis:	J. Ching	12-Apr-24	No sample leakage:	Y
PW, Filter and Gel Final Analysis:	J. Dennis	17-Apr-24	Filter not compromised:	Y
Data entered to computer:	L. Agassiz	17-Apr-24		

Comments:
No problems encountered in sample analysis.

APPENDIX 4

FIELD DATA SHEETS

A. Lanfranco and Associates Inc.

CA

CLIENT Atlantic Power	NOZZLE 5T70 DIAMETER, IN. 0.2570	IMPINGER VOLUMES	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
SOURCE Main Stack	PROBE 5A4 Cp 0.8412	Imp. #1	100 / 238 / 138
PARAMETER / RUN No Particulate Run 1	PORT LENGTH 8"	Imp. #2	100 / 128 / 28
DATE Apr.10.2024	STATIC PRESSURE, IN. H2O -0.32"	Imp. #3	0 / 0 / 0
OPERATOR: Justin Ching	STACK DIAMETER 138"	Imp. #4	GEL
CONTROL UNIT CAE ALT Y 0.9793 ΔH@ 1.857	STACK HEIGHT 200'	Imp. #5	
		Imp. #6	
BAROMETRIC PRESSURE, IN. Hg 27.76	INITIAL LEAK TEST 0.002 @15"	Upstream Diameters	
ASSUMED MOISTURE, Bw 18%	FINAL LEAK TEST 0.001 @7"	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. %		
	10:03	8.000												
1	5	11.36	0.59	1.43	60	297	259	253	38	2	16.0	4.9		
2	10	14.63	0.55	1.34	63	296								
3	15	17.67	0.47	1.16	65	290	256	251	40	2				
1	20	21.11	0.60	1.49	68	297					15.0	5.8		
2	25	24.48	0.57	1.41	70	298	252	254	41	2				
3	30	27.52	0.46	1.14	71	293								
1	35	31.07	0.62	1.55	76	298	247	251	44	2	14.5	6.5		
2	40	34.52	0.58	1.45	78	299								
3	45	37.69	0.49	1.23	78	296	251	251	45	2				
1	50	41.27	0.62	1.56	81	299					15.0	5.9		
2	55	44.77	0.59	1.49	82	299	252	251	43	2				
3	60	47.905	0.47	1.19	82	294								
END	11:25													

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4

CLIENT Atlantic Power	NOZZLE 5/16 DIAMETER, IN. 0.2570	IMPINGER	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
SOURCE Main stack	PROBE SA4 Cp 0.8412	VOLUMES	
PARAMETER / RUN No Particulate Run 2	PORT LENGTH 8"	Imp. #1	100 / 243 / 143
DATE Apr. 10 2024	STATIC PRESSURE, IN. H2O -0.32"	Imp. #2	100 / 110 / 10
OPERATOR: Justin Ching	STACK DIAMETER 138"	Imp. #3	0 / 0 / 0
CONTROL UNIT CAE AL1 Y 0.9793 ΔH@ 1.857	STACK HEIGHT 200'	Imp. #4	GEL
		Imp. #5	
		Imp. #6	
BAROMETRIC PRESSURE, IN. Hg 27.76	INITIAL LEAK TEST 0.003 @ 15"	Upstream Diameters	
ASSUMED MOISTURE, Bw 18.6%	FINAL LEAK TEST 0.001 @ 7"	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. %		
	11:42	48.191												
1	5	51.74	0.62	1.53	80	298	244	254	46	2	15.0	6.0		
2	10	55.20	0.59	1.46	81	300								
3	15	58.32	0.48	1.19	78	293	256	259	46	2				
1	20	61.87	0.61	1.50	78	300					15.0	6.1		
2	25	65.21	0.57	1.40	79	300	252	249	46	2				
3	30	68.33	0.44	1.19	79	295								
1	35	71.81	0.60	1.48	79	299	250	251	46	2	15.0	6.0		
2	40	75.18	0.56	1.38	80	300								
3	45	78.78	0.47	1.17	80	295	252	251	47	2				
1	50	81.74	0.59	1.45	80	300					15.0	5.8		
2	55	85.08	0.55	1.36	81	300	239	244	46	2				
3	60	88.124	0.45	1.12	81	294								
END	12:48													

A. Lanfranco and Associates Inc.

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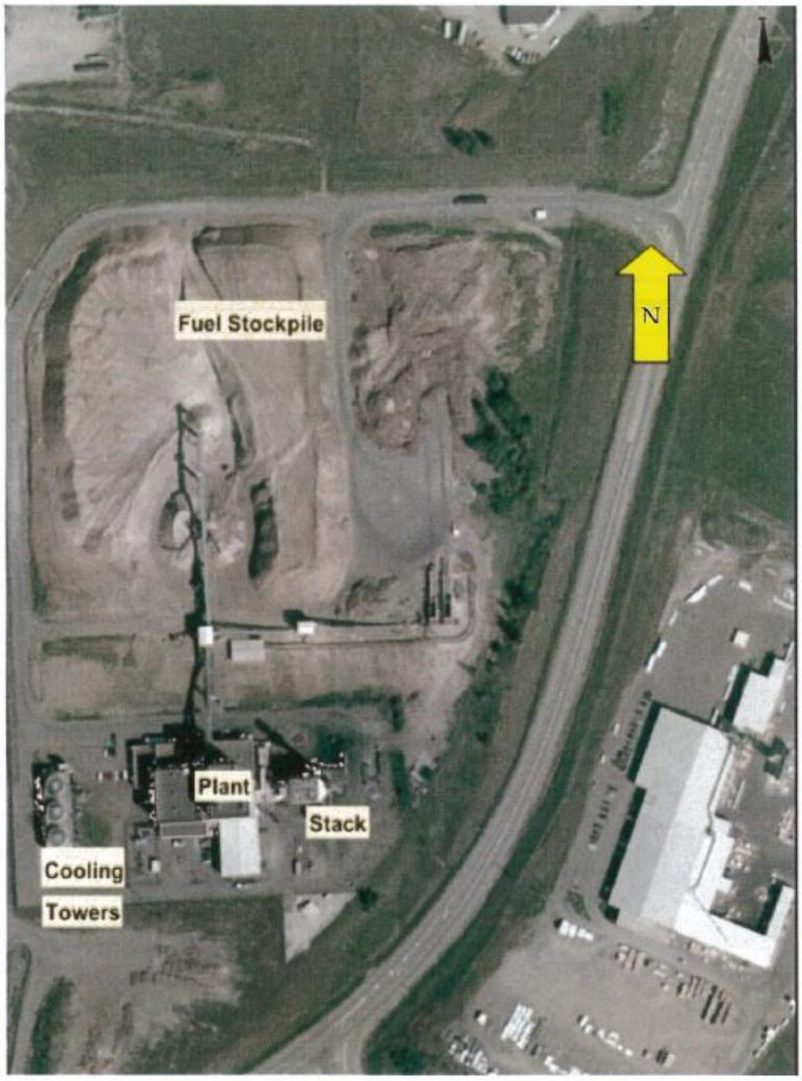
CLIENT Atlantic Power					NOZZLE ST20 DIAMETER, IN. 0.2570					IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)				
SOURCE Main Stack					PROBE SA4 Cp 0.8412					Imp. #1	100	253	150				
PARAMETER / RUN No Particulate Run 3					PORT LENGTH 8"					Imp. #2	100	112	12				
DATE April 10, 2024					STATIC PRESSURE, IN. H2O -0.32"					Imp. #3	0	6	0				
OPERATOR: Justin Ching					STACK DIAMETER 138"					Imp. #4	GEL						
CONTROL UNIT CAE AL1 Y 0.9793					STACK HEIGHT 200'					Imp. #5							
ΔH@ 1.857										Imp. #6							
BAROMETRIC PRESSURE, IN. Hg 27.76					INITIAL LEAK TEST 0.002 @ 15"					Upstream Diameters							
ASSUMED MOISTURE, Bw 15.6					FINAL LEAK TEST 0.000 @ 5"					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. %		
	13:01	88.398												
1	5	91.90	0.60	1.49	82	297	244	251	44	3	16.0	5.8		
2	10	95.31	0.57	1.41	82	299								
3	15	98.42	0.47	1.17	83	296	256	252	47	2				
1	20	101.90	0.59	1.47	84	299					16.0	5.8		
2	25	105.33	0.57	1.42	85	300	254	253	45	3				
3	30	108.48	0.48	1.20	85	297								
1	35	112.14	0.64	1.60	88	299	237	239	46	3	16.0	5.4		
2	40	115.71	0.61	1.53	88	300								
3	45	118.93	0.49	1.24	89	294	252	249	46	2				
1	50	122.54	0.62	1.56	90	300					15.5	5.7		
2	55	126.09	0.60	1.51	90	300	251	243	47	3				
3	60	129.246	0.47	1.19	90	295								
END	14:06													

APPENDIX 5

SITE MAP

SITE PLAN



APPENDIX 5

CALIBRATION DATA AND CERTIFICATIONS

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Christian De La O
Date: 09-Jan-24
Signature:

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
ST01	0.1320	0.1315	0.1340	0.0025	0.1325	0.0000958
ST05	0.1750	0.1775	0.1775	0.0025	0.1767	0.0001702
SS-1	0.1775	0.1815	0.1785	0.0040	0.1792	0.0001751
SS-7	0.1805	0.1785	0.1775	0.0030	0.1788	0.0001744
ST11	0.2050	0.2059	0.2049	0.0010	0.2053	0.0002298
SS-8	0.2051	0.2066	0.2070	0.0019	0.2062	0.0002320
ST10	0.2175	0.2170	0.2185	0.0015	0.2177	0.0002584
SS-18	0.2325	0.2315	0.2312	0.0013	0.2317	0.0002929
ST15	0.2430	0.2430	0.2415	0.0015	0.2425	0.0003207
SS-2	0.2470	0.2445	0.2465	0.0025	0.2460	0.0003301
SS-3	0.2485	0.2490	0.2490	0.0005	0.2488	0.0003377
SS-24	0.2500	0.2475	0.2475	0.0025	0.2483	0.0003364
B	0.2515	0.2525	0.2515	0.0010	0.2518	0.0003459
SS-14	0.2478	0.2491	0.2477	0.0014	0.2482	0.0003360
ST30	0.2510	0.2525	0.2525	0.0015	0.2520	0.0003464
ST20	0.2560	0.2575	0.2575	0.0015	0.2570	0.0003602
A	0.2542	0.2529	0.2549	0.0020	0.2540	0.0003519
SS-9	0.2719	0.2680	0.2715	0.0039	0.2705	0.0003990
ST40	0.2865	0.2865	0.2855	0.0010	0.2862	0.0004466
SS-30	0.2995	0.2980	0.3015	0.0035	0.2997	0.0004898
SS-13	0.3060	0.3070	0.3065	0.0010	0.3065	0.0005124
ST60	0.3060	0.3070	0.3050	0.0020	0.3060	0.0005107
ST50	0.3125	0.3090	0.3095	0.0035	0.3103	0.0005253
SS-10	0.3195	0.3155	0.3185	0.0040	0.3178	0.0005510
SS-327	0.3320	0.3300	0.3305	0.0020	0.3308	0.0005970
ST65	0.3385	0.3370	0.3385	0.0015	0.3380	0.0006231
ST66	0.3395	0.3375	0.3390	0.0020	0.3387	0.0006256
ST80	0.3670	0.3675	0.3670	0.0005	0.3672	0.0007353
ST75	0.3725	0.3725	0.3700	0.0025	0.3717	0.0007534
SS-5	0.3725	0.3735	0.3745	0.0020	0.3735	0.0007609
SS-16	0.3780	0.3765	0.3780	0.0015	0.3775	0.0007773
ST76	0.3750	0.3765	0.3780	0.0030	0.3765	0.0007731
ST85	0.4035	0.4020	0.4010	0.0025	0.4022	0.0008821
SS-15	0.4070	0.4070	0.4040	0.0030	0.4060	0.0008990
DD	0.4055	0.4040	0.4060	0.0020	0.4052	0.0008954
SS11	0.4225	0.4200	0.4225	0.0025	0.4217	0.0009698
ST70	0.4270	0.4260	0.4270	0.0010	0.4267	0.0009929
ST86	0.4565	0.4575	0.4545	0.0030	0.4562	0.0011349
C	0.4941	0.4936	0.4961	0.0025	0.4946	0.0013342
SS-491	0.4980	0.4960	0.4980	0.0020	0.4973	0.0013490
SS-49	0.5010	0.5010	0.5015	0.0005	0.5012	0.0013699
SS-6	0.4985	0.4985	0.4995	0.0010	0.4988	0.0013572
SS-492	0.4955	0.4955	0.4975	0.0020	0.4962	0.0013427
ST90	0.5050	0.5065	0.5045	0.0020	0.5053	0.0013928
ST92	0.5055	0.5040	0.5065	0.0025	0.5053	0.0013928
SS-558	0.5600	0.5600	0.5605	0.0005	0.5602	0.0017114
ST96	0.5605	0.5580	0.5615	0.0035	0.5600	0.0017104
SS-635	0.6435	0.6415	0.6430	0.0020	0.6427	0.0022527
SS-12	0.7460	0.7460	0.7470	0.0010	0.7463	0.0030380

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

Pitot Tube Calibration

Date: 09-Jan-24
Pbar (in.Hg): 29.84

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)
0.130	0.180	24.1	0.8413	0.0000
0.230	0.320	32.1	0.8393	0.0020
0.340	0.470	39.0	0.8420	0.0007
0.470	0.650	45.8	0.8418	0.0005
0.550	0.760	49.6	0.8422	0.0008
		Average :	0.8413	0.0008

Pitot ID: **5A-2**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.120	0.170	23.2	0.8318	0.0095
0.230	0.320	32.1	0.8393	0.0019
0.350	0.490	39.6	0.8367	0.0045
0.440	0.600	44.3	0.8478	0.0065
0.570	0.772	50.5	0.8507	0.0094
		Average :	0.8412	0.0064

Pitot ID: **ST 5A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.125	0.170	23.6	0.8489	0.0008
0.250	0.340	33.4	0.8489	0.0008
0.340	0.460	39.0	0.8511	0.0030
0.425	0.590	43.6	0.8402	0.0079
0.540	0.730	49.1	0.8515	0.0033
		Average :	0.8481	0.0032

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)
0.150	0.200	25.9	0.8574	0.0085
0.230	0.310	32.1	0.8527	0.0039
0.360	0.490	40.1	0.8486	0.0002
0.420	0.580	43.3	0.8425	0.0064
0.580	0.800	50.9	0.8430	0.0059
		Average :	0.8488	0.0050

Pitot ID: **5A-4**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.140	0.190	25.0	0.8498	0.0086
0.230	0.320	32.1	0.8393	0.0019
0.320	0.450	37.8	0.8348	0.0064
0.440	0.610	44.3	0.8408	0.0004
0.520	0.720	48.2	0.8413	0.0001
		Average :	0.8412	0.0035

Pitot ID: **5A-5**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.170	0.230	27.6	0.8511	0.0100
0.240	0.340	32.8	0.8318	0.0093
0.330	0.460	38.4	0.8385	0.0026
0.470	0.650	45.8	0.8418	0.0007
0.550	0.760	49.6	0.8422	0.0011
		Average :	0.8411	0.0048

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: Jeremy Gibbs Signature: Date: Jan.9, 2024

A.Lanfranco & Associates inc.

EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

Model #: CAE AL1
Serial #: 0028-070611-1

Date: 11-Jan-24
Barometric Pressure: 29.72 (in. Hg)
Theoretical Critical Vacuum: 14.02 (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)
3.72	18.00	677.900	697.310	19.410	65.0	65.0	67.0	67.0	73	0.8185	14.5	69.0	74.0	71.5
1.90	20.50	698.000	714.085	16.085	67.0	67.0	70.0	68.0	63	0.5956	17.0	72.0	78.0	75.0
1.25	30.00	714.400	732.870	18.470	71.0	71.0	74.0	74.0	55	0.4606	18.8	73.0	69.0	71.0
0.67	16.00	733.100	740.615	7.515	74.0	74.0	74.0	74.0	48	0.3560	20.1	68.0	74.0	71.0
0.33	17.00	672.000	677.432	5.432	63.0	63.0	65.0	65.0	40	0.2408	21.5	65.0	68.0	66.5

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

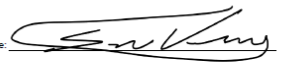
--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------			
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vor(std) (cu ft)	VOLUME CORRECTED Vor(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	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)
19.524	552.9	18.993	537.9	19.255	0.973	-0.006	1.874	47.60	0.016	0.703
16.046	454.4	15.688	444.3	16.010	0.978	-0.002	1.814	46.08	-0.043	0.714
18.240	516.6	17.822	504.7	18.051	0.977	-0.002	1.962	49.84	0.105	0.687
7.390	209.3	7.346	208.0	7.441	0.994	0.015	1.756	44.60	-0.102	0.714
5.439	154.0	5.302	150.2	5.325	0.975	-0.004	1.881	47.78	0.023	0.704
				Average Y---------->	**0.9793**	**Average dH@----->**	**1.857**	**47.2**	**Average Ko----->**	**0.704**

TEMPERATURE CALIBRATION

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

Reference Set-Point	Temperature Device Reading: Stack		Hot Box		Probe		Imp Out		Aux	
(deg F)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)	(deg F)	(% diff)
32	32	0.00%	35	0.61%	35	0.61%	32	0.00%	32	0.00%
100	100	0.00%	102	0.36%	103	0.54%	100	0.00%	100	0.00%
300	300	0.00%	301	0.13%	304	0.53%	299	-0.13%	300	0.00%
500	499	-0.10%	501	0.10%	504	0.42%	499	-0.10%	499	-0.10%
1000	998	-0.14%	1001	0.07%	1004	0.27%	999	-0.07%	999	-0.07%

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: Sean Verby Signature:  Date: January 11, 2024

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	15-Jan-24	99.8	29.46	29.37	29.44	0.02
DS	15-Jan-24	99.8	29.46	29.36	29.43	0.03
CL	15-Jan-24	99.8	29.46	29.37	29.44	0.02
JC	15-Jan-24	99.8	29.46	29.34	29.41	0.05
LF	15-Jan-24	99.8	29.46	29.36	29.43	0.03
SH	15-Jan-24	99.8	29.46	29.35	29.42	0.04
CDO	15-Jan-24	99.8	29.46	29.34	29.41	0.05
JG	15-Jan-24	99.8	29.46	29.32	29.39	0.07
ML	15-Jan-24	99.8	29.46	29.34	29.41	0.05
BL	15-Jan-24	99.8	29.46	29.36	29.43	0.03

Calibrated by: Louis Agassiz Signature:  Date: 11-Jan-24

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 and ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Calibrated by: Louis Agassiz
Date: 12-Jan-24
Signature:

TEMPERATURE DEVICE CALIBRATIONS

Reference Device Model CL23A Calibrator			Temperature Settings (degrees F)													
			32		100		200		300		500		800		1700	
Device	ALA #	Serial #	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation	Reading	Variation
Omega HH11A	3	300132	32	0.00%	99	-0.18%	201	0.15%	301	0.13%	500	0.00%	800	0.00%	1699	-0.05%
Omega HH11A	4	200167	32	0.00%	99	-0.18%	200	0.00%	303	0.39%	499	-0.10%	799	-0.08%	1697	-0.14%
Omega HH11A	6	600059	33	0.20%	100	0.00%	201	0.15%	300	0.00%	499.2	-0.08%	798	-0.16%	1696	-0.19%
TPI 341K	7	2.0315E+10	31	-0.20%	99.6	-0.07%	199	-0.15%	301	0.13%	499.1	-0.09%	799.1	-0.07%	1695	-0.23%
TPI 341K	8	2.0313E+10	32	0.00%	99.7	-0.05%	200.4	0.06%	301	0.13%	498.5	-0.16%	799.2	-0.06%	1696	-0.19%
Cont Cmpny	10	102008464	31	-0.20%	99.2	-0.14%	199.5	-0.08%	299	-0.13%	499	-0.10%	799.1	-0.07%	1699	-0.05%
Omega HH11	14	409426	32.5	0.10%	99.1	-0.16%	199	-0.15%	298	-0.26%	501	0.10%	799.1	-0.07%	1698	-0.09%
TPI 341K	16	400120029	31	-0.20%	100	0.00%	199.2	-0.12%	299.3	-0.09%	501	0.10%	799.1	-0.07%	1700	0.00%
TPI 341K	18	2.0329E+10	31	-0.20%	99.8	-0.04%	199.2	-0.12%	299.8	-0.03%	500	0.00%	799.5	-0.04%	1701	0.05%
TPI 341K	20	2.0329E+10	31	-0.20%	99.2	-0.14%	199.1	-0.14%	299	-0.13%	499.2	-0.08%	799.2	-0.06%	1699	-0.05%
TPI 341K	22	2.0329E+10	32	0.00%	99.6	-0.07%	199.2	-0.12%	298.4	-0.21%	499.1	-0.09%	798.5	-0.12%	1698	-0.09%
Reference device is a NIST certified digital thermocouple calibrator																
Variation expressed as a percentage of the absolute temperature must be within 1.5 %																

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).

CALA

Accreditation No.: 1004232
Issued On: 4/11/2023
Accreditation Date: 2/5/2021
Expiry Date: 10/11/2025

K McKinley

President and CEO

ILAC MRA CALA

This certificate is the property of the Canadian Association for Laboratory Accreditation Inc. and must be returned on request; reproduction must follow policy in place at date of issue.
For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.cala.ca.

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: Justin Ching

   Title: Environmental Technician

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 Technician - specialising 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: x Justin Ching

Print Name: Justin Ching

Witnessed by: x Daryl Sampson

Print Name: Daryl Sampson

Date signed: June 28, 2023

[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 UNIVERSITY
Faculty of Continuing Education

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CALGARY, ALBERTA

Justin Ching

has successfully completed

Stack Sampling

The Faculty of Continuing Education
Mount Royal University

30 hours | May 26, 2023

Dimitra Fotopoulos, Vice Dean
Professional and Continuing Education

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 Justin Ching, 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 Justin Ching

Print name: Justin Ching

Date: June 28, 2023

Witnessed by:

X

Print name: Mark Lanfranco

[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.

Appendix B - Ash Analysis Reports

Site Location: WILLIAMS LAKE POWER PLANT
Your C.O.C. #: C#721953-01-01

Attention: Jacob Steyl

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

Report Date: 2024/04/19
Report #: R3490028
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C425509
Received: 2024/04/12, 09:28

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals - TCLP	1	2024/04/17	2024/04/18	BBY7SOP-00001	EPA 1311, 6020bR2 m
Moisture	1	2024/04/15	2024/04/16	BBY8SOP-00017	BCMOE BCLM Dec2000 m
TCLP pH Measurements	1	N/A	2024/04/17	BBY7SOP-00005	EPA 1311

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, EPA, APHA or the Quebec Ministry of Environment.

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.

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

Site Location: WILLIAMS LAKE POWER PLANT
Your C.O.C. #: C#721953-01-01

Attention: Jacob Steyl

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

Report Date: 2024/04/19
Report #: R3490028
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C425509
Received: 2024/04/12, 09:28

Encryption Key

Melissa McIntosh
Customer Solutions Representative
25 Apr 2024 15:14:20

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

==========

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 #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

PHYSICAL TESTING (SOIL)

Bureau Veritas ID		CMB038		
Sampling Date		2024/04/10 14:00		
COC Number		C#721953-01-01		
	UNITS	AC 11	RDL	QC Batch
Physical Properties				
Moisture	%	1.2	0.30	B339832
RDL = Reportable Detection Limit				

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

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Bureau Veritas ID		CMB038	
Sampling Date		2024/04/10 14:00	
COC Number		C#721953-01-01	
	UNITS	AC 11	QC Batch
TCLP Extraction Procedure			
Initial pH of Sample	pH	12.3	B341171
pH after HCl	pH	11.7	B341171
Final pH of Leachate	pH	9.36	B341171
pH of Leaching Fluid	pH	2.91	B341171

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

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

TCLP METALS (SOIL)

Bureau Veritas ID		CMB038		
Sampling Date		2024/04/10 14:00		
COC Number		C#721953-01-01		
	UNITS	AC 11	RDL	QC Batch
TCLP Extraction Procedure				
Leachate Antimony (Sb)	mg/L	<0.10	0.10	B342502
Leachate Arsenic (As)	mg/L	<0.10	0.10	B342502
Leachate Barium (Ba)	mg/L	2.32	0.10	B342502
Leachate Beryllium (Be)	mg/L	<0.10	0.10	B342502
Leachate Boron (B)	mg/L	1.87	0.10	B342502
Leachate Cadmium (Cd)	mg/L	<0.10	0.10	B342502
Leachate Chromium (Cr)	mg/L	<0.10	0.10	B342502
Leachate Cobalt (Co)	mg/L	<0.10	0.10	B342502
Leachate Copper (Cu)	mg/L	<0.10	0.10	B342502
Leachate Iron (Fe)	mg/L	<0.50	0.50	B342502
Leachate Lead (Pb)	mg/L	<0.10	0.10	B342502
Leachate Mercury (Hg)	mg/L	<0.0020	0.0020	B342502
Leachate Molybdenum (Mo)	mg/L	0.18	0.10	B342502
Leachate Nickel (Ni)	mg/L	<0.10	0.10	B342502
Leachate Selenium (Se)	mg/L	<0.10	0.10	B342502
Leachate Silver (Ag)	mg/L	<0.010	0.010	B342502
Leachate Thallium (Tl)	mg/L	<0.10	0.10	B342502
Leachate Uranium (U)	mg/L	<0.10	0.10	B342502
Leachate Vanadium (V)	mg/L	<0.10	0.10	B342502
Leachate Zinc (Zn)	mg/L	0.22	0.10	B342502
Leachate Zirconium (Zr)	mg/L	<0.10	0.10	B342502
RDL = Reportable Detection Limit				

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Data page 3: TCLP Metals for 10 Apr 2024

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

GENERAL COMMENTS

Sample CMB038 [AC 11] : PAHSIMAV-S cannot be conducted due to "charcoal like" sample matrix. Re-extraction using less sample amount yields similar results.

Results relate only to the items tested.

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

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B339832	IP1	Method Blank	Moisture	2024/04/16	<0.30		%	
B339832	IP1	RPD	Moisture	2024/04/16	1.3		%	20
B341171	S2L	Method Blank	Initial pH of Sample	2024/04/17	4.95		pH	
			pH after HCl	2024/04/17	NA		pH	
			Final pH of Leachate	2024/04/17	4.95		pH	
			pH of Leaching Fluid	2024/04/17	4.95		pH	
B341171	S2L	RPD	Initial pH of Sample	2024/04/17	0.73		%	N/A
			pH after HCl	2024/04/17	0.58		%	N/A
			Final pH of Leachate	2024/04/17	0.66		%	N/A
			pH of Leaching Fluid	2024/04/17	0		%	N/A
B342502	RLC	Matrix Spike	Leachate Antimony (Sb)	2024/04/18		123	%	75 - 125
			Leachate Arsenic (As)	2024/04/18		125	%	75 - 125
			Leachate Barium (Ba)	2024/04/18		115	%	75 - 125
			Leachate Beryllium (Be)	2024/04/18		119	%	75 - 125
			Leachate Boron (B)	2024/04/18		NC	%	75 - 125
			Leachate Cadmium (Cd)	2024/04/18		125	%	75 - 125
			Leachate Chromium (Cr)	2024/04/18		122	%	75 - 125
			Leachate Cobalt (Co)	2024/04/18		119	%	75 - 125
			Leachate Copper (Cu)	2024/04/18		115	%	75 - 125
			Leachate Iron (Fe)	2024/04/18		NC	%	75 - 125
			Leachate Lead (Pb)	2024/04/18		115	%	75 - 125
			Leachate Mercury (Hg)	2024/04/18		118	%	75 - 125
			Leachate Molybdenum (Mo)	2024/04/18		120	%	75 - 125
			Leachate Nickel (Ni)	2024/04/18		119	%	75 - 125
			Leachate Selenium (Se)	2024/04/18		131 (1)	%	75 - 125
			Leachate Silver (Ag)	2024/04/18		114	%	75 - 125
			Leachate Thallium (Tl)	2024/04/18		117	%	75 - 125
			Leachate Uranium (U)	2024/04/18		117	%	75 - 125
			Leachate Vanadium (V)	2024/04/18		123	%	75 - 125
			Leachate Zinc (Zn)	2024/04/18		NC	%	75 - 125
			Leachate Zirconium (Zr)	2024/04/18		125	%	75 - 125
B342502	RLC	Spiked Blank	Leachate Antimony (Sb)	2024/04/18		97	%	75 - 125
			Leachate Arsenic (As)	2024/04/18		107	%	75 - 125
			Leachate Barium (Ba)	2024/04/18		99	%	75 - 125
			Leachate Beryllium (Be)	2024/04/18		102	%	75 - 125
			Leachate Boron (B)	2024/04/18		102	%	75 - 125
			Leachate Cadmium (Cd)	2024/04/18		104	%	75 - 125
			Leachate Chromium (Cr)	2024/04/18		101	%	75 - 125
			Leachate Cobalt (Co)	2024/04/18		100	%	75 - 125
			Leachate Copper (Cu)	2024/04/18		99	%	75 - 125
			Leachate Iron (Fe)	2024/04/18		100	%	75 - 125
			Leachate Lead (Pb)	2024/04/18		99	%	75 - 125
			Leachate Mercury (Hg)	2024/04/18		100	%	75 - 125
			Leachate Molybdenum (Mo)	2024/04/18		100	%	75 - 125
			Leachate Nickel (Ni)	2024/04/18		98	%	75 - 125
			Leachate Selenium (Se)	2024/04/18		109	%	75 - 125
			Leachate Silver (Ag)	2024/04/18		94	%	75 - 125
			Leachate Thallium (Tl)	2024/04/18		99	%	75 - 125
			Leachate Uranium (U)	2024/04/18		101	%	75 - 125
			Leachate Vanadium (V)	2024/04/18		100	%	75 - 125
			Leachate Zinc (Zn)	2024/04/18		101	%	75 - 125
			Leachate Zirconium (Zr)	2024/04/18		106	%	75 - 125
B342502	RLC	Method Blank	Leachate Antimony (Sb)	2024/04/18	<0.10		mg/L	
			Leachate Arsenic (As)	2024/04/18	<0.10		mg/L	

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

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachate Barium (Ba)	2024/04/18	<0.10		mg/L	
			Leachate Beryllium (Be)	2024/04/18	<0.10		mg/L	
			Leachate Boron (B)	2024/04/18	<0.10		mg/L	
			Leachate Cadmium (Cd)	2024/04/18	<0.10		mg/L	
			Leachate Chromium (Cr)	2024/04/18	<0.10		mg/L	
			Leachate Cobalt (Co)	2024/04/18	<0.10		mg/L	
			Leachate Copper (Cu)	2024/04/18	<0.10		mg/L	
			Leachate Iron (Fe)	2024/04/18	<0.50		mg/L	
			Leachate Lead (Pb)	2024/04/18	<0.10		mg/L	
			Leachate Mercury (Hg)	2024/04/18	<0.0020		mg/L	
			Leachate Molybdenum (Mo)	2024/04/18	<0.10		mg/L	
			Leachate Nickel (Ni)	2024/04/18	<0.10		mg/L	
			Leachate Selenium (Se)	2024/04/18	<0.10		mg/L	
			Leachate Silver (Ag)	2024/04/18	<0.010		mg/L	
			Leachate Thallium (Tl)	2024/04/18	<0.10		mg/L	
			Leachate Uranium (U)	2024/04/18	<0.10		mg/L	
			Leachate Vanadium (V)	2024/04/18	<0.10		mg/L	
			Leachate Zinc (Zn)	2024/04/18	<0.10		mg/L	
			Leachate Zirconium (Zr)	2024/04/18	<0.10		mg/L	
B342502	RLC	RPD	Leachate Antimony (Sb)	2024/04/18	NC		%	35
			Leachate Arsenic (As)	2024/04/18	NC		%	35
			Leachate Barium (Ba)	2024/04/18	1.4		%	35
			Leachate Beryllium (Be)	2024/04/18	NC		%	35
			Leachate Boron (B)	2024/04/18	0.18		%	35
			Leachate Cadmium (Cd)	2024/04/18	NC		%	35
			Leachate Chromium (Cr)	2024/04/18	NC		%	35
			Leachate Cobalt (Co)	2024/04/18	1.1		%	35
			Leachate Copper (Cu)	2024/04/18	NC		%	35
			Leachate Iron (Fe)	2024/04/18	1.5		%	35
			Leachate Lead (Pb)	2024/04/18	2.8		%	35
			Leachate Mercury (Hg)	2024/04/18	NC		%	35
			Leachate Molybdenum (Mo)	2024/04/18	NC		%	35
			Leachate Nickel (Ni)	2024/04/18	0.031		%	35
			Leachate Selenium (Se)	2024/04/18	NC		%	35
			Leachate Silver (Ag)	2024/04/18	NC		%	35
			Leachate Thallium (Tl)	2024/04/18	NC		%	35
			Leachate Uranium (U)	2024/04/18	NC		%	35
			Leachate Vanadium (V)	2024/04/18	NC		%	35
			Leachate Zinc (Zn)	2024/04/18	2.9		%	35
			Leachate Zirconium (Zr)	2024/04/18	NC		%	35

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.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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 or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

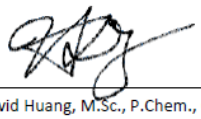
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C425509
Report Date: 2024/04/19

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JS

VALIDATION SIGNATURE PAGE

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



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

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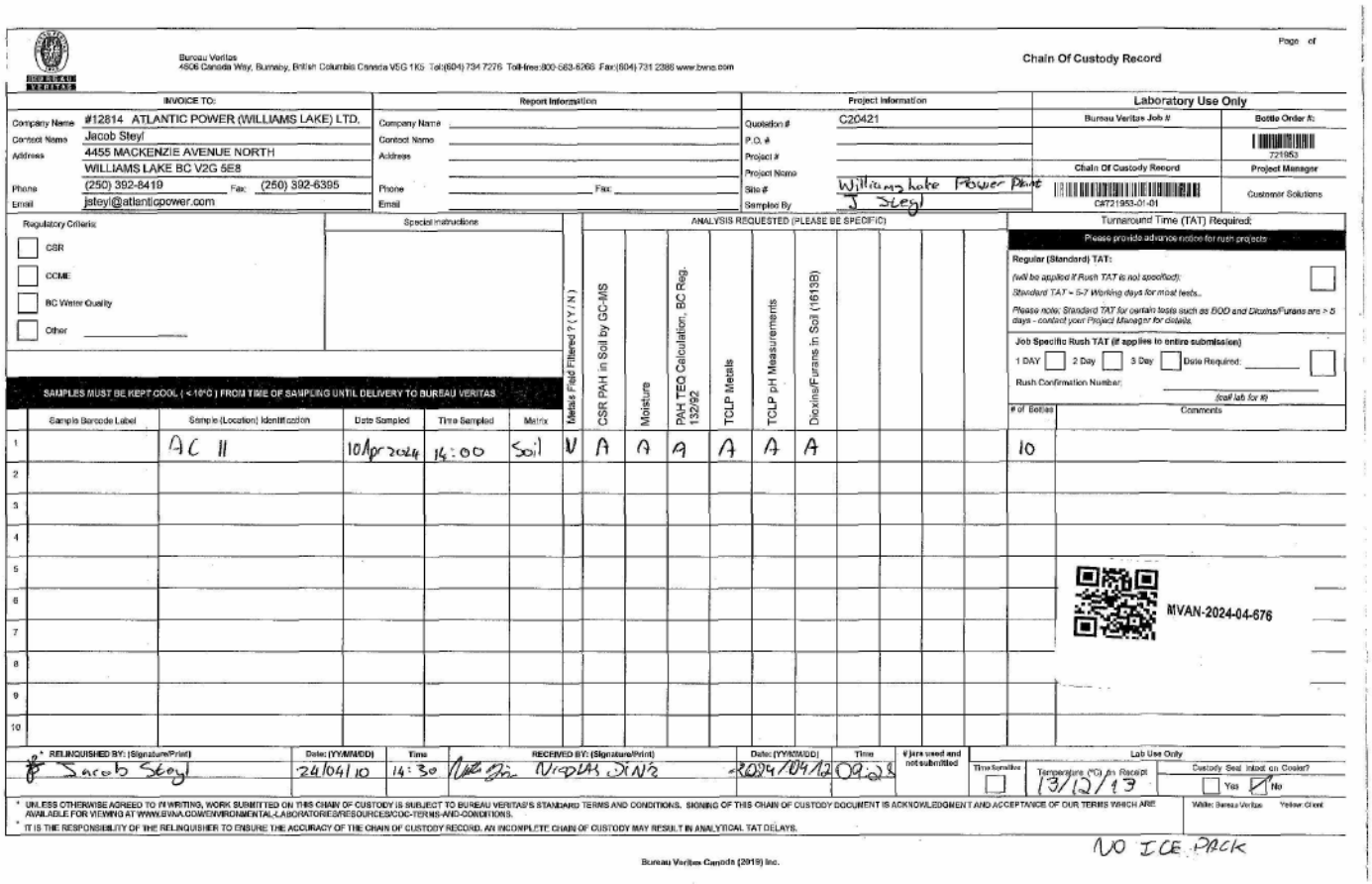

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-5266 Fax:(604) 731 2386 www.bvna.com

Page of

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#12814 ATLANTIC POWER (WILLIAMS LAKE) LTD.	Company Name		Quotation #	C20421	Bureau Veritas Job #	Bottle Order #:
Contact Name	Jacob Steyl	Contact Name		P.O. #			721953
Address	4455 MACKENZIE AVENUE NORTH WILLIAMS LAKE BC V2G 5E8	Address		Project #		Chain Of Custody Record	Project Manager
Phone	(250) 392-8419 Fax: (250) 392-6395	Phone	Fax:	Project Name		C#721953-01-01	Customer Solutions
Email	jsteyl@atlanticpower.com	Email		Site #	Williams Lake Power Plant		
				Sampled By	J Steyl		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other

Special Instructions

Turnaround Time (TAT) Required:
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 Dioxins/Furans 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: (call lab for #)

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	CSR PAH in Soil by GC-MS	Moisture	PAH TEQ Calculation, BC Reg. 13292	TCLP Metals	TCLP pH Measurements	Dioxins/Furans in Soil (1613B)	# of Bottles	Comments
1		AC II	10/Apr/2024	16:00	Soil	N	A	A	A	A	A	A	10	
2														
3														
4														
5														
6														
7														
8														
9														
10														

MVAN-2024-04-676

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	If jars used and not submitted	Lab Use Only: Time Sensitive ☐	Temperature (°C) on Receipt 13/12/13	Custody Seal Intact on Cooler? ☐ Yes ☒ No
Jacob Steyl	24/04/10	14:30	NIKLAS JINZ	2024/04/12	09:28				

* 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/ENVIRONMENTAL-LABORATORIES/RESOURCES/DOC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

NO ICE PACK

Bureau Veritas Canada (2019) Inc.

Site Location: WILLIAMS LAKE POWER PLANT
Your C.O.C. #: 08534657

Attention: Jacob Steyl

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

Report Date: 2024/05/03
Report #: R3495814
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C428023
Received: 2024/04/23, 09:57

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals - TCLP	1	2024/04/25	2024/04/25	BBY7SOP-00001	EPA 1311, 6020bR2 m
Moisture	1	2024/04/23	2024/04/24	BBY8SOP-00017	BCMOE BCLM Dec2000 m
PAH in Soil by GC/MS (SIM)	1	2024/04/23	2024/04/24	BBY8SOP-00022	BCMOE BCLM Jul2017m
PAH TEQ Calculation, BC Reg. 132/92 (2)	1	N/A	2024/04/30	BBY WI-00033	Auto Calc
Total PAH and B(a)P Calculation (3)	1	N/A	2024/04/30	BBY WI-00033	Auto Calc
TCLP pH Measurements	1	N/A	2024/04/25	BBY7SOP-00005	EPA 1311
Dioxins/Furans in Soil (1613B) (1, 4)	1	2024/04/28	2024/05/01	BRL SOP-00410	EPA 1613B m
2378TCDF Confirmation (M8290A/M1613) (1)	1	2024/04/28	2024/05/02	BRL SOP-00406/00410	EPA 8290A m/1613B m

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, EPA, APHA or the Quebec Ministry of Environment.

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

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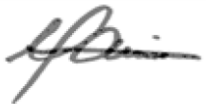
and Benzo(g,h,i)perylene.

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



Aldean Alicando
Customer Solutions Representative
03 May 2024 17:45:23

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

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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.

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Bureau Veritas Job #: C428023
Report Date: 2024/05/03

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

PHYSICAL TESTING (SOIL)

Bureau Veritas ID		CML385		
Sampling Date		2024/04/22 08:30		
COC Number		08534657		
	UNITS	AC 11 FLY ASH	RDL	QC Batch
Physical Properties				
Moisture	%	1.2	0.30	B348112
RDL = Reportable Detection Limit				

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Bureau Veritas ID		CML385		
Sampling Date		2024/04/22 08:30		
COC Number		08534657		
	UNITS	**AC 11 FLY ASH**	**RDL**	**QC Batch**
Calculated Parameters				
PAH Toxicity Equivalency	mg/kg	0.065	0.050	B347975
RDL = Reportable Detection Limit				

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Data page 4: PAH TEQ for 22 Apr 2024

Bureau Veritas Job #: C428023
Report Date: 2024/05/03

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Bureau Veritas ID		CML385	
Sampling Date		2024/04/22 08:30	
COC Number		08534657	
	UNITS	AC 11 FLY ASH	QC Batch
TCLP Extraction Procedure			
Initial pH of Sample	pH	12.5	B349089
pH after HCl	pH	12.1	B349089
Final pH of Leachate	pH	9.77	B349089
pH of Leaching Fluid	pH	2.91	B349089

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Bureau Veritas Job #: C428023
Report Date: 2024/05/03

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

DIOXIN AND FURANS BY HRMS (SOIL)

Bureau Veritas ID		CML385						
Sampling Date		2024/04/22 08:30						
COC Number		08534657			TOXIC EQUIVALENCY		# of	
	UNITS	AC 11 FLY ASH	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
DIOXINS								
2,3,7,8-Tetra CDD *	pg/g	46.5	0.673	5.00	1.00	46.5	1	B359234
1,2,3,7,8-Penta CDD *	pg/g	55.1	0.661	25.0	1.00	55.1	1	B359234
1,2,3,4,7,8-Hexa CDD *	pg/g	27.4	0.686	25.0	0.100	2.74	1	B359234
1,2,3,6,7,8-Hexa CDD *	pg/g	25.5	0.738	25.0	0.100	2.55	1	B359234
1,2,3,7,8,9-Hexa CDD *	pg/g	45.7	0.704	25.0	0.100	4.57	1	B359234
1,2,3,4,6,7,8-Hepta CDD *	pg/g	61.0	0.683	25.0	0.0100	0.610	1	B359234
Octa CDD *	pg/g	23.2	0.775	50.0	0.000300	0.00696	1	B359234
Total Tetra CDD *	pg/g	1510	0.673	5.00			15	B359234
Total Penta CDD *	pg/g	926	0.661	25.0			12	B359234
Total Hexa CDD *	pg/g	458	0.709	25.0			6	B359234
Total Hepta CDD *	pg/g	116	0.683	25.0			2	B359234
2,3,7,8-Tetra CDF **	pg/g	<663 (1)	663	5.00	0.100	66.3	0	B359234
1,2,3,7,8-Penta CDF **	pg/g	119	0.702	25.0	0.0300	3.57	1	B359234
2,3,4,7,8-Penta CDF **	pg/g	137	0.600	25.0	0.300	41.1	1	B359234
1,2,3,4,7,8-Hexa CDF **	pg/g	45.9	0.732	25.0	0.100	4.59	1	B359234
1,2,3,6,7,8-Hexa CDF **	pg/g	34.5	0.702	25.0	0.100	3.45	1	B359234
2,3,4,6,7,8-Hexa CDF **	pg/g	23.7	0.712	25.0	0.100	2.37	1	B359234
1,2,3,7,8,9-Hexa CDF **	pg/g	6.00	0.833	25.0	0.100	0.600	1	B359234
1,2,3,4,6,7,8-Hepta CDF **	pg/g	15.5	0.649	25.0	0.0100	0.155	1	B359234
1,2,3,4,7,8,9-Hepta CDF **	pg/g	3.11	0.678	25.0	0.0100	0.0311	1	B359234
Octa CDF **	pg/g	3.48	0.712	50.0	0.000300	0.00104	1	B359234
Total Tetra CDF **	pg/g	4310	0.576	5.00			17	B359234

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

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Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

DIOXIN AND FURANS BY HRMS (SOIL)

Bureau Veritas ID		CML385						
Sampling Date		2024/04/22 08:30						
COC Number		08534657			TOXIC EQUIVALENCY		# of	
	UNITS	AC 11 FLY ASH	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Total Penta CDF **	pg/g	1230	0.648	25.0			15	B359234
Total Hexa CDF **	pg/g	277	0.742	25.0			13	B359234
Total Hepta CDF **	pg/g	27.7	0.663	25.0			4	B359234
TCDF Confirmation								
Confirmation 2,3,7,8-Tetra CDF **	pg/g	295	0.71	5.0	0.100	29.5		B359235
TOTAL TOXIC EQUIVALENCY	pg/g					197		
Surrogate Recovery (%)								
37CL4 2378 Tetra CDD *	%	87						B359234
C13-1234678 HeptaCDD *	%	102						B359234
C13-1234678 HeptaCDF **	%	100						B359234
C13-123478 HexaCDD *	%	91						B359234
C13-123478 HexaCDF **	%	92						B359234
C13-1234789 HeptaCDF **	%	117						B359234
C13-123678 HexaCDD *	%	81						B359234
C13-123678 HexaCDF **	%	92						B359234
C13-12378 PentaCDD *	%	92						B359234
C13-12378 PentaCDF **	%	87						B359234
C13-123789 HexaCDF **	%	98						B359234
C13-234678 HexaCDF **	%	95						B359234
C13-23478 PentaCDF **	%	94						B359234
C13-2378 TetraCDD *	%	78						B359234
C13-2378 TetraCDF **	%	87						B359234
C13-OCDD *	%	90						B359234
Confirmation C13-2378 TetraCDF **	%	66						B359235

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

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Data page 5: Dioxin/Furan TEQ for 22 Apr 2024

Bureau Veritas Job #: C428023
Report Date: 2024/05/03

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

TCLP METALS (SOIL)

Bureau Veritas ID		CML385		
Sampling Date		2024/04/22 08:30		
COC Number		08534657		
	UNITS	AC 11 FLY ASH	RDL	QC Batch
TCLP Extraction Procedure				
Leachate Antimony (Sb)	mg/L	<0.10	0.10	B350475
Leachate Arsenic (As)	mg/L	<0.10	0.10	B350475
Leachate Barium (Ba)	mg/L	1.88	0.10	B350475
Leachate Beryllium (Be)	mg/L	<0.10	0.10	B350475
Leachate Boron (B)	mg/L	2.36	0.10	B350475
Leachate Cadmium (Cd)	mg/L	<0.10	0.10	B350475
Leachate Chromium (Cr)	mg/L	<0.10	0.10	B350475
Leachate Cobalt (Co)	mg/L	<0.10	0.10	B350475
Leachate Copper (Cu)	mg/L	<0.10	0.10	B350475
Leachate Iron (Fe)	mg/L	<0.50	0.50	B350475
Leachate Lead (Pb)	mg/L	<0.10	0.10	B350475
Leachate Mercury (Hg)	mg/L	<0.0020	0.0020	B350475
Leachate Molybdenum (Mo)	mg/L	0.19	0.10	B350475
Leachate Nickel (Ni)	mg/L	<0.10	0.10	B350475
Leachate Selenium (Se)	mg/L	<0.10	0.10	B350475
Leachate Silver (Ag)	mg/L	<0.010	0.010	B350475
Leachate Thallium (Tl)	mg/L	<0.10	0.10	B350475
Leachate Uranium (U)	mg/L	<0.10	0.10	B350475
Leachate Vanadium (V)	mg/L	<0.10	0.10	B350475
Leachate Zinc (Zn)	mg/L	<0.10	0.10	B350475
Leachate Zirconium (Zr)	mg/L	<0.10	0.10	B350475
RDL = Reportable Detection Limit				

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Data page 6: TCLP Metals for 22 Apr 2024

Bureau Veritas Job #: C428023
Report Date: 2024/05/03

ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

CSR PAH IN SOIL BY GC-MS (SOIL)

Bureau Veritas ID		CML385		
Sampling Date		2024/04/22 08:30		
COC Number		08534657		
	UNITS	AC 11 FLY ASH	RDL	QC Batch
Calculated Parameters				
Low Molecular Weight PAH`s	mg/kg	<0.13	0.13	B347827
High Molecular Weight PAH`s	mg/kg	<0.13	0.13	B347827
Total PAH	mg/kg	<0.13	0.13	B347827
B[a]P TPE Total Potency Equivalents	mg/kg	0.059	0.010	B347827
Polycyclic Aromatics				
Naphthalene	mg/kg	<0.025 (1)	0.025	B348533
2-Methylnaphthalene	mg/kg	<0.050 (1)	0.050	B348533
Acenaphthylene	mg/kg	<0.013 (1)	0.013	B348533
Acenaphthene	mg/kg	<0.013 (1)	0.013	B348533
Fluorene	mg/kg	<0.050 (1)	0.050	B348533
Phenanthrene	mg/kg	<0.025 (1)	0.025	B348533
Anthracene	mg/kg	<0.010 (1)	0.010	B348533
Fluoranthene	mg/kg	<0.050 (1)	0.050	B348533
Pyrene	mg/kg	<0.050 (1)	0.050	B348533
Benzo(a)anthracene	mg/kg	<0.050 (1)	0.050	B348533
Chrysene	mg/kg	<0.050 (1)	0.050	B348533
Benzo(b&j)fluoranthene	mg/kg	<0.020 (1)	0.020	B348533
Benzo(b)fluoranthene	mg/kg	<0.050 (1)	0.050	B348533
Benzo(k)fluoranthene	mg/kg	<0.050 (1)	0.050	B348533
Benzo(a)pyrene	mg/kg	<0.050 (1)	0.050	B348533
Indeno(1,2,3-cd)pyrene	mg/kg	<0.050 (1)	0.050	B348533
Dibenz(a,h)anthracene	mg/kg	<0.050 (1)	0.050	B348533
Benzo(g,h,i)perylene	mg/kg	<0.13 (1)	0.13	B348533
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	0 (2)		B348533
D8-ACENAPHTHYLENE (sur.)	%	0 (2)		B348533
D8-NAPHTHALENE (sur.)	%	0.32 (2)		B348533
TERPHENYL-D14 (sur.)	%	0 (2)		B348533

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

(2) Surrogate recovery below acceptance criteria due to matrix interference-ash sample.

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

GENERAL COMMENTS

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B348112	IP1	Method Blank	Moisture	2024/04/24	<0.30		%	
B348112	IP1	RPD	Moisture	2024/04/24	0.61		%	20
B348533	MDW	Matrix Spike	D10-ANTHRACENE (sur.)	2024/04/24		67	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2024/04/24		64	%	50 - 140
			D8-NAPHTHALENE (sur.)	2024/04/24		68	%	50 - 140
			TERPHENYL-D14 (sur.)	2024/04/24		68	%	50 - 140
			Naphthalene	2024/04/24		76	%	50 - 140
			2-Methylnaphthalene	2024/04/24		81	%	50 - 140
			Acenaphthylene	2024/04/24		68	%	50 - 140
			Acenaphthene	2024/04/24		75	%	50 - 140
			Fluorene	2024/04/24		74	%	50 - 140
			Phenanthrene	2024/04/24		71	%	50 - 140
			Anthracene	2024/04/24		70	%	50 - 140
			Fluoranthene	2024/04/24		72	%	50 - 140
			Pyrene	2024/04/24		72	%	50 - 140
			Benzo(a)anthracene	2024/04/24		72	%	50 - 140
			Chrysene	2024/04/24		74	%	50 - 140
			Benzo(b&j)fluoranthene	2024/04/24		70	%	50 - 140
			Benzo(b)fluoranthene	2024/04/24		71	%	50 - 140
			Benzo(k)fluoranthene	2024/04/24		72	%	50 - 140
			Benzo(a)pyrene	2024/04/24		71	%	50 - 140
			Indeno(1,2,3-cd)pyrene	2024/04/24		74	%	50 - 140
			Dibenz(a,h)anthracene	2024/04/24		70	%	50 - 140
			Benzo(g,h,i)perylene	2024/04/24		73	%	50 - 140
B348533	MDW	Spiked Blank	D10-ANTHRACENE (sur.)	2024/04/24		72	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2024/04/24		70	%	50 - 140
			D8-NAPHTHALENE (sur.)	2024/04/24		69	%	50 - 140
			TERPHENYL-D14 (sur.)	2024/04/24		72	%	50 - 140
			Naphthalene	2024/04/24		80	%	50 - 140
			2-Methylnaphthalene	2024/04/24		86	%	50 - 140
			Acenaphthylene	2024/04/24		73	%	50 - 140
			Acenaphthene	2024/04/24		79	%	50 - 140
			Fluorene	2024/04/24		79	%	50 - 140
			Phenanthrene	2024/04/24		75	%	50 - 140
			Anthracene	2024/04/24		75	%	50 - 140
			Fluoranthene	2024/04/24		77	%	50 - 140
			Pyrene	2024/04/24		76	%	50 - 140
			Benzo(a)anthracene	2024/04/24		76	%	50 - 140
			Chrysene	2024/04/24		79	%	50 - 140
			Benzo(b&j)fluoranthene	2024/04/24		74	%	50 - 140
			Benzo(b)fluoranthene	2024/04/24		76	%	50 - 140
			Benzo(k)fluoranthene	2024/04/24		76	%	50 - 140
			Benzo(a)pyrene	2024/04/24		75	%	50 - 140
			Indeno(1,2,3-cd)pyrene	2024/04/24		79	%	50 - 140
			Dibenz(a,h)anthracene	2024/04/24		75	%	50 - 140
			Benzo(g,h,i)perylene	2024/04/24		78	%	50 - 140
B348533	MDW	Method Blank	D10-ANTHRACENE (sur.)	2024/04/24		76	%	50 - 140
			D8-ACENAPHTHYLENE (sur.)	2024/04/24		63	%	50 - 140
			D8-NAPHTHALENE (sur.)	2024/04/24		64	%	50 - 140
			TERPHENYL-D14 (sur.)	2024/04/24		79	%	50 - 140
			Naphthalene	2024/04/24	<0.010		mg/kg	
			2-Methylnaphthalene	2024/04/24	<0.020		mg/kg	
			Acenaphthylene	2024/04/24	<0.0050		mg/kg	
			Acenaphthene	2024/04/24	<0.0050		mg/kg	

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Fluorene	2024/04/24	<0.020		mg/kg	
			Phenanthrene	2024/04/24	<0.010		mg/kg	
			Anthracene	2024/04/24	<0.0040		mg/kg	
			Fluoranthene	2024/04/24	<0.020		mg/kg	
			Pyrene	2024/04/24	<0.020		mg/kg	
			Benzo(a)anthracene	2024/04/24	<0.020		mg/kg	
			Chrysene	2024/04/24	<0.020		mg/kg	
			Benzo(b&j)fluoranthene	2024/04/24	<0.020		mg/kg	
			Benzo(b)fluoranthene	2024/04/24	<0.020		mg/kg	
			Benzo(k)fluoranthene	2024/04/24	<0.020		mg/kg	
			Benzo(a)pyrene	2024/04/24	<0.020		mg/kg	
			Indeno(1,2,3-cd)pyrene	2024/04/24	<0.020		mg/kg	
			Dibenz(a,h)anthracene	2024/04/24	<0.020		mg/kg	
			Benzo(g,h,i)perylene	2024/04/24	<0.050		mg/kg	
B348533	MDW	RPD	Naphthalene	2024/04/24	NC		%	50
			2-Methylnaphthalene	2024/04/24	NC		%	50
			Acenaphthylene	2024/04/24	NC		%	50
			Acenaphthene	2024/04/24	NC		%	50
			Fluorene	2024/04/24	NC		%	50
			Phenanthrene	2024/04/24	NC		%	50
			Anthracene	2024/04/24	NC		%	50
			Fluoranthene	2024/04/24	NC		%	50
			Pyrene	2024/04/24	NC		%	50
			Benzo(a)anthracene	2024/04/24	NC		%	50
			Chrysene	2024/04/24	NC		%	50
			Benzo(b&j)fluoranthene	2024/04/24	NC		%	50
			Benzo(b)fluoranthene	2024/04/24	NC		%	50
			Benzo(k)fluoranthene	2024/04/24	NC		%	50
			Benzo(a)pyrene	2024/04/24	NC		%	50
			Indeno(1,2,3-cd)pyrene	2024/04/24	NC		%	50
			Dibenz(a,h)anthracene	2024/04/24	NC		%	50
			Benzo(g,h,i)perylene	2024/04/24	NC		%	50
B349089	S2L	Method Blank	Initial pH of Sample	2024/04/25	4.96		pH	
			pH after HCl	2024/04/25	NA		pH	
			Final pH of Leachate	2024/04/25	4.94		pH	
			pH of Leaching Fluid	2024/04/25	4.96		pH	
B349089	S2L	RPD	Initial pH of Sample	2024/04/25	0.58		%	N/A
			pH after HCl	2024/04/25	3.2		%	N/A
			Final pH of Leachate	2024/04/25	0.41		%	N/A
			pH of Leaching Fluid	2024/04/25	0		%	N/A
B350475	RLC	Matrix Spike [CML385-02]	Leachate Antimony (Sb)	2024/04/25		107	%	75 - 125
			Leachate Arsenic (As)	2024/04/25		104	%	75 - 125
			Leachate Barium (Ba)	2024/04/25		98	%	75 - 125
			Leachate Beryllium (Be)	2024/04/25		105	%	75 - 125
			Leachate Boron (B)	2024/04/25		106	%	75 - 125
			Leachate Cadmium (Cd)	2024/04/25		102	%	75 - 125
			Leachate Chromium (Cr)	2024/04/25		100	%	75 - 125
			Leachate Cobalt (Co)	2024/04/25		98	%	75 - 125
			Leachate Copper (Cu)	2024/04/25		94	%	75 - 125
			Leachate Iron (Fe)	2024/04/25		102	%	75 - 125
			Leachate Lead (Pb)	2024/04/25		100	%	75 - 125
			Leachate Mercury (Hg)	2024/04/25		104	%	75 - 125
			Leachate Molybdenum (Mo)	2024/04/25		105	%	75 - 125

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachate Nickel (Ni)	2024/04/25		97	%	75 - 125
			Leachate Selenium (Se)	2024/04/25		105	%	75 - 125
			Leachate Silver (Ag)	2024/04/25		98	%	75 - 125
			Leachate Thallium (Tl)	2024/04/25		103	%	75 - 125
			Leachate Uranium (U)	2024/04/25		100	%	75 - 125
			Leachate Vanadium (V)	2024/04/25		107	%	75 - 125
			Leachate Zinc (Zn)	2024/04/25		95	%	75 - 125
			Leachate Zirconium (Zr)	2024/04/25		108	%	75 - 125
B350475	RLC	Spiked Blank	Leachate Antimony (Sb)	2024/04/25		104	%	75 - 125
			Leachate Arsenic (As)	2024/04/25		107	%	75 - 125
			Leachate Barium (Ba)	2024/04/25		103	%	75 - 125
			Leachate Beryllium (Be)	2024/04/25		105	%	75 - 125
			Leachate Boron (B)	2024/04/25		106	%	75 - 125
			Leachate Cadmium (Cd)	2024/04/25		104	%	75 - 125
			Leachate Chromium (Cr)	2024/04/25		105	%	75 - 125
			Leachate Cobalt (Co)	2024/04/25		103	%	75 - 125
			Leachate Copper (Cu)	2024/04/25		100	%	75 - 125
			Leachate Iron (Fe)	2024/04/25		106	%	75 - 125
			Leachate Lead (Pb)	2024/04/25		102	%	75 - 125
			Leachate Mercury (Hg)	2024/04/25		106	%	75 - 125
			Leachate Molybdenum (Mo)	2024/04/25		105	%	75 - 125
			Leachate Nickel (Ni)	2024/04/25		99	%	75 - 125
			Leachate Selenium (Se)	2024/04/25		107	%	75 - 125
			Leachate Silver (Ag)	2024/04/25		99	%	75 - 125
			Leachate Thallium (Tl)	2024/04/25		106	%	75 - 125
			Leachate Uranium (U)	2024/04/25		102	%	75 - 125
			Leachate Vanadium (V)	2024/04/25		111	%	75 - 125
			Leachate Zinc (Zn)	2024/04/25		101	%	75 - 125
			Leachate Zirconium (Zr)	2024/04/25		110	%	75 - 125
B350475	RLC	Method Blank	Leachate Antimony (Sb)	2024/04/25	<0.10		mg/L	
			Leachate Arsenic (As)	2024/04/25	<0.10		mg/L	
			Leachate Barium (Ba)	2024/04/25	<0.10		mg/L	
			Leachate Beryllium (Be)	2024/04/25	<0.10		mg/L	
			Leachate Boron (B)	2024/04/25	<0.10		mg/L	
			Leachate Cadmium (Cd)	2024/04/25	<0.10		mg/L	
			Leachate Chromium (Cr)	2024/04/25	<0.10		mg/L	
			Leachate Cobalt (Co)	2024/04/25	<0.10		mg/L	
			Leachate Copper (Cu)	2024/04/25	<0.10		mg/L	
			Leachate Iron (Fe)	2024/04/25	<0.50		mg/L	
			Leachate Lead (Pb)	2024/04/25	<0.10		mg/L	
			Leachate Mercury (Hg)	2024/04/25	<0.0020		mg/L	
			Leachate Molybdenum (Mo)	2024/04/25	<0.10		mg/L	
			Leachate Nickel (Ni)	2024/04/25	<0.10		mg/L	
			Leachate Selenium (Se)	2024/04/25	<0.10		mg/L	
			Leachate Silver (Ag)	2024/04/25	<0.010		mg/L	
			Leachate Thallium (Tl)	2024/04/25	<0.10		mg/L	
			Leachate Uranium (U)	2024/04/25	<0.10		mg/L	
			Leachate Vanadium (V)	2024/04/25	<0.10		mg/L	
			Leachate Zinc (Zn)	2024/04/25	<0.10		mg/L	
			Leachate Zirconium (Zr)	2024/04/25	<0.10		mg/L	
B359234	éGP	Spiked Blank	37CL4 2378 Tetra CDD	2024/05/01		57	%	35 - 197
			C13-1234678 HeptaCDD	2024/05/01		62	%	23 - 140
			C13-1234678 HeptaCDF	2024/05/01		57	%	28 - 143
			C13-123478 HexaCDD	2024/05/01		60	%	32 - 141

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			C13-123478 HexaCDF	2024/05/01		59	%	26 - 152
			C13-1234789 HeptaCDF	2024/05/01		65	%	26 - 138
			C13-123678 HexaCDD	2024/05/01		56	%	28 - 130
			C13-123678 HexaCDF	2024/05/01		58	%	26 - 123
			C13-12378 PentaCDD	2024/05/01		67	%	25 - 181
			C13-12378 PentaCDF	2024/05/01		55	%	24 - 185
			C13-123789 HexaCDF	2024/05/01		62	%	29 - 147
			C13-234678 HexaCDF	2024/05/01		59	%	28 - 136
			C13-23478 PentaCDF	2024/05/01		59	%	21 - 178
			C13-2378 TetraCDD	2024/05/01		53	%	25 - 164
			C13-2378 TetraCDF	2024/05/01		61	%	24 - 169
			C13-OCDD	2024/05/01		59	%	17 - 157
			2,3,7,8-Tetra CDD	2024/05/01		109	%	67 - 158
			1,2,3,7,8-Penta CDD	2024/05/01		95	%	25 - 181
			1,2,3,4,7,8-Hexa CDD	2024/05/01		98	%	70 - 164
			1,2,3,6,7,8-Hexa CDD	2024/05/01		100	%	76 - 134
			1,2,3,7,8,9-Hexa CDD	2024/05/01		105	%	64 - 162
			1,2,3,4,6,7,8-Hepta CDD	2024/05/01		99	%	70 - 140
			Octa CDD	2024/05/01		99	%	78 - 144
			2,3,7,8-Tetra CDF	2024/05/01		104	%	75 - 158
			1,2,3,7,8-Penta CDF	2024/05/01		102	%	80 - 134
			2,3,4,7,8-Penta CDF	2024/05/01		99	%	68 - 160
			1,2,3,4,7,8-Hexa CDF	2024/05/01		97	%	72 - 134
			1,2,3,6,7,8-Hexa CDF	2024/05/01		98	%	84 - 130
			2,3,4,6,7,8-Hexa CDF	2024/05/01		101	%	70 - 156
			1,2,3,7,8,9-Hexa CDF	2024/05/01		102	%	78 - 130
			1,2,3,4,6,7,8-Hepta CDF	2024/05/01		97	%	82 - 122
			1,2,3,4,7,8,9-Hepta CDF	2024/05/01		93	%	78 - 138
			Octa CDF	2024/05/01		101	%	63 - 170
B359234	éGP	RPD	2,3,7,8-Tetra CDD	2024/05/01	0		%	25
			1,2,3,7,8-Penta CDD	2024/05/01	1.1		%	25
			1,2,3,4,7,8-Hexa CDD	2024/05/01	1.0		%	25
			1,2,3,6,7,8-Hexa CDD	2024/05/01	3.0		%	25
			1,2,3,7,8,9-Hexa CDD	2024/05/01	2.8		%	25
			1,2,3,4,6,7,8-Hepta CDD	2024/05/01	3.0		%	25
			Octa CDD	2024/05/01	0		%	25
			2,3,7,8-Tetra CDF	2024/05/01	4.7		%	25
			1,2,3,7,8-Penta CDF	2024/05/01	1.9		%	25
			2,3,4,7,8-Penta CDF	2024/05/01	0		%	25
			1,2,3,4,7,8-Hexa CDF	2024/05/01	4.0		%	25
			1,2,3,6,7,8-Hexa CDF	2024/05/01	3.0		%	25
			2,3,4,6,7,8-Hexa CDF	2024/05/01	6.7		%	25
			1,2,3,7,8,9-Hexa CDF	2024/05/01	6.6		%	25
			1,2,3,4,6,7,8-Hepta CDF	2024/05/01	7.0		%	25
			1,2,3,4,7,8,9-Hepta CDF	2024/05/01	11		%	25
			Octa CDF	2024/05/01	6.7		%	25
B359234	éGP	Method Blank	37CL4 2378 Tetra CDD	2024/05/01		70	%	35 - 197
			C13-1234678 HeptaCDD	2024/05/01		86	%	23 - 140
			C13-1234678 HeptaCDF	2024/05/01		82	%	28 - 143
			C13-123478 HexaCDD	2024/05/01		72	%	32 - 141
			C13-123478 HexaCDF	2024/05/01		72	%	26 - 152
			C13-1234789 HeptaCDF	2024/05/01		94	%	26 - 138
			C13-123678 HexaCDD	2024/05/01		72	%	28 - 130
			C13-123678 HexaCDF	2024/05/01		70	%	26 - 123

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			C13-12378 PentaCDD	2024/05/01		79	%	25 - 181
			C13-12378 PentaCDF	2024/05/01		73	%	24 - 185
			C13-123789 HexaCDF	2024/05/01		80	%	29 - 147
			C13-234678 HexaCDF	2024/05/01		73	%	28 - 136
			C13-23478 PentaCDF	2024/05/01		73	%	21 - 178
			C13-2378 TetraCDD	2024/05/01		61	%	25 - 164
			C13-2378 TetraCDF	2024/05/01		77	%	24 - 169
			C13-OCDD	2024/05/01		85	%	17 - 157
			2,3,7,8-Tetra CDD	2024/05/01	<0.680, EDL=0.680		pg/g	
			1,2,3,7,8-Penta CDD	2024/05/01	<0.644, EDL=0.644		pg/g	
			1,2,3,4,7,8-Hexa CDD	2024/05/01	<0.699, EDL=0.699		pg/g	
			1,2,3,6,7,8-Hexa CDD	2024/05/01	1.99, EDL=0.672		pg/g	
			1,2,3,7,8,9-Hexa CDD	2024/05/01	5.24, EDL=0.679		pg/g	
			1,2,3,4,6,7,8-Hepta CDD	2024/05/01	7.04, EDL=0.762		pg/g	
			Octa CDD	2024/05/01	4.97, EDL=0.607		pg/g	
			Total Tetra CDD	2024/05/01	20.8, EDL=0.680 (1)		pg/g	
			Total Penta CDD	2024/05/01	28.2, EDL=0.644 (1)		pg/g	
			Total Hexa CDD	2024/05/01	37.5, EDL=0.683 (1)		pg/g	
			Total Hepta CDD	2024/05/01	23.1, EDL=0.762		pg/g	
			2,3,7,8-Tetra CDF	2024/05/01	<0.627, EDL=0.627		pg/g	
			1,2,3,7,8-Penta CDF	2024/05/01	<0.692, EDL=0.692		pg/g	
			2,3,4,7,8-Penta CDF	2024/05/01	<0.639, EDL=0.639		pg/g	
			1,2,3,4,7,8-Hexa CDF	2024/05/01	<0.686, EDL=0.686		pg/g	
			1,2,3,6,7,8-Hexa CDF	2024/05/01	<0.680, EDL=0.680		pg/g	
			2,3,4,6,7,8-Hexa CDF	2024/05/01	<0.686, EDL=0.686		pg/g	
			1,2,3,7,8,9-Hexa CDF	2024/05/01	<0.756, EDL=0.756		pg/g	
			1,2,3,4,6,7,8-Hepta CDF	2024/05/01	<0.641, EDL=0.641		pg/g	
			1,2,3,4,7,8,9-Hepta CDF	2024/05/01	<0.690, EDL=0.690		pg/g	
			Octa CDF	2024/05/01	<0.661, EDL=0.661		pg/g	
			Total Tetra CDF	2024/05/01	<0.627, EDL=0.627		pg/g	
			Total Penta CDF	2024/05/01	<0.664, EDL=0.664		pg/g	

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ATLANTIC POWER (WILLIAMS LAKE) LTD.
Site Location: WILLIAMS LAKE POWER PLANT
Sampler Initials: JG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Hexa CDF	2024/05/01	<0.699, EDL=0.699		pg/g	
			Total Hepta CDF	2024/05/01	<0.665, EDL=0.665		pg/g	
B359235	éGP	Method Blank	Confirmation C13-2378 TetraCDF	2024/05/01		57	%	40 - 135
			Confirmation 2,3,7,8-Tetra CDF	2024/05/01	<1.4, EDL=1.4		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) Conc in sample is 10x higher than method blank. Result is reportable with flag.

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Sampler Initials: JG

VALIDATION SIGNATURE PAGE

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

Cathy Xu, Senior Analyst, HRMS Services, Senior Analyst, HRMS Services

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

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.

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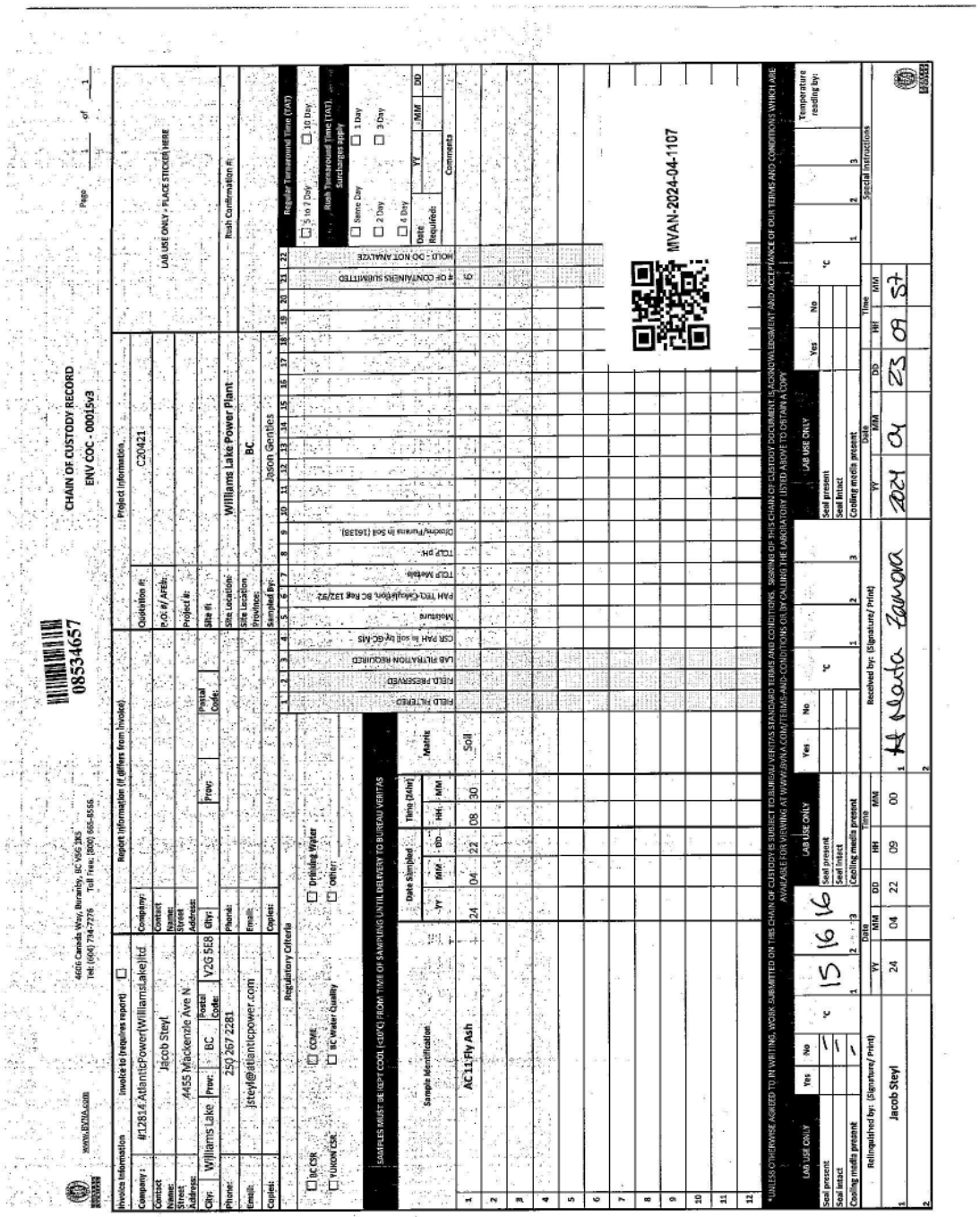

CHAIN OF CUSTODY RECORD
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Tel: (604) 734-7276 Toll Free: (800) 665-8566

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Invoice Information | Invoice to (required report) ☐ | Report Information (if differs from Invoice) | Project Information

Company: #12814 AtlanticPower(WilliamsLake)ltd | Company: | Quotation #: C20421
Contact Name: Jacob Steyl | Contact Name: | P.O. #/ Ariba:
Street Address: 4455 Mackenzie Ave N | Street Address: | Project #:
City: Williams Lake | Prov: BC | Postal Code: V2G 5S8 | City: | Prov: | Postal Code: | Site #: | LAB USE ONLY - PLACE STICKER HERE
Phone: 250 267 2281 | Phone: | Site Locations: Williams Lake Power Plant | Rush Confirmation #:
Email: jsteyl@atlanticpower.com | Email: | Site Location - Province: BC
Copies: | Copies: | Sampled By: Jason Geddes

Regulatory Criteria: ☐ BC CSR ☐ YUKON CSR ☐ CCME ☐ BC Water Quality ☐ Drinking Water ☐ Other:

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

	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH:	MM	Matrix	FIELD FILTERED	FIELD PRESERVED	LAB FILTRATION REQUIRED	CSR PAH in soil by GC-MS	Moisture	PAH TEQ - Calculation: BC Reg 132/92	TCLP Metals	TCLP pH	Chlorine/Pharma in Soil (16138)	# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE
1	AC11 Fly Ash	24	04	22	08	30	Soil										9	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		

MVAN-2024-04-1107

Regular Turnaround Time (TAT): ☐ 5 to 7 Day ☐ 10 Day
Rush Turnaround Time (TAT): Surcharges apply
☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day
Date Required: YY MM DD
Comments

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS AN ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.HTM. BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY.

LAB USE ONLY	Yes	No	°C
Seal present			
Seal intact			
Cooling media present			

Relinquished by: (Signature/ Print)	YY	MM	DD	HH	MM
1 Jacob Steyl	24	04	22	09	00
2					

LAB USE ONLY	Yes	No	°C
Seal present			
Seal intact			
Cooling media present			

Received by: (Signature/ Print)	YY	MM	DD	HH	MM
1 H Acosta Zamora	2024	04	23	09	57
2					

Temperature reading by:

Special instructions