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

July 2022 Survey

Operational Certificate 107051

Prepared by Mark Lanfranco

Report Issued: August 30, 2022

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. S. Harrington (certified), Mr. J. Ching.

The report was prepared by Mr. M. 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.

Mark Lanfranco, CST
President | Owner

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APPENDICES

TEST PROGRAM ORGANIZATION

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Sampling Crew:	Mr. S. Harrington – A. Lanfranco and Associates Inc. Mr. J. Ching – A. Lanfranco and Associates Inc.

SUMMARY

The following table presents the average of triplicate emission test results from Unit 2 for various trace organics on July 25-27, 2022. Additional parameters were measured by the facility's certified continuous emission monitoring system.

Parameter		**Unit 2**	**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)	0.1725	5.0
HCB*	(µg/Sm^3 @ 11% O_2)	0.0012	
Total CB	(µg/Sm^3 @ 11% O_2)	0.2244	1.0
Total CP*	(µg/Sm^3 @ 11% O_2)	0.0060	1.0
Total PCB	(µg/Sm^3 @ 11% O_2)	0.0171	1.0
Flowrate	(Sm^3/min)	1215	
Temperature	(°C)	145	
O_2	(vol % dry)	10.5	

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

Note - for PCDD/PCDF if the results of all parameters for all three test runs are non-detect, the average result is reported as 'ND' rather than at one half detection limit

*Calculated using one half detection limit

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 source monitored for 2022 was Unit 2.

2 METHODOLOGY

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

Parameter	Reference Method
Sample and Velocity traverse points	EPS 1/RM/8 A Determination of Sampling Site and Traverse Points
Velocity and flowrate	EPS 1/RM/8 B Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Gas molecular weight (O_2/CO_2)	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 EPA Method 23 Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from Stationary Sources supporting
Dioxin/Furan (analytical)	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.

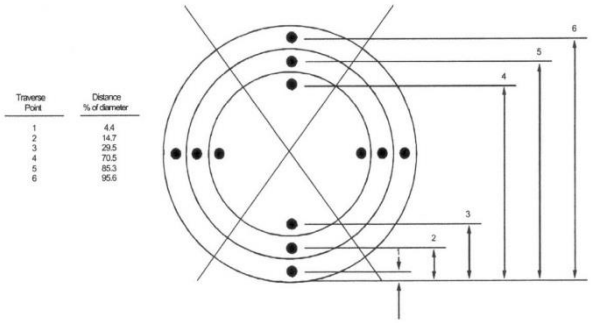


Figure 1. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

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.

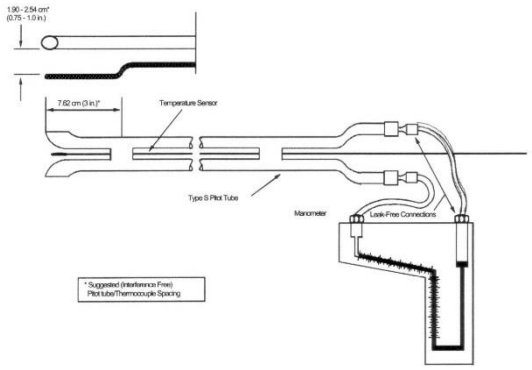


Figure 2. Type S Pitot Tube Manometer Assembly

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-para-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.

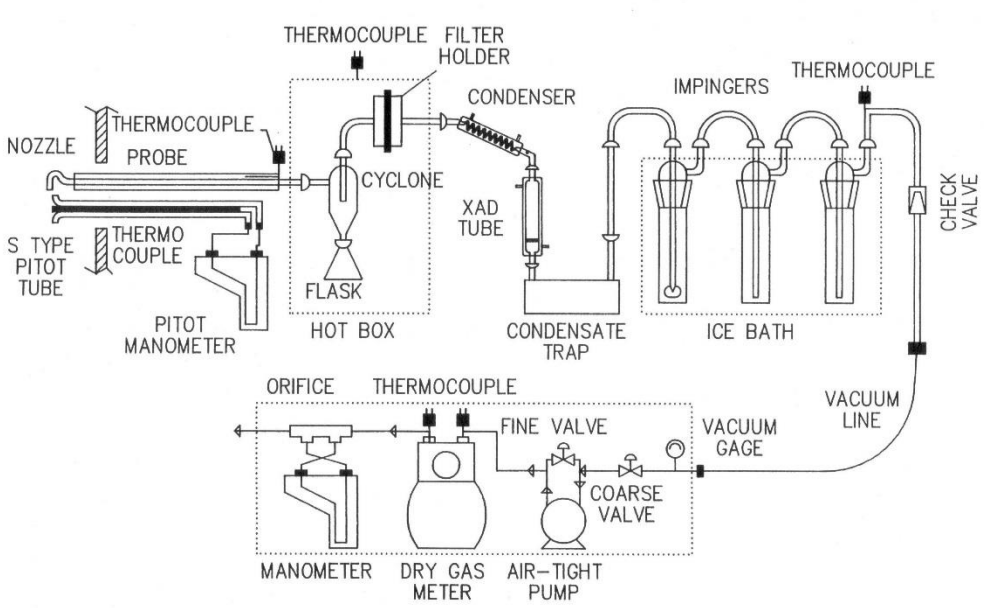


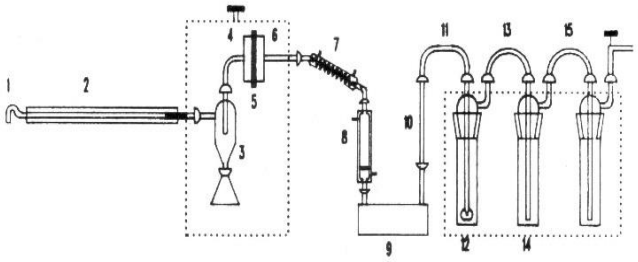
Figure 3 - Dioxin / Furan Sampling Train

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.

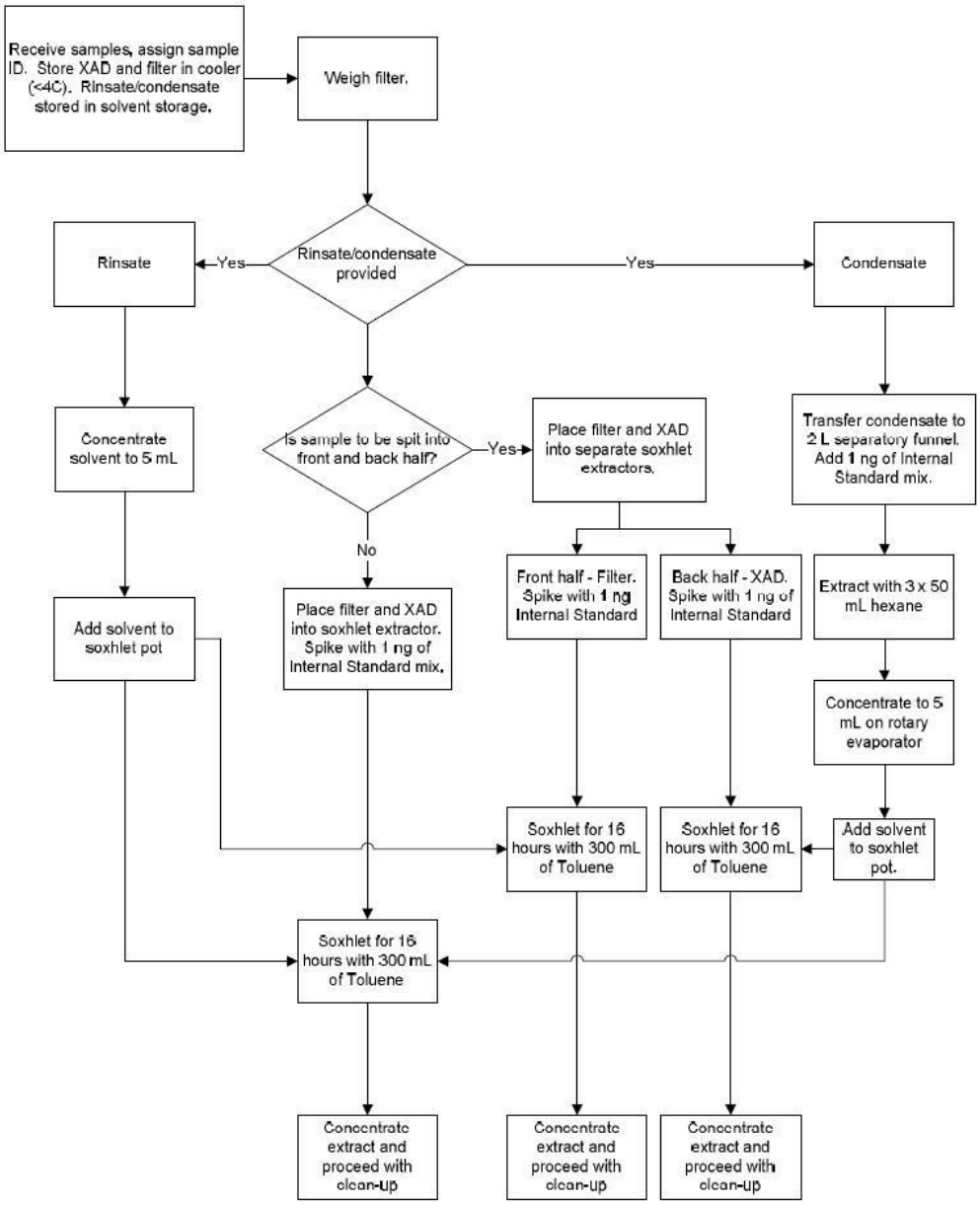


Figure 5 - Semi-Volatile Organics XAD and Filter Recovery Schematic

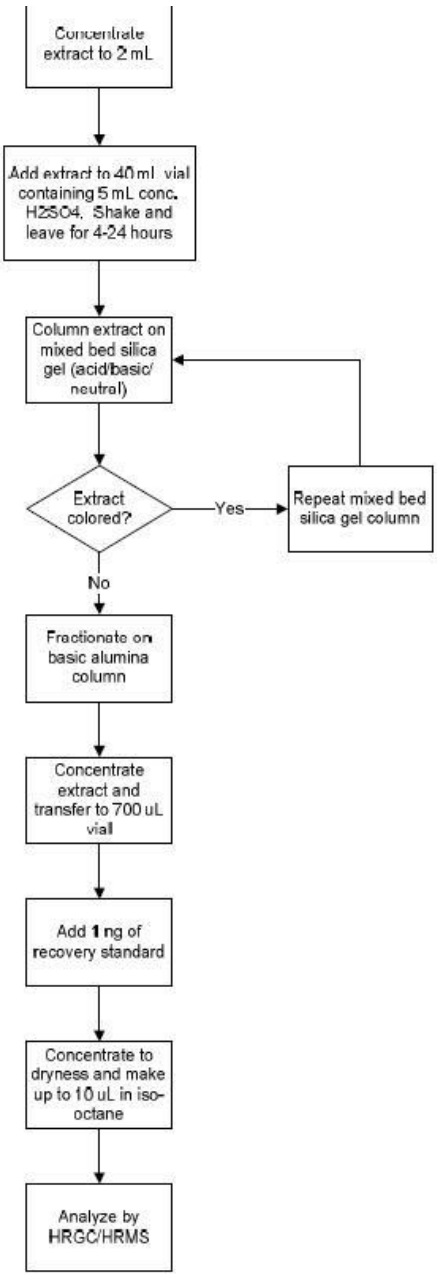


Figure 6 - Schematic of analytical methodology for dioxins and furans

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 ± 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

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

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

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

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

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

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

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

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

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

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

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

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:

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

$$1 \text{ µg} = 10^{-6} \text{ g}$$

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

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

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

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

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

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

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

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

$$T_{Stk} = \frac{1}{n} \sum_{i=1}^{n} T_{Stk_i}, where\ n = the\ number\ of\ points \quad \textbf{Equation 17}$$

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

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

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

$$Iso_i = \frac{v_{nzi}}{v_i}$$ **Equation 21**

$$v_i = 85.49 \times c_p \times \sqrt{\Delta p_i} \times \sqrt{\frac{(T_{Stk_i} + 459.67)}{(P_{Stk} \times M_W)}}$$ **Equation 22**

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

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

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

$$v_{nz} = \frac{1}{n}\sum_{i=1}^{n} v_{nzi} \, , where\ n = the\ number\ of\ points$$ **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_2O)*
T_{Stk} = *Average flue gas temperature (°F), second subscript i, indicates individual point measurements*
$\Delta H_{i(act)}$ = *Calculated individual point orifice pressures (inches of H_2O)*
P_g = *Stack Static pressure (inches of H_2O)*
P_{stk} = *Absolute stack pressure (inches of Hg)*
M_w = *Wet gas molecular weight (g/gmol)*
M_D = *Dry gas molecular weight (g/gmol)*
$\%CO_2$ = *Stack gas carbon dioxide concentration (% dry basis)*
$\%O_2$ = *Stack gas oxygen concentration (% dry basis)*
B_{wo} = *Stack gas water vapour, proportion by volume*
V_{cond} = *Total volume of water vapor collected, corrected to standard conditions (ft^3)*
V_{gain} = *Condensate gain of impinger contents (mL)*
P_{std} = *Standard pressure (29.92 inches of Hg)*
v_{stk} = *Average flue gas velocity (ft/sec)*

v_i = *Individual point flue gas velocity (ft/sec)*
v_{nz} = *Average velocity at nozzle(ft/sec)*
v_{nzi} = *Individual point velocity at nozzle(ft/sec)*
Iso_i = *Individual point isokinetic variation (%)*
Iso = *Average isokinetic variation (%)*
R_m = *Isokinetic sampling rate (ft^3/min)*

2.2.3 Volumetric Flowrate Calculations

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

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

$$A_{stk} = \pi \left(\frac{d}{24}\right)^2$$ **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 O_2). 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 2 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 2 TRACE ORGANICS RESULTS TABLE

Parameter		Test 1	Test 2	Test 3	Average
Test Date		25-Jul-22	26-Jul-22	27-Jul-22	
Test Time		10:00 - 14:04	09:48 - 12:51	08:33 - 12:39	
Duration	(minutes)	240	240	240	240
PCDD & PCDF TEQ	(ng/Sm^3)	0.0000	0.0000	0.0000	0.0000
PCDD & PCDF TEQ	**(ng/Sm^3 @ 11% O_2)**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Total PAH	($\mu g/Sm^3$)	0.0648	0.3183	0.1585	0.1805
Total PAH	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0616**	**0.3057**	**0.1503**	**0.1725**
Total HCB*	($\mu g/Sm^3$)	0.0012	0.0013	0.0012	0.0012
Total HCB*	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0012**	**0.0012**	**0.0012**	**0.0012**
Total CB	($\mu g/Sm^3$)	0.2864	0.4113	0.0065	0.2347
Total CB	**($\mu g/Sm^3$ @ 11% O_2)**	**0.2722**	**0.3949**	**0.0061**	**0.2244**
Total CP*	($\mu g/Sm^3$)	0.0062	0.0063	0.0062	0.0062
Total CP*	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0059**	**0.0061**	**0.0059**	**0.0060**
Total PCB	($\mu g/Sm^3$)	0.0094	0.0437	0.0005	0.0179
Total PCB	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0089**	**0.0420**	**0.0005**	**0.0171**
Stack Temperature	(°C)	144	145	147	145
Flowrate	(Sm^3/min)	1219	1199	1227	1215
Oxygen (O_2)	(vol % dry)	10.5	10.6	10.5	10.5
Carbon Dioxide (CO_2)	(vol % dry)	9.3	9.0	8.8	9.0
Moisture	(vol %)	13.8	14.1	13.7	13.9
Isokinetic Variation	(%)	104	104	104	104

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:		25-Jul-22		26-Jul-22		27-Jul-22	
Test Time:		10:00 - 14:04		09:48 - 12:51		08:33 - 12:39	
Component	**TEF**	**Analyzed** (ng)	**TEQ** (ng)	**Analyzed** (ng)	**TEQ** (ng)	**Analyzed** (ng)	**TEQ** (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)			**4.0120**		**3.9582**		**4.0390**
PCDD & PCDF TEQ	**ng/dscm**		**0.00000**		**0.00000**		**0.00000**
PCDD & PCDF TEQ	**ng/dscm @ 11% O_2**		**0.00000**		**0.00000**		**0.00000**
PCDD & PCDF TEQ	**grams/day**		**0.000000**		**0.000000**		**0.000000**
Flowrate (dscm/min)			1219		1199		1227
Oxygen (Vol. %)			10.5		10.6		10.5
Carbon Dioxide (Vol. %)			9.3		9.0		8.8
Moisture (Vol. %)			13.8		14.1		13.7
Temperature (oC)			144		145		147
Isokinetic Variation (%)			104		104		104

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

	Test 1	Test 2	Test 3
Test Date:	25-Jul-22	26-Jul-22	27-Jul-22
Test Time:	10:00 - 14:04	09:48 - 12:51	08:33 - 12:39
Component	**Analyzed** (ug)	**Analyzed** (ug)	**Analyzed** (ug)
Benz(a)anthracene	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND
Benzo(b) fluoranthene	ND	ND	ND
Benzo(e)pyrene	ND	0.010	ND
Benzo(g,h,i)perylene	ND	0.030	ND
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	0.020	0.070	ND
Indeno(1,2,3-c,d)pyrene	ND	ND	ND
Phenanthrene	0.160	0.600	0.200
Pyrene	0.040	0.180	0.010
7H-dibenzo(c,g)carbazole	ND	ND	ND
Acenaphthene	**ND**	**ND**	**ND**
Acenaphthylene	**ND**	**0.280**	**0.400**
Fluorene	**0.040**	**0.090**	**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	**1.1490**	**1.6280**	**0.0261**
HCB	**0.0050**	**0.0050**	**0.0050**
* ND = Less than detection limit			
PCB Total (ng)	**37.7**	**173.0**	**2.1**
Total PAH (ug)	**0.260**	**1.260**	**0.640**
Sample Volume (dscm)	**4.01**	**3.96**	**4.04**
Oxygen	10.5	10.6	10.5
PAH ug/dscm	**0.0648**	**0.3183**	**0.1585**
HCB ug/dscm	**0.0012**	**0.0013**	**0.0012**
CB Total ug/dscm	**0.2864**	**0.4113**	**0.0065**
CP Total ug/dscm	**0.0062**	**0.0063**	**0.0062**
PCB Total ug/dscm	**0.0094**	**0.0437**	**0.0005**
PAH ug/dscm @ 11% O_2	**0.0616**	**0.3057**	**0.1503**
HCB ug/dscm @ 11% O_2	**0.0012**	**0.0012**	**0.0012**
CB Total ug/dscm @ 11% O_2	**0.2722**	**0.3949**	**0.0061**
CP Total ug/dscm @ 11% O_2	**0.0059**	**0.0061**	**0.0059**
PCB Total ug/dscm @ 11% O_2	**0.0089**	**0.0420**	**0.0005**

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 for the first time since at least 2015. The additional trace organics results are similar to data from 2020 and 2021; however, PAH results were slightly up, while Total CB was down. Total PCB was also down compared to 2021, but still elevated when compared to historical levels. Again, the vast majority of PCB's were found as dichlorobiphenyl.

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 42 to 81%.

EPA Method 23 surrogate recoveries ranged from 72 to 115% 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

Client:	Metro Vancouver	**Date:**	25-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	1 PCDD-PCDF
Source:	Unit 2	**Run Time:**	10:00 - 14:04

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:	4.0120 dscm	141.682 dscf
Total Sample Time:	240.0 minutes	

Average Isokineticity: 103.6 %

Flue Gas Characteristics

Moisture:	13.79 %	
Temperature	143.7 oC	290.7 oF
Flow	1218.7 dscm/min	43037 dscf/min
	20.31 dscm/sec	717.3 dscf/sec
	2110.2 Acm/min	74521 Acf/min
Velocity	13.808 m/sec	45.30 f/sec
Gas Analysis	10.49 % O2	9.29 % CO2
	29.905 Mol. Wt (g/gmole) Dry	28.263 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	**Date:**	25-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	1 PCDD-PCDF
Source:	Unit 2	**Run Time:**	10:00 - 14:04

Control Unit (Y)	1.0014
Nozzle Diameter (in.)	0.2580
Pitot Factor	0.8506
Baro. Press. (in. Hg)	29.90
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	9.40	10.10
Trav 2	9.17	10.87
Average =	**9.29**	**10.49**

Condensate Collection:

Impinger 1 (grams)	456.0
Impinger 2 (grams)	10.0
Impinger 3 (grams)	3.0
Impinger 4 (grams)	12.6
Total Gain (grams)	**481.6**

Collection:

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

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	186.130							
1	1	5.0	188.730	0.320	0.91	80	80	294	1.5	102.3
		10.0	191.490	0.360	1.03	80	80	294	1.5	102.4
	2	15.0	194.440	0.410	1.17	80	80	294	4.7	102.6
		20.0	197.450	0.430	1.23	80	80	294	4.7	102.3
	3	25.0	200.400	0.400	1.17	80	80	290	8.4	103.6
		30.0	203.350	0.400	1.17	80	80	290	8.4	103.6
	4	35.0	206.200	0.370	1.08	81	81	290	12.5	103.9
		40.0	209.050	0.370	1.08	81	81	290	12.5	103.9
	5	45.0	211.620	0.300	0.88	81	81	291	17.7	104.1
		50.0	214.180	0.300	0.88	81	81	291	17.7	103.7
	6	55.0	216.560	0.260	0.76	81	81	290	25.2	103.4
		60.0	218.980	0.270	0.79	81	81	290	25.2	103.2
	7	65.0	221.790	0.360	1.06	82	82	287	45.6	103.4
		70.0	224.680	0.380	1.12	82	82	287	45.6	103.6
	8	75.0	227.860	0.460	1.36	82	82	284	53.2	103.4
		80.0	231.080	0.470	1.39	82	82	284	53.2	103.6
	9	85.0	234.370	0.490	1.45	83	83	286	58.3	103.6
		90.0	237.760	0.520	1.53	83	83	288	58.3	103.8
	10	95.0	241.250	0.550	1.62	84	84	290	62.5	103.9
		100.0	244.700	0.540	1.59	84	84	291	62.5	103.7
	11	105.0	248.120	0.530	1.56	84	84	290	66.1	103.7
		110.0	251.470	0.510	1.50	84	84	291	66.1	103.6
	12	115.0	254.780	0.500	1.47	84	84	292	69.4	103.5
		120.0	258.180	0.520	1.53	84	84	290	69.4	104.1
		0.0	258.180							
2	1	5.0	261.070	0.380	1.12	84	84	292	1.5	103.5
		10.0	264.040	0.400	1.18	85	85	292	1.5	103.5
	2	15.0	267.020	0.400	1.18	85	85	292	4.7	103.9
		20.0	270.060	0.420	1.24	85	85	292	4.7	103.4
	3	25.0	272.960	0.380	1.12	85	85	293	8.4	103.8
		30.0	275.810	0.370	1.09	85	85	293	8.4	103.3
	4	35.0	278.640	0.360	1.06	86	86	291	12.5	103.7
		40.0	281.420	0.350	1.03	85	85	291	12.5	103.5
	5	45.0	284.210	0.350	1.03	86	86	291	17.7	103.7
		50.0	287.030	0.360	1.06	86	86	292	17.7	103.4
	6	55.0	289.860	0.360	1.06	86	86	291	25.2	103.7
		60.0	292.720	0.370	1.09	86	86	292	25.2	103.4
	7	65.0	296.050	0.500	1.48	86	86	290	45.6	103.6
		70.0	299.350	0.490	1.45	86	86	289	45.6	103.6
	8	75.0	302.680	0.500	1.48	86	86	290	53.2	103.6
		80.0	305.940	0.480	1.42	86	86	290	53.2	103.5
	9	85.0	309.270	0.500	1.48	86	86	291	58.3	103.6
		90.0	312.640	0.510	1.51	86	86	291	58.3	103.9
	10	95.0	315.880	0.470	1.39	86	86	292	62.5	104.0
		100.0	319.080	0.460	1.36	86	86	292	62.5	103.9
	11	105.0	322.250	0.450	1.33	86	86	292	66.1	104.0
		110.0	325.390	0.440	1.30	87	87	292	66.1	104.0
	12	115.0	328.440	0.420	1.24	87	87	293	69.4	103.5
		120.0	331.510	0.420	1.24	87	87	291	69.4	104.0
			Average:	0.420	1.235	83.8	83.8	290.7		103.6

Client:	Metro Vancouver	**Date:**	26-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	2 PCDD-PCDF
Source:	Unit 3	**Run Time:**	09:48 - 12:51

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:	3.9582	dscm	139.783 dscf
Total Sample Time:	240.0	minutes	
Average Isokineticity:	103.9	%	

Flue Gas Characteristics

Moisture:	14.12	%	
Temperature	144.9	oC	292.8 oF
Flow	1198.7	dscm/min	42334 dscf/min
	19.98	dscm/sec	705.6 dscf/sec
	2092.9	Acm/min	73912 Acf/min
Velocity	13.695	m/sec	44.93 f/sec
Gas Analysis	10.59	% O2	8.95 % CO2
	29.856	Mol. Wt (g/gmole) Dry	28.182 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	**Date:**	26-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	2 PCDD-PCDF
Source:	Unit 3	**Run Time:**	09:48 - 12:51

Control Unit (Y)	1.0014
Nozzle Diameter (in.)	0.2580
Pitot Factor	0.8506
Baro. Press. (in. Hg)	29.85
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	8.80	10.68
Trav 2	9.10	10.50
Average =	**8.95**	**10.59**

Condensate Collection:

Impinger 1 (grams)	457.0
Impinger 2 (grams)	16.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	13.1
Total Gain (grams)	**488.1**

Collection:

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

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	331.902							
1	1	5.0	334.900	0.400	1.21	89	89	287	1.5	103.6
		10.0	337.820	0.380	1.13	89	89	289	1.5	103.6
	2	15.0	340.830	0.400	1.19	89	89	290	4.7	104.2
		20.0	343.720	0.370	1.10	89	89	290	4.7	104.0
	3	25.0	346.640	0.380	1.13	89	89	290	8.4	103.7
		30.0	349.480	0.360	1.07	89	89	290	8.4	103.6
	4	35.0	352.210	0.330	1.00	89	89	290	12.5	104.0
		40.0	354.900	0.320	0.95	89	89	290	12.5	104.0
	5	45.0	357.720	0.350	1.04	89	89	291	17.7	104.4
		50.0	360.560	0.360	1.07	89	89	291	17.7	103.6
	6	55.0	363.440	0.370	1.10	89	89	291	25.2	103.7
		60.0	366.330	0.370	1.10	89	89	290	25.2	104.0
	7	65.0	369.260	0.380	1.13	89	89	292	45.6	104.2
		70.0	372.120	0.360	1.07	89	89	292	45.6	104.4
	8	75.0	375.270	0.440	1.30	89	89	292	53.2	104.1
		80.0	378.450	0.450	1.33	89	89	292	53.2	103.9
	9	85.0	381.670	0.460	1.36	89	89	293	58.3	104.2
		90.0	384.990	0.490	1.45	89	89	293	58.3	104.1
	10	95.0	388.440	0.530	1.57	89	89	293	62.5	104.0
		100.0	391.910	0.540	1.60	89	89	293	62.5	103.7
	11	105.0	395.320	0.520	1.54	89	89	294	66.1	103.9
		110.0	398.670	0.500	1.48	89	89	294	66.1	104.1
	12	115.0	402.020	0.500	1.48	89	89	294	69.4	104.1
		120.0	405.400	0.510	1.51	89	89	294	69.4	104.0
								.		
		0.0	405.400							
2	1	5.0	408.410	0.400	1.20	89	89	288	1.5	104.0
		10.0	411.420	0.400	1.20	89	89	292	1.5	104.3
	2	15.0	414.480	0.420	1.24	89	89	293	4.7	103.6
		20.0	417.550	0.420	1.24	89	89	293	4.7	103.9
	3	25.0	420.310	0.340	1.01	91	91	295	8.4	103.5
		30.0	422.990	0.320	0.95	91	91	296	8.4	103.7
	4	35.0	425.790	0.350	1.03	91	91	297	12.5	103.7
		40.0	428.630	0.360	1.07	91	91	296	12.5	103.6
	5	45.0	431.390	0.340	1.01	91	91	295	17.7	103.5
		50.0	434.200	0.350	1.04	92	92	295	17.7	103.7
	6	55.0	436.720	0.280	0.83	92	92	293	25.2	103.8
		60.0	439.190	0.270	0.81	92	92	292	25.2	103.5
	7	65.0	442.310	0.430	1.28	92	92	292	45.6	103.7
		70.0	445.510	0.450	1.34	92	92	292	45.6	104.0
	8	75.0	448.710	0.450	1.34	93	93	293	53.2	103.9
		80.0	451.970	0.470	1.40	93	93	293	53.2	103.6
	9	85.0	455.350	0.500	1.50	93	93	293	58.3	104.2
		90.0	458.660	0.480	1.45	93	93	293	58.3	104.1
	10	95.0	461.860	0.453	1.34	93	93	295	62.5	103.7
		100.0	464.990	0.430	1.28	93	93	295	62.5	104.1
	11	105.0	468.160	0.440	1.31	94	94	296	66.1	104.1
		110.0	471.250	0.420	1.25	94	94	297	66.1	103.9
	12	115.0	474.310	0.410	1.22	94	94	297	69.4	104.2
		120.0	477.330	0.400	1.20	94	94	297	69.4	104.1
			Average:	0.409	1.218	90.4	90.4	292.8		103.9

Client:	Metro Vancouver	**Date:**	27-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	3 - PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:33 - 12:39

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:	4.0390	dscm	142.638	dscf
Total Sample Time:	240.0	minutes		
Average Isokineticity:	103.6	%		

Flue Gas Characteristics

Moisture:	13.66	%		
Temperature	147.1	oC	296.8	oF
Flow	1226.9	dscm/min	43327	dscf/min
	20.45	dscm/sec	722.1	dscf/sec
	2138.5	Acm/min	75520	Acf/min
Velocity	13.993	m/sec	45.91	f/sec
Gas Analysis	10.46	% O2	8.80	% CO2
	29.826	Mol. Wt (g/gmole) Dry	28.211	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	**Date:**	27-Jul-22
Jobsite:	WTE (Burnaby, BC)	**Run:**	3 - PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:33 - 12:39

Control Unit (Y)	1.0014
Nozzle Diameter (in.)	0.2580
Pitot Factor	0.8506
Baro. Press. (in. Hg)	29.90
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	8.30	10.40
Trav 2	9.30	10.52
Average =	**8.80**	**10.46**

Condensate Collection:

Impinger 1 (grams)	452.0
Impinger 2 (grams)	12.0
Impinger 3 (grams)	2.0
Impinger 4 (grams)	13.4
Total Gain (grams)	**479.4**

Collection:

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

Traverse	Point	Time (min.)	Dry Gas Meter (ft3)	Pitot ^P (in. H2O)	Orifice ^H (in. H2O)	Dry Gas Temperature Inlet (oF)	Outlet (oF)	Stack (oF)	Wall Dist. (in.)	Isokin. (%)
		0.0	477.626							
1	1	5.0	480.620	0.400	1.18	91	91	297	1.5	103.3
		10.0	483.700	0.420	1.25	92	92	296	1.5	103.5
	2	15.0	486.890	0.450	1.33	92	92	296	4.7	103.6
		20.0	490.080	0.450	1.33	92	92	297	4.7	103.6
	3	25.0	493.050	0.390	1.16	92	92	297	8.4	103.6
		30.0	496.060	0.400	1.18	92	92	297	8.4	103.7
	4	35.0	498.950	0.370	1.09	92	92	299	12.5	103.6
		40.0	501.760	0.350	1.03	92	92	299	12.5	103.6
	5	45.0	504.520	0.340	1.00	91	91	298	17.7	103.3
		50.0	507.250	0.330	0.97	92	92	298	17.7	103.5
	6	55.0	510.100	0.360	1.07	92	92	299	25.2	103.6
		60.0	512.870	0.340	1.00	92	92	300	25.2	103.6
	7	65.0	515.790	0.380	1.12	92	92	300	45.6	103.4
		70.0	518.760	0.390	1.15	92	92	300	45.6	103.8
	8	75.0	521.990	0.460	1.37	94	94	296	53.2	103.3
		80.0	525.260	0.470	1.40	94	94	296	53.2	103.5
	9	85.0	528.570	0.480	1.43	95	95	295	58.3	103.4
		90.0	531.990	0.510	1.52	95	95	295	58.3	103.7
	10	95.0	535.450	0.520	1.55	96	96	296	62.5	103.8
		100.0	538.910	0.520	1.55	96	96	296	62.5	103.8
	11	105.0	542.400	0.530	1.60	97	97	296	66.1	103.5
		110.0	545.830	0.510	1.53	97	97	296	66.1	103.7
	12	115.0	549.300	0.520	1.56	97	97	295	69.4	103.8
		120.0	552.720	0.510	1.53	97	97	295	69.4	103.3
		0.0	552.720							
2	1	5.0	555.670	0.380	1.14	97	97	295	1.5	103.2
		10.0	558.750	0.410	1.23	97	97	295	1.5	103.7
	2	15.0	561.860	0.420	1.26	97	97	296	4.7	103.5
		20.0	564.960	0.420	1.26	97	97	296	4.7	103.2
	3	25.0	567.830	0.360	1.08	97	97	296	8.4	103.2
		30.0	570.670	0.350	1.05	97	97	296	8.4	103.5
	4	35.0	573.540	0.360	1.08	97	97	297	12.5	103.2
		40.0	576.410	0.360	1.07	97	97	298	12.5	103.3
	5	45.0	579.190	0.340	1.01	96	96	297	17.7	103.1
		50.0	581.850	0.310	0.93	96	96	298	17.7	103.3
	6	55.0	584.720	0.360	1.07	95	95	297	25.2	103.6
		60.0	587.600	0.360	1.07	95	95	297	25.2	104.0
	7	65.0	591.050	0.520	1.55	95	95	298	45.6	103.8
		70.0	594.430	0.500	1.50	95	95	298	45.6	103.7
	8	75.0	597.770	0.490	1.46	96	96	296	53.2	103.2
		80.0	601.090	0.480	1.43	95	95	296	53.2	103.8
	9	85.0	604.480	0.500	1.50	96	96	297	58.3	103.8
		90.0	607.810	0.480	1.44	96	96	297	58.3	104.0
	10	95.0	611.070	0.460	1.38	97	97	296	62.5	103.7
		100.0	614.330	0.460	1.38	97	97	296	62.5	103.7
	11	105.0	617.520	0.440	1.32	98	98	297	66.1	103.7
		110.0	620.782	0.440	1.32	98	98	297	66.1	106.0
	12	115.0	623.870	0.430	1.59	98	98	297	69.4	101.6
		120.0	626.990	0.420	1.26	98	98	296	69.4	103.7
			Average:	0.426	1.277	95.0	95.0	296.8		103.6

APPENDIX 2

COMPUTER OUTPUTS OF MEASURED and CALCULATED DATA

SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR222292

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

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

RECEIVED BY: V. Lau
CONDITION: Okay, 22.5°C

DATE/TIME: July 28, 2022 (9:45 a.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
5	Stack	Blk Dioxin Unit – 2	PR222292	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	Run 1 – Dioxin Unit – 2	PR222293	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	Run 2 – Dioxin Unit – 2	PR222294	PCB, PAH/HCB, CB, CP
5	Stack	Run 3 – Dioxin Unit – 2	PR222295	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: August 19, 2022

Comments: Results relate only to items tested.

_____
David Hope, P.Chem, CEO

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	25-Jul-22
Client ID:	Blk Dioxin Unit – 2	**Date Extracted:**	5-Aug-22
PRL ID:	PR222292	**Date Analysed:**	14-Aug-22
		Filter Wt.:	0.36g

DIOXINS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	0			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	ND	4	0			
1,2,3,4,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDD	ND	4		ND	0.2	0.4
Total HxCDD	ND	4	0			
1,2,3,4,6,7,8-HpCDD	ND	4		ND	0.02	0.04
Total HpCDD	ND	4	0			
OCDD	ND	15	0	ND	0.0075	0.015
		Total Dioxin TEQ		**0.0**	**2.6**	**5.3**

FURANS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	ND	2	0			
1,2,3,7,8-PeCDF	ND	4		ND	0.1	0.2
2,3,4,7,8-PeCDF	ND	4		ND	1	2
Total PeCDF	ND	4	0			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDF	ND	4		ND	0.2	0.4
2,3,4,6,7,8-HxCDF	ND	4		ND	0.2	0.4
Total HxCDF	ND	4	0			
1,2,3,4,6,7,8-HpCDF	ND	4		ND	0.02	0.04
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	ND	4	0			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**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	94
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	109
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	85
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	79
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	77

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	51
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	70
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	73
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	73
$^{13}C_{12}$ -OCDD	50
$^{13}C_{12}$ -2,3,7,8-TCDF	43
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	62
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	67
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	70

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	25-Jul-22
Client ID:	Run 1 – Dioxin Unit – 2	**Date Extracted:**	5-Aug-22
PRL ID:	PR222293	**Date Analysed:**	14-Aug-22
		Filter Wt.:	0.34g

DIOXINS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	0			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	ND	4	0			
1,2,3,4,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDD	ND	4		ND	0.2	0.4
Total HxCDD	ND	4	0			
1,2,3,4,6,7,8-HpCDD	ND	4		ND	0.02	0.04
Total HpCDD	ND	4	0			
OCDD	ND	15	0	ND	0.0075	0.015
		Total Dioxin TEQ		**0.0**	**2.6**	**5.3**

FURANS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	ND	2	0			
1,2,3,7,8-PeCDF	ND	4		ND	0.1	0.2
2,3,4,7,8-PeCDF	ND	4		ND	1	2
Total PeCDF	ND	4	0			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDF	ND	4		ND	0.2	0.4
2,3,4,6,7,8-HxCDF	ND	4		ND	0.2	0.4
Total HxCDF	ND	4	0			
1,2,3,4,6,7,8-HpCDF	ND	4		ND	0.02	0.04
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	ND	4	0			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**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	90
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	107
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	82
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	76
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	72

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	50
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	77
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	80
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	75
$^{13}C_{12}$ -OCDD	56
$^{13}C_{12}$ -2,3,7,8-TCDF	43
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	67
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	69
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	81

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	26-Jul-22
Client ID:	Run 2 – Dioxin Unit – 2	**Date Extracted:**	5-Aug-22
PRL ID:	PR222294	**Date Analysed:**	14-Aug-22
		Filter Wt.:	0.34g

DIOXINS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	0			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	ND	4	0			
1,2,3,4,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDD	ND	4		ND	0.2	0.4
Total HxCDD	ND	4	0			
1,2,3,4,6,7,8-HpCDD	ND	4		ND	0.02	0.04
Total HpCDD	ND	4	0			
OCDD	ND	15	0	ND	0.0075	0.015
		Total Dioxin TEQ		**0.0**	**2.6**	**5.3**

FURANS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	ND	2	0			
1,2,3,7,8-PeCDF	ND	4		ND	0.1	0.2
2,3,4,7,8-PeCDF	ND	4		ND	1	2
Total PeCDF	ND	4	0			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDF	ND	4		ND	0.2	0.4
2,3,4,6,7,8-HxCDF	ND	4		ND	0.2	0.4
Total HxCDF	ND	4	0			
1,2,3,4,6,7,8-HpCDF	ND	4		ND	0.02	0.04
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	ND	4	0			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**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	107
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	115
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	80
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	83
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	85

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	56
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	80
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	74
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	65
$^{13}C_{12}$ -OCDD	42
$^{13}C_{12}$ -2,3,7,8-TCDF	45
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	74
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	64
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	69

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	27-Jul-22
Client ID:	Run 3 – Dioxin Unit – 2	**Date Extracted:**	5-Aug-22
PRL ID:	PR222295	**Date Analysed:**	14-Aug-22
		Filter Wt.:	0.34g

DIOXINS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	0			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	ND	4	0			
1,2,3,4,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDD	ND	4		ND	0.2	0.4
Total HxCDD	ND	4	0			
1,2,3,4,6,7,8-HpCDD	ND	4		ND	0.02	0.04
Total HpCDD	ND	4	0			
OCDD	ND	15	0	ND	0.0075	0.015
		Total Dioxin TEQ		**0.0**	**2.6**	**5.3**

FURANS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	ND	2	0			
1,2,3,7,8-PeCDF	ND	4		ND	0.1	0.2
2,3,4,7,8-PeCDF	ND	4		ND	1	2
Total PeCDF	ND	4	0			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDF	ND	4		ND	0.2	0.4
2,3,4,6,7,8-HxCDF	ND	4		ND	0.2	0.4
Total HxCDF	ND	4	0			
1,2,3,4,6,7,8-HpCDF	ND	4		ND	0.02	0.04
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	ND	4	0			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**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	99
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	107
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	93
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	88
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	78

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	50
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	81
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	65
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	65
$^{13}C_{12}$ -OCDD	61
$^{13}C_{12}$ -2,3,7,8-TCDF	44
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	74
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	62
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	79

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	BLANK	**Date Extracted:**	5-Aug-22
PRL ID:	DF220586B	**Date Analysed:**	14-Aug-22

DIOXINS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	0			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	ND	4	0			
1,2,3,4,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDD	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDD	ND	4		ND	0.2	0.4
Total HxCDD	ND	4	0			
1,2,3,4,6,7,8-HpCDD	ND	4		ND	0.02	0.04
Total HpCDD	ND	4	0			
OCDD	ND	15	0	ND	0.0075	0.015
		Total Dioxin TEQ		**0.0**	**2.6**	**5.3**

FURANS

		DL	# of	I-TEQs (ND=0)	I-TEQs (ND=½DL)	I-TEQs (ND=DL)
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	ND	2	0			
1,2,3,7,8-PeCDF	ND	4		ND	0.1	0.2
2,3,4,7,8-PeCDF	ND	4		ND	1	2
Total PeCDF	ND	4	0			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,7,8,9-HxCDF	ND	4		ND	0.2	0.4
2,3,4,6,7,8-HxCDF	ND	4		ND	0.2	0.4
Total HxCDF	ND	4	0			
1,2,3,4,6,7,8-HpCDF	ND	4		ND	0.02	0.04
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	ND	4	0			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**0.0**	**2.0**	**4.1**

Total PCDD/PCDF Toxic Equivalent (pg)	**0.0**	**4.7**	**9.4**

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	43
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	79
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	69
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	73
$^{13}C_{12}$ -OCDD	55
$^{13}C_{12}$ -2,3,7,8-TCDF	42
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	64
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	65
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	73

ND - none detected

QC REPORT - SPIKE

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	SPIKE	**Date Extracted:**	5-Aug-22
PRL ID:	DF220587S	**Date Analysed:**	14-Aug-22

DIOXINS			**Acceptable Recovery**		**Pass/Fail**	**Int. Std**
	LOF	**Recovery**	**Min**	**Max**		**Recoveries**
Congeners	**pg**	**%**	**%**	**%**		**%**
2,3,7,8-TCDD	200	105	80	120	Pass	49
1,2,3,7,8-PeCDD	200	108	80	120	Pass	60
1,2,3,4,7,8-HxCDD	400	107	80	120	Pass	-
1,2,3,6,7,8-HxCDD	400	102	80	120	Pass	67
1,2,3,7,8,9-HxCDD	400	111	80	120	Pass	-
1,2,3,4,6,7,8-HpCDD	400	102	80	120	Pass	69
OCDD	1000	116	80	120	Pass	57

FURANS			**Acceptable Recovery**		**Pass/Fail**	**Int. Std**
	LOF	**Recovery**	**Min**	**Max**		**Recoveries**
Congeners	**pg**	**%**	**%**	**%**		**%**
2,3,7,8-TCDF	200	105	80	120	Pass	42
1,2,3,7,8-PeCDF	200	113	80	120	Pass	60
2,3,4,7,8-PeCDF	200	114	80	120	Pass	-
1,2,3,4,7,8-HxCDF	400	113	80	120	Pass	-
1,2,3,6,7,8-HxCDF	400	113	80	120	Pass	58
1,2,3,7,8,9-HxCDF	400	116	80	120	Pass	-
2,3,4,6,7,8-HxCDF	400	107	80	120	Pass	-
1,2,3,4,6,7,8-HpCDF	400	106	80	120	Pass	69
1,2,3,4,7,8,9-HpCDF	400	92	80	120	Pass	-
OCDF	1000	108	80	120	Pass	-

LOF - Level of Fortification

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**Blk Dioxin Unit – 2**	**Date Extracted:**	5-Aug-22
PRL ID:	PR222292	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs				**Surrogate**	**WHO-TEQs (2005)**	
			DL	**Recoveries**	**(ND=0)**	**(ND=DL)**
Chemical Name	**IUPAC #**	**ng**	**ng**	**%**	**ng**	**ng**
3,4,4',5-TeCB	PCB 81	ND	0.02	52	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	48	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	64	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	56	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	56	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	64	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	68	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	60	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	64	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	80	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	72	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	56	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)			0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**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	20
13C12-4,4'-DiCB	15L	48
13C12-2,2',6'-TrCB	19L	44
13C12-3,4,4'-TrCB	37L	48
13C12-2,2',6,6'-TeCB	54L	56
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	76
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	76
13C12-2,3,3',4,4',5,5',6-OcCB	205L	80
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	68
13C12-DeCB	209L	80

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**Run 1 – Dioxin Unit – 2**	**Date Extracted:**	5-Aug-22
PRL ID:	PR222293	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs				**Surrogate**	**WHO-TEQs (2005)**	
			DL	**Recoveries**	**(ND=0)**	**(ND=DL)**
Chemical Name	**IUPAC #**	**ng**	**ng**	**%**	**ng**	**ng**
3,4,4',5-TeCB	PCB 81	ND	0.02	44	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	48	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	76	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	64	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	60	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	68	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	60	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	48	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	64	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	84	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	48	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	48	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)			0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**ng**
Monochlorobiphenyls	0.5	0.05
Dichlorobiphenyls	36.1	0.05
Trichlorobiphenyls	0.80	0.05
Tetrachlorobiphenyls	0.31	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	37.7	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	20
13C12-4,4'-DiCB	15L	36
13C12-2,2',6'-TrCB	19L	44
13C12-3,4,4'-TrCB	37L	48
13C12-2,2',6,6'-TeCB	54L	44
13C12-2,2',4,6,6'-PeCB	104L	68
13C12-2,2',4,4',6,6'-HxCB	155L	52
13C12-2,2',3,4',5,6,6'-HpCB	188L	100
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	72
13C12-2,3,3',4,4',5,5',6-OcCB	205L	68
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	64
13C12-DeCB	209L	76

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**Run 2 – Dioxin Unit – 2**	**Date Extracted:**	5-Aug-22
PRL ID:	PR222294	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs				**Surrogate**	**WHO-TEQs (2005)**	
			DL	**Recoveries**	**(ND=0)**	**(ND=DL)**
Chemical Name	**IUPAC #**	**ng**	**ng**	**%**	**ng**	**ng**
3,4,4',5-TeCB	PCB 81	ND	0.02	36	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	40	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	72	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	56	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	64	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	68	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	56	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	32	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	56	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	64	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	44	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	48	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)			0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**ng**
Monochlorobiphenyls	ND	0.05
Dichlorobiphenyls	169.9	0.05
Trichlorobiphenyls	2.31	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	173	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	20
13C12-4,4'-DiCB	15L	40
13C12-2,2',6'-TrCB	19L	32
13C12-3,4,4'-TrCB	37L	44
13C12-2,2',6,6'-TeCB	54L	44
13C12-2,2',4,6,6'-PeCB	104L	60
13C12-2,2',4,4',6,6'-HxCB	155L	44
13C12-2,2',3,4',5,6,6'-HpCB	188L	84
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	40
13C12-2,3,3',4,4',5,5',6-OcCB	205L	64
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	48
13C12-DeCB	209L	28

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**Run 3 – Dioxin Unit – 2**	**Date Extracted:**	5-Aug-22
PRL ID:	PR222295	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs				**Surrogate**	**WHO-TEQs (2005)**	
			DL	**Recoveries**	**(ND=0)**	**(ND=DL)**
Chemical Name	**IUPAC #**	**ng**	**ng**	**%**	**ng**	**ng**
3,4,4',5-TeCB	PCB 81	ND	0.02	48	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	40	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	56	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	52	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	56	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	56	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	48	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	44	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	48	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	60	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	44	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	64	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)			0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**ng**
Monochlorobiphenyls	ND	0.05
Dichlorobiphenyls	1.9	0.05
Trichlorobiphenyls	0.13	0.05
Tetrachlorobiphenyls	0.10	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	2.14	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	20
13C12-4,4'-DiCB	15L	36
13C12-2,2',6'-TrCB	19L	48
13C12-3,4,4'-TrCB	37L	48
13C12-2,2',6,6'-TeCB	54L	48
13C12-2,2',4,6,6'-PeCB	104L	60
13C12-2,2',4,4',6,6'-HxCB	155L	56
13C12-2,2',3,4',5,6,6'-HpCB	188L	68
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	64
13C12-2,3,3',4,4',5,5',6-OcCB	205L	68
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	44
13C12-DeCB	209L	52

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**BLANK**	**Date Extracted:**	5-Aug-22
PRL ID:	PC220586B	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs					**Surrogate**	**WHO-TEQs (2005)**	
			DL		**Recoveries**	**(ND=0)**	**(ND=DL)**
Chemical Name	**IUPAC #**	**ng**	**ng**		**%**	**ng**	**ng**
3,4,4',5-TeCB	PCB 81	ND	0.02		32	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02		40	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02		48	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02		44	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02		48	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02		52	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02		52	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02		48	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02		48	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02		60	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02		56	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02		56	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)				0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**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	20
13C12-4,4'-DiCB	15L	32
13C12-2,2',6'-TrCB	19L	28
13C12-3,4,4'-TrCB	37L	28
13C12-2,2',6,6'-TeCB	54L	36
13C12-2,2',4,6,6'-PeCB	104L	40
13C12-2,2',4,4',6,6'-HxCB	155L	32
13C12-2,2',3,4',5,6,6'-HpCB	188L	60
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	52
13C12-2,3,3',4,4',5,5',6-OcCB	205L	64
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	68
13C12-DeCB	209L	64

QC REPORT - SPIKE

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**SPIKE**	**Date Extracted:**	5-Aug-22
PRL ID:	PC220587S	**Date Analysed:**	16-Aug-22

Dioxin-like PCBs			**Acceptable Recovery**		**Pass/Fail**	**Surrogate Recoveries**
	LOF	**Recovery**	**Min**	**Max**		
Chemical Name	**ng**	**%**	**%**	**%**		**%**
3,4,4',5-TeCB (81)	1	76	60	135	Pass	36
3,3',4,4'-TeCB (77)	1	108	60	135	Pass	32
2,3',4,4',5'-PeCB (123)	1	128	60	135	Pass	52
2,3',4,4',5-PeCB (118)	1	120	60	135	Pass	48
2,3,4,4',5-PeCB (114)	1	117	60	135	Pass	48
2,3,3',4,4'-PeCB (105)	1	109	60	135	Pass	52
3,3',4,4',5-PeCB (126)	1	97	60	135	Pass	48
2,3',4,4',5,5'-HxCB (167)	1	76	60	135	Pass	40
2,3,3',4,4',5-HxCB (156)	1	97	60	135	Pass	40
2,3,3',4,4',5'-HxCB (157)	1	72	60	135	Pass	56
3,3',4,4',5,5'-HxCB (169)	1	120	60	135	Pass	36
2,3,3',4,4',5,5'-HpCB (189)	1	110	60	135	Pass	64

Total PCB			**Acceptable Recovery**		**Pass/Fail**
	LOF	**Recovery**	**Min**	**Max**	
Homologs	**ng**	**%**	**%**	**%**	
Monochlorobiphenyls	2	115			
Dichlorobiphenyls	4	118			
Trichlorobiphenyls	6	103			
Tetrachlorobiphenyls	12	106			
Pentachlorobiphenyls	13	128			
Hexachlorobiphenyls	15	100			
Heptachlorobiphenyls	11	107			
Octachlorobiphenyls	6	90			
Nonachlorobiphenyls	2	100			
Decachlorobiphenyl	1	124			
Total PCB	72	108	50	150	Pass

LOF - Level of Fortification

DATA REPORT

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

Date Extracted: 5-Aug-22
Date Analysed: 11-Aug-22

	Client ID:	Blk Dioxin Unit – 2	Run 1 – Dioxin Unit – 2	Run 2 – Dioxin Unit – 2	Run 3 – Dioxin Unit – 2		BLANK
	PRL ID:	PR222292	PR222293	PR222294	PR222295		PH220586B
NPRI PAH	**DL**						
	µg	**µg**	**µg**	**µg**	**µg**		**µg**
Acenaphthylene	0.05	ND	ND	0.28	0.40		ND
Acenaphthene	0.05	ND	ND	ND	ND		ND
Fluorene	0.02	ND	0.04	0.09	0.03		ND
Phenanthrene	0.02	ND	0.16	0.60	0.20		ND
Fluoranthene	0.01	ND	0.02	0.07	ND		ND
Pyrene	0.01	ND	0.04	0.18	0.01		ND
Benz(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	ND	ND	ND		ND
Dibenz(a,h)anthracene	0.01	ND	ND	ND	ND		ND
Benzo(ghi)perylene	0.01	ND	ND	0.03	ND		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	ND	0.01	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	0.12	0.54	0.88	0.49		ND
Anthracene	0.05	ND	ND	0.05	ND		ND
Chlorobenzenes							
Hexachlorobenzene	0.01	ND	ND	ND	ND		ND

DATA REPORT

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

Date Extracted: 5-Aug-22
Date Analysed: 11-Aug-22

	Client ID:	Blk Dioxin Unit – 2	Run 1 – Dioxin Unit – 2	Run 2 – Dioxin Unit – 2	Run 3 – Dioxin Unit – 2		BLANK
	PRL ID:	PR222292	PR222293	PR222294	PR222295		PH220586B
NPRI PAH	**DL**						
Surrogate Recoveries (%)							
d8-Naphthalene		44	36	40	36		40
d10-Acenaphthylene		60	44	36	40		44
d10-Acenaphthene		56	40	48	44		44
d10-Fluorene		72	60	72	68		52
d10-Phenanthrene		60	52	52	60		52
d10-Fluoranthene		64	60	60	64		60
d10-Pyrene		60	56	56	60		52
d12-Chrysene		64	60	60	64		68
d12-Benzo(b)fluoranthene		80	72	76	80		80
d12-Benzo(a)pyrene		76	76	68	68		68
d14-Dibenz(a,h)anthracene		92	88	96	96		88
13C6-Hexachlorobenzene		44	32	36	44		40

ND - none detected

DATA REPORT

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

Date Extracted: 5-Aug-22
Date Analysed: 11-Aug-22

Client ID: SPIKE
PRL ID:

NPRI PAH

	µg/g	LOF	Recovery	Acceptable	Pass/Fail
Acenaphthene	1.40	1	140%	50-150%	pass
Acenaphthylene	1.40	1	140%	50-150%	pass
Benz(a)anthracene	1.24	1	124%	50-150%	pass
Benzo(a)pyrene	1.28	1	128%	50-150%	pass
Benzo(b)fluoranthene	1.32	1	132%	50-150%	pass
Benzo(ghi)perylene	1.09	1	109%	50-150%	pass
Benzo(k)fluoranthene	1.35	1	135%	50-150%	pass
Chrysene	1.14	1	114%	50-150%	pass
Dibenz(a,h)anthracene	1.05	1	105%	50-150%	pass
Fluoranthene	1.28	1	128%	50-150%	pass
Fluorene	1.40	1	140%	50-150%	pass
Indeno(1,2,3-cd)pyrene	1.18	1	118%	50-150%	pass
Phenanthrene	1.46	1	146%	50-150%	pass
Pyrene	1.24	1	124%	50-150%	pass
Dibenz(a,h)acridine	1.02	1	102%		
Dibenz(a,j)acridine	1.19	1	119%		
7H-Dibenzo(c,g)carbazole	0.74	1	74%		
Dibenzo(a,e)fluoranthene	0.88	1	88%		
Dibenzo(a,h)pyrene	0.91	1	91%		
Dibenzo(a,e)pyrene	0.75	1	75%		
Dibenzo(a,i)pyrene	0.27	1	27%		
Dibenzo(a,l)pyrene	0.76	1	76%		
7,12-Dimethylbenz(a)anthracene	0.68	1	68%		
3-Methylcholanthrene	0.69	1	69%		
5-Methylchrysene	0.85	1	85%		
1-Nitropyrene	0.66	1	66%		
Other PAH					
Naphthalene	1.36	1	136%	50-150%	pass
Chlorobenzenes					
Hexachlorobenzene	1.24	1	124%	50-150%	pass

DATA REPORT

Client: A. Lanfranco & Associates
Contact: Mark Lanfranco

Date Extracted: 5-Aug-22
Date Analysed: 17-Aug-22

	Client ID:	Blk Dioxin Unit – 2	Run 1 – Dioxin Unit – 2	Run 2 – Dioxin Unit – 2	Run 3 – Dioxin Unit – 2		BLANK
	PRL ID:	PR222292	PR222293	PR222294	PR222295		CP220586B
Compound	**DL µg**	**µg**	**µg**	**µg**	**µg**		**µg**
Trichlorobenzenes	0.05	ND	0.872	1.27	0.206		ND
Tetrachlorobenzenes	0.05	ND	0.277	0.358	0.055		ND
Pentachlorobenzene	0.05	ND	ND	ND	ND		ND
Hexachlorobenzene	0.01	ND	ND	ND	ND		ND
Surrogate Recoveries (%)							
13C6-Hexachlorobenzene		40	36	40	44		32

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		60	100	100	100		84
13C6-Tetrachlorophenol		64	92	92	112		92
13C6-Pentachlorophenol		104	56	84	48		72

ND - none detected

QC REPORT - SPIKE

Client: A. Lanfranco & Associates
Contact: Mark Lanfranco

Date Extracted: 5-Aug-22
Date Analysed: 17-Aug-22

Client ID: SPIKE
PRL ID: CP220587S

Compound	LOF µg	µg	Recovery
Trichlorobenzenes	2.0	2.07	104%
Tetrachlorobenzenes	3.0	2.91	97%
Pentachlorobenzene	1.0	0.99	99%
Hexachlorobenzene	1.0	1.21	121%
Trichlorophenols	1.0	1.19	119%
Tetrachlorophenols	1.0	1.01	101%
Pentachlorophenol	1.0	0.93	93%

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 Method 23**	
	Min (%)	**Max (%)**
$^{37}Cl_4$ -2,3,7,8-TCDD	70	130
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	70	130
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	70	130
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	70	130
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	70	130

Acceptable recoveries for Internal Standards

	EPA Method 23		**Env. Can. 1-RM-3**	
	Min (%)	**Max (%)**	**Min (%)**	**Max (%)**
$^{13}C_{12}$ -2,3,7,8-TCDD	40	130	40	130
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	40	130	40	130
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	40	130	40	130
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	25	130	40	130
$^{13}C_{12}$ -OCDD	25	130	40	130
$^{13}C_{12}$ -2,3,7,8-TCDF	40	130	40	130
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	40	130		
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	40	130		
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	25	130		

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
Acenapthylene-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

PACIFIC RIM LABORATORIES INC

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 Lanfranco

PHONE: *604-881-2582*

DATE: 28-Jul-22

EMAIL: mark.lanfranco@alanfranco.com

CLIENT: Metro Vancouver WTE

SOURCE: Unit 2

SAMPLE ID	PRL ID	DATE SAMPLED	SAMPLE MATRIX	NUMBER OF CONTAINERS	DIOXIN/FURAN	PCB - dioxin-like (12)	PCB - 209 congener	PAH	HCB	TBT	Nonylphenol	PBDE	CB, CP	COMMENTS
Blk Dioxin Unit - 2	PR222292	25-Jul-22		5	X	X		X	X				X	
Run 1 - Dioxin Unit - 2	2293	25-Jul-22		5	X	X		X	X				X	
Run 2 - Dioxin Unit - 2	2294	26-Jul-22		5		X		X	X				X	
Run 3 - Dioxin Unit - 2	2295	27-Jul-22		5	X	X		X	X				X	

Sampler's Signature	Relinquished by:	Company	Date	Time	Received by:	
Comments:	Method of Shipment	Waybill No.:	Rec'd for PRL:		Date: 28 JUL 22	Time: 9:45 AM
	Shipment Condition	Temp.: 22.5°C	Cooler Opened By: VL			

APPENDIX 3

FIELD DATA SHEETS

Initial LC Vol. = 0.02
Final LC Vol. = 0.23

PLANT	MV. WTE	PROBE TIP DIAMETER, IN.	P ~ 0.2380
RUN No	1 PCDD / PCDF	PROBE LENGTH, FT / Cp	7 AL GVRD - 10.800
LOCATION	Unit #1	FILTER NUMBER	
DATE	July 23/22	STATIC PRESSURE, IN. H_2O	-19.0
OPERATOR		STACK DIAMETER	70.90
CONTROL UNIT / Y	1.0014 FE-R 1.875	STACK HEIGHT	
BAROMETRIC PRESSURE, IN. Hg	29.90	INITIAL LEAK TEST	0.001 @ 15"
ASSUMED MOISTURE, Bw	14% 13% *	FINAL LEAK TEST	0.001 @ 15"

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. # 1	0	456	456
Imp. # 2	100	110	10
Imp. # 3	0	3	3
Imp. # 4	200		

S.H.

Upstream Diameters
Downstream Diameters

Fyrites Tests 2

Point	Clock Time	Dry Gas Meter Ft^3	Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp. Outlet °F	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg Gauge	CO_2 Vol. %	O_2 Vol. %	
	10:00	186.13											
1		188.43	0.32	0.91	80	294	290	292	56	7	9.5	9.5	4
1		191.49	0.36	1.03	80	294							4
2		194.44	0.41	1.17	80	294	292	294	55	7			4
2		197.45	0.43	1.23	80	294							4
3		200.40	0.40	1.14	80	290	294	294	57	7			4
3		203.35	0.40	1.14	80	290					9.5	10.0	4
4		206.28	0.37	1.05	81	290	295	294	57	7			4
4		209.03	0.34	0.96	81	290							4
5		211.62	0.30	0.85	81	291	295	294	57	7			4
5		214.18	0.30	0.85	81	291							4
6		216.56	0.26	0.76	81	290	295	294	58	7	9.0	10.0	40
6		218.98	0.27	0.79	84	290							40
7		221.79	0.36	1.06	81	287	295	293	57	7			40
7		224.6	0.33	1.12	82	287							40
8		227.86	0.46	1.36	82	284	293	293	57	7			40
8		231.02	0.47	1.39	82	284					9.5	10.5	40
9		234.37	0.49	1.45	83	286	294	292	57	8			40
9		237.76	0.52	1.53	83	288							40
10		241.25	0.55	1.62	84	290	294	292	57	8			40
10		244.70	0.54	1.59	84	291							40
11		248.12	0.53	1.56	84	290	294	293	58	8	9.5	10.5	40
11		251.47	0.51	1.50	84	291							40
12		254.78	0.50	1.47	84	292	295	293	58	8			40
12		258.18	0.52	1.53	84	290							40

5-A

PLANT	MV. WTE	PROBE TIP DIAMETER, IN.	P-0.250
		PROBE LENGTH, FT / Cp	8.3 05
RUN No	1 Confd- PC001/PC01-	FILTER NUMBER	
LOCATION	Unit -2		
DATE	July 25/22	STATIC PRESSURE, IN. H_2O	-17.0
OPERATOR		STACK DIAMETER	70.90
CONTROL UNIT / Y	1.0014 FE-18	STACK HEIGHT	
BAROMETRIC PRESSURE, IN. Hg	29.90	INITIAL LEAK TEST	0.001 @ 15"
ASSUMED MOISTURE, Bw.	13%	FINAL LEAK TEST	0.001 @ 13"

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. # 1	0		
Imp. # 2	100		
Imp. # 3	0		
Imp. # 4	200		

Upstream Diameters

Downstream Diameters

Point	Clock Time	Dry Gas Meter Ft³	Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp. XAD	Dry Gas Temp. Outlet °F	Temperature °F Stack	Temperature °F Probe	Temperature °F Box	Temperature °F Impinger Exit	Pump Vac. IN. Hg Gauge	Fyrites CO_2 Vol. %	Fyrites O_2 Vol. %
		256.18											
1		261.07	0.38	1.17	42	84	292	245	245	57	7	7.5	10.5
2		264.04	0.40	1.18	42	85	292						
2		267.07	0.40	1.18	42	85	291	246	245	56	7		
3		270.06	0.42	1.24	42	85	292						
3		273.96	0.38	1.12	42	85	293	246	245	56	7		
4		275.91	0.37	1.09	42	85	293						
4		278.64	0.36	1.06	43	86	291	245	245	56	7	.95	10.5
5		281.42	0.35	1.03	43	85	291						
5		284.21	0.35	1.03	44	86	291	245	244	56	8		
6		287.03	0.36	1.06	44	86	292						
6		289.86	0.36	1.06	44	86	291	245	244	56	8	.90	11.0
7		292.72	0.37	1.09	45	86	292						
7		296.05	0.50	1.48	45	86	290	245	243	58	9	8.5	11.2
8		299.35	0.49	1.45	46	86	289						
8		302.68	0.50	1.48	46	86	290	244	244	57	9		
9		305.94	0.48	1.42	46	86	290					9.5	11.5
9		309.27	0.50	1.48	45	86	291	244	244	57	9		
10		312.64	0.51	1.51	45	86	291						
10		315.88	0.47	1.39	43	86	292	245	244	57	9		
11		319.08	0.46	1.36	43	86	292						
11		322.23	0.45	1.33	43	86	291	245	243	57	8	9.0	10.5
12		325.39	0.44	1.30	43	87	291						
12	14:04	328.44	0.42	1.24	43	87	293	245	243	57	8		
		331.31	0.42	1.24	43	87	291						

Initial L.C.Vol=.024
Final L.C.Vol=0.17

PLANT	MV. WTE	PROBE TIP DIAMETER, IN.	0.2580	IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
		PROBE LENGTH, FT / Cp	0.8306				
RUN No	2 PCDD / PCDF	FILTER NUMBER		Imp. # 1	0	437	437
LOCATION	Unit-2			Imp. # 2	100	116	16
DATE	July 26/22	STATIC PRESSURE, IN. H_2O	~ 19.0"	Imp. # 3	0	2	2
OPERATOR		STACK DIAMETER	70.90"	Imp. # 4	200		
CONTROL UNIT / Y	1.0014 FE-18	STACK HEIGHT					
BAROMETRIC PRESSURE, IN. Hg	29.83	INITIAL LEAK TEST	0.001 @ 15"				
ASSUMED MOISTURE, Bw.	13%	FINAL LEAK TEST	0.001 @ 15"	Upstream Diameters			
				Downstream Diameters			

Point	Clock Time	Dry Gas Meter Ft^3	Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp. XAP	Dry Gas Temp. Outlet °F	Temperature °F Stack	Temperature °F Probe	Temperature °F Box	Temperature °F Impinger Exit	Pump Vac. IN. Hg Gauge	Fyrites CO_2 Vol. %	Fyrites O_2 Vol. %
	09:48	331.902											
1		334.90	0.40	1.20	46	89	284	144	150	57	7	8.5	10.3
1		337.81	0.38	1.13	46	89	289						
2		340.83	0.40	1.19	46	89	290	143	150	58	7		
2		343.72	0.37	1.10	45	89	290						
3		346.64	0.38	1.13	45	89	290	143	151	58	7		
3		349.48	0.36	1.07	43	89	290					8.5	10.2
4		352.21	0.33	1.00	40	89	290	142	150	58	7		
4		354.90	0.32	0.95	40	89	290						
5		357.72	0.33	1.04	40	89	291	141	148	58	7		
5		360.56	0.36	1.07	40	89	291						
6		363.44	0.37	1.10	40	89	291	144	147	58	7	9.0	11.2
6		366.33	0.37	1.10	39	89	290						
7		369.26	0.38	1.13	39	89	292	146	147	58	7		
7		372.17	0.36	1.07	39	89	292						
8		375.17	0.34	1.30	39	89	292	146	148	57	7		
8		378.23	0.45	1.33	39	89	292					9.0	10.5
9		381.67	0.46	1.36	39	89	293	145	146	57	7		
10		384.99	0.49	1.45	39	89	293						
10		388.44	0.53	1.57	39	89	293	145	146	57	7		
11		391.91	0.54	1.60	39	89	293						
11		395.37	0.52	1.54	39	89	294	144	147	57	7	9.0	11.0
12		398.87	0.50	1.48	39	89	294						
12		402.02	0.50	1.48	39	89	294	143	147	57	7		
		405.40	0.51	1.51	39	89	294						

SH.

PLANT	Mt. WTE	PROBE TIP DIAMETER, IN.	0.2580
		PROBE LENGTH, FT / Cp	0.8606
RUN No	2nd Contd PCDD/PCDF	FILTER NUMBER	
LOCATION	Unit 7		
DATE	July 26 / 22	STATIC PRESSURE, IN. H_2O	-19.0
OPERATOR		STACK DIAMETER	70.90
CONTROL UNIT / Y	1.0014 FE-18	STACK HEIGHT	
BAROMETRIC PRESSURE, IN. Hg	29.85	INITIAL LEAK TEST	0.001 @ 15"
ASSUMED MOISTURE, Bw.	13%	FINAL LEAK TEST	0.001 @ 15"

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. # 1	0		
Imp. # 2	100		
Imp. # 3	0		
Imp. # 4	200		

Upstream Diameters

Downstream Diameters

Point	Clock Time	Dry Gas Meter Ft^3	Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp.		Temperature °F				Pump Vac. IN. Hg Gauge	Fyrites	
					Inlet	Outlet °F	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %
		405.40			XAO								
1		408.41	0.40	1.10	90	89	288	140	142	58	7	9.0	10.5
1		411.42	0.40	1.20	90	89	291						
2		414.48	0.42	1.24	90	89	293	141	142	58	7		
2		417.55	0.41	1.24	90	89	293						
3		420.31	0.34	1.01	90	91	295	241	142	59	7		
3		422.99	0.32	0.95	90	91	296						
4		425.79	0.33	1.03	91	91	297	242	241	59	7	9.0	11.0
4		428.63	0.35	1.07	91	91	296						
5		431.39	0.34	1.01	91	91	295	240	142	60	7		
5		434.20	0.33	1.04	92	92	295						
6		436.72	0.28	0.83	91	92	293	236	142	60	7	9.5	10.5
6		439.19	0.27	0.81	91	92	292						
7		442.31	0.43	1.29	91	92	292	236	241	60	7		
7		445.51	0.45	1.34	90	93	292						
8		448.71	0.43	1.34	90	93	293	237	141	58	7		
8		451.97	0.47	1.40	90	93	293					9.0	10.5
9		455.35	0.50	1.50	90	93	293	237	240	58	7		
9		458.66	0.48	1.43	90	93	293						
10		461.86	0.45	1.34	90	93	295	240	240	58	7		
10		464.99	0.43	1.28	90	93	295						
11		468.16	0.44	1.31	90	94	296	240	241	58	7	9.0	10.5
11		471.23	0.42	1.25	91	94	297						
12		474.31	0.41	1.22	91	94	297	240	241	59	7		
12	12:51	477.33	0.40	1.20	91	94	297						

Initial L.C Vol=02
Final L.C Vol.=02

PLANT	M.V. WTE	PROBE TIP DIAMETER, IN.	0.2380 P
		PROBE LENGTH, FT / Cp	0.8306 THERMO
RUN No	3 FCDD / PCDF	FILTER NUMBER	
LOCATION	Unit-2		
DATE	July 27/22	STATIC PRESSURE, IN. H_2O	-19.0
OPERATOR		STACK DIAMETER	70.98"
CONTROL UNIT / Y	1.0014 FE-18	STACK HEIGHT	
BAROMETRIC PRESSURE, IN. Hg	29.90	INITIAL LEAK TEST	0.001 @ 15"
ASSUMED MOISTURE, Bw	13%	FINAL LEAK TEST	@ 15"

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. # 1	0	457	457
Imp. # 2	100	112	12
Imp. # 3	0	2	2
Imp. # 4	20		

Upstream Diameters

Downstream Diameters

Point	Clock Time	Dry Gas Meter Ft^3	Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp. XAD	Dry Gas Temp. Outlet °F	Temperature °F Stack	Temperature °F Probe	Temperature °F Box	Temperature °F Impinger Exit	Pump Vac. IN. Hg Gauge	Fyrites CO_2 Vol. %	Fyrites O_2 Vol. %
	08:33	477.626											
1		480.64	0.40	1.18	44	91	297	245	250	57	7	8.5	11.0
1		483.70	0.42	1.25	44	91	296						
2		486.89	0.45	1.33	44	92	296	245	250	57	7		
2		490.08	0.43	1.33	44	92	297						
3		493.05	0.39	1.16	45	91	297	244	250	57	7		
3		496.06	0.40	1.18	45	91	297					8.5	10.0
4		498.95	0.37	1.09	45	91	299	244	250	57	7		
4		501.76	0.33	1.03	45	91	299						
5		504.52	0.34	1.00	44	91	298	244	250	58	7		
5		507.25	0.33	0.97	44	91	298						
6		510.10	0.36	1.07	44	91	299	244	250	58	7	8.5	10.5
6		512.87	0.37	1.08	42	92	300						
7		515.79	0.38	1.12	42	91	300	241	251	57	7		
7		518.79	0.39	1.15	44	92	300						
8		521.99	0.46	1.37	45	94	296	242	250	57	7		
8		525.26	0.47	1.40	45	94	296					8.0	10.5
9		528.57	0.48	1.43	45	95	295	242	249	57	9		
9		531.99	0.51	1.52	46	95	293						
10		535.45	0.52	1.55	45	96	296	244	249	57	9		
10		538.91	0.52	1.55	45	96	296						
11		542.40	0.53	1.60	45	97	296	244	248	58	9	8.0	10.0
11		545.83	0.51	1.53	46	97	296						
12		549.30	0.52	1.56	45	97	295	244	248	58	9		
12		552.77	0.51	1.53	45	97	295						

PLANT	M.V. WTE	PROBE TIP DIAMETER, IN.	0.2580	IMPINGER VOLUMES	INITIAL (mL) / FINAL (mL) / TOTAL GAIN (mL)
		PROBE LENGTH, FT / Cp	0.8306		
RUN No	3 with CDD / PCDF	FILTER NUMBER		Imp. # 1	9 /
LOCATION	Unit - 2			Imp. # 2	100 /
DATE	July 27/22	STATIC PRESSURE, IN. H_2O	-19.0	Imp. # 3	0 /
OPERATOR		STACK DIAMETER	70.70	Imp. # 4	200 /
CONTROL UNIT / Y	1.0014	STACK HEIGHT			
BAROMETRIC PRESSURE, IN. Hg	29.90	INITIAL LEAK TEST	0.001 @ 15"		
ASSUMED MOISTURE, Bw	13%	FINAL LEAK TEST	@ 15"	Upstream Diameters	
				Downstream Diameters	

Point	Clock Time	Dry Gas Meter Ft^3		Pitot IN. H_2O ΔP	Orifice ΔH IN. H_2O	Dry Gas Temp. Inlet °F	Dry Gas Temp. Outlet °F	Temperature °F Stack	Temperature °F Probe	Temperature °F Box	Temperature °F Impinger Exit	Pump Vac. IN. Hg Gauge	Fyrites CO_2 Vol. %	Fyrites O_2 Vol. %
		552.72				XAO								
1		555.67	6f	0.38	1.14	42	97	295	238	240	59	7	10	10
1		558.75		0.41	1.23	42	97	295						
2		561.86		0.42	1.26	42	97	296	238	240	59	7		
2		564.98		0.42	1.26	42	97	296						
3		567.83		0.36	1.08	41	97	296	238	240	59	7		
3		570.67		0.35	1.05	41	97	296						
4		573.54		0.36	1.08	41	97	297	239	240	59	7	9.5	10.5
4		576.41		0.36	1.07	41	97	298						
5		579.19		0.34	1.01	41	96	297	240	240	59	7		
5		581.85		0.31	0.93	41	97	298						
6		584.72		0.36	1.07	41	96	297	238	241	58	7	9.5	10.5
6		587.60		0.36	1.07	41	96	297						
7		591.05		0.32	1.35	41	95	298	238	241	58	7		
7		594.43		0.30	1.30	41	95	298						
8		597.77		0.49	1.46	42	95	296	239	241	58	9		
8		601.09		0.48	1.43	42	95	296					8.5	11.2
9		604.48		0.50	1.50	42	96	297	240	240	58	9		
9		607.81		0.48	1.44	42	96	297						
10		611.07		0.46	1.38	42	97	296	240	240	59	9		
10		614.33		0.46	1.38	42	97	296						
11		617.52		0.44	1.32	42	98	297	240	238	59	8	9.0	10.4
11		620.72		0.44	1.32	42	98	297						
12		623.87		0.43	1.29	42	98	297	238	239	59	8		
12	12:37	626.99		0.42	1.26	42	98	296						

APPENDIX 4

CALIBRATION DATA and

CERTIFICATION

BAROMETER CALIBRATION FORM

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

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

Performance Specification is

Device Corrected for Elevation must be +/- 0.1 " Hg of ENV CANADA SEA-LEVEL Pbar

Enter Environment canada Pressure from their website for Vancouver (link below)
and the reading from your barometer on the ground floor of the office.

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

A.Lanfranco & Associates inc.

EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

Model #: FE 18

Serial #: 0028-020118-1

Date: 4-Jul-22

Barometric Pressure: 29.87 (in. Hg)

Theoretical Critical Vacuum: 14.09 (in. Hg)

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

---------- DRY GAS METER READINGS ----------

dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Initial Temps. Inlet (deg F)	Initial Temps. Outlet (deg F)	Final Temps. Inlet (deg F)	Final Temps. Outlet (deg F)
3.60	18.00	54.520	73.555	19.035	72.0	72.0	73.0	73.0
1.90	18.00	40.670	54.425	13.755	70.0	70.0	72.0	72.0
1.20	18.00	29.815	40.582	10.767	70.0	70.0	72.0	72.0
0.69	15.00	22.830	29.685	6.855	70.0	70.0	70.0	70.0
0.35	15.00	18.095	22.792	4.697	72.0	72.0	71.0	71.0

-CRITICAL ORIFICE READINGS-

Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	-- Ambient Temperature -- Initial (deg F)	Final (deg F)	Average (deg F)
73	0.8185	15.0	78.0	80.0	79.0
63	0.5956	17.5	81.0	80.0	80.5
55	0.4606	19.5	79.0	80.0	79.5
48	0.3560	21.0	75.0	80.0	77.5
40	0.2408	22.5	73.0	74.0	73.5

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

--- DRY GAS METER --- VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	--------- ORIFICE --------- VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	-- DRY GAS METER -- CALIBRATION FACTOR Y Value (number)	CALIBRATION FACTOR Y Variation (number)	--------- ORIFICE --------- CALIBRATION FACTOR dH@ Value (in H2O)	CALIBRATION FACTOR dH@ Value (mm H2O)	CALIBRATION FACTOR dH@ Variation (in H2O)	Ko (value)
19.002	538.1	18.955	536.8	19.390	0.998	-0.004	1.808	45.91	-0.068	0.714
13.713	388.3	13.774	390.1	14.129	1.004	0.003	1.812	46.02	-0.064	0.710
10.716	303.5	10.662	301.9	10.917	0.995	-0.006	1.910	48.51	0.034	0.699
6.827	193.3	6.880	194.8	7.018	1.008	0.006	1.835	46.61	-0.041	0.704
4.660	132.0	4.671	132.3	4.730	1.002	0.001	2.013	51.14	0.138	0.676
				Average Y--------->	**1.0014**	**Average dH@----->**	**1.875**	**47.6**	**Average Ko----->**	**0.701**

TEMPERATURE CALIBRATION

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

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

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

Calibrated by: Liam Forrer Signature: Shaun Harrington Date: July 4, 2022

Pitot Tube Calibration

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

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

Pitot ID: **7A-1**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.035	0.050	12.5	0.8283	0.0098
0.130	0.180	24.1	0.8413	0.0032
0.250	0.350	33.4	0.8367	0.0014
0.480	0.660	46.3	0.8443	0.0061
0.720	1.000	56.7	0.8400	0.0019
		Average :	0.8381	0.0045

Pitot ID: **ST 8A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.035	0.050	12.5	0.8283	0.0044
0.140	0.200	25.0	0.8283	0.0044
0.250	0.350	33.4	0.8367	0.0040
0.600	0.850	51.7	0.8318	0.0009
0.710	0.990	56.3	0.8384	0.0057
		Average :	0.8327	0.0039

Pitot ID: **7B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.035	0.050	12.5	0.8283	0.0046
0.100	0.140	21.1	0.8367	0.0038
0.230	0.320	32.0	0.8393	0.0064
0.430	0.610	43.8	0.8312	0.0017
0.680	0.970	55.1	0.8289	0.0040
		Average :	0.8329	0.0041

Pitot ID: **ST 8B**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.040	0.055	13.4	0.8443	0.0032
0.140	0.190	25.0	0.8498	0.0087
0.270	0.380	34.7	0.8345	0.0066
0.500	0.700	47.2	0.8367	0.0044
0.720	1.000	56.7	0.8400	0.0010
		Average :	0.8411	0.0048

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

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.040	0.055	16.3	0.8443	0.0063
0.120	0.160	19.9	0.8574	0.0067
0.200	0.270	25.3	0.8521	0.0014
0.430	0.580	35.8	0.8524	0.0018
0.710	0.970	48.4	0.8470	0.0036
		Average :	0.8506	0.0040

Pitot ID: **ST 8C**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.055	0.075	14.9	0.8478	0.0021
0.105	0.145	19.4	0.8425	0.0033
0.210	0.290	29.0	0.8425	0.0033
0.500	0.680	43.1	0.8489	0.0032
0.710	0.970	52.8	0.8470	0.0013
		Average :	0.8457	0.0026

Pitot ID: **7C**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.040	0.055	13.4	0.8443	0.0068
0.130	0.180	16.3	0.8413	0.0098
0.250	0.335	33.4	0.8552	0.0041
0.630	0.840	30.5	0.8574	0.0063
0.690	0.920	47.0	0.8574	0.0063
		Average :	0.8511	0.0066

Pitot ID:

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

* Average absolute deviation must not exceed 0.01.

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

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

GLASS NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Scott Ferguson
Date: January 18, 2022

Signature:

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
A	0.1260	0.1260	0.1270	0.0010	0.1263	0.0000870
G-165	0.1650	0.1640	0.1640	0.0010	0.1643	0.0001473
G-170	0.1700	0.1720	0.1690	0.0030	0.1703	0.0001582
G-178	0.1790	0.1800	0.1820	0.0030	0.1803	0.0001774
J	0.1890	0.1900	0.1890	0.0010	0.1893	0.0001955
E	0.1910	0.1910	0.1900	0.0010	0.1907	0.0001983
Q	0.2060	0.2050	0.2020	0.0040	0.2043	0.0002277
L	0.2090	0.2100	0.2120	0.0030	0.2103	0.0002413
G-215	0.2150	0.2140	0.2140	0.0010	0.2143	0.0002506
G-218	0.2170	0.2190	0.2200	0.0030	0.2187	0.0002608
G-221	0.2210	0.2190	0.2190	0.0020	0.2197	0.0002632
G-2231	0.2310	0.2280	0.2300	0.0030	0.2297	0.0002877
G-2232	0.2240	0.2220	0.2220	0.0020	0.2227	0.0002704
G-225	0.2220	0.2190	0.2200	0.0030	0.2203	0.0002648
G-2501	0.2490	0.2500	0.2510	0.0020	0.2500	0.0003409
P	0.2590	0.2570	0.2580	0.0020	0.2580	0.0003631
G-282	0.2910	0.2870	0.2880	0.0040	0.2887	0.0004545
G-2871	0.2860	0.2870	0.2870	0.0010	0.2867	0.0004482
G-292	0.2905	0.2890	0.2875	0.0030	0.2890	0.0004555
MV-01	0.3060	0.3040	0.3060	0.0020	0.3053	0.0005085
G-3072	0.3080	0.3080	0.3090	0.0010	0.3083	0.0005185
G-309	0.3060	0.3070	0.3070	0.0010	0.3067	0.0005129
G-3121	0.3080	0.3100	0.3110	0.0030	0.3097	0.0005230
G-345	0.3460	0.3440	0.3460	0.0020	0.3453	0.0006504
G-433	0.4320	0.4320	0.4340	0.0020	0.4327	0.0010210
P-29	0.4680	0.4680	0.4690	0.0010	0.4683	0.0011963
P-7	0.4920	0.4890	0.4920	0.0030	0.4910	0.0013149
B	0.5010	0.5020	0.5030	0.0020	0.5020	0.0013745
G-540	0.5390	0.5390	0.5390	0.0000	0.5390	0.0015845

Where:

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

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

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

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

1. Name of Qualified Professional Shawn Harrington

   Title Senior Environmental Technician /Project manager

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

   Name of Association: _____ Registration # _____

3. Brief description of professional services:

   Environmental consulting ,specializing in air and atmospheric sciences

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

Declaration

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

Signature:

x Shawn Harrington

Print Name: Shawn Harrington

Witnessed by:

x

Print Name: Mark Lanfranco

Date signed: November 26, 2020

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

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

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

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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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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: Mark Lanfranco

Witnessed by:

X _____

Print Name: Melissa Watkins

Date signed: Nov.16, 2020

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

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

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

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

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

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

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

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

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

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

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

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

Declaration

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

Select one of the following:

☒ Absence from conflict of interest

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

☐ 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: Mark Lanfranco

Witnessed by:

X _____

Print name: Carter Lanfranco

Date: Dec. 16, 2020

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

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

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

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Declaration

I Shawn Harrington, as a member of **Air and Waste Management Association** declare

Select one of the following:

☒ Absence from conflict of interest

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

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

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

_____

_____

_____

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Signature:

X Shawn Harrington

Print name: Shawn Harrington

Witnessed by:

X

Print name: Mark Lanfranco

Date: Dec.16, 2020

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BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

BCIT

Shawn Harrington

has met the requirements of

Stack Testing for Pollutants

(CHSC 7760)

School of Process, Energy and Natural Resources
Chemical Sciences Program

Endorsed by:

Greater Vancouver Regional District

Environment Canada Environnement Canada

Province of British Columbia
Ministry of Environment, Lands and Parks

Marsh Hemekey, Dean
School of Process, Energy and Natural Resources

JUNE 21, 2001
Dated