



**A. Lanfranco
& Associates Inc.**

Environmental Consultants

Prepared for

METRO VANCOUVER

Metrotower III

4515 Central Boulevard

Burnaby, BC V5H 0C6

**Annual Trace Organics Emission Report
Waste-to-Energy Facility**

November 2023 Survey

Operational Certificate 107051

Prepared by Mr. Carter Lanfranco

Report Issued: January 25, 2024

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. C. Lanfranco (certified), and Mr. C. De La O.

The report was prepared by Mr. C. Lanfranco using reporting principles and guidelines generally acceptable to Metro Vancouver (MV).

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

Report reviewed on Jan.25, 2024 by:



Mr. Mark Lanfranco, CST

President | Owner

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TEST PROGRAM ORGANIZATION

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Sampling Crew:	Mr. C. Lanfranco – A. Lanfranco and Associates Inc. Mr. C. De La O – A. Lanfranco and Associates Inc.

SUMMARY

The following table presents the average of triplicate emission test results from Unit 1 for various trace organics on Nov.28-30, 2023. Additional parameters were measured by the facility's certified continuous emission monitoring system.

Parameter		Unit 1	Limit
PCDD/PCDF	(TEQ ng/Sm ³ @ 11% O ₂)	ND	0.08
PCDD/PCDF Mass Emission	(TEQ g/day)	ND	
PAH	(µg/Sm ³ @ 11% O ₂)	0.0788	5.0
HCB*	(µg/Sm ³ @ 11% O ₂)	0.0013	
Total CB	(µg/Sm ³ @ 11% O ₂)	0.3469	1.0
Total CP*	(µg/Sm ³ @ 11% O ₂)	0.0063	1.0
Total PCB	(µg/Sm ³ @ 11% O ₂)	0.0241	1.0
Flowrate	(Sm ³ /min)	1202	
Temperature	(°C)	148	
O ₂	(vol % dry)	10.4	

Standard conditions (S) of 20 °C and 101.325 kPa (dry)

Note: PCDD/PCDF results are in nanograms per cubic meter and grams/day, PAH/HCB/CB/CP are reported in micrograms per cubic meter.

1 INTRODUCTION

Metro Vancouver (MV) commissioned an emissions (air) monitoring survey at the Waste-to-Energy Facility (WTEF) in Burnaby, B.C. This report documents the results of a semi-volatile organics survey for dioxin/furan (PCDD/PCDF), polychlorinated biphenyl (PCB), polycyclic aromatic hydrocarbons (PAH), hexachlorobenzenes (HCB), chlorobenzenes (CB), and chlorophenols (CP) during normal operations at the facility.

This report includes detailed emission results, a brief outline of methods employed, equipment used, and a discussion of the survey. Supporting data is presented in the appendices section of this report.

The individual emission source monitored for 2023 was Unit 1.

2 METHODOLOGY

All services provided by A. Lanfranco and Associates were conducted in accordance with approved reference methods as promulgated by:

- Metro Vancouver
- BC Ministry of Environment & Climate Change Strategy
- Environment Canada (EC)
- US Environmental Protection Agency (EPA)

2.1 Sampling and Analytical Methods

The following table lists the test methods used for the different parameters measured. The subsequent paragraphs briefly describe each method.

<u>Parameter</u>	<u>Reference Method</u>
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)	EPS 1/RM/8 C Determination of Molecular Weight by Gas Analysis
Flue gas Moisture	EPS 1/RM/8 D Determination of Moisture Content
Dioxin/Furan (sampling)	EPS 1/RM/2 Reference Method for Source Testing - Measurement of Releases of Semi-Volatile Organic Compounds from Stationary Sources
Dioxin/Furan (analytical)	EPA Method 23 Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from Stationary Sources supporting Methodology for Organic Analysis - A Method for the Analysis of Polychlorinated Dibenzopara-Dioxins (PCDD's), Polychlorinated Dibenzofurans (PCDF's) Environment Canada, December 1989

Sampling Site and Traverse Points

Primary: EPS 1/RM/8 Method A
 Supporting: 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.

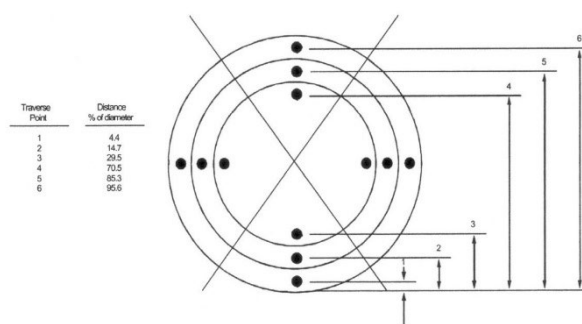


Figure 1. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

Stack Gas Velocity
and Volumetric Flow Rate

Primary: EPS 1/RM/8 Method B
 Supporting: 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.

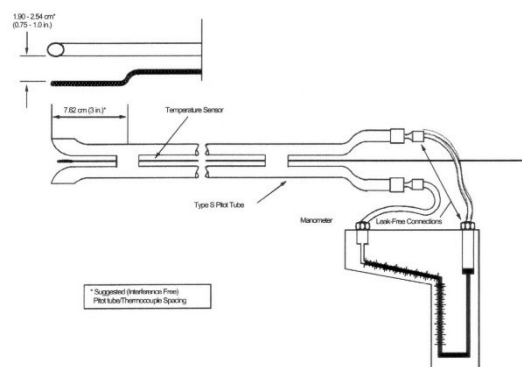


Figure 2. Type S Pitot Tube Manometer Assembly

Molecular Weight by Gas Analysis

Primary: EPS 1/RM/8 Method C
 Supporting: EPA Method 3

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: EPS 1/RM/8 Method D
 Supporting: 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.

Dioxins / Furans

Primary: EPS 1/RM/2, 1/RM/3, 1/RM/23
 Supporting: EPA Method 23

This method is applicable to the determination of emissions of polychlorinated dibenzo-pa-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and other semi-volatile organic compounds from stationary sources. An integrated gas sample is isokinetically withdrawn from the stack similar to Method 5. Semi-volatile organic compounds associated with particulate matter are collected in the front half components with remaining compounds not collected by the filter, being absorbed in an Amberlite XAD-2 resin trap.

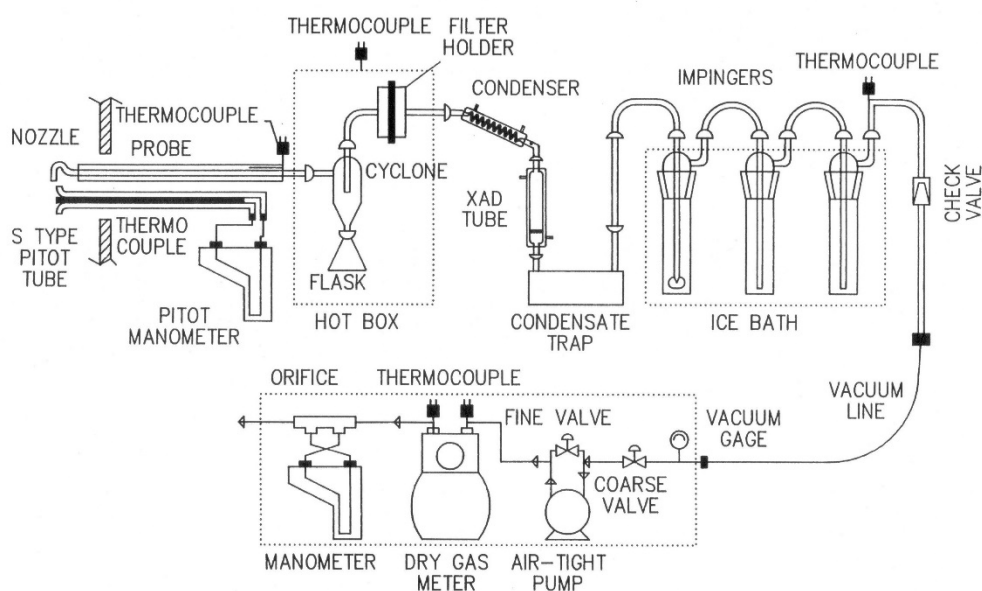


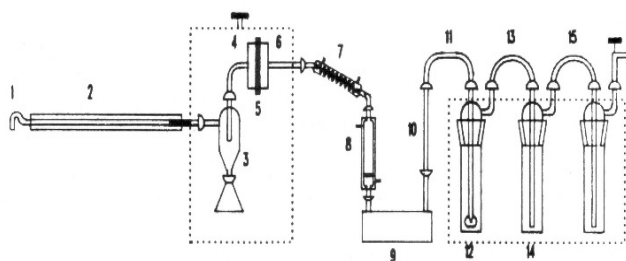
Figure 3 - Dioxin / Furan Sampling Train

Due to the sensitivity of this test method, extra care and precautions are used. All sample trains were cleaned professionally at an accredited laboratory. A solvent proof of the glassware and XAD was archived as suggested by the method.

The train was operated for duration of 240 minutes. Upon completion, it was removed to a clean area for recovery. The recovered sample consists of 6 individual components:

• Filter Rinses	• Front Half Rinses
• XAD Trap	• Soak
• Impingers	• Final Rinse

Complete sampling and recovery procedures can be supplied upon request.



Container or Sample	Component(s)	Recovery Procedure
1	1, 2, 3, 4	Wash and brush 3 times each with hexane (H) and acetone (A). Rinse 3 times each with H and A.
2	5	Remove carefully from holder. Place on pre-cleaned foil. Fold in half. Place in pre-cleaned glass petri dish.
3	6, 7	Soak 5 minutes each with H and A. Rinse 3 times each with H and A.
4	8	Cap ends and wrap in foil.
5	9, 12	Empty contents into container and rinse each 3 times with HPLC water.
6	6 to 15 except 8	Rinse 3 times each with H and A.

Mark liquid levels on all bottles.
All sample containers are pre-cleaned amber glass bottles with pre-cleaned Teflon lid liners.

Figure 4 Recovery Procedures for Semi-Volatile Organics

Samples are analyzed on a high-resolution GS/MS at Pacific Rim Laboratories Inc. of Surrey, BC. Following is a description, in very simplified terms, of the basic procedures used to process the sample train and blank train components.

Initially the sample components are separated into liquid (containers 1, 4, 5 and 6) or solid phases (containers 2 and 3) and surrogate compounds (for recovery calculations) are injected into the solid phases of the front and back half samples. Liquid and solid samples are extracted with various solvents (usually benzene), sometimes under acid conditions. Figure 5 and Figure 6 demonstrate the step by step procedures used to extract the components of interest into a solvent phase which

is ready for detailed splitting and clean-up. The concentrated extracts from Figure 5 are combined and are processed per procedures detailed in Figure 6.

When each target group has been isolated, as indicated in Figure 4, the extract volumes are dried, concentrated, and analysed by GC/MS analytical instrumentation. Prior to actual analysis, all samples were spiked with a performance standard for laboratory QA/QC purposes.

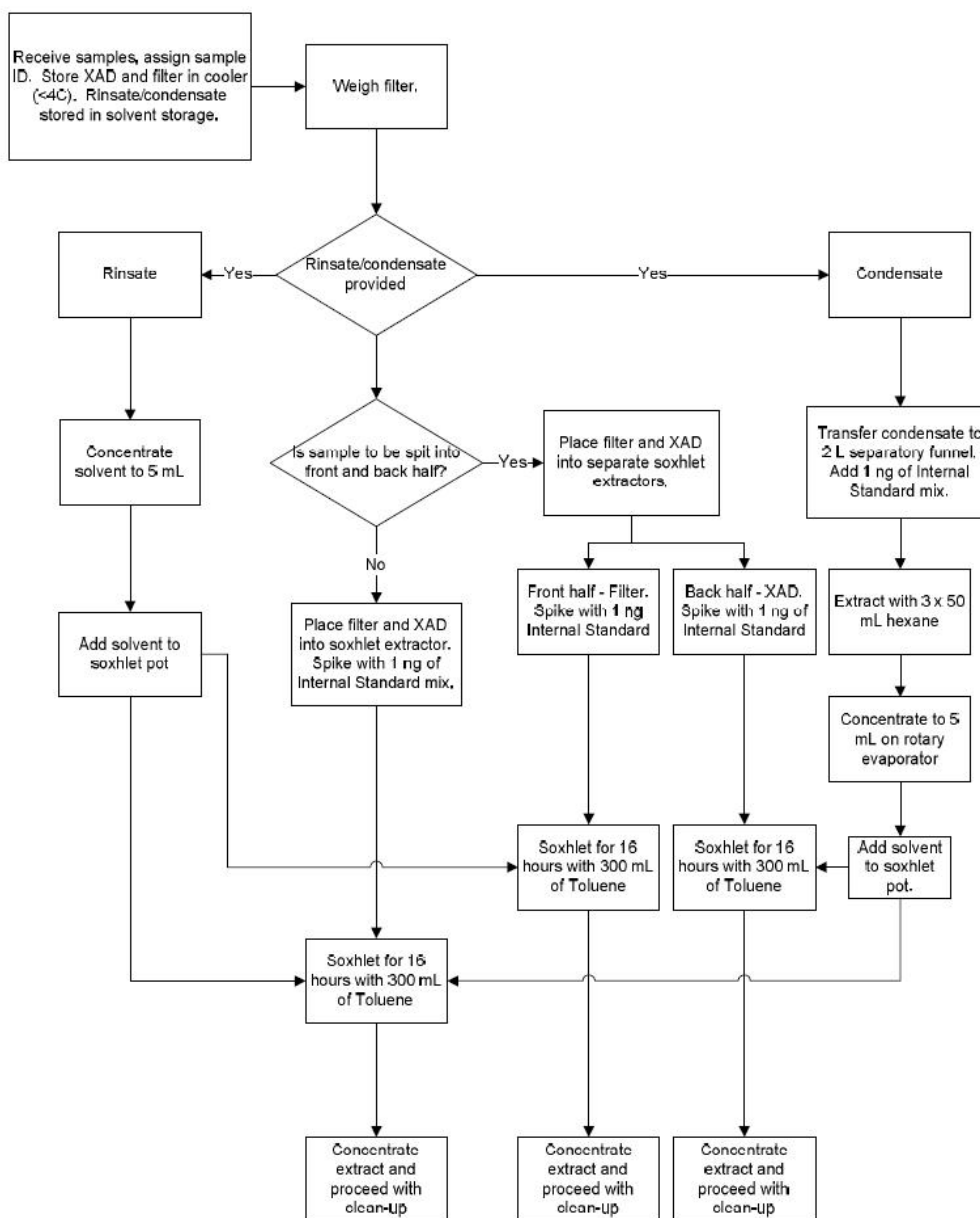


Figure 5 - Semi-Volatile Organics XAD and Filter Recovery Schematic

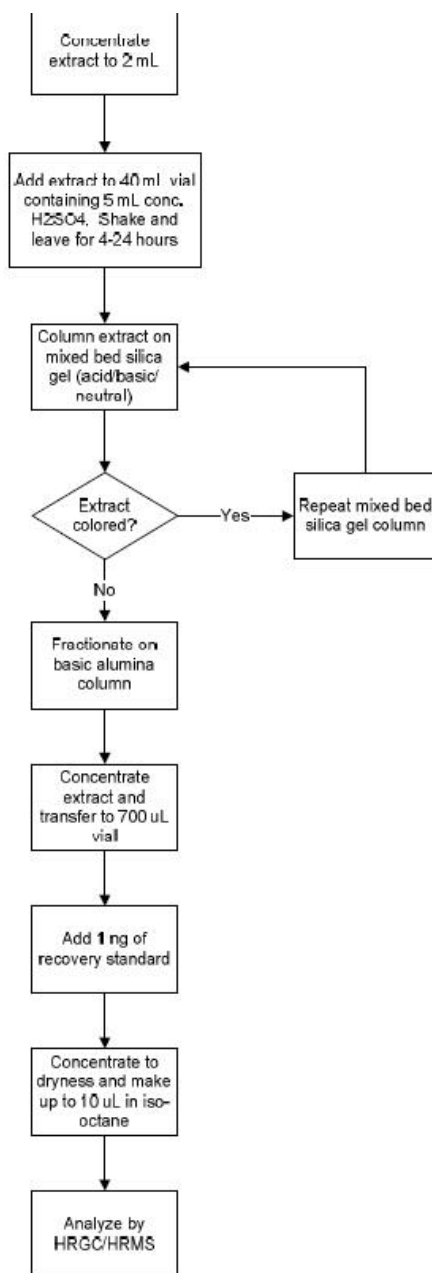


Figure 6 - Schematic of analytical methodology for dioxins and furans

2.2 Calculations

The following sections show the equations and define the variables that were used for this survey. The equations are organized in three sections. Equations 1-11 were used to calculate particulate concentration at standard conditions on a dry basis. Equations 12-26 were used to sample within the $100 \pm 10\%$ isokinetic variation and to confirm that sampling meets this isokinetic variation threshold. Equations 27-29 were used to calculate the volumetric flowrate of the stack flue gas.

2.2.1 Contaminant Concentration Calculations

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

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

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

$$m_{HF} = \frac{20.006}{18.998} (m_F - m_{blank}) / 1000 \quad \text{Equation 4}$$

$$V_{std} = \frac{V_{std(imp)}}{35.315} \quad \text{Equation 5}$$

$$V_{std(imp)} = \frac{V_{samp} \times y \times P_m \times (T_{std} + 459.67)}{P_{std} \times (T_{m(ave)} + 459.67)} \quad \text{Equation 6}$$

$$V_{samp} = V_{final} - V_{init} \quad \text{Equation 7}$$

$$P_m = P_B + \frac{\Delta H_{ave}}{13.6} \quad \text{Equation 8}$$

$$\Delta H_{ave} = \frac{1}{n} \sum_{i=1}^n \Delta H_{i(act)}, \text{ where } n = \text{the number of points} \quad \text{Equation 9}$$

$$OC = \frac{20.9 - \%O_{2c}}{20.9 - \%O_{2m}} \quad \text{Equation 10}$$

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

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)
$V_{std(imp)}$	= 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)
$\%O_{2c}$	= Oxygen concentration to correct to (% dry basis)
$\%O_{2m}$	= 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.

The dioxins/furans and other semi-volatile organic compounds were treated slightly different. The blank results for all trace organic species are used as a Quality Assurance check and are not used to correct the analytic results. Also, according to the terms of the service agreement, individual trace organic species were reported as “non-detect” (ND) if all three tests for that species are below the detection limit. If one (or more) of the triplicate samples has a reportable value, the corresponding ND samples from the other test runs were reported at half the detection limit. For calculating of summarized results (PCDD/PCDF TEQ, Total PAHs, Total Chlorobenzenes, Total Chlorophenols, and Total PCBs) the substitution of half DL for each individual species, as detailed above, was performed prior to calculating the sums.

All results are reported in the units outlined in the service agreement. The following unit conversions were used throughout:

$$1 \text{ mg} = 10^{-3} \text{ g}$$

$$1 \text{ } \mu\text{g} = 10^{-6} \text{ g}$$

$$1 \text{ ng} = 10^{-9} \text{ g}$$

$$1 \text{ tonne} = 10^6 \text{ g}$$

Oxygen corrections were applied by multiplying the result of Equation 1 by the result of Equation 10 for each individual result.

2.2.2 Isokinetic Variation Calculations

$$\Delta H_i = \frac{2.62 \times 10^7 \times c_p \times A_n \times (1 - B_{wo}) \times M_D \times (T_m + 459.67) \times \Delta p_i}{k_o \times M_w \times (T_{stk} + 459.67)} \quad \text{Equation 12}$$

$$R_m = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{stk_i} + 459.67)}{M_w \times P_B}} \times 60 \times A_n \times \frac{(T_{m_i} + 459.67) \times (1 - B_{wo})}{(T_{stk_i} + 459.67) \times y} \quad \text{Equation 13}$$

$$A_n = \pi \left(\frac{d_n}{24} \right)^2 \quad \text{Equation 14}$$

$$M_w = M_D \times (1 - B_{wo}) + 18 \times B_{wo} \quad \text{Equation 15}$$

$$M_D = 0.44 \times \%CO_2 + 0.32 \times \%O_2 + 0.28 \times (100 - \%CO_2 - \%O_2) \quad \text{Equation 16}$$

$$T_{stk} = \frac{1}{n} \sum_{i=1}^n T_{stk_i}, \text{ where } n = \text{the number of points} \quad \text{Equation 17}$$

$$B_{wo} = \frac{V_{cond}}{V_{cond} + V_{std(imp)}} \quad \text{Equation 18}$$

$$V_{cond} = 0.04707 \times V_{gain} \quad \text{Equation 19}$$

$$Iso = \frac{1}{n} \sum_{i=1}^n Iso_i, \text{ where } n = \text{the number of points} \quad \text{Equation 20}$$

$$ISO_i = \frac{v_{nzi}}{v_i} \quad \text{Equation 21}$$

$$v_i = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{stk_i} + 459.67)}{(P_{stk} \times M_w)}} \quad \text{Equation 22}$$

$$v_{nzi} = \frac{(V_i - V_{i-1}) \times y \times (T_{stk_i} + 459.67) \times (P_B + \frac{\Delta H_{i(act)}}{13.6})}{A_n \times t_i \times 60 \times (T_{m(i)} + 459.67) \times P_{stk} \times (1 - B_{wo})} \quad \text{Equation 23}$$

$$P_{stk} = P_B + \frac{P_g}{13.6} \quad \text{Equation 24}$$

$$v_{stk} = \frac{1}{n} \sum_{i=1}^n v_i, \text{ where } n = \text{the number of points} \quad \text{Equation 25}$$

$$v_{nz} = \frac{1}{n} \sum_{i=1}^n v_{nzi}, \text{ where } n = \text{the number of points} \quad \text{Equation 26}$$

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 ₂ O)
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 ₂ O)
P_g	= Stack Static pressure (inches of H ₂ O)
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)

2.2.3 Volumetric Flowrate Calculations

$$Q_S = Q_A \times \frac{(T_{Std} + 459.67)}{(T_{Stk} + 459.67)} \times \frac{P_{Stk}}{P_{Std}} \quad \text{Equation 27}$$

$$Q_A = \frac{v_{stk} \times 60 \times A_{stk}}{35.315} \quad \text{Equation 28}$$

$$A_{stk} = \pi \left(\frac{d}{24} \right)^2 \quad \text{Equation 29}$$

Where,

Q_A	= Actual flowrate (Am ³ /min)
Q_S	= Flowrate (m ³ /min) at standard conditions on a dry basis
A_{stk}	= Area of stack (ft ²)
d	= Diameter of stack (inches)

2.3 Quality Assurance/Quality Control (QA/QC) Techniques

QA/QC of this survey was accomplished by the following mechanisms.

1. Pre and Post-test leak checks.
2. Calibration of volume measuring and monitoring instrumentation.
3. Proofing of organic glassware and supplies.
4. Analysis of all blank solutions and materials.
5. Surrogate spiking of XAD using EPA protocols
6. Internal standard spiking and recovery analysis of organic trains to Env. Canada specs
7. Blank train sampling of leak check average volume

3 TEST RESULTS

The results of stack emissions were calculated using a “STACK” computer program developed by A. Lanfranco and Associates to meet BC MOE/MV requirements.

Table 1 presents summarized trace organic results using the Hazardous Waste Regulation TEQ's, as well as additional organic species. Table 2 presents detailed PCDD/PCDF data and Table 3 presents trace organics results as a mass emission (not corrected for O₂). Detailed PAH and additional chlorinated organic species emission concentrations are presented in Table 4 and Appendix 2.

Trace organic results were recovery corrected according to surrogate recovery efficiencies determined for each organic analysis. Surrogates added and the recoveries determined are listed in the analytical data presented in the Appendices.

A stratification check was performed in 2018 and a cyclonic flow check was performed in 2006. Neither condition was present at the Unit 1 sampling location.

During the survey the weather was seasonally normal. There was no significant rainfall or wind. Some airborne dust was observed at the facility but there is no reason to believe the sampling was compromised as a result.

TABLE 1: UNIT 1 TRACE ORGANICS RESULTS TABLE

Parameter		Test 1	Test 2	Test 3	Average
Test Date		28-Nov-23	29-Nov-23	30-Nov-23	
Test Time		10:05 - 14:08	09:24 - 13:28	08:57 - 13:01	
Duration	(minutes)	240	240	240	240
PCDD & PCDF TEQ	(ng/Sm ³)	0.0000	0.0000	0.0000	0.0000
PCDD & PCDF TEQ	(ng/Sm³ @ 11% O₂)	0.0000	0.0000	0.0000	0.0000
Total PAH	(µg/Sm ³)	0.1106	0.0807	0.0604	0.0839
Total PAH	(µg/Sm³ @ 11% O₂)	0.1027	0.0766	0.0570	0.0788
Total HCB*	(µg/Sm ³)	0.0013	0.0013	0.0014	0.0013
Total HCB*	(µg/Sm³ @ 11% O₂)	0.0012	0.0012	0.0013	0.0013
Total CB	(µg/Sm ³)	0.1580	0.1718	0.7741	0.3680
Total CB	(µg/Sm³ @ 11% O₂)	0.1468	0.1631	0.7309	0.3469
Total CP*	(µg/Sm ³)	0.0066	0.0065	0.0069	0.0067
Total CP*	(µg/Sm³ @ 11% O₂)	0.0061	0.0062	0.0065	0.0063
Total PCB	(µg/Sm ³)	0.0033	0.0020	0.0714	0.0256
Total PCB	(µg/Sm³ @ 11% O₂)	0.0031	0.0019	0.0674	0.0241
Stack Temperature	(°C)	148	150	145	148
Flowrate	(Sm ³ /min)	1207	1227	1172	1202
Oxygen (O ₂)	(vol % dry)	10.2	10.5	10.4	10.4
Carbon Dioxide (CO ₂)	(vol % dry)	9.7	9.5	9.4	9.5
Moisture	(vol %)	13.6	12.8	12.1	12.8
Isokinetic Variation	(%)	101	101	100	101

Standard conditions (S) of 20 °C and 101.325 kPa (dry)

*Calculated using half DL convention.

TABLE 2 Detailed PCDD/PCDF Emission Results

		Test 1		Test 2		Test 3	
Test Date:		28-Nov-23		29-Nov-23		30-Nov-23	
Test Time:		10:05 - 14:08		09:24 - 13:28		08:57 - 13:01	
Component	TEF	Analyzed	TEQ	Analyzed	TEQ	Analyzed	TEQ
		(ng)	(ng)	(ng)	(ng)	(ng)	(ng)
2378 TCDD	1.0000	0.0000	ND	0.0000	ND	0.0000	ND
12378 PCDD	0.5000	0.0000	ND	0.0000	ND	0.0000	ND
123478 HxCDD	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
123678 HxCDD	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
123789 HxCDD	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
1234678 HpCDD	0.0100	0.0000	ND	0.0000	ND	0.0000	ND
OCDD	0.0010	0.0000	ND	0.0000	ND	0.0000	ND
2378 TCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
12378 PCDF	0.0500	0.0000	ND	0.0000	ND	0.0000	ND
23478 PCDF	0.5000	0.0000	ND	0.0000	ND	0.0000	ND
123478 HxCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
123678 HxCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
234678 HxCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
123789 HxCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
1234678 HpCDF	0.0100	0.0000	ND	0.0000	ND	0.0000	ND
1234789 HpCDF	0.0100	0.0000	ND	0.0000	ND	0.0000	ND
OCDF	0.0010	0.0000	ND	0.0000	ND	0.0000	ND
Summed PCDD & PCDF TEQ (ng)		0.0000		0.0000		0.0000	
Sample Volume (dscm)		3.7965		3.8411		3.6430	
PCDD & PCDF TEQ ng/dscm		0.00000		0.00000		0.00000	
PCDD & PCDF TEQ ng/dscm @ 11% O₂		0.00000		0.00000		0.00000	
PCDD & PCDF TEQ grams/day		0.000000		0.000000		0.000000	
Flowrate (dscm/min)		1207		1227		1172	
Oxygen (Vol. %)		10.2		10.5		10.4	
Carbon Dioxide (Vol. %)		9.67		9.45		9.44	
Moisture (Vol. %)		13.6		12.8		12.1	
Temperature (oC)		148		150		145	
Isokinetic Variation (%)		101		101		100	

TABLE 3 Detailed PCB/PAH/CB/CP Emission Results

	Test 1	Test 2	Test 3
Test Date:	28-Nov-23	29-Nov-23	30-Nov-23
Test Time:	10:05 - 14:08	09:24 - 13:28	08:57 - 13:01
Component	Analyzed	Analyzed	Analyzed
	(ug)	(ug)	(ug)
Benz(a)anthracene	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND
Benzo(b) fluoranthene	ND	ND	ND
Benzo(e)pyrene	0.040	0.030	ND
Benzo(g,h,i)perylene	0.100	0.080	0.030
Benzo(k)fluoranthene	ND	ND	ND
Chrysene	ND	ND	ND
Dibenz(a,j)acridine	ND	ND	ND
Dibenz(a,h)acridine	ND	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzo(a,i)pyrene	ND	ND	ND
Fluoranthene	0.050	0.030	0.030
Indeno(1,2,3-c,d)pyrene	0.010	ND	ND
Phenanthrene	0.130	0.100	0.090
Pyrene	0.060	0.050	0.040
7H-dibenzo(c,g)carbazole	ND	ND	ND
Acenaphthene	ND	ND	ND
Acenaphthylene	ND	ND	ND
Fluorene	0.030	0.020	0.030
Dibenzo(a,e) fluoranthene	ND	ND	ND
3-Methylcholanthrene	ND	ND	ND
5-Methylchrysene	ND	ND	ND
7,12-Dimethylbenz(a)anthracene	ND	ND	ND
Dibenzo(a,h)pyrene	ND	ND	ND
Dibenzo(a,e)pyrene	ND	ND	ND
Dibenzo(a,l)pyrene	ND	ND	ND
Quinoline	ND	ND	ND
Total CP	0.0250	0.0250	0.0250
Total CB	0.6000	0.6600	2.8200
HCB	0.0050	0.0050	0.0050
* ND = Less than detection limit			
PCB Total (ng)	12.7	7.74	260.0
Total PAH (ug)	0.420	0.310	0.220
Sample Volume (dscm)	3.80	3.84	3.64
Oxygen	10.2	10.5	10.4
PAH ug/dscm	0.1106	0.0807	0.0604
HCB ug/dscm	0.0013	0.0013	0.0014
CB Total ug/dscm	0.1580	0.1718	0.7741
CP Total ug/dscm	0.0066	0.0065	0.0069
PCB Total ug/dscm	0.0033	0.0020	0.0714
PAH ug/dscm @ 11% O₂	0.1027	0.0766	0.0570
HCB ug/dscm @ 11% O₂	0.0012	0.0012	0.0013
CB Total ug/dscm @ 11% O₂	0.1468	0.1631	0.7309
CP Total ug/dscm @ 11% O₂	0.0061	0.0062	0.0065
PCB Total ug/dscm @ 11% O₂	0.0031	0.0019	0.0674

TABLE 4: UNIT 1 - SUMMARY OF OPERATING DATA

Parameter		Run 1	Run 2	Run 3	Normal
Test Date - Particulate/Metals		28-Nov-23	29-Nov-23	30-Nov-23	
Test Time - Particulate/Metals		10:05 - 14:08	09:24 - 13:28	08:57 - 13:01	
Boiler Steam Production	(kg/h)	35954	35513	35690	37089
Percentage of normal	(%)	97%	96%	96%	
Boiler Secondary Combustion Zone Temp	(°C)	917	944	947	920
Percentage of normal	(%)	100%	103%	103%	
Rate of refuse fired	(kg/hr)	9987	9864	9913	10302
Percentage of normal	(%)	97%	96%	96%	
Rate of aux. fuel fired (Natural Gas)	m ³ /hr	0	0	0	65
Percentage of normal (%)	(%)	0%	0%	0%	

*Normal refers to the average operating rate from the previous 30 days

4 DISCUSSION

The emissions monitoring for this survey was performed during normal processing of municipal solid waste at the Waste-to-Energy facility. Three sample runs for each test parameter were conducted over three days to determine final results.

Results from this survey indicate that emissions are below the operational certificate limits for each pollutant.

Dioxin and Furan congeners were universally undetected, the same as 2022 and previously in 2015. The additional trace organics results are similar to data from 2021 and 2022; however, PCB results were slightly up. In particular the results from Run 3 were high, which correlated with high results for chlorobenzene for the same time frame. The vast majority of PCB's were found as dichlorobiphenyl.

Total PAH, HCB and CP were all measured at similar concentrations compared to 2022.

Dioxin/Furan results are expressed using the International Toxic Equivalents (I-TEQ). In this report, individual species that were measured below detection limits were reported as zero or "non-detect" if there was no detection in any of the three test runs.

There were no trace organics species of any kind detected in any of the blank sample analysis.

The QA/QC program showed very low or non-detectable levels of target contaminants in the blank sample, which used the same solid sorbent resin and clean-up solvents as those used for samples. Additionally, the proof analysis of the glassware and XAD (prior recent blanks) showed no significant PCDD/PCDF.

For all tests and the blank test, internal standard recoveries ranged from 55 to 104%.

EPA Method 23 surrogate recoveries ranged from 77 to 102% for each Dioxin/Furan sample. The recovery QA/QC data is expected to meet EPA performance specifications (M23) of 70 to 130% for pre-test spiked surrogates. The M23 spiking protocol is not required in Canada and is included in the sampling/analytical protocol for additional QA/QC and information purposes only.

There were no problems associated with sample collection or analysis. Sampling was conducted in accordance with the respective reference methods and passed all appropriate quality assurance and quality control criteria. It is therefore stated that these results are reported with a high degree of confidence and are an accurate representation of emission characteristics for the operating conditions maintained on the test dates.

APPENDIX 1

ANALYTICAL DATA and

QA/QC RESULTS

SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR233697

CLIENT: A. Lanfranco & Associates
Unit 101 9488 – 189 St.
Surrey, BC
V4N 4W7

Phone: (604) 881-2582
Email: mark.lanfranco@alanfranco.com

RECEIVED BY: D. Wu
CONDITION: Okay, 15.2°C

DATE/TIME: December 01, 2023 (2:02 p.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
5	Stack	Blk Dioxin Unit – 1	PR233697	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	Run 1 – Dioxin Unit – 1	PR233698	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	Run 2 – Dioxin Unit – 1	PR233699	PCB, PAH/HCB, CB, CP
5	Stack	Run 3 – Dioxin Unit – 1	PR233700	PCDD/F, PCB, PAH/HCB, CB, CP

STORAGE: XAD and filter stored at 4°C, rinses stored at ambient temperature.

ANALYTES: HRGC/HRMS analysis for polychlorinated dibenzo(p)dioxins and dibenzofurans (PCDD/F), polychlorinated biphenyls (PCB) and polycyclic aromatic hydrocarbons (PAH).

SPECIAL INSTRUCTIONS: None.

METHODOLOGY

Reference Method: PCDD/F: SOP LAB01; EPA Method 23, Environment Canada 1-RM-3
PCB: SOP LAB02; EPA Method 1668C
PAH/CB/CP: SOP LAB013; in house

Data summarized in Data Report attached.

Report sent to: Mark Lanfranco

Date: January 3, 2023

Comments: Results relate only to items tested.

David Hope, P.Chem, CEO

METHOD 23/1-RM-3 DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: Blk Dioxin Unit – 1
 PRL ID: PR233697

Sample Date: 30-Nov-23
 Date Extracted: 20-Dec-23
 Date Analysed: 28-Dec-23
 Filter Wt.: 0.35g

DIOXINS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDD	ND	2	
Total TCDD	ND	2	0
1,2,3,7,8-PeCDD	ND	4	
Total PeCDD	ND	4	0
1,2,3,4,7,8-HxCDD	ND	4	
1,2,3,6,7,8-HxCDD	ND	4	
1,2,3,7,8,9-HxCDD	ND	4	
Total HxCDD	ND	4	0
1,2,3,4,6,7,8-HpCDD	ND	4	
Total HpCDD	ND	4	0
OCDD	ND	15	0
Total Dioxin TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	1	2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.6	5.3

FURANS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDF	ND	2	
Total TCDF	ND	2	0
1,2,3,7,8-PeCDF	ND	4	
2,3,4,7,8-PeCDF	ND	4	
Total PeCDF	ND	4	0
1,2,3,4,7,8-HxCDF	ND	4	
1,2,3,6,7,8-HxCDF	ND	4	
1,2,3,7,8,9-HxCDF	ND	4	
2,3,4,6,7,8-HxCDF	ND	4	
Total HxCDF	ND	4	0
1,2,3,4,6,7,8-HpCDF	ND	4	
1,2,3,4,7,8,9-HpCDF	ND	4	
Total HpCDF	ND	4	0
OCDF	ND	15	0
Total Furan TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	0.1	0.2
ND	0.1	0.2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.0	4.1

Total PCDD/PCDF Toxic Equivalent (pg)

0.0	4.7	9.4
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Surrogate Recoveries (%)

³⁷ Cl ₄ -2,3,7,8-TCDD	77
¹³ C ₁₂ -2,3,4,7,8-PeCDF	87
¹³ C ₁₂ -1,2,3,4,7,8-HxCDD	90
¹³ C ₁₂ -1,2,3,4,7,8-HxCDF	89
¹³ C ₁₂ -1,2,3,4,7,8,9-HpCDF	90

ND - none detected

Internal Standards (%)

¹³ C ₁₂ -2,3,7,8-TCDD	68
¹³ C ₁₂ -1,2,3,7,8-PeCDD	81
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	82
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	88
¹³ C ₁₂ -OCDD	60
¹³ C ₁₂ -2,3,7,8-TCDF	67
¹³ C ₁₂ -1,2,3,7,8-PeCDF	82
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	83
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	88

METHOD 23/1-RM-3 DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: Run 1 – Dioxin Unit – 1
 PRL ID: PR233698

Sample Date: 28-Nov-23
 Date Extracted: 20-Dec-23
 Date Analysed: 28-Dec-23
 Filter Wt.: 0.35g

DIOXINS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDD	ND	2	
Total TCDD	ND	2	0
1,2,3,7,8-PeCDD	ND	4	
Total PeCDD	ND	4	0
1,2,3,4,7,8-HxCDD	ND	4	
1,2,3,6,7,8-HxCDD	ND	4	
1,2,3,7,8,9-HxCDD	ND	4	
Total HxCDD	71	4	1
1,2,3,4,6,7,8-HpCDD	ND	4	
Total HpCDD	ND	4	0
OCDD	ND	15	0
Total Dioxin TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	1	2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.6	5.3

FURANS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDF	ND	2	
Total TCDF	ND	2	0
1,2,3,7,8-PeCDF	ND	4	
2,3,4,7,8-PeCDF	ND	4	
Total PeCDF	ND	4	0
1,2,3,4,7,8-HxCDF	ND	4	
1,2,3,6,7,8-HxCDF	ND	4	
1,2,3,7,8,9-HxCDF	ND	4	
2,3,4,6,7,8-HxCDF	ND	4	
Total HxCDF	ND	4	0
1,2,3,4,6,7,8-HpCDF	ND	4	
1,2,3,4,7,8,9-HpCDF	ND	4	
Total HpCDF	ND	4	0
OCDF	ND	15	0
Total Furan TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	0.1	0.2
ND	0.1	0.2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.0	4.1

Total PCDD/PCDF Toxic Equivalent (pg)

0.0	4.7	9.4
-----	-----	-----

Surrogate Recoveries (%)

³⁷ Cl ₄ -2,3,7,8-TCDD	86
¹³ C ₁₂ -2,3,4,7,8-PeCDF	102
¹³ C ₁₂ -1,2,3,4,7,8-HxCDD	99
¹³ C ₁₂ -1,2,3,4,7,8-HxCDF	95
¹³ C ₁₂ -1,2,3,4,7,8,9-HpCDF	90

ND - none detected

Internal Standards (%)

¹³ C ₁₂ -2,3,7,8-TCDD	60
¹³ C ₁₂ -1,2,3,7,8-PeCDD	68
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	74
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	80
¹³ C ₁₂ -OCDD	60
¹³ C ₁₂ -2,3,7,8-TCDF	55
¹³ C ₁₂ -1,2,3,7,8-PeCDF	59
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	71
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	76

METHOD 23/1-RM-3 DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: Run 3 – Dioxin Unit – 1
 PRL ID: PR233700

Sample Date: 30-Nov-23
 Date Extracted: 20-Dec-23
 Date Analysed: 28-Dec-23
 Filter Wt.: 0.35g

DIOXINS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDD	ND	2	
Total TCDD	ND	2	0
1,2,3,7,8-PeCDD	ND	4	
Total PeCDD	ND	4	0
1,2,3,4,7,8-HxCDD	ND	4	
1,2,3,6,7,8-HxCDD	ND	4	
1,2,3,7,8,9-HxCDD	ND	4	
Total HxCDD	ND	4	0
1,2,3,4,6,7,8-HpCDD	ND	4	
Total HpCDD	ND	4	0
OCDD	ND	15	0
Total Dioxin TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	1	2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.6	5.3

FURANS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDF	ND	2	
Total TCDF	ND	2	0
1,2,3,7,8-PeCDF	ND	4	
2,3,4,7,8-PeCDF	ND	4	
Total PeCDF	ND	4	0
1,2,3,4,7,8-HxCDF	ND	4	
1,2,3,6,7,8-HxCDF	ND	4	
1,2,3,7,8,9-HxCDF	ND	4	
2,3,4,6,7,8-HxCDF	ND	4	
Total HxCDF	ND	4	0
1,2,3,4,6,7,8-HpCDF	ND	4	
1,2,3,4,7,8,9-HpCDF	ND	4	
Total HpCDF	ND	4	0
OCDF	ND	15	0
Total Furan TEQ			

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	0.1	0.2
ND	0.1	0.2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.0	4.1

Total PCDD/PCDF Toxic Equivalent (pg)

0.0	4.7	9.4
-----	-----	-----

Surrogate Recoveries (%)

³⁷ Cl ₄ -2,3,7,8-TCDD	97
¹³ C ₁₂ -2,3,4,7,8-PeCDF	85
¹³ C ₁₂ -1,2,3,4,7,8-HxCDD	88
¹³ C ₁₂ -1,2,3,4,7,8-HxCDF	96
¹³ C ₁₂ -1,2,3,4,7,8,9-HpCDF	80

ND - none detected

Internal Standards (%)

¹³ C ₁₂ -2,3,7,8-TCDD	73
¹³ C ₁₂ -1,2,3,7,8-PeCDD	76
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	82
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	104
¹³ C ₁₂ -OCDD	67
¹³ C ₁₂ -2,3,7,8-TCDF	73
¹³ C ₁₂ -1,2,3,7,8-PeCDF	77
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	79
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	101

METHOD 23/1-RM-3 DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: BLANK
 PRL ID: DF230908B

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 28-Dec-23

DIOXINS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDD	ND	2	
Total TCDD	ND	2	0
1,2,3,7,8-PeCDD	ND	4	
Total PeCDD	ND	4	0
1,2,3,4,7,8-HxCDD	ND	4	
1,2,3,6,7,8-HxCDD	ND	4	
1,2,3,7,8,9-HxCDD	ND	4	
Total HxCDD	ND	4	0
1,2,3,4,6,7,8-HpCDD	ND	4	
Total HpCDD	ND	4	0
OCDD	ND	15	0
		Total Dioxin TEQ	

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	1	2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.6	5.3

FURANS			
Congeners	pg	DL pg	# of peaks
2,3,7,8-TCDF	ND	2	
Total TCDF	ND	2	0
1,2,3,7,8-PeCDF	ND	4	
2,3,4,7,8-PeCDF	ND	4	
Total PeCDF	ND	4	0
1,2,3,4,7,8-HxCDF	ND	4	
1,2,3,6,7,8-HxCDF	ND	4	
1,2,3,7,8,9-HxCDF	ND	4	
2,3,4,6,7,8-HxCDF	ND	4	
Total HxCDF	ND	4	0
1,2,3,4,6,7,8-HpCDF	ND	4	
1,2,3,4,7,8,9-HpCDF	ND	4	
Total HpCDF	ND	4	0
OCDF	ND	15	0
		Total Furan TEQ	

I-TEQs		
(ND=0)	(ND=½DL)	(ND=DL)
pg	pg	pg
ND	0.1	0.2
ND	0.1	0.2
ND	1	2
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.2	0.4
ND	0.02	0.04
ND	0.02	0.04
ND	0.0075	0.015
0.0	2.0	4.1

Total PCDD/PCDF Toxic Equivalent (pg)

0.0	4.7	9.4
-----	-----	-----

ND - none detected

Internal Standards (%)

¹³ C ₁₂ -2,3,7,8-TCDD	74
¹³ C ₁₂ -1,2,3,7,8-PeCDD	97
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	80
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	97
¹³ C ₁₂ -OCDD	62
¹³ C ₁₂ -2,3,7,8-TCDF	86
¹³ C ₁₂ -1,2,3,7,8-PeCDF	88
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	83
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	89

QC REPORT - SPIKE

Client: A. Lanfranco & Associates
 Client ID: SPIKE
 PRL ID: DF230909S

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 28-Dec-23

DIOXINS		Acceptable Recovery			Pass/Fail
Congeners	LOF pg	Recovery %	Min %	Max %	
2,3,7,8-TCDD	200	107	80	120	Pass
1,2,3,7,8-PeCDD	200	115	80	120	Pass
1,2,3,4,7,8-HxCDD	400	115	80	120	Pass
1,2,3,6,7,8-HxCDD	400	108	80	120	Pass
1,2,3,7,8,9-HxCDD	400	107	80	120	Pass
1,2,3,4,6,7,8-HpCDD	400	115	80	120	Pass
OCDD	1000	116	80	120	Pass

Int. Std Recoveries %
67
85
-
80
-
79
65

FURANS		Acceptable Recovery			Pass/Fail
Congeners	LOF pg	Recovery %	Min %	Max %	
2,3,7,8-TCDF	200	114	80	120	Pass
1,2,3,7,8-PeCDF	200	111	80	120	Pass
2,3,4,7,8-PeCDF	200	110	80	120	Pass
1,2,3,4,7,8-HxCDF	400	109	80	120	Pass
1,2,3,6,7,8-HxCDF	400	117	80	120	Pass
1,2,3,7,8,9-HxCDF	400	106	80	120	Pass
2,3,4,6,7,8-HxCDF	400	97	80	120	Pass
1,2,3,4,6,7,8-HpCDF	400	120	80	120	Pass
1,2,3,4,7,8,9-HpCDF	400	92	80	120	Pass
OCDF	1000	110	80	120	Pass

Int. Std Recoveries %
60
72
-
-
78
-
-
79
-
-

LOF - Level of Fortification

DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: **Blk Dioxin Unit – 1**
 PRL ID: PR233697

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs				DL	Surrogate Recoveries
Chemical Name	IUPAC #	ng	ng		%
3,4,4',5-TeCB	PCB 81	ND	0.02		144
3,3',4,4'-TeCB	PCB 77	ND	0.02		144
2,3',4,4',5'-PeCB	PCB 123	ND	0.02		76
2,3',4,4',5-PeCB	PCB 118	0.04	0.02		76
2,3,4,4',5-PeCB	PCB 114	ND	0.02		80
2,3,3',4,4'-PeCB	PCB 105	ND	0.02		80
3,3',4,4',5-PeCB	PCB 126	ND	0.02		96
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02		76
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02		116
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02		104
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02		124
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02		76
Toxic Equivalent (WHO-TEQ)					

WHO-TEQs (2005)	
(ND=0)	(ND=DL)
ng	ng
ND	6.00E-06
ND	2.00E-06
ND	6.00E-07
1.14E-06	1.14E-06
ND	6.00E-07
ND	6.00E-07
ND	2.00E-03
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-04
ND	6.00E-07
1.14E-06	2.61E-03

Total PCB		
Homologs	ng	DL
Monochlorobiphenyls	ND	0.05
Dichlorobiphenyls	0.97	0.05
Trichlorobiphenyls	0.07	0.05
Tetrachlorobiphenyls	0.12	0.05
Pentachlorobiphenyls	ND	0.05
Hexachlorobiphenyls	0.06	0.05
Heptachlorobiphenyls	ND	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	1.22	

ND - none detected

Surrogate Recoveries		
Chemical Name	IUPAC #	%
13C12-2-MoCB	1L	56
13C12-4,4'-DiCB	15L	88
13C12-2,2',6'-TrCB	19L	48
13C12-3,4,4'-TrCB	37L	112
13C12-2,2',6,6'-TeCB	54L	60
13C12-2,2',4,6,6'-PeCB	104L	60
13C12-2,2',4,4',6,6'-HxCB	155L	48
13C12-2,2',3,4',5,6,6'-HpCB	188L	56
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	52
13C12-2,3,3',4,4',5,5',6-OcCB	205L	96
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	72
13C12-DeCB	209L	72

DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: **Run 1 – Dioxin Unit – 1**
 PRL ID: PR233698

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs				Surrogate Recoveries
Chemical Name	IUPAC #	ng	DL ng	%
3,4,4',5-TeCB	PCB 81	ND	0.02	136
3,3',4,4'-TeCB	PCB 77	ND	0.02	128
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	72
2,3',4,4',5-PeCB	PCB 118	0.07	0.02	68
2,3,4,4',5-PeCB	PCB 114	ND	0.02	68
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	68
3,3',4,4',5-PeCB	PCB 126	ND	0.02	132
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	72
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	104
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	132
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	124
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	80
Toxic Equivalent (WHO-TEQ)				

WHO-TEQs (2005)	
(ND=0)	(ND=DL)
ng	ng
ND	6.00E-06
ND	2.00E-06
ND	6.00E-07
2.10E-06	2.10E-06
ND	6.00E-07
ND	6.00E-07
ND	2.00E-03
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-04
ND	6.00E-07
2.10E-06	2.61E-03

Total PCB		
Homologs	ng	DL ng
Monochlorobiphenyls	0.59	0.05
Dichlorobiphenyls	9.60	0.05
Trichlorobiphenyls	1.49	0.05
Tetrachlorobiphenyls	0.81	0.05
Pentachlorobiphenyls	0.07	0.05
Hexachlorobiphenyls	0.12	0.05
Heptachlorobiphenyls	ND	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	12.7	

ND - none detected

Surrogate Recoveries		
Chemical Name	IUPAC #	%
13C12-2-MoCB	1L	48
13C12-4,4'-DiCB	15L	76
13C12-2,2',6'-TrCB	19L	48
13C12-3,4,4'-TrCB	37L	92
13C12-2,2',6,6'-TeCB	54L	56
13C12-2,2',4,6,6'-PeCB	104L	52
13C12-2,2',4,4',6,6'-HxCB	155L	48
13C12-2,2',3,4',5,6,6'-HpCB	188L	48
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	48
13C12-2,3,3',4,4',5,5',6-OcCB	205L	88
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	104
13C12-DeCB	209L	68

DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: Run 2 – Dioxin Unit – 1
 PRL ID: PR233699

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs				DL	Surrogate Recoveries
Chemical Name	IUPAC #	ng	ng		%
3,4,4',5-TeCB	PCB 81	ND	0.02		140
3,3',4,4'-TeCB	PCB 77	ND	0.02		140
2,3',4,4',5'-PeCB	PCB 123	ND	0.02		108
2,3',4,4',5-PeCB	PCB 118	ND	0.02		104
2,3,4,4',5-PeCB	PCB 114	ND	0.02		104
2,3,3',4,4'-PeCB	PCB 105	ND	0.02		100
3,3',4,4',5-PeCB	PCB 126	ND	0.02		112
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02		84
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02		100
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02		104
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02		92
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02		112
Toxic Equivalent (WHO-TEQ)					

WHO-TEQs (2005)	
(ND=0)	(ND=DL)
ng	ng
ND	6.00E-06
ND	2.00E-06
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	2.00E-03
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-04
ND	6.00E-07
0.00E+00	2.61E-03

Total PCB		
Homologs	ng	DL
Monochlorobiphenyls	0.82	0.05
Dichlorobiphenyls	5.93	0.05
Trichlorobiphenyls	0.65	0.05
Tetrachlorobiphenyls	0.35	0.05
Pentachlorobiphenyls	ND	0.05
Hexachlorobiphenyls	ND	0.05
Heptachlorobiphenyls	ND	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	7.74	

ND - none detected

Surrogate Recoveries		
Chemical Name	IUPAC #	%
13C12-2-MoCB	1L	68
13C12-4,4'-DiCB	15L	84
13C12-2,2',6'-TrCB	19L	76
13C12-3,4,4'-TrCB	37L	136
13C12-2,2',6,6'-TeCB	54L	64
13C12-2,2',4,6,6'-PeCB	104L	56
13C12-2,2',4,4',6,6'-HxCB	155L	56
13C12-2,2',3,4',5,6,6'-HpCB	188L	72
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	56
13C12-2,3,3',4,4',5,5',6-OcCB	205L	96
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	124
13C12-DeCB	209L	92

DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: Run 3 – Dioxin Unit – 1
 PRL ID: PR233700

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs				Surrogate Recoveries
Chemical Name	IUPAC #	ng	DL ng	%
3,4,4',5-TeCB	PCB 81	ND	0.02	108
3,3',4,4'-TeCB	PCB 77	ND	0.02	108
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	64
2,3',4,4',5-PeCB	PCB 118	ND	0.02	60
2,3,4,4',5-PeCB	PCB 114	ND	0.02	64
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	68
3,3',4,4',5-PeCB	PCB 126	ND	0.02	84
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	72
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	80
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	124
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	116
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	52
Toxic Equivalent (WHO-TEQ)				

WHO-TEQs (2005)	
(ND=0)	(ND=DL)
ng	ng
ND	6.00E-06
ND	2.00E-06
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	2.00E-03
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-04
ND	6.00E-07
0.00E+00	2.61E-03

Total PCB		
Homologs	ng	DL ng
Monochlorobiphenyls	1.38	0.05
Dichlorobiphenyls	254	0.05
Trichlorobiphenyls	1.54	0.05
Tetrachlorobiphenyls	2.80	0.05
Pentachlorobiphenyls	ND	0.05
Hexachlorobiphenyls	ND	0.05
Heptachlorobiphenyls	ND	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	260	

ND - none detected

Surrogate Recoveries		
Chemical Name	IUPAC #	%
13C12-2-MoCB	1L	60
13C12-4,4'-DiCB	15L	28
13C12-2,2',6'-TrCB	19L	40
13C12-3,4,4'-TrCB	37L	40
13C12-2,2',6,6'-TeCB	54L	20
13C12-2,2',4,6,6'-PeCB	104L	48
13C12-2,2',4,4',6,6'-HxCB	155L	44
13C12-2,2',3,4',5,6,6'-HpCB	188L	20
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	36
13C12-2,3,3',4,4',5,5',6-OcCB	205L	56
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	32
13C12-DeCB	209L	28

DATA REPORT

Client: A. Lanfranco & Associates
 Client ID: **BLANK**
 PRL ID: PC230908B

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs				Surrogate Recoveries
Chemical Name	IUPAC #	ng	DL ng	%
3,4,4',5-TeCB	PCB 81	ND	0.02	128
3,3',4,4'-TeCB	PCB 77	ND	0.02	128
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	60
2,3',4,4',5-PeCB	PCB 118	ND	0.02	64
2,3,4,4',5-PeCB	PCB 114	ND	0.02	68
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	80
3,3',4,4',5-PeCB	PCB 126	ND	0.02	100
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	84
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	124
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	132
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	132
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	92
Toxic Equivalent (WHO-TEQ)				

WHO-TEQs (2005)	
(ND=0) ng	(ND=DL) ng
ND	6.00E-06
ND	2.00E-06
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	2.00E-03
ND	6.00E-07
ND	6.00E-07
ND	6.00E-07
ND	6.00E-04
ND	6.00E-07
0.00E+00	2.61E-03

Total PCB		
Homologs	ng	DL ng
Monochlorobiphenyls	ND	0.05
Dichlorobiphenyls	ND	0.05
Trichlorobiphenyls	ND	0.05
Tetrachlorobiphenyls	ND	0.05
Pentachlorobiphenyls	ND	0.05
Hexachlorobiphenyls	ND	0.05
Heptachlorobiphenyls	ND	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	ND	

ND - none detected

Surrogate Recoveries		
Chemical Name	IUPAC #	%
13C12-2-MoCB	1L	60
13C12-4,4'-DiCB	15L	84
13C12-2,2',6'-TrCB	19L	56
13C12-3,4,4'-TrCB	37L	112
13C12-2,2',6,6'-TeCB	54L	52
13C12-2,2',4,6,6'-PeCB	104L	44
13C12-2,2',4,4',6,6'-HxCB	155L	52
13C12-2,2',3,4',5,6,6'-HpCB	188L	48
13C12-2,2',3,3',5,5',6,6'-OoCB	202L	52
13C12-2,3,3',4,4',5,5',6-OoCB	205L	100
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	84
13C12-DeCB	209L	84

QC REPORT - SPIKE

Client: A. Lanfranco & Associates
 Client ID: **SPIKE**
 PRL ID: PC230909S

Contact: Mark Lanfranco
 Date Extracted: 20-Dec-23
 Date Analysed: 29-Dec-23

Dioxin-like PCBs			Acceptable Recovery		Pass/Fail	Surrogate Recoveries %
Chemical Name	LOF ng	Recovery %	Min %	Max %		
3,4,4',5-TeCB (81)	1	98	60	135	Pass	116
3,3',4,4'-TeCB (77)	1	107	60	135	Pass	136
2,3',4,4',5'-PeCB (123)	1	70	60	135	Pass	48
2,3',4,4',5'-PeCB (118)	1	80	60	135	Pass	52
2,3,4,4',5'-PeCB (114)	1	66	60	135	Pass	48
2,3,3',4,4'-PeCB (105)	1	72	60	135	Pass	44
3,3',4,4',5'-PeCB (126)	1	69	60	135	Pass	52
2,3',4,4',5,5'-HxCB (167)	1	82	60	135	Pass	68
2,3,3',4,4',5'-HxCB (156)	1	95	60	135	Pass	116
2,3,3',4,4',5'-HxCB (157)	1	63	60	135	Pass	100
3,3',4,4',5,5'-HxCB (169)	1	80	60	135	Pass	112
2,3,3',4,4',5,5'-HpCB (189)	1	74	60	135	Pass	48

Total PCB			Acceptable Recovery		Pass/Fail
Homologs	LOF ng	Recovery %	Min %	Max %	
Monochlorobiphenyls	2	81			
Dichlorobiphenyls	4	97			
Trichlorobiphenyls	6	78			
Tetrachlorobiphenyls	12	89			
Pentachlorobiphenyls	13	106			
Hexachlorobiphenyls	15	75			
Heptachlorobiphenyls	11	124			
Octachlorobiphenyls	6	90			
Nonachlorobiphenyls	2	103			
Decachlorobiphenyl	1	98			
Total PCB	72	95	50	150	Pass

LOF - Level of Fortification

DATA REPORT

Client: A. Lanfranco & Associates
 Contact: Mark Lanfranco
 Project:

Date Extracted: 20-Dec-23
 Date Analysed: 27-Dec-23

Client ID:		Blk Dioxin Unit – 1	Run 1 – Dioxin Unit – 1	Run 2 – Dioxin Unit – 1	Run 3 – Dioxin Unit – 1		BLANK
PRL ID:		PR233697	PR233698	PR233699	PR233700		PH230908B
NPRI PAH	DL						
	µg	µg	µg	µg	µg		µg
Acenaphthylene	0.05	ND	ND	ND	ND		ND
Acenaphthene	0.05	ND	ND	ND	ND		ND
Fluorene	0.02	ND	0.03	0.02	0.02		ND
Phenanthrene	0.02	0.17	0.13	0.10	0.09		0.03
Fluoranthene	0.01	ND	0.05	0.03	0.03		ND
Pyrene	0.01	ND	0.06	0.05	0.04		ND
Benzo(a)anthracene	0.02	ND	ND	ND	ND		ND
Chrysene	0.02	ND	ND	ND	ND		ND
Benzo(b)fluoranthene	0.01	ND	ND	ND	ND		ND
Benzo(k)fluoranthene	0.01	ND	ND	ND	ND		ND
Benzo(a)pyrene	0.01	ND	ND	ND	ND		ND
Indeno(1,2,3-cd)pyrene	0.01	ND	0.01	ND	ND		ND
Dibenz(a,h)anthracene	0.01	ND	ND	ND	ND		ND
Benzo(ghi)perylene	0.01	ND	0.10	0.08	0.03		ND
1-Nitropyrene	0.05	ND	ND	ND	ND		ND
5-Methylchrysene	0.05	ND	ND	ND	ND		ND
7,12-Dimethylbenz(a)anthr	0.05	ND	ND	ND	ND		ND
3-Methylcholanthrene	0.05	ND	ND	ND	ND		ND
Benzo(e)pyrene	0.01	ND	0.04	0.03	ND		ND
Perylene	0.05	ND	ND	ND	ND		ND
Dibenz(a,h)acridine	0.05	ND	ND	ND	ND		ND
Dibenz(a,j)acridine	0.05	ND	ND	ND	ND		ND
7H-Dibenzo(c,g)carbazole	0.05	ND	ND	ND	ND		ND
Dibenzo(a,e)fluoranthene	0.05	ND	ND	ND	ND		ND
Dibenzo(a,e)pyrene	0.05	ND	ND	ND	ND		ND
Dibenzo(a,h)pyrene	0.05	ND	ND	ND	ND		ND
Dibenzo(a,l)pyrene	0.05	ND	ND	ND	ND		ND
Dibenzo(a,i)pyrene	0.05	ND	ND	ND	ND		ND
Quinoline	0.05	ND	ND	ND	ND		ND
Other PAH							
Naphthalene	0.05	1.10	0.49	0.53	0.38		0.06
Anthracene	0.05	ND	ND	ND	ND		ND

DATA REPORT

Client: A. Lanfranco & Associates
 Contact: Mark Lanfranco
 Project: _____

Date Extracted: 20-Dec-23
 Date Analysed: 27-Dec-23

Client ID:		Blk Dioxin Unit – 1	Run 1 – Dioxin Unit – 1	Run 2 – Dioxin Unit – 1	Run 3 – Dioxin Unit – 1		BLANK
PRL ID:		PR233697	PR233698	PR233699	PR233700		PH230908B
NPRI PAH	DL						
Surrogate Recoveries (%)							
d8-Naphthalene		80	88	80	52		80
d10-Acenaphthylene		92	108	108	120		100
d10-Acenaphthene		100	104	108	128		108
d10-Fluorene		96	104	108	128		104
d10-Phenanthrene		108	108	104	104		104
d10-Fluoranthene		120	108	108	108		112
d10-Pyrene		112	112	112	108		116
d12-Chrysene		124	108	116	112		120
d12-Benzo(b)fluoranthene		124	116	124	128		132
d12-Benzo(a)pyrene		132	116	124	120		124
d14-Dibenz(a,h)anthracene		120	136	144	116		140

ND - none detected

DATA REPORT

Client: A. Lanfranco & Associates
 Contact: Mark Lanfranco
 Project:

Date Extracted: 20-Dec-23
 Date Analysed: 27-Dec-23

Client ID: SPIKE
 PRL ID: PH230909S

NPRI PAH

	µg/g	LOF	Recovery	Acceptable	Pass/Fail
Acenaphthene	0.79	1.00	79%	50-150%	pass
Acenaphthylene	0.77	1.00	77%	50-150%	pass
Benz(a)anthracene	0.71	1.00	71%	50-150%	pass
Benzo(a)pyrene	0.64	1.00	64%	50-150%	pass
Benzo(b)fluoranthene	0.77	1.00	77%	50-150%	pass
Benzo(ghi)perylene	0.75	1.00	75%	50-150%	pass
Benzo(k)fluoranthene	0.77	1.00	77%	50-150%	pass
Chrysene	0.76	1.00	76%	50-150%	pass
Dibenz(a,h)anthracene	0.68	1.00	68%	50-150%	pass
Fluoranthene	0.81	1.00	81%	50-150%	pass
Fluorene	0.87	1.00	87%	50-150%	pass
Indeno(1,2,3-cd)pyrene	0.78	1.00	78%	50-150%	pass
Phenanthrene	0.85	1.00	85%	50-150%	pass
Pyrene	0.76	1.00	76%	50-150%	pass
Dibenz(a,h)acridine	0.72	1.00	72%		
Dibenz(a,j)acridine	0.81	1.00	81%		
7H-Dibenzo(c,g)carbazole	0.56	1.00	56%		
Dibenzo(a,e)fluoranthene	0.61	1.00	61%		
Dibenzo(a,h)pyrene	0.58	1.00	58%		
Dibenzo(a,e)pyrene	0.51	1.00	51%		
Dibenzo(a,i)pyrene	0.27	1.00	27%		
Dibenzo(a,l)pyrene	0.56	1.00	56%		
7,12-Dimethylbenz(a)anthracene	0.35	1.00	35%		
3-Methylcholanthrene	0.52	1.00	52%		
5-Methylchrysene	0.78	1.00	78%		
1-Nitropyrene	0.52	1.00	52%		
Other PAH					
Naphthalene	0.78	1.00	78%	50-150%	pass

DATA REPORT

Client: A. Lanfranco & Associates
Contact: Mark Lanfranco

Date Extracted: 20-Dec-23
Date Analysed: 2-Jan-24

Compound	DL µg	Client ID:	Blk Dioxin Unit – 1	Run 1 – Dioxin Unit – 1	Run 2 – Dioxin Unit – 1	Run 3 – Dioxin Unit – 1	BLANK
		PRL ID:	PR233697	PR233698	PR233699	PR233700	CP230908B
			µg	µg	µg	µg	µg
Trichlorobenzenes	0.05		ND	0.43	0.46	0.57	ND
Tetrachlorobenzenes	0.05		ND	0.17	0.20	2.25	ND
Pentachlorobenzene	0.05		ND	ND	ND	ND	ND
Hexachlorobenzene	0.01		ND	ND	ND	ND	ND

Surrogate Recoveries (%)

13C6-Hexachlorobenzene		52	60	44	44		32
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Compound	DL µg	µg	µg	µg	µg		µg
Trichlorophenols	0.05	ND	ND	ND	ND		ND
Tetrachlorophenols	0.05	ND	ND	ND	ND		ND
Pentachlorophenol	0.05	ND	ND	ND	ND		ND

Surrogate Recoveries (%)

13C6-Trichlorophenol		88	116	108	84		88
13C6-Tetrachlorophenol		40	104	92	132		100
13C6-Pentachlorophenol		60	84	88	88		52

ND - none detected

QC REPORT - SPIKE

Client: A. Lanfranco & Associates
Contact: Mark Lanfranco

Date Extracted: 20-Dec-23
Date Analysed: 29-Dec-23

Client ID: SPIKE
PRL ID: CP230909S

Compound	LOF		
	μg	μg	Recovery
Trichlorobenzenes	2.00	1.78	89%
Tetrachlorobenzenes	3.00	2.92	97%
Pentachlorobenzene	1.00	0.99	99%
Hexachlorobenzene	1.00	0.95	95%
Trichlorophenols	1.00	0.77	77%
Tetrachlorophenols	1.00	0.75	75%
Pentachlorophenol	1.00	0.73	73%

LOF - level of fortification

Acronyms used in reporting dioxins and furans:

TCDD = Tetrachlorodibenzo-*p*-dioxin
 PeCDD = Pentachlorodibenzo-*p*-dioxin
 HxCDD = Hexachlorodibenzo-*p*-dioxin
 HpCDD = Heptachlorodibenzo-*p*-dioxin
 OCDD = Octachlorodibenzo-*p*-dioxin

TCDF = Tetrachlorodibenzofuran
 PeCDF = Pentachlorodibenzofuran
 HxCDF = Hexachlorodibenzofuran
 HpCDF = Heptachlorodibenzofuran
 OCDF = Octachlorodibenzofuran

Acceptable recoveries for surrogates**EPA 1613**

	Min (%)	Max (%)
¹³ C ₁₂ -2,3,7,8-TCDD	25	164
¹³ C ₁₂ -1,2,3,7,8-PeCDD	25	181
¹³ C ₁₂ -1,2,3,4,7,8-HxCDD	32	141
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	28	130
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	23	140
¹³ C ₁₂ -OCDD	17	157
¹³ C ₁₂ -2,3,7,8-TCDF	24	169
¹³ C ₁₂ -1,2,3,7,8-PeCDF	24	185
¹³ C ₁₂ -2,3,4,7,8-PeCDF	21	178
¹³ C ₁₂ -1,2,3,4,7,8-HxCDF	26	152
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	26	123
¹³ C ₁₂ -1,2,3,7,8,9-HxCDF	29	147
¹³ C ₁₂ -2,3,4,6,7,8-HxCDF	28	136
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	28	143
¹³ C ₁₂ -1,2,3,4,7,8,9-HpCDF	26	138

Acronyms used in reporting Polychlorinated Biphenyls (PCBs)

MoCB = Monochlorobiphenyl

DiCB = Dichlorobiphenyl

TrCB = Trichlorobiphenyl

TeCB = Tetrachlorobiphenyl

PeCB = Pentachlorobiphenyl

HxCB = Hexachlorobiphenyl

HpCB = Heptachlorobiphenyl

OcCB = Octachlorobiphenyl

NoCB = Nonachlorobiphenyl

DeCB = Decachlorobiphenyl

Acceptable recoveries for PCB Internal Standards - EPA 1668C

Chemical Name	IUPAC #	Min	Max
¹³ C ₁₂ -2-MoCB	1L	5	145
¹³ C ₁₂ -4-MoCB	3L	5	145
¹³ C ₁₂ -2,2'-DiCB	4L	5	145
¹³ C ₁₂ -4,4'-DiCB	15L	5	145
¹³ C ₁₂ -2,2',6'-TrCB	19L	5	145
¹³ C ₁₂ -3,4,4'-TrCB	37L	5	145
¹³ C ₁₂ -2,2',6,6'-TeCB	54L	5	145
¹³ C ₁₂ -3,4,4',5'-TeCB	81L	10	145
¹³ C ₁₂ -3,3',4,4'-TeCB	77L	10	145
¹³ C ₁₂ -2,2',4,6,6'-PeCB	104L	10	145
¹³ C ₁₂ -2',3,4,4',5'-PeCB	123L	10	145
¹³ C ₁₂ -2,3',4,4',5'-PeCB	118L	10	145
¹³ C ₁₂ -2,3,4,4',5'-PeCB	114L	10	145
¹³ C ₁₂ -2,3,3',4,4'-PeCB	105L	10	145
¹³ C ₁₂ -3,3',4,4',5'-PeCB	126L	10	145
¹³ C ₁₂ -2,2',4,4',6,6'-HxCB	155L	10	145
¹³ C ₁₂ -2,3',4,4',5,5'-HxCB	167L	10	145
¹³ C ₁₂ -2,3,3',4,4',5'-HxCB	156L	10	145
¹³ C ₁₂ -2,3,3',4,4',5'-HxCB	157L	10	145
¹³ C ₁₂ -3,3',4,4',5,5'-HxCB	169L	10	145
¹³ C ₁₂ -2,2',3,4',5,6,6'-HpCB	188L	10	145
¹³ C ₁₂ -2,3,3',4,4',5,5'-HpCB	189L	10	145
¹³ C ₁₂ -2,2',3,3',5,5',6,6'-OcCB	202L	10	145
¹³ C ₁₂ -2,3,3',4,4',5,5',6'-OcCB	205L	10	145
¹³ C ₁₂ -2,2',3,3',4',5,5',6,6'-NoCB	208L	10	145
¹³ C ₁₂ -2,2',3,3',4,4',5,5',6'-NoCB	206L	10	145
¹³ C ₁₂ -DeCB	209L	10	145
¹³ C ₁₂ -2,4,4'-TrCB	28L	5	145
¹³ C ₁₂ -2,3,3',5,5'-PeCB	111L	10	145
¹³ C ₁₂ -2,2',3,3',5,5',6'-HpCB	178L	10	145

Acceptable recoveries for Polycyclic Aromatic Hydrocarbon Standards in Environmental Samples

	Surrogate Recovery	
	Min (%)	Max (%)
Naphthalene-d8	0	135
Biphenyl-d10	15	135
Acenaphthylene-d10	15	135
Acenaphthene-d10	15	135
Fluorene-d10	30	135
Phenanthrene-d10	30	135
Fluoranthene-d10	30	135
Pyrene-d10	30	135
Chrysene-d12	30	150
Benzo(b)fluoranthene-d12	30	150
Benzo(a)pyrene-d12	15	150
Dibenz(a,h)anthracene-d14	30	150



CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST

Pacific Rim Laboratories Inc. #103, 19575 - 55A Avenue, Surrey, BC V3S 8P8 Tel: 604-532-8711 Fax: 604-532-8712

COMPANY: A. Lanfranco & Associates Inc.
101-9488 189 Street
Surrey, BC Canada V4N 4W7

CONTACT: Mark LanfrancoPHONE: 604-881-2582DATE: 1-Dec-23EMAIL: mark.lanfranco@alanfranco.comCLIENT: Metro Vancouver WTESOURCE: Unit 1

SAMPLE ID	PRL ID	DATE SAMPLED	SAMPLE MATRIX	NUMBER OF CONTAINERS										COMMENTS
				DIOXIN/FURAN	PCB - dioxin-like (12)	PCB - 209 congener	PAH	HCB	TBT	Nonylphenol	PBDE	CB, CP		
	PR123697													
Blk Dioxin Unit - 1		30-Nov-23		5	X	X		X	X				X	
Run 1 - Dioxin Unit - 1	3698	28-Nov-23		5	X	X		X	X				X	
Run 2 - Dioxin Unit - 1	3699	29-Nov-23		5		X		X	X				X	
Run 3 - Dioxin Unit - 1	3700	30-Nov-23		5	X	X		X	X				X	

Sampler's Signature	Relinquished by:	Company	Date	Time	Received by:
					DW 15:00
Comments:	Method of Shipment	Waybill No.:	Rec'd for PRL:	Date	Time
				01-Dec-23	@ 14:02
	Shipment Condition	Temp.:	Cooler Opened By:		

APPENDIX 2

COMPUTER OUTPUTS OF MEASURED and CALCULATED DATA

Client:	Metro Vancouver	Date:	28-Nov-23
Jobsite:	WTE (Burnaby, BC)	Run:	2 PCDD-PCDF
Source:	Unit 1	Run Time:	10:05 - 14:08

Dioxin Concentration:	0.0 pg/dscm	0.0000 gr/dscf
	0.0 pg/dscm	0.0000 gr/Acf
	0.0 pg/dscm (@ 11% O2)	0.0000 gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.7965 dscm	134.073 dscf
Total Sample Time:	240.0 minutes	

Average Isokineticity:	101.3 %
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Flue Gas Characteristics

Moisture:	13.55 %	
Temperature	148.4 oC	299.2 oF
Flow	1207.0 dscm/min	42625 dscf/min
	20.12 dscm/sec	710.4 dscf/sec
	2085.7 Acf/min	73657 Acf/min
Velocity	13.648 m/sec	44.78 f/sec
Gas Analysis	10.24 % O2	9.67 % CO2
	29.956 Mol. Wt (g/gmole) Dry	28.336 Mol. Wt (g/gmole) Wet

*** Standard Conditions:**

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

Client: Metro Vancouver
Jobsite: WTE (Burnaby, BC)
Source: Unit 1

Date: 28-Nov-23
Run: 2 PCDD-PCDF
Run Time: 10:05 - 14:08

Control Unit (Y) 1.0051
Nozzle Diameter (in.) 0.2550
Pitot Factor 0.8489
Baro. Press. (in. Hg) 30.20
Static Press. (in. H₂O) -19.00
Stack Height (ft) 30
Stack Diameter (in.) 70.9
Stack Area (sq.ft.) 27.417
Minutes Per Reading 5.0
Minutes Per Point 10.0

Gas Analysis (Vol. %):

	CO ₂	O ₂
Trav 1	9.75	10.20
Trav 2	9.58	10.28
Average =	<u>9.67</u>	<u>10.24</u>

Condensate Collection:

Impinger 1 (grams)	424.0
Impinger 2 (grams)	8.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	12.5

Total Gain (grams) **446.5**

Collection:

D/F TEQ (ng) **0.0000**

Traverse	Point	Time (min.)	Dry Gas Meter (ft ³)	Pitot ΔP (in. H ₂ O)	Orifice ΔH (in. H ₂ O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	909.600							
1	1	5.0	911.920	0.300	0.90	50	50	299	1.5	103.5
		10.0	914.340	0.320	0.96	52	52	300	1.5	104.2
	2	15.0	916.660	0.300	0.90	52	52	300	4.7	103.1
		20.0	918.900	0.280	0.84	53	53	298	4.7	102.7
	3	25.0	921.290	0.320	0.96	54	54	298	8.4	102.4
		30.0	923.680	0.320	0.96	53	53	300	8.4	102.7
	4	35.0	926.090	0.320	0.96	54	54	300	12.5	103.3
		40.0	928.490	0.320	0.96	54	54	301	12.5	103.0
	5	45.0	930.820	0.300	0.90	55	55	301	17.7	103.0
		50.0	933.070	0.280	0.84	56	56	298	17.7	102.6
	6	55.0	935.320	0.280	0.84	56	56	298	25.2	102.6
		60.0	937.640	0.300	0.90	56	56	297	25.2	102.1
	7	65.0	940.820	0.560	1.67	57	57	300	45.6	102.7
		70.0	944.050	0.580	1.73	58	58	300	45.6	102.3
	8	75.0	947.170	0.540	1.61	60	60	300	53.2	102.0
		80.0	950.230	0.520	1.55	60	60	301	53.2	102.0
	9	85.0	953.240	0.500	1.50	61	61	300	58.3	102.0
		90.0	956.240	0.500	1.50	62	62	300	58.3	101.5
	10	95.0	959.260	0.500	1.50	63	63	300	62.5	102.0
		100.0	962.330	0.520	1.55	63	63	300	62.5	101.6
	11	105.0	965.350	0.500	1.50	64	64	300	66.1	101.8
		110.0	968.270	0.470	1.41	64	64	300	66.1	101.5
	12	115.0	971.120	0.450	1.33	64	64	297	69.4	101.0
		120.0	973.940	0.440	1.32	66	66	295	69.4	100.5
		0.0	973.940							
2	1	5.0	976.480	0.360	1.08	66	66	297	1.5	100.2
		10.0	979.020	0.360	1.08	66	66	296	1.5	100.1
	2	15.0	981.600	0.370	1.11	67	67	296	4.7	100.1
		20.0	984.220	0.380	1.14	68	68	297	4.7	100.2
	3	25.0	986.910	0.400	1.20	68	68	296	8.4	100.2
		30.0	989.590	0.400	1.20	69	69	296	8.4	99.7
	4	35.0	992.530	0.480	1.44	68	68	298	12.5	100.2
		40.0	995.560	0.510	1.52	67	67	299	12.5	100.5
	5	45.0	998.680	0.540	1.61	67	67	300	17.7	100.6
		50.0	1001.820	0.550	1.64	67	67	300	17.7	100.3
	6	55.0	1004.880	0.520	1.55	68	68	301	25.2	100.4
		60.0	1007.870	0.500	1.50	68	68	301	25.2	100.0
	7	65.0	1010.820	0.480	1.44	67	67	300	45.6	100.9
		70.0	1013.760	0.480	1.44	66	66	300	45.6	100.7
	8	75.0	1016.570	0.440	1.32	66	66	300	53.2	100.5
		80.0	1019.320	0.420	1.26	66	66	301	53.2	100.7
	9	85.0	1022.070	0.420	1.26	67	67	301	58.3	100.5
		90.0	1024.760	0.400	1.20	67	67	300	58.3	100.7
	10	95.0	1027.340	0.370	1.11	68	68	300	62.5	100.2
		100.0	1029.880	0.360	1.08	67	67	299	62.5	100.1
	11	105.0	1032.390	0.350	1.05	67	67	299	66.1	100.3
		110.0	1034.900	0.350	1.05	68	68	300	66.1	100.2
	12	115.0	1037.480	0.370	1.11	68	68	300	69.4	100.2
		120.0	1039.990	0.350	1.05	68	68	300	69.4	100.2
			Average:	0.414	1.240	62.5	62.5	299.2		101.3

Client:	Metro Vancouver	Date:	29-Nov-23
Jobsite:	WTE (Burnaby, BC)	Run:	2 PCDD-PCDF
Source:	Unit 1	Run Time:	09:24 - 13:28

Dioxin Concentration:	0.00 pg/dscm	0.0000 gr/dscf
	0.0 pg/dscm	0.0000 gr/Acf
	0.00 pg/dscm (@ 11% O2)	0.0000 gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.8411 dscm	135.649 dscf
Total Sample Time:	240.0 minutes	

Average Isokineticity:	100.8 %
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Flue Gas Characteristics

Moisture:	12.81 %	
Temperature	150.0 oC	301.9 oF
Flow	1227.1 dscm/min	43336 dscf/min
	20.45 dscm/sec	722.3 dscf/sec
	2113.9 Acf/min	74653 Acf/min
Velocity	13.832 m/sec	45.38 f/sec
Gas Analysis	10.47 % O2	9.45 % CO2
	29.931 Mol. Wt (g/gmole) Dry	28.402 Mol. Wt (g/gmole) Wet

*** Standard Conditions:**

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

Client: Metro Vancouver
Jobsite: WTE (Burnaby, BC)
Source: Unit 1

Date: 29-Nov-23
Run: 2 PCDD-PCDF
Run Time: 09:24 - 13:28

Control Unit (Y) 1.0051
Nozzle Diameter (in.) 0.2550
Pitot Factor 0.8489
Baro. Press. (in. Hg) 30.15
Static Press. (in. H2O) -19.00
Stack Height (ft) 30
Stack Diameter (in.) 70.9
Stack Area (sq.ft.) 27.417
Minutes Per Reading 5.0
Minutes Per Point 10.0

Gas Analysis (Vol. %):

	CO2	O2
Trav 1	9.50	10.56
Trav 2	9.40	10.38
Average = 9.45		10.47

Condensate Collection:

Impinger 1 (grams)	400.0
Impinger 2 (grams)	8.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	13.5

Total Gain (grams) **423.5**

Collection:

D/F TEQ (ng) **0.0000**

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ΔP (in. H2O)	Orifice ΔH (in. H2O)	Dry Gas Temperature		Stack (oF)	Wall Dist. (in.)	Isokin. (%)
						Inlet (oF)	Outlet (oF)			
		0.0	43.800							
1	1	5.0	46.120	0.300	0.90	49	49	299	1.5	102.8
		10.0	48.540	0.320	0.96	52	52	299	1.5	103.3
	2	15.0	50.780	0.280	0.84	52	52	300	4.7	102.2
		20.0	53.110	0.300	0.90	50	50	300	4.7	103.1
	3	25.0	55.360	0.280	0.84	50	50	299	8.4	103.0
		30.0	57.620	0.280	0.84	52	52	300	8.4	103.1
	4	35.0	59.870	0.280	0.84	52	52	300	12.5	102.7
		40.0	62.110	0.280	0.84	53	53	300	12.5	102.0
	5	45.0	64.230	0.250	0.75	54	54	300	17.7	102.0
		50.0	66.260	0.230	0.69	55	55	299	17.7	101.5
	6	55.0	68.500	0.280	0.84	56	56	299	25.2	101.4
		60.0	70.890	0.320	0.96	56	56	300	25.2	101.3
	7	65.0	74.090	0.570	1.70	57	57	300	45.6	101.6
		70.0	77.350	0.590	1.76	58	58	301	45.6	101.6
	8	75.0	80.420	0.520	1.55	58	58	301	53.2	101.9
		80.0	83.440	0.500	1.50	59	59	301	53.2	102.0
	9	85.0	86.560	0.540	1.56	60	60	301	58.3	101.2
		90.0	89.770	0.570	1.70	60	60	302	58.3	101.4
	10	95.0	93.030	0.590	1.76	60	60	302	62.5	101.3
		100.0	96.340	0.610	1.82	61	61	302	62.5	100.9
	11	105.0	99.460	0.540	1.61	61	61	301	66.1	101.0
		110.0	102.520	0.520	1.55	62	62	301	66.1	100.7
	12	115.0	105.460	0.480	1.44	62	62	300	69.4	100.7
		120.0	108.310	0.450	1.35	63	63	301	69.4	100.6
		0.0	108.310							
2	1	5.0	111.160	0.450	1.35	63	63	301	1.5	100.6
		10.0	113.920	0.420	1.26	64	64	302	1.5	100.7
	2	15.0	116.600	0.400	1.20	64	64	302	4.7	100.2
		20.0	119.220	0.380	1.14	64	64	301	4.7	100.4
	3	25.0	122.130	0.470	1.41	65	65	301	8.4	100.2
		30.0	125.100	0.490	1.47	65	65	302	8.4	100.2
	4	35.0	128.160	0.520	1.55	65	65	302	12.5	100.2
		40.0	131.220	0.520	1.55	65	65	303	12.5	100.3
	5	45.0	134.130	0.470	1.41	66	66	303	17.7	100.1
		50.0	136.970	0.450	1.35	66	66	302	17.7	99.8
	6	55.0	139.940	0.490	1.47	67	67	302	25.2	99.8
		60.0	142.990	0.520	1.55	67	67	303	25.2	99.6
	7	65.0	145.900	0.470	1.41	67	67	304	45.6	100.0
		70.0	148.740	0.450	1.35	68	68	304	45.6	99.5
	8	75.0	151.520	0.430	1.29	68	68	305	53.2	99.7
		80.0	154.270	0.420	1.26	68	68	306	53.2	99.9
	9	85.0	157.090	0.440	1.32	69	69	306	58.3	99.9
		90.0	159.910	0.440	1.32	70	70	307	58.3	99.7
	10	95.0	162.660	0.420	1.26	69	69	307	62.5	99.7
		100.0	165.420	0.420	1.26	69	69	306	62.5	100.0
	11	105.0	168.110	0.400	1.20	70	70	305	66.1	99.6
		110.0	170.720	0.380	1.14	71	71	304	66.1	98.9
	12	115.0	173.270	0.360	1.08	71	71	304	69.4	99.3
		120.0	175.740	0.340	1.02	72	72	303	69.4	98.7
			Average:	0.426	1.273	61.8	61.8	301.9		100.8

Client:	Metro Vancouver	Date:	30-Nov-23
Jobsite:	WTE (Burnaby, BC)	Run:	3 - PCDD-PCDF
Source:	Unit 1	Run Time:	08:57 - 13:01

Dioxin Concentration:	0.0 pg/dscm	0.0000 gr/dscf
	0.0 pg/Acm	0.0000 gr/Acf
	0.0 pg/dscm (@ 11% O2)	0.0000 gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.6430 dscm	128.654 dscf
Total Sample Time:	240.0 minutes	

Average Isokineticity:	100.1 %
-------------------------------	---------

Flue Gas Characteristics

Moisture:	12.12 %	
Temperature	144.9 oC	292.9 oF
Flow	1172.4 dscm/min	41404 dscf/min
	19.54 dscm/sec	690.1 dscf/sec
	1986.8 Acm/min	70164 Acf/min
Velocity	13.001 m/sec	42.65 f/sec
Gas Analysis	10.42 % O2	9.44 % CO2
	29.926 Mol. Wt (g/gmole) Dry	28.481 Mol. Wt (g/gmole) Wet

*** Standard Conditions:**

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

Client: Metro Vancouver
Jobsite: WTE (Burnaby, BC)
Source: Unit 1

Date: 30-Nov-23
Run: 3 - PCDD-PCDF
Run Time: 08:57 - 13:01

Control Unit (Y) 1.0051
Nozzle Diameter (in.) 0.2550
Pitot Factor 0.8489
Baro. Press. (in. Hg) 30.05
Static Press. (in. H₂O) -19.00
Stack Height (ft) 30
Stack Diameter (in.) 70.9
Stack Area (sq.ft.) 27.417
Minutes Per Reading 5.0
Minutes Per Point 10.0

Gas Analysis (Vol. %):

	CO ₂	O ₂
Trav 1	9.67	10.03
Trav 2	9.20	10.80

Average = 9.44 10.42

Condensate Collection:

Impinger 1 (grams)	350.0
Impinger 2 (grams)	10.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	15.0

Total Gain (grams) 377.0

Collection:

D/F TEQ (ng) 0.0000

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ΔP (in. H ₂ O)	Orifice ΔH (in. H ₂ O)	Dry Gas Temperature Inlet (oF)	Dry Gas Temperature Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	177.700							
1	1	5.0	179.780	0.240	0.72	48	48	294	1.5	102.1
		10.0	181.940	0.260	0.78	50	50	294	1.5	101.5
	2	15.0	184.110	0.260	0.78	52	52	296	4.7	101.7
		20.0	186.360	0.280	0.84	52	52	296	4.7	101.6
	3	25.0	188.570	0.270	0.81	51	51	294	8.4	101.7
		30.0	190.690	0.250	0.75	52	52	292	8.4	101.0
	4	35.0	192.810	0.250	0.75	52	52	290	12.5	100.9
		40.0	194.930	0.250	0.75	51	51	290	12.5	101.1
	5	45.0	197.010	0.240	0.72	52	52	290	17.7	101.0
		50.0	199.090	0.240	0.72	52	52	291	17.7	101.1
	6	55.0	201.290	0.270	0.81	52	52	292	25.2	100.9
		60.0	203.540	0.280	0.84	54	54	291	25.2	100.9
	7	65.0	206.220	0.400	1.20	56	56	292	45.6	100.3
		70.0	209.000	0.430	1.29	56	56	290	45.6	100.2
	8	75.0	211.750	0.420	1.26	57	57	288	53.2	100.0
		80.0	214.510	0.420	1.26	58	58	289	53.2	100.2
	9	85.0	217.420	0.470	1.41	58	58	289	58.3	99.9
		90.0	220.390	0.490	1.47	57	57	290	58.3	100.1
	10	95.0	223.450	0.520	1.55	57	57	291	62.5	100.2
		100.0	226.570	0.540	1.61	58	58	292	62.5	100.2
	11	105.0	229.520	0.480	1.44	58	58	292	66.1	100.4
		110.0	232.360	0.450	1.34	58	58	292	66.1	99.8
	12	115.0	235.110	0.420	1.26	59	59	291	69.4	99.8
		120.0	237.870	0.420	1.26	60	60	291	69.4	99.9
		0.0	237.870							
2	1	5.0	240.620	0.420	1.26	60	60	292	1.5	99.7
		10.0	243.370	0.420	1.26	59	59	292	1.5	99.8
	2	15.0	246.120	0.420	1.26	60	60	291	4.7	99.6
		20.0	248.870	0.420	1.26	60	60	291	4.7	99.6
	3	25.0	251.660	0.430	1.29	61	61	292	8.4	99.7
		30.0	254.520	0.450	1.35	62	62	292	8.4	99.8
	4	35.0	257.330	0.440	1.32	61	61	294	12.5	99.4
		40.0	260.140	0.440	1.32	61	61	294	12.5	99.4
	5	45.0	262.960	0.440	1.32	62	62	295	17.7	99.7
		50.0	265.840	0.460	1.38	62	62	295	17.7	99.6
	6	55.0	268.780	0.480	1.44	62	62	296	25.2	99.6
		60.0	271.790	0.500	1.50	63	63	296	25.2	99.7
	7	65.0	274.610	0.440	1.32	62	62	296	45.6	99.7
		70.0	277.360	0.420	1.26	62	62	296	45.6	99.5
	8	75.0	279.990	0.380	1.14	61	61	296	53.2	100.2
		80.0	282.500	0.350	1.05	61	61	296	53.2	99.7
	9	85.0	284.970	0.340	1.02	62	62	295	58.3	99.2
		90.0	287.440	0.340	1.02	62	62	295	58.3	99.2
	10	95.0	289.920	0.340	1.02	62	62	296	62.5	99.7
		100.0	292.390	0.340	1.02	63	63	296	62.5	99.1
	11	105.0	294.900	0.350	1.05	63	63	294	66.1	99.1
		110.0	297.480	0.370	1.11	64	64	294	66.1	98.9
	12	115.0	299.990	0.350	1.05	64	64	293	69.4	98.9
		120.0	302.430	0.330	0.99	64	64	293	69.4	99.0
			Average:	0.380	1.138	58.2	58.2	292.9		100.1

APPENDIX 3

FIELD DATA SHEETS

14.24 2.99ΔH

14.24 2.99ΔH

PLANT	PROBE TIP DIAMETER, IN.	IMPINGER	INITIAL	FINAL	TOTAL GAIN							
MURD	PROBE LENGTH, FT / Cp	VOLUMES	(mL)	(mL)	(mL)							
RUN No	FILTER NUMBER	Imp. # 1										
LOCATION		Imp. # 2										
DATE	STATIC PRESSURE, IN. H ₂ O	Imp. # 3										
OPERATOR	STACK DIAMETER	Imp. # 4										
CONTROL UNIT / Y	STACK HEIGHT											
	INITIAL LEAK TEST											
	FINAL LEAK TEST											
	UPSTREAM DIAMETERS											
	DOWNSTREAM DIAMETERS											
Point	Clock Time	Dry Gas Meter Ft ³	Pitot IN. H ₂ O ΔP	Orifice ΔH IN. H ₂ O	Dry Gas Temp. Outlet °F	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg Gauge	CO ₂ Vol. %	O ₂ Vol. %
1	10:05	909.600			XAD							
2		911.927			40	299	250	250	148	2		
3		914.271			50	300	250	250	50	2		
4		916.66			50	300	250	250	50	2		
5		918.90			50	300	250	250	50	2		
6		921.21			50	300	250	250	50	2		
7		923.60			50	300	250	250	50	2		
8		926.01			50	300	250	250	50	2		
9		928.49			50	300	250	250	50	2		
10		930.87			50	300	250	250	50	2		
11		933.07			50	300	250	250	50	2		
12		935.27			50	300	250	250	50	2		
13		937.61			50	300	250	250	50	2		
14		940.02			50	300	250	250	50	2		
15		942.43			50	300	250	250	50	2		
16		944.83			50	300	250	250	50	2		
17		947.17			50	300	250	250	50	2		
18		950.27			50	300	250	250	50	2		
19		952.71			50	300	250	250	50	2		
20		956.21			50	300	250	250	50	2		
21		959.27			50	300	250	250	50	2		
22		962.37			50	300	250	250	50	2		
23		965.27			50	300	250	250	50	2		
24		968.27			50	300	250	250	50	2		
25		971.67			50	300	250	250	50	2		
26		975.67			50	300	250	250	50	2		
27		976.48			50	300	250	250	50	2		
28		979.02			50	300	250	250	50	2		
29		981.60			50	300	250	250	50	2		
30		984.60			50	300	250	250	50	2		
31		988.60			50	300	250	250	50	2		
32		991.51			50	300	250	250	50	2		
33		995.51			50	300	250	250	50	2		
34		999.51			50	300	250	250	50	2		
35		1003.51			50	300	250	250	50	2		
36		1007.51			50	300	250	250	50	2		
37		1011.51			50	300	250	250	50	2		
38		1015.51			50	300	250	250	50	2		
39		1019.51			50	300	250	250	50	2		
40		1023.51			50	300	250	250	50	2		
41		1027.51			50	300	250	250	50	2		
42		1031.51			50	300	250	250	50	2		
43		1035.51			50	300	250	250	50	2		
44		1039.51			50	300	250	250	50	2		
45		1043.51			50	300	250	250	50	2		
46		1047.51			50	300	250	250	50	2		
47		1051.51			50	300	250	250	50	2		
48		1055.51			50	300	250	250	50	2		
49		1059.51			50	300	250	250	50	2		
50		1063.51			50	300	250	250	50	2		
51		1067.51			50	300	250	250	50	2		
52		1071.51			50	300	250	250	50	2		
53		1075.51			50	300	250	250	50	2		
54		1079.51			50	300	250	250	50	2		
55		1083.51			50	300	250	250	50	2		
56		1087.51			50	300	250	250	50	2		
57		1091.51			50	300	250	250	50	2		
58		1095.51			50	300	250	250	50	2		
59		1099.51			50	300	250	250	50	2		
60		1103.51			50	300	250	250	50	2		
61		1107.51			50	300	250	250	50	2		
62		1111.51			50	300	250	250	50	2		
63		1115.51			50	300	250	250	50	2		
64		1119.51			50	300	250	250	50	2		
65		1123.51			50	300	250	250	50	2		
66		1127.51			50	300	250	250	50	2		
67		1131.51			50	300	250	250	50	2		
68		1135.51			50	300	250	250	50	2		
69		1139.51			50	300	250	250	50	2		
70		1143.51			50	300	250	250	50	2		
71		1147.51			50	300	250	250	50	2		
72		1151.51			50	300	250	250	50	2		
73		1155.51			50	300	250	250	50	2		
74		1159.51			50	300	250	250	50	2		
75		1163.51			50	300	250	250	50	2		
76		1167.51			50	300	250	250	50	2		
77		1171.51			50	300	250	250	50	2		
78		1175.51			50	300	250	250	50	2		
79		1179.51			50	300	250	250	50	2		
80		1183.51			50	300	250	250	50	2		
81		1187.51			50	300	250	250	50	2		
82		1191.51			50	300	250	250	50	2		
83		1195.51			50	300	250	250	50	2		
84		1199.51			50	300	250	250	50	2		
85		1203.51			50	300	250	250	50	2		
86		1207.51			50	300	250	250	50	2		
87		1211.51			50	300	250	250	50	2		
88		1215.51			50	300	250	250	50	2		
89		1219.51			50	300	250	250	50	2		
90		1223.51			50	300	250	250	50	2		
91		1227.51			50	300	250	250	50	2		
92		1231.51			50	300	250	250	50	2		
93		1235.51			50	300	250	250	50	2		
94		1239.51			50	300	250	250	50	2		
95		1243.51			50	300	250	250	50	2		
96		1247.51			50	300	250	250	50	2		
97		1251.51			50	300	250	250	50	2		
98		1255.51			50	300	250	250	50	2		
99		1259.51			50	300	250	250	50	2		
100		1263.51			50	300	250	250	50	2		
101		1267.51			50	300	250	250	50	2		
102		1271.51			50	300	250	250	50	2		
103		1275.51			50	300	250	250	50	2		
104		1279.51			50	300	250	250	50	2		
105		1283.51			50	300	250	250	50	2		
106		1287.51			50	300	250	250	50	2		
107		1291.51			50	300	250	250	50	2		
108		1295.51			50	300	250	250	50	2		
109		1299.51			50	300	250	250	50	2		
110		1303.51			50	300	250	250	50	2		
111		1307.51			50	300	250	250	50	2		
112		1311.51			50	300	250	250	50	2		
113		1315.51			50	300	250	250	50	2		
114		1319.51			50	300	250	250	50	2		
115		1323.51			50	300	250	250	50	2		
116		1327.51			50	300	250	250	50	2		
117		1331.51			50	300	250	250	50	2		
118		1335.51			50	300	250	250	50	2		
119		1339.51			50	300	250	250	50	2		
120		1343.51			50	300	250	250	50	2		
121		1347.51			50	300	250	250	50	2		
122		1351.51			50	300	250	250	50	2		
123		1355.51			50	300	250	250	50	2		
124		1359.51			50	300	250	250	50	2		
125		1363.51			50	300	250	250	50	2		
126		1367.51			50	300	250	250	50	2		
127		1371.51			50	300	250	250	50	2		
128		1375.51			50	300	250	250	50	2		
129		1379.51			50	300	250	250	50	2		
130		1383.51			50	300	250	250	50	2		
131		1387.51			50	300	250	250	50	2		

14.24 2.99ΔH

PLANT	M.V.E.D.	PROBE TIP DIAMETER, IN.	IMPINGER	INITIAL	FINAL	TOTAL GAIN						
		PROBE LENGTH, FT / Cp	VOLUMES	(mL)	(mL)	(mL)						
RUN No	1	PROBE LENGTH, FT / Cp	Imp. # 1									
LOCATION	Unit #1	FILTER NUMBER	Imp. # 2									
DATE	Nov. 28/23	STATIC PRESSURE, IN. H ₂ O	Imp. # 3									
OPERATOR		STACK DIAMETER	Imp. # 4									
CONTROL UNIT / Y		STACK HEIGHT										
BAROMETRIC PRESSURE, IN. Hg		INITIAL LEAK TEST										
ASSUMED MOISTURE, Bw		FINAL LEAK TEST										
		Upstream Diameters										
		Downstream Diameters										
Point	Clock Time	Dry Gas Meter Ft ³	Pitot IN. H ₂ O ΔP	Orifice ΔH IN. H ₂ O	Dry Gas Temp. Outlet of	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg Gauge	CO ₂ Vol. %	O ₂ Vol. %
4	Cont.	999.59	1.48	1.44	XAD	298	250	250	52	6	10.0	10.0
4		993.53	1.51	1.52	40	299	250	250	52	6		
5		996.60	1.54	1.61	42	300	250	250	52	6		
5		1001.82	1.55	1.64	40	300	250	250	53	6		
6		1004.80	1.52	1.50	40	301	250	250	53	6		
7		1007.87	1.50	1.49	40	301	250	250	54	6	9.5	10.5
7		1010.82	1.49	1.44	40	300	250	250	54	6		
8		1013.76	1.49	1.44	40	300	250	250	54	6		
8		1016.57	1.48	1.38	40	300	250	250	54	6	9.5	10.5
9		1019.32	1.49	1.26	40	300	250	250	52	6		
9		1022.07	1.49	1.26	42	300	250	250	52	6		
10		1024.70	1.49	1.20	42	300	250	250	50	6	9.5	10.2
10		1027.37	1.49	1.11	42	300	250	250	50	6		
11		1029.88	1.49	1.08	42	300	250	250	50	6		
11		1032.31	1.49	1.05	42	300	250	250	50	6		
11		1034.90	1.49	1.00	44	300	250	250	50	6		
12	14:08	1037.40	1.49	1.11	44	300	250	250	50	6		
12		1039.99	1.49	1.06	40	300						

12.24 2.99ΔH

PLANT	W J R D	PROBE TIP DIAMETER, IN.	9.56	IMPINGER	INITIAL	FINAL	TOTAL GAIN		
		PROBE LENGTH, FT / Cp	7.2	VOLUMES	(mL)	(mL)	(mL)		
RUN No	2	FILTER NUMBER	8489	Imp. # 1	0	400	400		
LOCATION	UNIT #1			Imp. # 2	100	100	0		
DATE	06.20.23			Imp. # 3	0	2	2		
OPERATOR	C.L. + C.D.L.D	STATIC PRESSURE, IN. H ₂ O	19.00	Imp. # 4					
CONTROL UNIT / Y	5014 1.0051	STACK DIAMETER	70.90						
		STACK HEIGHT	30'						
BAROMETRIC PRESSURE, IN. Hg	30.15	INITIAL LEAK TEST	0.002 C 15"						
ASSUMED MOISTURE, Bw	15%	FINAL LEAK TEST	0.002 C 15"						
		Upstream Diameters							
Point	Clock Time		Dry Gas Meter Ft ³		Temperature °F		Fyrites		
					Probe	Box	Impinger Exit	CO ₂ Vol. %	O ₂ Vol. %
1	09:24	41,800	48	48	250	250	48	9.5	10.5
2		48.57	50	50	250	250	48		
3		50.76	48	48	250	250	50		
4		52.76	44	44	250	250	48		
5		55.67	42	42	250	250	48		
6		58.23	41	41	250	250	48		
7		60.50	40	40	250	250	50		
8		64.09	41	41	250	250	50		
9		66.42	42	42	250	250	52		
10		69.57	42	42	250	250	52		
11		72.57	42	42	250	250	51		
12		75.46	42	42	250	250	52		
13		78.31	42	42	250	250	52		
14		81.16	42	42	250	250	50		
15		84.02	41	41	250	250	48		
16		86.85	41	41	250	250	48		
17		89.70	41	41	250	250	48		
18		92.52	41	41	250	250	48		
19		95.39	41	41	250	250	48		
20		98.24	41	41	250	250	48		
21		101.07	41	41	250	250	48		
22		103.86	41	41	250	250	48		
23		106.60	41	41	250	250	48		
24		109.37	41	41	250	250	48		
25		112.10	41	41	250	250	48		
26		114.82	41	41	250	250	48		
27		117.56	41	41	250	250	48		
28		120.27	41	41	250	250	48		
29		122.96	41	41	250	250	48		
30		125.60	41	41	250	250	48		
31		128.27	41	41	250	250	48		
32		130.89	41	41	250	250	48		
33		133.52	41	41	250	250	48		
34		136.16	41	41	250	250	48		
35		138.77	41	41	250	250	48		
36		141.37	41	41	250	250	48		
37		143.96	41	41	250	250	48		
38		146.52	41	41	250	250	48		
39		149.07	41	41	250	250	48		
40		151.60	41	41	250	250	48		
41		154.16	41	41	250	250	48		
42		156.67	41	41	250	250	48		
43		159.16	41	41	250	250	48		
44		161.60	41	41	250	250	48		
45		164.07	41	41	250	250	48		
46		166.52	41	41	250	250	48		
47		168.96	41	41	250	250	48		
48		171.37	41	41	250	250	48		
49		173.77	41	41	250	250	48		
50		176.16	41	41	250	250	48		
51		178.52	41	41	250	250	48		
52		180.89	41	41	250	250	48		
53		183.27	41	41	250	250	48		
54		185.60	41	41	250	250	48		
55		187.96	41	41	250	250	48		
56		190.31	41	41	250	250	48		
57		192.67	41	41	250	250	48		
58		195.02	41	41	250	250	48		
59		197.37	41	41	250	250	48		
60		199.70	41	41	250	250	48		
61		202.07	41	41	250	250	48		
62		204.42	41	41	250	250	48		
63		206.77	41	41	250	250	48		
64		209.16	41	41	250	250	48		
65		211.52	41	41	250	250	48		
66		213.89	41	41	250	250	48		
67		216.27	41	41	250	250	48		
68		218.60	41	41	250	250	48		
69		220.96	41	41	250	250	48		
70		223.31	41	41	250	250	48		
71		225.67	41	41	250	250	48		
72		228.02	41	41	250	250	48		
73		230.37	41	41	250	250	48		
74		232.70	41	41	250	250	48		
75		235.07	41	41	250	250	48		
76		237.42	41	41	250	250	48		
77		239.77	41	41	250	250	48		
78		242.16	41	41	250	250	48		
79		244.52	41	41	250	250	48		
80		246.89	41	41	250	250	48		
81		249.27	41	41	250	250	48		
82		251.60	41	41	250	250	48		
83		253.96	41	41	250	250	48		
84		256.31	41	41	250	250	48		
85		258.67	41	41	250	250	48		
86		261.02	41	41	250	250	48		
87		263.37	41	41	250	250	48		
88		265.70	41	41	250	250	48		
89		268.07	41	41	250	250	48		
90		270.42	41	41	250	250	48		
91		272.77	41	41	250	250	48		
92		275.16	41	41	250	250	48		
93		277.52	41	41	250	250	48		
94		279.89	41	41	250	250	48		
95		282.27	41	41	250	250	48		
96		284.60	41	41	250	250	48		
97		286.96	41	41	250	250	48		
98		289.31	41	41	250	250	48		
99		291.67	41	41	250	250	48		
100		294.02	41	41	250	250	48		
101		296.37	41	41	250	250	48		
102		298.70	41	41	250	250	48		
103		301.07	41	41	250	250	48		
104		303.42	41	41	250	250	48		
105		305.77	41	41	250	250	48		
106		308.16	41	41	250	250	48		
107		310.52	41	41	250	250	48		
108		312.89	41	41	250	250	48		
109		315.27	41	41	250	250	48		
110		317.60	41	41	250	250	48		
111		319.96	41	41	250	250	48		
112		322.31	41	41	250	250	48		
113		324.67	41	41	250	250	48		
114		327.02	41	41	250	250	48		
115		329.37	41	41	250	250	48		
116		331.70	41	41	250	250	48		
117		334.07	41	41	250	250	48		
118		336.42	41	41	250	250	48		
119		338.77	41	41	250	250	48		
120		341.16	41	41	250	250	48		
121		343.52	41	41	250	250	48		
122		345.89	41	41	250	250	48		
123		348.27	41	41	250	250	48		
124		350.60	41	41	250	250	48		
125		352.96	41	41	250	250	48		
126		355.31	41	41	250	250	48		
127		357.67	41	41	250	250	48		
128		360.02	41	41	250	250	48		
129		362.37	41	41	250	250	48		
130		364.70	41	41	250	250	48		
131		367.07	41	41	250	250	48		
132		369.42	41	41	250	250	48		
133		371.77	41	41	250	250	48		
134		374.16	41	41	250	250	48		
135		376.52	41	41	250	250	48		
136		378.89	41	41	250	250	48		
137		381.27	41	41	250	250	48		
138		383.60	41	41	250	250	48		
139		385.96	41	41	250	250	48		
140		388.31	41	41	250	250	48		
141		390.67	41	41	250	250	48		
142		393.02	41	41	250	250	48		
143		395.37	41	41	250	250	48		
144		397.70	41	41	250	250	48		
145		400.07	41	41	250	250	48		
146		402.42	41	41	250	250	48		
147		404.77	41	41	250	250	48		
148		407.16	41	41	250	250	48		
149		409.52	41	41	250	250	48		
150		411.89	41	41	250	250	48		
151		414.27	41	41	250	250	48		
152		416.60	41	41	250	250	48		
153		418.96	41	41	250	250	48		
154		421.31	41	41	250	250	48		
155		423.67	41	41	250	250	48		
156		426.02	41	41	250	250	48		
157		428.37	41	41	250	250	48		
158		430.70	41	41	250	250	48		
159		433.07	41	41	250	250	48		
160		435.42	41	41	250	250	48</		

[illegible]

14.04 2.99 ΔH

PLANT	MURD	PROBE TIP DIAMETER, IN.	IMPINGER	INITIAL	FINAL	TOTAL GAIN
RUN No	3 RDD/RDF	PROBE LENGTH, FT / Cp	VOLUMES	(mL)	(mL)	(mL)
LOCATION	UNIT #1	FILTER NUMBER	Imp. # 1	0	350	350
DATE	Nov. 20/23	STATIC PRESSURE, IN. H ₂ O	Imp. # 2	100	110	10
OPERATOR	C. L. C. D. L. G.	STACK DIAMETER	Imp. # 3	0	2	2
CONTROL UNIT / Y	3014 1.0051	STACK HEIGHT	Imp. # 4			
BAROMETRIC PRESSURE, IN. Hg	30.05	INITIAL LEAK TEST	Upstream Diameters			
ASSUMED MOISTURE, Bw	153	FINAL LEAK TEST	Downstream Diameters			

Point	Clock Time	Dry Gas Meter Ft ³	Pilot IN. H ₂ O ΔP	Orifice ΔH IN. H ₂ O	Dry Gas Temp. Outlet of	Stack	Temperature °F		Impinger Exit	Pump Vac. IN. Hg Gauge	Fyrites	
							Probe	Box			CO ₂ Vol. %	O ₂ Vol. %
1	08:54	177.700	1.24	1.24	144	294	250	250	46	3	9.0	11.0
2		161.94	1.26	1.26	142	294	250	250	50	3		
3		164.11	1.28	1.28	144	294	250	250	52	3		
4		168.52	1.30	1.30	142	294	250	250	50	3	9.5	10.2
5		160.61	1.32	1.32	142	294	250	250	48	3		
6		164.81	1.34	1.34	144	294	250	250	48	3	9.5	10.5
7		167.01	1.36	1.36	142	294	250	250	50	4	10.5	9.5
8		163.54	1.38	1.38	142	294	250	250	52	4		
9		166.32	1.40	1.40	144	294	250	250	50	6	10.0	9.5
10		169.00	1.42	1.42	144	294	250	250	50	6		
11		171.75	1.44	1.44	142	294	250	250	50	6	9.5	10.5
12		174.51	1.46	1.46	144	294	250	250	50	6		
13		177.42	1.48	1.48	142	294	250	250	50	6		
14		180.31	1.50	1.50	144	294	250	250	50	6		
15		183.15	1.52	1.52	142	294	250	250	50	6		
16		186.01	1.54	1.54	144	294	250	250	50	6		
17		188.87	1.56	1.56	142	294	250	250	50	6		
18		191.75	1.58	1.58	144	294	250	250	50	6		
19		194.61	1.60	1.60	142	294	250	250	50	6		
20		197.47	1.62	1.62	144	294	250	250	50	6		
21		200.32	1.64	1.64	142	294	250	250	50	6		
22		203.17	1.66	1.66	144	294	250	250	50	6		
23		206.01	1.68	1.68	142	294	250	250	50	6		
24		208.87	1.70	1.70	144	294	250	250	50	6		
25		211.75	1.72	1.72	142	294	250	250	50	6		
26		214.51	1.74	1.74	144	294	250	250	50	6		
27		217.42	1.76	1.76	142	294	250	250	50	6		
28		220.31	1.78	1.78	144	294	250	250	50	6		
29		223.15	1.80	1.80	142	294	250	250	50	6		
30		226.01	1.82	1.82	144	294	250	250	50	6		
31		228.87	1.84	1.84	142	294	250	250	50	6		
32		231.75	1.86	1.86	144	294	250	250	50	6		
33		234.61	1.88	1.88	142	294	250	250	50	6		
34		237.47	1.90	1.90	144	294	250	250	50	6		
35		240.32	1.92	1.92	142	294	250	250	50	6		
36		243.17	1.94	1.94	144	294	250	250	50	6		
37		246.01	1.96	1.96	142	294	250	250	50	6		
38		248.87	1.98	1.98	144	294	250	250	50	6		
39		251.75	2.00	2.00	142	294	250	250	50	6		
40		254.61	2.02	2.02	144	294	250	250	50	6		
41		257.47	2.04	2.04	142	294	250	250	50	6		
42		260.32	2.06	2.06	144	294	250	250	50	6		
43		263.17	2.08	2.08	142	294	250	250	50	6		
44		266.01	2.10	2.10	144	294	250	250	50	6		
45		268.87	2.12	2.12	142	294	250	250	50	6		
46		271.75	2.14	2.14	144	294	250	250	50	6		
47		274.61	2.16	2.16	142	294	250	250	50	6		
48		277.47	2.18	2.18	144	294	250	250	50	6		
49		280.32	2.20	2.20	142	294	250	250	50	6		
50		283.17	2.22	2.22	144	294	250	250	50	6		
51		286.01	2.24	2.24	142	294	250	250	50	6		
52		288.87	2.26	2.26	144	294	250	250	50	6		
53		291.75	2.28	2.28	142	294	250	250	50	6		
54		294.61	2.30	2.30	144	294	250	250	50	6		
55		297.47	2.32	2.32	142	294	250	250	50	6		
56		300.32	2.34	2.34	144	294	250	250	50	6		
57		303.17	2.36	2.36	142	294	250	250	50	6		
58		306.01	2.38	2.38	144	294	250	250	50	6		
59		308.87	2.40	2.40	142	294	250	250	50	6		
60		311.75	2.42	2.42	144	294	250	250	50	6		
61		314.61	2.44	2.44	142	294	250	250	50	6		
62		317.47	2.46	2.46	144	294	250	250	50	6		
63		320.32	2.48	2.48	142	294	250	250	50	6		
64		323.17	2.50	2.50	144	294	250	250	50	6		
65		326.01	2.52	2.52	142	294	250	250	50	6		
66		328.87	2.54	2.54	144	294	250	250	50	6		
67		331.75	2.56	2.56	142	294	250	250	50	6		
68		334.61	2.58	2.58	144	294	250	250	50	6		
69		337.47	2.60	2.60	142	294	250	250	50	6		
70		340.32	2.62	2.62	144	294	250	250	50	6		
71		343.17	2.64	2.64	142	294	250	250	50	6		
72		346.01	2.66	2.66	144	294	250	250	50	6		
73		348.87	2.68	2.68	142	294	250	250	50	6		
74		351.75	2.70	2.70	144	294	250	250	50	6		
75		354.61	2.72	2.72	142	294	250	250	50	6		
76		357.47	2.74	2.74	144	294	250	250	50	6		
77		360.32	2.76	2.76	142	294	250	250	50	6		
78		363.17	2.78	2.78	144	294	250	250	50	6		
79		366.01	2.80	2.80	142	294	250	250	50	6		
80		368.87	2.82	2.82	144	294	250	250	50	6		
81		371.75	2.84	2.84	142	294	250	250	50	6		
82		374.61	2.86	2.86	144	294	250	250	50	6		
83		377.47	2.88	2.88	142	294	250	250	50	6		
84		380.32	2.90	2.90	144	294	250	250	50	6		
85		383.17	2.92	2.92	142	294	250	250	50	6		
86		386.01	2.94	2.94	144	294	250	250	50	6		
87		388.87	2.96	2.96	142	294	250	250	50	6		
88		391.75	2.98	2.98	144	294	250	250	50	6		
89		394.61	3.00	3.00	142	294	250	250	50	6		
90		397.47	3.02	3.02	144	294	250	250	50	6		
91		400.32	3.04	3.04	142	294	250	250	50	6		
92		403.17	3.06	3.06	144	294	250	250	50	6		
93		406.01	3.08	3.08	142	294	250	250	50	6		
94		408.87	3.10	3.10	144	294	250	250	50	6		
95		411.75	3.12	3.12	142	294	250	250	50	6		
96		414.61	3.14	3.14	144	294	250	250	50	6		
97		417.47	3.16	3.16	142	294	250	250	50	6		
98		420.32	3.18	3.18	144	294	250	250	50	6		
99		423.17	3.20	3.20	142	294	250	250	50	6		
100		426.01	3.22	3.22	144	294	250	250	50	6		

4.24 2.99 Δ H

PLANT	PROBE TIP DIAMETER, IN.	IMPINGER	INITIAL	FINAL	TOTAL GAIN								
RUN No	PROBE LENGTH, FT / Cp	VOLUMES	(mL)	(mL)	(mL)								
LOCATION	FILTER NUMBER	Imp. # 1											
DATE	STATIC PRESSURE, IN. H ₂ O	Imp. # 2											
OPERATOR	STACK DIAMETER	Imp. # 3											
CONTROL UNIT / Y	STACK HEIGHT	Imp. # 4											
BAROMETRIC PRESSURE, IN. Hg		Upstream Diameters											
ASSUMED MOISTURE, Bw		Downstream Diameters											
Point	Clock Time	Dry Gas Meter Ft ³	Pitot IN. H ₂ O ΔP	Orifice ΔH IN. H ₂ O	Dry Gas Temp. Outlet of	Stack	Probe	Temperature °F	Box	Impinger Exit	Pump Vac. IN. Hg Gauge	CO ₂ Vol. %	O ₂ Vol. %
1	Continued	254.52	144	1.32	140	244	250	250	250	48	6		
2		257.33	144	1.32	40	244	250	250	250	48	6	9.0	11.0
3		260.14	144	1.32	40	244	250	250	250	48	6		
4		262.06	146	1.32	42	246	250	250	250	48	6		
5		265.81	148	1.44	42	246	250	250	250	48	6		
6		268.40	150	1.50	42	246	250	250	250	48	6	9.5	10.5
7		271.71	144	1.32	42	246	250	250	250	48	6		
8		274.61	142	1.26	41	246	250	250	250	50	6		
9		277.36	130	1.14	40	246	250	250	250	52	6	9.5	10.5
10		279.99	130	1.00	40	246	250	250	250	52	6		
11		282.50	131	1.02	40	246	250	250	250	52	6		
12		284.07	131	1.02	40	246	250	250	250	52	6	9.0	11.0
13		287.14	131	1.02	42	244	250	250	250	52	6		
14		288.02	131	1.02	42	244	250	250	250	52	6		
15		292.39	131	1.02	42	244	250	250	250	52	6		
16		294.00	131	1.02	42	244	250	250	250	52	6		
17		297.19	131	1.02	42	244	250	250	250	52	6		
18	13.01	299.09	131	1.02	42	244	250	250	250	52	6		
19		302.15	131	1.02	42	244	250	250	250	52	6		

APPENDIX 4

CALIBRATION DATA and

CERTIFICATION

Pitot Tube Calibration

Date: 27-Jun-23
Pbar (in.Hg): 29.84

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

Pitot ID: **7A-1**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.075	0.100	18.3	0.8574	0.0105
0.155	0.210	26.3	0.8505	0.0036
0.295	0.400	36.3	0.8502	0.0033
0.460	0.630	45.3	0.8459	0.0010
0.570	0.810	50.5	0.8305	0.0164
Average :			0.8469	0.0070

Pitot ID: **ST 8A**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.055	0.075	15.7	0.8478	0.0019
0.180	0.250	28.4	0.8400	0.0059
0.270	0.365	34.7	0.8515	0.0055
0.450	0.620	44.8	0.8434	0.0025
0.505	0.690	47.5	0.8469	0.0010
Average :			0.8459	0.0034

Pitot ID: **7B**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.050	0.072	14.9	0.8250	0.0101
0.130	0.180	24.1	0.8413	0.0062
0.295	0.400	36.3	0.8502	0.0151
0.460	0.630	45.3	0.8459	0.0108
0.560	0.830	50.0	0.8132	0.0219
Average :			0.8351	0.0128

Pitot ID: **ST 8B**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.040	0.055	13.4	0.8443	0.0076
0.110	0.155	22.2	0.8340	0.0179
0.300	0.420	36.6	0.8367	0.0152
0.460	0.630	45.3	0.8459	0.0059
0.560	0.680	50.0	0.8984	0.0465
Average :			0.8519	0.0186

Pitot ID: **7 AL GVRD-1**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.075	0.105	16.3	0.8367	0.0099
0.160	0.220	19.9	0.8443	0.0024
0.360	0.480	25.3	0.8574	0.0107
0.460	0.630	35.8	0.8459	0.0007
0.500	0.680	48.4	0.8489	0.0023
Average :			0.8466	0.0052

Pitot ID: **ST 8C**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.075	0.105	14.9	0.8367	0.0020
0.160	0.220	19.4	0.8443	0.0055
0.280	0.380	29.0	0.8498	0.0111
0.570	0.810	43.1	0.8305	0.0082
0.615	0.870	52.8	0.8324	0.0064
Average :			0.8387	0.0067

Pitot ID: **7C**

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
0.038	0.051	13.0	0.8546	0.0057
0.110	0.150	16.3	0.8478	0.0011
0.295	0.400	36.3	0.8502	0.0013
0.450	0.620	30.5	0.8434	0.0055
0.540	0.735	47.0	0.8486	0.0003
Average :			0.8489	0.0028

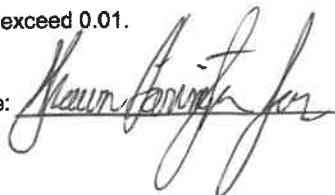
Pitot ID:

Reference Pitot (in H ₂ O)	S-Type Pitot (in H ₂ O)	Air Velocity (ft/s)	Pitot Coeff. C _p	Deviation (absolute)
Average :				

* Average absolute deviation must not exceed 0.01.

Calibrated by: Jeremy Gibb

Signature:



Date:

June 27, 2023

BAROMETER CALIBRATION FORM

Device	Cal Date	Pbar Env Canada		Device (inches of Hg)		Difference
		(kPa)	(inches of Hg)	Reading	Elevation Corrected	(Env Can - Elv Corr)
LA	10-Jul-23	101.6	30.01	29.92	29.99	0.02
DS	10-Jul-23	101.6	30.01	29.91	29.98	0.03
CL	10-Jul-23	101.6	30.01	29.92	29.99	0.02
JC	10-Jul-23	101.6	30.01	29.89	29.96	0.05
LF	10-Jul-23	101.6	30.01	29.91	29.98	0.03
SH	10-Jul-23	101.6	30.01	29.90	29.97	0.04
CDO	10-Jul-23	101.6	30.01	29.89	29.96	0.05
JG	10-Jul-23	101.6	30.01	29.87	29.94	0.07
ML	10-Jul-23	101.6	30.01	29.89	29.96	0.05
BL	10-Jul-23	101.6	30.01	29.91	29.98	0.03

Calibrated by: Daryl Sampson

Signature: Daryl Sampson

Date: 10-Jul-23

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

GLASS NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Christian De La O
Date: 26-Jun-23

Signature:

Chris Del A O

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft ²)
A	0.1270	0.1270	0.1255	0.0015	0.1265	0.0000873
G-165	0.1650	0.1660	0.1645	0.0015	0.1652	0.0001488
G-170	0.1700	0.1710	0.1695	0.0015	0.1702	0.0001579
G-178	0.1760	0.1770	0.1790	0.0030	0.1773	0.0001715
E	0.1950	0.1930	0.1960	0.0030	0.1947	0.0002067
L	0.2100	0.2070	0.2090	0.0030	0.2087	0.0002375
P-2240	0.2160	0.2155	0.2170	0.0015	0.2162	0.0002549
G-221	0.2160	0.2185	0.2190	0.0030	0.2178	0.0002588
G-225	0.2190	0.2175	0.2180	0.0015	0.2182	0.0002596
G-218	0.2180	0.2200	0.2210	0.0030	0.2197	0.0002632
G-2232	0.2210	0.2200	0.2215	0.0015	0.2208	0.0002660
P-250	0.2500	0.2495	0.2505	0.0010	0.2500	0.0003409
C-250	0.2500	0.2500	0.2500	0.0000	0.2500	0.0003409
P-251	0.2545	0.2530	0.2540	0.0015	0.2538	0.0003514
P-254	0.2550	0.2540	0.2535	0.0015	0.2542	0.0003523
P-256	0.2540	0.2550	0.2560	0.0020	0.2550	0.0003547
P-280	0.2810	0.2805	0.2815	0.0010	0.2810	0.0004307
C-280	0.2800	0.2800	0.2800	0.0000	0.2800	0.0004276
G-282	0.2820	0.2800	0.2825	0.0025	0.2815	0.0004322
P-281	0.2820	0.2820	0.2815	0.0005	0.2818	0.0004332
G-292	0.2820	0.2840	0.2850	0.0030	0.2837	0.0004389
G-309	0.3045	0.3065	0.3065	0.0020	0.3058	0.0005101
P-311	0.3115	0.3120	0.3120	0.0005	0.3118	0.0005304
P-312	0.3120	0.3110	0.3105	0.0015	0.3112	0.0005281
G-3121	0.3090	0.3085	0.3075	0.0015	0.3083	0.0005185
P-313	0.3140	0.3130	0.3130	0.0010	0.3133	0.0005355
P-314	0.3135	0.3135	0.3140	0.0005	0.3137	0.0005366
P-315	0.3145	0.3145	0.3145	0.0000	0.3145	0.0005395
V-06	0.3220	0.3215	0.3200	0.0020	0.3212	0.0005626
G-345	0.3470	0.3475	0.3475	0.0005	0.3473	0.0006580
P27	0.3490	0.3480	0.3500	0.0020	0.3490	0.0006643
G-367	0.3700	0.3685	0.3690	0.0015	0.3692	0.0007433
P-375	0.3730	0.3750	0.3745	0.0020	0.3742	0.0007636
P-401	0.3980	0.3990	0.4000	0.0020	0.3990	0.0008683
G-433	0.4360	0.4360	0.4355	0.0005	0.4358	0.0010360
G-437	0.4690	0.4690	0.4700	0.0010	0.4693	0.0012014
G-468	0.4700	0.4685	0.4720	0.0035	0.4702	0.0012057
P-7	0.4965	0.4945	0.4975	0.0030	0.4962	0.0013427
G-540	0.5400	0.5410	0.5400	0.0010	0.5403	0.0015924

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

A. LANFRANCO and ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Calibrated by: Daryl Sampson

Date: 8-Jul-23

Signature:

Daryl Sampson

TEMPERATURE DEVICE CALIBRATIONS

Reference Device			Temperature Settings (degrees F)													
Model CL23A Calibrator			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 %																

A.Lanfranco & Associates inc.

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

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

Date: 27-Jun-23
Barometric Pressure: 29.82 (in. Hg)
Theoretical Critical Vacuum: 14.07 (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)²(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.		Final Temps.		Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature --		
					Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)				Initial (deg F)	Final (deg F)	Average (deg F)
4.10	24.00	578.500	603.936	25.436	73.0	73.0	77.0	77.0	73	0.8185	15.0	77.0	79.0	78.0
2.20	16.00	565.700	577.951	12.251	72.0	72.0	73.0	73.0	63	0.5956	18.0	78.0	77.0	77.5
1.80	19.00	604.400	615.844	11.444	77.0	77.0	79.0	79.0	55	0.4606	19.0	79.0	78.0	78.5
0.73	23.00	616.200	626.790	10.590	79.0	79.0	80.0	80.0	48	0.3560	20.0	78.0	79.0	78.5
0.38	16.00	627.100	632.181	5.081	81.0	81.0	81.0	81.0	40	0.2408	21.0	79.0	79.0	79.0

***** RESULTS *****												
--- DRY GAS METER ---			----- ORIFICE -----			-- DRY GAS METER --			----- ORIFICE -----			
VOLUME CORRECTED	VOLUME CORRECTED		VOLUME CORRECTED	VOLUME CORRECTED	VOLUME NOMINAL	CALIBRATION FACTOR Y			CALIBRATION FACTOR dH@			
Vm(std) (cu ft)	Vm(std) (liters)		Vcr(std) (cu ft)	Vcr(std) (liters)	Vcr (cu ft)	Value (number)	Variation (number)		Value (in H2O)	Value (mm H2O)	Ko (value)	
25.262	715.4		25.255	715.2	25.830	1.000	-0.005		2.049	52.03	0.672	
12.168	344.6		12.257	347.1	12.525	1.007	0.002		2.084	52.93	0.662	
11.239	318.3		11.246	318.5	11.513	1.001	-0.005		2.827	71.80	0.573	
10.344	292.9		10.522	298.0	10.771	1.017	0.012		1.914	48.61	0.686	
4.945	140.0		4.949	140.1	5.071	1.001	-0.004		2.173	55.20	0.654	
Average Y----->						1.0051	Average dH@----->		2.209	56.1	Average Ko---->	0.649

TEMPERATURE CALIBRATION			
Calibration Standard ----->		Omega Model CL23A S/N:T-218768	
Reference Temperature Set-Point (deg F)	Temperature Device Reading (deg F)	Results	
		Variation (degF)	Percent of Absolute
32	32	0	0.00%
100	100	0	0.00%
300	300	0	0.00%
500	500	0	0.00%
1000	1000	0	0.00%

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02.
For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H2O that equates to 0.75 dm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +0.2.
For Temperature Device, the reading must be within 1.5% of certified calibration standard (absolute temperature) to be acceptable.

Calibrated by: Justin Ching

Signature: _____

Justin Ching

Date: June 27, 2023

Calibration Certificate

Date: 08-Aug-23
 Calibrated by: Louis Agassiz
 Authorizing Signature: 

Insrtument Calibrated: Testo 2 (330-2LX)
 Serial #: 03282252
 Customer: ALA

Ambient Conditions: Temperature: 25 °C Barometric Pressure: 101.6 kPa Relative Humidity: 65%

A. Lanfranco and Associates Inc. certifies that the described instrument has been inspected and tested following calibration procedures in the Environment Canada Report EPS 1/PG/7 (Revised 2005). Below are the observed readings after calibrations are complete. Calibration checks should be completed at least every 6 months.

O ₂	Initial Evaluation				After Calibration				Certified Value (vol %)
	Instrument Reading (vol %)	Calibration Error	Pass/Fail	Notes	Instrument Reading (vol %)	Calibration Error	Pass/Fail	Notes	
Zero	0.1	0.10	Pass		0	0.00	Pass		0
O ₂	11.1	0.03	Pass		11.1	0.03	Pass		11.07
Ambient	21	0.04	Pass		21.0	0.04	Pass		20.96

Performance Specification: +/- 1% O₂ (absolute diff)

CO	Initial Evaluation				After Calibration				Certified Value (ppm)
	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	
Zero	0	0.0%	Pass	Replaced CO cell	0	0.0%	Pass		0
1 Gas	592	25.6%	Fail		472	0.1%	Pass		472
2 Gas	2154	13.1%	Fail		1900	0.2%	Pass		1904
3 Gas	245	2.3%	Pass		251	0.1%	Pass		251

Performance Specification: +/- 5% of Certified Gas Value

NO	Initial Evaluation				After Calibration				Certified Value (ppm)
	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	
Zero	0	0.0%	Pass	Re cal on 1 Gas	0	0.0%	Pass		0
1 Gas	428	9.6%	Fail		473	0.1%	Pass		473.4
2 Gas	235	8.9%	Fail		261	1.2%	Pass		258.0
3 Gas	45	3.6%	Pass		45	3.6%	Pass		43.4

Performance Specification: +/- 5% of Certified Gas Value

NIST Traceable Calibration Gases:

Cylinder	Cylinder ID Number	Certification Date	Expiration Date	Cylinder Pressure (PSI)	NO (ppm)	O ₂ (Vol. %)	CO (ppm)
Zero Gas (N ₂)	T97227026	10-Nov-2022	9-Nov-2027	2270	0	0	0
1 Gas	SG9107852B	6-May-2021	5-May-2024	950	473.4	0	471.5
2 Gas	CC320634	23-Mar-2018	23-Mar-2026	520	258	0	1904
3 Gas	CC22286	18-Nov-2022	19-Nov-2026	1030	43.42	0	250.7
O ₂ /CO ₂	CC256047	11-Nov-2022	12-Nov-2030	1320	0	11.07	0

Note: National Institute of Standards and Technology traceable certificates are available upon request.



MOUNT ROYAL COLLEGE

Faculty of Continuing Education and Extension

Carter Lanfranco

has successfully completed

Stack Sampling

May 2009

Date

Dean
Faculty of Continuing Education and Extension

Conflict of Interest Disclosure Statement

A qualified professional¹ 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 Carter Lanfranco, as a member of Air and Waste Management Association
declare

Select one of the following:

☒ Absence from conflict of interest

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

Mr. Sajid Barlas, erring on the side of caution.

☐ 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

Print name: Carter Lanfranco

Witnessed by:

X

Print name: Mark Lanfranco

Date: Dec. 16, 2020

¹Qualified 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.



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 professionals¹, 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

Carter Lanfanco

Title

Chief operations officer / caretaker

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:

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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

Print Name: _____

Carter Lanfanco

Witnessed by: _____

X

Print Name: _____

Shawn Harrington

Date signed: _____

Dec. 7/2020

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1. Name of Qualified Professional Mark Lanfranco
Title President | Owner

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

Name of Association: _____ Registration # _____

3. Brief description of professional services:

Environmental consulting, specializing in air and atmospheric sciences

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Signature:

X [Signature]

Print Name: Mark Lanfranco

Witnessed by:

X [Signature]

Print Name: Melissa Watkins

Date signed: Nov.16, 2020

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MOUNT ROYAL COLLEGE

Faculty of Continuing Education and Extension

Mark Lanfranco

has successfully completed

The program of studies and is awarded the certificate in

STACK SAMPLING

May 2005

Date

Dean

Faculty of Continuing Education and Extension

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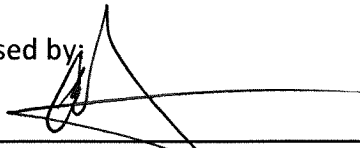
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Signature:

X 

Print name: Mark Lanfranco

Witnessed by:

X 

Print name: Carter Lanfranco

Date: Dec.16, 2020

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