A.Lanfranco & Associates Inc.
Environmental Consultants

Prepared for

METRO VANCOUVER

Metrotower III 4730 Kingsway
Burnaby, BC V5H 0C6

Annual Trace Organics Emission Report
Waste-to-Energy Facility

August 2021 Survey
Operational Certificate 107051
Report Issued: September 23, 2021

CERTIFICATION

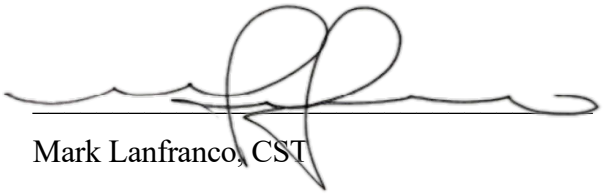
The field monitoring for this survey was conducted by certified stack test technicians as required by the British Columbia Ministry of Environment (BC MOE) Field Sampling Manual.

The field crew consisted of:

Mr. L. Agassiz (certified), Mr. C. Lanfranco (certified), Mr. J. Gibbs (certified) and Mr. S. Baker.

The report was prepared by Mr. L. Agassiz 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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TEST PROGRAM ORGANIZATION

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Sampling Crew:	Mr. L. Agassiz – A. Lanfranco and Associates Inc. Mr. C. Lanfranco – A. Lanfranco and Associates Inc. Mr. J. Gibbs – A. Lanfranco and Associates Inc. Mr. S. Baker – A. Lanfranco and Associates Inc.

SUMMARY

The following tables present the average of triplicate test results on Unit 3 for various trace organics on August 18-19, 2021. Additional emission parameters were measured by the facility's certified continuous emission monitoring system.

SUMMARY - Trace Organics

Parameter		Unit 3	Limit
PCDD/PCDF	(TEQ ng/Sm^3 @ 11% O_2)	0.0022	0.08
PCDD/PCDF Mass Emission	(TEQ g/day)	4.03E-06	
PAH	(µg/Sm^3 @ 11% O_2)	0.1038	5.0
HCB*	(µg/Sm^3 @ 11% O_2)	0.0012	
Total CB	(µg/Sm^3 @ 11% O_2)	0.3097	1.0
Total CP*	(µg/Sm^3 @ 11% O_2)	0.0061	1.0
Total PCB	(µg/Sm^3 @ 11% O_2)	0.0143	1.0
Flowrate	(Sm^3/min)	1105	
Temperature	(°C)	152	
O_2	(vol % dry)	9.4	

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

*Calculated using 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 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 2021 was Unit 3.

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.

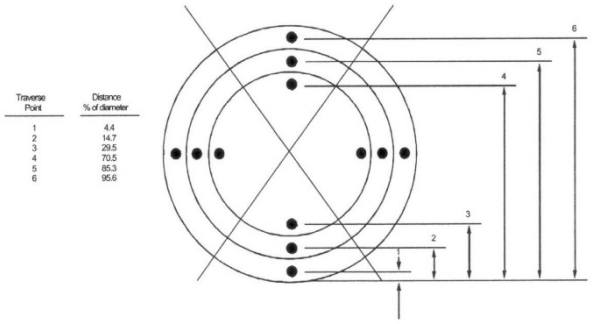


Figure 1. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

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.

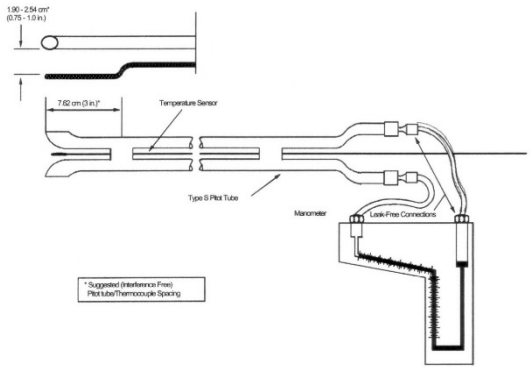


Figure 2. Type S Pitot Tube Manometer Assembly

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.

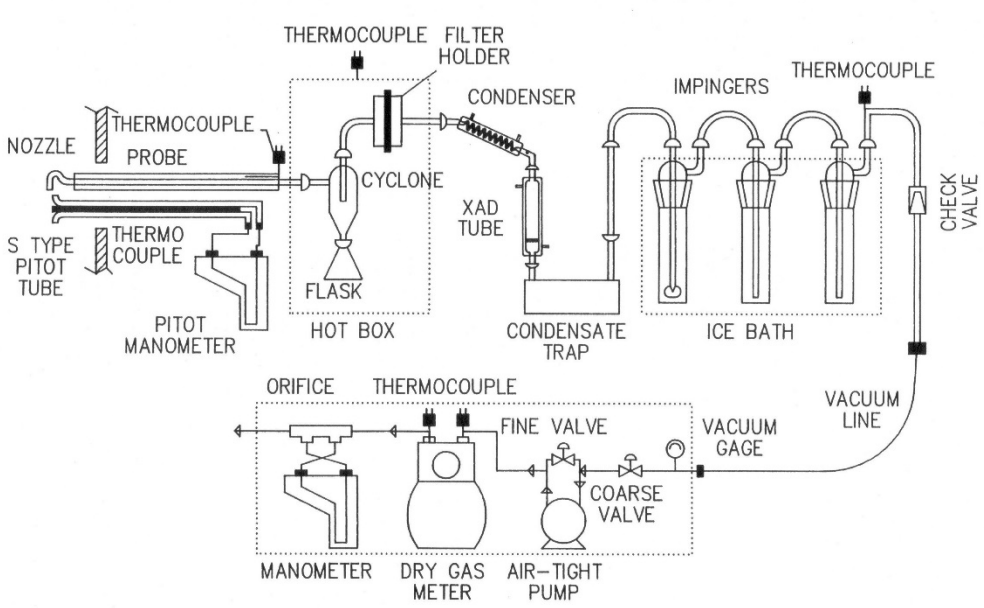


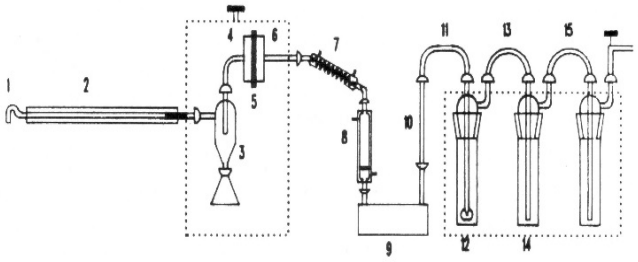
Figure 3 - Dioxin / Furan Sampling Train

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.

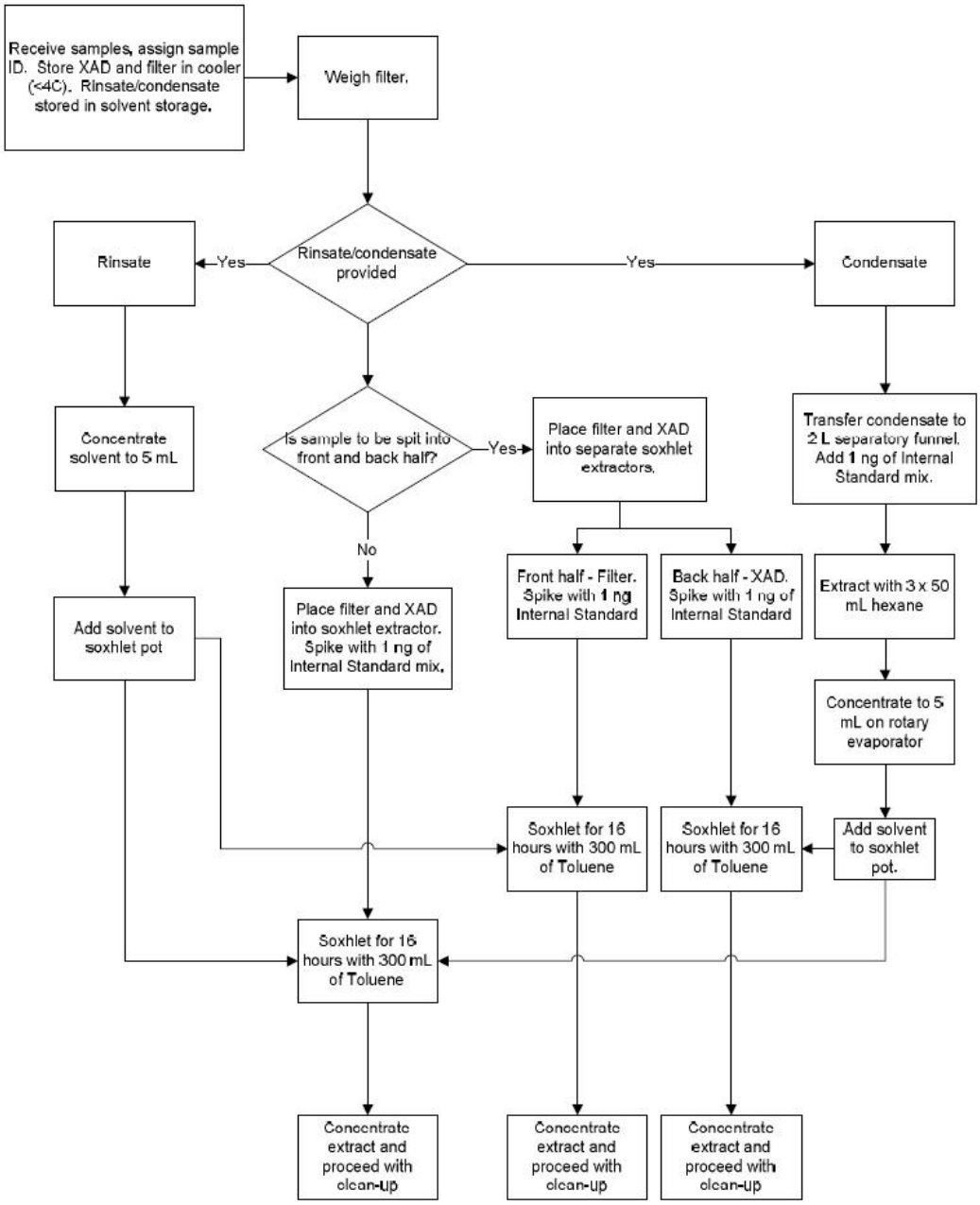


Figure 5 - Semi-Volatile Organics XAD and Filter Recovery Schematic

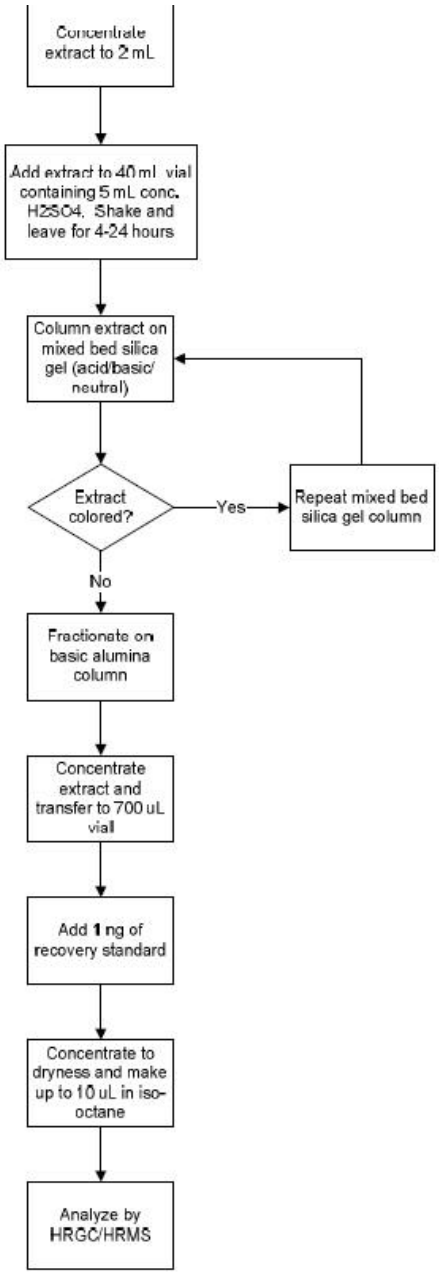


Figure 6 - Schematic of analytical methodology for dioxins and furans

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 (ft²)*
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 (ft³)*
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 3 sampling location.

TABLE 1: UNIT 3 TRACE ORGANICS RESULTS TABLE

Parameter		Test 1	Test 2	Test 3	Average
Test Date		18-Aug-21	19-Aug-21	19-Aug-21	
Test Time		08:30 - 12:32	08:36 - 12:38	12:57 - 17:00	
Duration	(minutes)	240	240	240	240
PCDD & PCDF TEQ	(ng/Sm^3)	0.0007	0.0037	0.0032	0.0025
PCDD & PCDF TEQ	**(ng/Sm^3 @ 11% O_2)**	**0.0006**	**0.0032**	**0.0028**	**0.0022**
Total PAH	($\mu g/Sm^3$)	0.1045	0.1769	0.0815	0.1210
Total PAH	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0859**	**0.1531**	**0.0723**	**0.1038**
Total HCB*	($\mu g/Sm^3$)	0.0015	0.0014	0.0014	0.0014
Total HCB*	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0013**	**0.0012**	**0.0012**	**0.0012**
Total CB	($\mu g/Sm^3$)	0.2572	0.4659	0.3544	0.3591
Total CB	**($\mu g/Sm^3$ @ 11% O_2)**	**0.2115**	**0.4032**	**0.3144**	**0.3097**
Total CP*	($\mu g/Sm^3$)	0.0077	0.0070	0.0068	0.0071
Total CP*	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0063**	**0.0060**	**0.0060**	**0.0061**
Total PCB	($\mu g/Sm^3$)	0.0033	0.0449	0.0014	0.0165
Total PCB	**($\mu g/Sm^3$ @ 11% O_2)**	**0.0027**	**0.0388**	**0.0012**	**0.0143**
Stack Temperature	(°C)	150	153	154	152
Flowrate	(Sm^3/min)	1097	1099	1118	1105
Oxygen (O_2)	(vol % dry)	8.9	9.5	9.7	9.4
Carbon Dioxide (CO_2)	(vol % dry)	10.9	10.2	9.8	10.3
Moisture	(vol %)	15.0	15.9	16.2	15.7
Isokinetic Variation	(%)	102	103	104	103

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:		18-Aug-21		19-Aug-21		19-Aug-21	
Test Time:		08:30 - 12:32		08:36 - 12:38		12:57 - 17:00	
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	0.0020	0.0002	0.0020	0.0002	0.0049	0.0005
1234678 HpCDD	0.0100	0.0140	0.0001	0.0320	0.0003	0.0380	0.00038
OCDD	0.0010	0.0300	0.00003	0.0730	0.00007	0.0730	0.00007
2378 TCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
12378 PCDF	0.0500	0.0020	0.0001	0.0090	0.0005	0.0130	0.0007
23478 PCDF	0.5000	0.0020	0.0010	0.0200	0.0100	0.0170	0.0085
123478 HxCDF	0.1000	0.0000	ND	0.0000	ND	0.0000	ND
123678 HxCDF	0.1000	0.0020	0.0002	0.0020	0.0002	0.0089	0.0009
234678 HxCDF	0.1000	0.0020	0.0002	0.0130	0.0013	0.0020	0.0002
123789 HxCDF	0.1000	0.0020	0.0002	0.0020	0.0002	0.0020	0.0002
1234678 HpCDF	0.0100	0.0240	0.00024	0.0430	0.00043	0.0350	0.00035
1234789 HpCDF	0.0100	0.0000	ND	0.0000	ND	0.0000	ND
OCDF	0.0010	0.0075	7.5E-06	0.0240	0.000024	0.0075	7.50E-06
Summed PCDD & PCDF TEQ (ng)			**0.0023**		**0.0132**		**0.0117**
Sample Volume (dscm)			**3.2546**		**3.5888**		**3.6826**
PCDD & PCDF TEQ	**ng/dscm**		**0.00071**		**0.00368**		**0.00319**
PCDD & PCDF TEQ	**ng/dscm @ 11% O_2**		**0.00059**		**0.00318**		**0.00283**
PCDD & PCDF TEQ	**grams/day**		**0.000001**		**0.000006**		**0.000005**
Flowrate (dscm/min)			1097		1099		1118
Oxygen (Vol. %)			8.9		9.5		9.7
Carbon Dioxide (Vol. %)			10.9		10.2		9.8
Moisture (Vol. %)			15.0		15.9		16.2
Temperature (oC)			150		153		154
Isokinetic Variation (%)			102		103		104

TABLE 3: UNIT 3 TRACE ORGANICS MASS EMISSIONS RESULTS

Parameter		Test 1	Test 2	Test 3	Average
PCDD & PCDF TEQ	(g/sec)	1.30E-11	6.74E-11	5.94E-11	4.66E-11
PCDD & PCDF TEQ	(tonnes/annum)	4.11E-10	2.12E-09	1.87E-09	1.47E-09
Total PAH	(g/sec)	1.91E-06	3.24E-06	1.52E-06	2.22E-06
Total PAH	(tonnes/annum)	6.02E-05	1.02E-04	4.79E-05	7.01E-05
Total HCB*	(g/sec)	2.81E-08	2.55E-08	2.53E-08	2.63E-08
Total HCB*	(tonnes/annum)	8.86E-07	8.05E-07	7.98E-07	8.29E-07
Total CB	(g/sec)	4.70E-06	8.53E-06	6.60E-06	6.61E-06
Total CB	(tonnes/annum)	1.48E-04	2.69E-04	2.08E-04	2.09E-04
Total CP*	(g/sec)	1.40E-07	1.28E-07	1.26E-07	1.32E-07
Total CP*	(tonnes/annum)	4.43E-06	4.02E-06	3.99E-06	4.15E-06
Total PCB	(g/sec)	6.07E-08	8.22E-07	2.59E-08	3.03E-07
Total PCB	(tonnes/annum)	1.91E-06	2.59E-05	8.17E-07	9.55E-06

Standard conditions (S) of 20 °C and 101.325 kPa (dry)
*Calculated using half DL convention.
Note - tonnes/annum based on 8760 operating hours

TABLE 4 Detailed PCB/PAH/CB/CP Emission Results

		Test 1	Test 2	Test 3
Test Date:		18-Aug-21	19-Aug-21	19-Aug-21
Test Time:		08:30 - 12:32	08:36 - 12:38	12:57 - 17:00
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		0.030	0.005	0.040
Benzo(g,h,i)perylene		0.030	0.250	0.010
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		0.040	0.070	0.030
Indeno(1,2,3-c,d)pyrene		ND	ND	0.030
Phenanthrene		0.140	0.180	0.110
Pyrene		0.070	0.090	0.050
7H-dibenzo(c,g)carbazole		ND	ND	ND
Acenaphthene		**ND**	**ND**	**ND**
Acenaphthylene		**ND**	**ND**	**ND**
Fluorene		**0.030**	**0.040**	**0.030**
Dibenzo(a,e) fluoranthene		**ND**	**ND**	**ND**
3-Methylcholanthrene		**ND**	**ND**	**ND**
5-Methylchrysene		**ND**	**ND**	**ND**
7,12-Dimethylbenz(a)anthracene		**ND**	**ND**	**ND**
Dibenzo(a,h)pyrene		**ND**	**ND**	**ND**
Dibenzo(a,e)pyrene		**ND**	**ND**	**ND**
Dibenzo(a,l)pyrene		**ND**	**ND**	**ND**
Quinoline		**ND**	**ND**	**ND**
Total CP		**0.0250**	**0.0250**	**0.0250**
Total CB		**0.8370**	**1.6720**	**1.3050**
HCB		**0.0050**	**0.0050**	**0.0050**
* ND = Less than detection limit				
PCB Total (ng)		**10.8**	**161.0**	**5.1**
Total PAH (ug)		**0.340**	**0.635**	**0.300**
Sample Volume (dscm)		**3.25**	**3.59**	**3.68**
Oxygen		8.9	9.5	9.7
PAH	**ug/dscm**	**0.1045**	**0.1769**	**0.0815**
HCB	**ug/dscm**	**0.0015**	**0.0014**	**0.0014**
CB Total	**ug/dscm**	**0.2572**	**0.4659**	**0.3544**
CP Total	**ug/dscm**	**0.0077**	**0.0070**	**0.0068**
PCB Total	**ug/dscm**	**0.0033**	**0.0449**	**0.0014**
PAH	**ug/dscm @ 11% O_2**	**0.0859**	**0.1531**	**0.0723**
HCB	**ug/dscm @ 11% O_2**	**0.0013**	**0.0012**	**0.0012**
CB Total	**ug/dscm @ 11% O_2**	**0.2115**	**0.4032**	**0.3144**
CP Total	**ug/dscm @ 11% O_2**	**0.0063**	**0.0060**	**0.0060**
PCB Total	**ug/dscm @ 11% O_2**	**0.0027**	**0.0388**	**0.0012**

4 DISCUSSION

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

Testing commenced on August 17, 2021; however, upset boiler conditions led to the test being terminated approximately one hour in. Two tests were then completed back-to-back on August 19, 2021.

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

Trace organics results are similar to data from 2019 and 2020; however, there was a notable increase in total PCB's this year. The increase was almost entirely attributed to results from Run 2 for Dichlorobiphenyl. Additional quality checks were requested from the analytical laboratory and the result is believed to be accurate. For example, surrogate recoveries were 34% and 36%, well within the acceptable range of 5%-145%. The lab manager also confirmed that 95% of the total PCB is coming from PCB011 – 3,3'-dichlorobiphenyl, which is a common occurrence when PCBs are elevated. The emissions can most likely be attributed to the yellow pigment found in paint.

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.

In the blank sample, no dioxin/furan congeners were detected, and minimal congeners were detected at levels only very slightly above the detection limit for PCB, CB and CP. There were a number of PAH's detected in the blank sample but at very low levels.

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 43 to 101%.

EPA Method 23 surrogate recoveries ranged from 73 to 126% for each Dioxin/Furan sample. The recovery QA/QC data is expected to meet EPA performance specifications (M23) of 70 to 130% for pre-test spiked surrogates. The M23 spiking protocol is not required in Canada and is included in the sampling/analytical protocol for additional QA/QC and information purposes only.

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

APPENDIX 1

ANALYTICAL DATA and

QA/QC RESULTS

SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR212732

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

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

RECEIVED BY: E. Douglas
CONDITION: Okay, 23.2°C

DATE/TIME: August 20, 2021 (3:20 p.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
5	Stack	MV Unit 3 – DF - Blank	PR212732	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	MV Unit 3 – DF - Run 1	PR212733	PCDD/F, PCB, PAH/HCB, CB, CP
5	Stack	MV Unit 3 – DF - Run 2	PR212734	PCB, PAH/HCB, CB, CP
5	Stack	MV Unit 3 – DF - Run 3	PR212735	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 LAB02F; EPA Method 1668C
PAH/CB/CP: SOP LAB013; in house

Data summarized in Data Report attached.

Report sent to: Mark Lanfranco Date: September 14, 2021

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:**	18-Aug-21
Client ID:	MV Unit 3 – DF - Blank	**Date Extracted:**	30-Aug-21
PRL ID:	PR212732	**Date Analysed:**	8-Sep-21
		Filter Wt.:	0.36

DIOXINS				I-TEQs		
		DL	# of	(ND=0)	(ND=½DL)	(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				I-TEQs		
		DL	# of	(ND=0)	(ND=½DL)	(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	109
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	122
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	73
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	83
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	76

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	45
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	92
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	88
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	73
$^{13}C_{12}$ -OCDD	69
$^{13}C_{12}$ -2,3,7,8-TCDF	40
$^{13}C_{12}$ -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	96

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	18-Aug-21
Client ID:	MV Unit 3 – DF - Run 1	**Date Extracted:**	30-Aug-21
PRL ID:	PR212733	**Date Analysed:**	8-Sep-21
		Filter Wt.:	0.36

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	13	2	4			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	14	4	2			
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	23	4	1			
1,2,3,4,6,7,8-HpCDD	14	4		0.14	0.14	0.14
Total HpCDD	33	4	2			
OCDD	30	15	1	0.03	0.03	0.03
		Total Dioxin TEQ		**0.2**	**2.8**	**5.4**

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	34	2	2			
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	24	4		0.24	0.24	0.24
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	30	4	2			
OCDF	ND	15	1	ND	0.0075	0.015
		Total Furan TEQ		**0.2**	**2.3**	**4.3**

Total PCDD/PCDF Toxic Equivalent (pg)	**0.4**	**5.0**	**9.7**

Surrogate Recoveries (%)

$^{37}Cl_4$ -2,3,7,8-TCDD	95
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	126
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	74
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	77
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	73

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	54
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	87
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	90
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	78
$^{13}C_{12}$ -OCDD	61
$^{13}C_{12}$ -2,3,7,8-TCDF	41
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	71
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	74
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	97

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	19-Aug-21
Client ID:	MV Unit 3 – DF - Run 2	**Date Extracted:**	30-Aug-21
PRL ID:	PR212734	**Date Analysed:**	8-Sep-21
		Filter Wt.:	0.36

DIOXINS				**I-TEQs**		
		DL	**# of**	**(ND=0)**	**(ND=½DL)**	**(ND=DL)**
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	4.2	2	1			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	19	4	2			
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	46	4	1			
1,2,3,4,6,7,8-HpCDD	32	4		0.32	0.32	0.32
Total HpCDD	62	4	2			
OCDD	73	15	1	0.073	0.073	0.073
		Total Dioxin TEQ		**0.4**	**3.0**	**5.6**

FURANS				**I-TEQs**		
		DL	**# of**	**(ND=0)**	**(ND=½DL)**	**(ND=DL)**
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	72	2	3			
1,2,3,7,8-PeCDF	9	4		0.45	0.45	0.45
2,3,4,7,8-PeCDF	20	4		10	10	10
Total PeCDF	100	4	4			
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	13	4		1.3	1.3	1.3
Total HxCDF	13	4	1			
1,2,3,4,6,7,8-HpCDF	43	4		0.43	0.43	0.43
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	43	4	1			
OCDF	24	15	1	0.024	0.024	0.024
		Total Furan TEQ		**12.2**	**12.9**	**13.6**

Total PCDD/PCDF Toxic Equivalent (pg)	**12.6**	**15.9**	**19.2**

Surrogate Recoveries (%)

$^{37}Cl_4$ -2,3,7,8-TCDD	108
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	123
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	77
$^{13}C_{12}$ -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	55
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	101
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	81
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	72
$^{13}C_{12}$ -OCDD	53
$^{13}C_{12}$ -2,3,7,8-TCDF	43
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	75
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	64
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	80

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Sample Date:**	19-Aug-21
Client ID:	MV Unit 3 – DF - Run 3	**Date Extracted:**	30-Aug-21
PRL ID:	PR212735	**Date Analysed:**	8-Sep-21
		Filter Wt.:	0.36

DIOXINS				**I-TEQs**		
		DL	**# of**	**(ND=0)**	**(ND=½DL)**	**(ND=DL)**
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDD	ND	2		ND	1	2
Total TCDD	ND	2	1			
1,2,3,7,8-PeCDD	ND	4		ND	1	2
Total PeCDD	27	4	2			
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	4.9	4		0.49	0.49	0.49
Total HxCDD	77	4	2			
1,2,3,4,6,7,8-HpCDD	38	4		0.38	0.38	0.38
Total HpCDD	82	4	2			
OCDD	73	15	1	0.073	0.073	0.073
		Total Dioxin TEQ		**0.9**	**3.3**	**5.7**

FURANS				**I-TEQs**		
		DL	**# of**	**(ND=0)**	**(ND=½DL)**	**(ND=DL)**
Congeners	**pg**	**pg**	**peaks**	**pg**	**pg**	**pg**
2,3,7,8-TCDF	ND	2		ND	0.1	0.2
Total TCDF	140	2	6			
1,2,3,7,8-PeCDF	13	4		0.65	0.65	0.65
2,3,4,7,8-PeCDF	17	4		8.5	8.5	8.5
Total PeCDF	120	4	4			
1,2,3,4,7,8-HxCDF	ND	4		ND	0.2	0.4
1,2,3,6,7,8-HxCDF	8.9	4		0.89	0.89	0.89
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	8.9	4	1			
1,2,3,4,6,7,8-HpCDF	35	4		0.35	0.35	0.35
1,2,3,4,7,8,9-HpCDF	ND	4		ND	0.02	0.04
Total HpCDF	37	4	1			
OCDF	ND	15	0	ND	0.0075	0.015
		Total Furan TEQ		**10.4**	**11.1**	**11.8**

Total PCDD/PCDF Toxic Equivalent (pg)	**11.3**	**14.5**	**17.6**

Surrogate Recoveries (%)

$^{37}Cl_4$ -2,3,7,8-TCDD	102
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	120
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	73
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	77
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	73

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	49
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	78
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	76
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	64
$^{13}C_{12}$ -OCDD	48
$^{13}C_{12}$ -2,3,7,8-TCDF	40
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	65
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	61
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	74

METHOD 23/1-RM-3 DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	BLANK	**Date Extracted:**	30-Aug-21
PRL ID:	DF210790B	**Date Analysed:**	8-Sep-21

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**

ND - none detected

Internal Standards (%)

$^{13}C_{12}$ -2,3,7,8-TCDD	58
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	85
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	85
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	79
$^{13}C_{12}$ -OCDD	55
$^{13}C_{12}$ -2,3,7,8-TCDF	48
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	65
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	66
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	84

QC REPORT - SPIKE

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	SPIKE	**Date Extracted:**	30-Aug-21
PRL ID:	DF210791S	**Date Analysed:**	8-Sep-21

DIOXINS			Acceptable Recovery		Pass/Fail	Int. Std
	LOF	Recovery	Min	Max		Recoveries
Congeners	**pg**	**%**	**%**	**%**		**%**
2,3,7,8-TCDD	200	93	80	120	Pass	56
1,2,3,7,8-PeCDD	200	117	80	120	Pass	81
1,2,3,4,7,8-HxCDD	400	82	80	120	Pass	-
1,2,3,6,7,8-HxCDD	400	96	80	120	Pass	88
1,2,3,7,8,9-HxCDD	400	101	80	120	Pass	-
1,2,3,4,6,7,8-HpCDD	400	107	80	120	Pass	84
OCDD	1000	116	80	120	Pass	75

FURANS			Acceptable Recovery		Pass/Fail	Int. Std
	LOF	Recovery	Min	Max		Recoveries
Congeners	**pg**	**%**	**%**	**%**		**%**
2,3,7,8-TCDF	200	102	80	120	Pass	46
1,2,3,7,8-PeCDF	200	115	80	120	Pass	72
2,3,4,7,8-PeCDF	200	117	80	120	Pass	-
1,2,3,4,7,8-HxCDF	400	82	80	120	Pass	-
1,2,3,6,7,8-HxCDF	400	101	80	120	Pass	69
1,2,3,7,8,9-HxCDF	400	105	80	120	Pass	-
2,3,4,6,7,8-HxCDF	400	100	80	120	Pass	-
1,2,3,4,6,7,8-HpCDF	400	86	80	120	Pass	80
1,2,3,4,7,8,9-HpCDF	400	88	80	120	Pass	-
OCDF	1000	97	80	120	Pass	-

LOF - Level of Fortification

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**MV Unit 3 – DF - Blank**	**Date Extracted:**	30-Aug-21
PRL ID:	PR212732	**Date Analysed:**	10-Sep-21

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	56	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	64	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	56	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	52	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	80	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	68	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	72	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	76	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	84	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	60	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	2.4	0.05
Trichlorobiphenyls	0.21	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	2.62	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	52
13C12-4,4'-DiCB	15L	44
13C12-2,2',6'-TrCB	19L	40
13C12-3,4,4'-TrCB	37L	56
13C12-2,2',6,6'-TeCB	54L	52
13C12-2,2',4,6,6'-PeCB	104L	48
13C12-2,2',4,4',6,6'-HxCB	155L	52
13C12-2,2',3,4',5,6,6'-HpCB	188L	44
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	52
13C12-2,3,3',4,4',5,5',6-OcCB	205L	60
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	64
13C12-DeCB	209L	60

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**MV Unit 3 – DF - Run 1**	**Date Extracted:**	30-Aug-21
PRL ID:	PR212733	**Date Analysed:**	10-Sep-21

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	56	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	64	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	56	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	52	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	80	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	68	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	72	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	76	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	84	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	60	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	8.2	0.05
Trichlorobiphenyls	1.74	0.05
Tetrachlorobiphenyls	0.53	0.05
Pentachlorobiphenyls	0.19	0.05
Hexachlorobiphenyls	0.14	0.05
Heptachlorobiphenyls	0.05	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	10.8	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	52
13C12-4,4'-DiCB	15L	44
13C12-2,2',6'-TrCB	19L	40
13C12-3,4,4'-TrCB	37L	56
13C12-2,2',6,6'-TeCB	54L	52
13C12-2,2',4,6,6'-PeCB	104L	48
13C12-2,2',4,4',6,6'-HxCB	155L	52
13C12-2,2',3,4',5,6,6'-HpCB	188L	44
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	52
13C12-2,3,3',4,4',5,5',6-OcCB	205L	60
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	64
13C12-DeCB	209L	60

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**MV Unit 3 – DF - Run 2**	**Date Extracted:**	30-Aug-21
PRL ID:	PR212734	**Date Analysed:**	10-Sep-21

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	60	ND	6.00E-06
3,3',4,4'-TeCB	PCB 77	ND	0.02	68	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	52	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	48	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	52	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	48	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	84	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	92	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02	92	ND	6.00E-07
2,3,3',4,4',5'-HxCB	PCB 157	ND	0.02	100	ND	6.00E-07
3,3',4,4',5,5'-HxCB	PCB 169	ND	0.02	96	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02	60	ND	6.00E-07
		Toxic Equivalent (WHO-TEQ)			0.00E+00	2.61E-03

Total PCB		
		DL
Homologs	**ng**	**ng**
Monochlorobiphenyls	0.8	0.05
Dichlorobiphenyls	156.4	0.05
Trichlorobiphenyls	3.21	0.05
Tetrachlorobiphenyls	0.55	0.05
Pentachlorobiphenyls	0.33	0.05
Hexachlorobiphenyls	0.07	0.05
Heptachlorobiphenyls	0.07	0.05
Octachlorobiphenyls	ND	0.05
Nonachlorobiphenyls	ND	0.05
Decachlorobiphenyl	ND	0.05
Total PCB	161	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	32
13C12-4,4'-DiCB	15L	36
13C12-2,2',6'-TrCB	19L	32
13C12-3,4,4'-TrCB	37L	52
13C12-2,2',6,6'-TeCB	54L	48
13C12-2,2',4,6,6'-PeCB	104L	40
13C12-2,2',4,4',6,6'-HxCB	155L	48
13C12-2,2',3,4',5,6,6'-HpCB	188L	64
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	76
13C12-2,3,3',4,4',5,5',6-OcCB	205L	60
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	64
13C12-DeCB	209L	72

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**MV Unit 3 – DF - Run 3**	**Date Extracted:**	30-Aug-21
PRL ID:	PR212735	**Date Analysed:**	10-Sep-21

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	60	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02	28	ND	6.00E-07
2,3',4,4',5-PeCB	PCB 118	ND	0.02	28	ND	6.00E-07
2,3,4,4',5-PeCB	PCB 114	ND	0.02	32	ND	6.00E-07
2,3,3',4,4'-PeCB	PCB 105	ND	0.02	28	ND	6.00E-07
3,3',4,4',5-PeCB	PCB 126	ND	0.02	44	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02	40	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	56	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	44	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	4.7	0.05
Trichlorobiphenyls	0.40	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	5.12	

ND - none detected

Surrogate Recoveries		
Chemical Name	**IUPAC #**	**%**
13C12-2-MoCB	1L	16
13C12-4,4'-DiCB	15L	36
13C12-2,2',6'-TrCB	19L	48
13C12-3,4,4'-TrCB	37L	44
13C12-2,2',6,6'-TeCB	54L	36
13C12-2,2',4,6,6'-PeCB	104L	44
13C12-2,2',4,4',6,6'-HxCB	155L	60
13C12-2,2',3,4',5,6,6'-HpCB	188L	48
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	88
13C12-2,3,3',4,4',5,5',6-OcCB	205L	48
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	92
13C12-DeCB	209L	112

DATA REPORT

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**BLANK**	**Date Extracted:**	30-Aug-21
PRL ID:	PC210790B	**Date Analysed:**	10-Sep-21

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		52	ND	2.00E-06
2,3',4,4',5'-PeCB	PCB 123	ND	0.02		36	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		68	ND	2.00E-03
2,3',4,4',5,5'-HxCB	PCB 167	ND	0.02		76	ND	6.00E-07
2,3,3',4,4',5-HxCB	PCB 156	ND	0.02		80	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		68	ND	6.00E-04
2,3,3',4,4',5,5'-HpCB	PCB 189	ND	0.02		44	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	28
13C12-4,4'-DiCB	15L	32
13C12-2,2',6'-TrCB	19L	32
13C12-3,4,4'-TrCB	37L	48
13C12-2,2',6,6'-TeCB	54L	40
13C12-2,2',4,6,6'-PeCB	104L	32
13C12-2,2',4,4',6,6'-HxCB	155L	32
13C12-2,2',3,4',5,6,6'-HpCB	188L	56
13C12-2,2',3,3',5,5',6,6'-OcCB	202L	84
13C12-2,3,3',4,4',5,5',6-OcCB	205L	48
13C12-2,2',3,3',4,4',5,5',6-NoCB	206L	76
13C12-DeCB	209L	88

QC REPORT - SPIKE

Client:	A. Lanfranco & Associates	**Contact:**	Mark Lanfranco
Client ID:	**SPIKE**	**Date Extracted:**	30-Aug-21
PRL ID:	PC210791S	**Date Analysed:**	10-Sep-21

Dioxin-like PCBs			**Acceptable Recovery**		**Pass/Fail**	**Surrogate Recoveries**
	LOF	**Recovery**	**Min**	**Max**		
Chemical Name	**ng**	**%**	**%**	**%**		**%**
3,4,4',5-TeCB (81)	1	94	60	135	Pass	36
3,3',4,4'-TeCB (77)	1	82	60	135	Pass	44
2,3',4,4',5'-PeCB (123)	1	92	60	135	Pass	44
2,3',4,4',5-PeCB (118)	1	88	60	135	Pass	40
2,3,4,4',5-PeCB (114)	1	115	60	135	Pass	36
2,3,3',4,4'-PeCB (105)	1	90	60	135	Pass	40
3,3',4,4',5-PeCB (126)	1	85	60	135	Pass	60
2,3',4,4',5,5'-HxCB (167)	1	73	60	135	Pass	52
2,3,3',4,4',5-HxCB (156)	1	98	60	135	Pass	48
2,3,3',4,4',5'-HxCB (157)	1	93	60	135	Pass	60
3,3',4,4',5,5'-HxCB (169)	1	85	60	135	Pass	48
2,3,3',4,4',5,5'-HpCB (189)	1	96	60	135	Pass	52

Total PCB			**Acceptable Recovery**		**Pass/Fail**
	LOF	**Recovery**	**Min**	**Max**	
Homologs	**ng**	**%**	**%**	**%**	
Monochlorobiphenyls	2	118			
Dichlorobiphenyls	4	93			
Trichlorobiphenyls	6	89			
Tetrachlorobiphenyls	12	97			
Pentachlorobiphenyls	13	114			
Hexachlorobiphenyls	15	87			
Heptachlorobiphenyls	11	119			
Octachlorobiphenyls	6	96			
Nonachlorobiphenyls	2	96			
Decachlorobiphenyl	1	105			
Total PCB	72	101	50	150	Pass

LOF - Level of Fortification

DATA REPORT

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

Date Extracted: 30-Aug-21
Date Analysed: 10-Sep-21

	Client ID:	MV Unit 3 – DF - Blank	MV Unit 3 – DF - Run 1	MV Unit 3 – DF - Run 2	MV Unit 3 – DF - Run 3		BLANK
	PRL ID:	PR212732	PR212733	PR212734	PR212735		PH210790B
NPRI PAH	**DL**						
	µg	**µg**	**µg**	**µg**	**µg**		**µg**
Acenaphthylene	0.05	ND	ND	ND	ND		ND
Acenaphthene	0.05	ND	ND	ND	ND		ND
Fluorene	0.02	ND	0.03	0.04	0.03		ND
Phenanthrene	0.02	0.05	0.14	0.18	0.11		0.04
Fluoranthene	0.01	0.01	0.04	0.07	0.03		ND
Pyrene	0.01	0.02	0.07	0.09	0.05		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	0.01	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	0.03	ND		ND
Dibenz(a,h)anthracene	0.01	ND	ND	ND	ND		ND
Benzo(ghi)perylene	0.01	0.04	0.03	0.25	0.01		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	0.01	0.03	0.06	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	0.05	0.07	0.06	ND		ND
Other PAH							
Naphthalene	0.05	0.15	0.56	0.74	0.60		ND
Anthracene	0.05	ND	ND	ND	ND		ND
Chlorobenzenes							
Hexachlorobenzene	0.01	ND	ND	ND	ND		ND

DATA REPORT

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

Date Extracted: 30-Aug-21
Date Analysed: 10-Sep-21

Client ID:		MV Unit 3 – DF - Blank	MV Unit 3 – DF - Run 1	MV Unit 3 – DF - Run 2	MV Unit 3 – DF - Run 3		BLANK
PRL ID:		PR212732	PR212733	PR212734	PR212735		PH210790B
NPRI PAH	**DL**						
Surrogate Recoveries (%)							
d8-Naphthalene		72	84	68	76		68
d10-Acenaphthylene		132	92	80	84		68
d10-Acenaphthene		112	84	80	84		72
d10-Fluorene		140	96	96	88		64
d10-Phenanthrene		124	100	72	68		44
d10-Fluoranthene		120	100	92	96		64
d10-Pyrene		116	100	92	96		72
d12-Chrysene		132	120	104	116		116
d12-Benzo(b)fluoranthene		124	116	108	112		120
d12-Benzo(a)pyrene		108	104	104	108		84
d14-Dibenz(a,h)anthracene		128	112	124	108		92
13C6-Hexachlorobenzene		52	60	40	36		32

ND - none detected

DATA REPORT

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

Date Extracted: 30-Aug-21
Date Analysed: 10-Sep-21

Client ID: SPIKE
PRL ID: PH210791S

NPRI PAH

	µg/g	LOF	Recovery	Acceptable	Pass/Fail
Acenaphthene	0.90	1	90%	50-150%	pass
Acenaphthylene	0.88	1	88%	50-150%	pass
Benz(a)anthracene	0.78	1	78%	50-150%	pass
Benzo(a)pyrene	0.74	1	74%	50-150%	pass
Benzo(b)fluoranthene	0.80	1	80%	50-150%	pass
Benzo(ghi)perylene	0.86	1	86%	50-150%	pass
Benzo(k)fluoranthene	0.79	1	79%	50-150%	pass
Chrysene	0.80	1	80%	50-150%	pass
Dibenz(a,h)anthracene	0.79	1	79%	50-150%	pass
Fluoranthene	0.85	1	85%	50-150%	pass
Fluorene	0.88	1	88%	50-150%	pass
Indeno(1,2,3-cd)pyrene	0.86	1	86%	50-150%	pass
Phenanthrene	0.83	1	83%	50-150%	pass
Pyrene	0.85	1	85%	50-150%	pass
Dibenz(a,h)acridine	0.84	1	84%		
Dibenz(a,j)acridine	0.77	1	77%		
7H-Dibenzo(c,g)carbazole	0.79	1	79%		
Dibenzo(a,e)fluoranthene	0.68	1	68%		
Dibenzo(a,h)pyrene	0.62	1	62%		
Dibenzo(a,e)pyrene	0.73	1	73%		
Dibenzo(a,i)pyrene	0.52	1	52%		
Dibenzo(a,l)pyrene	0.51	1	51%		
7,12-Dimethylbenz(a)anthracene	0.63	1	63%		
3-Methylcholanthrene	0.53	1	53%		
5-Methylchrysene	0.81	1	81%		
1-Nitropyrene	0.90	1	90%		
Perylene	0.75	1	75%		
Other PAH					
Naphthalene	0.95	1	95%	50-150%	pass
Chlorobenzenes					
Hexachlorobenzene	1.25	1	125%	50-150%	pass

DATA REPORT

Client: A. Lanfranco & Associates
Contact: Mark Lanfranco

Date Extracted: 30-Aug-21
Date Analysed: 14-Sep-21

	Client ID:	MV Unit 3 - DF - Blank	MV Unit 3 - DF - Run 1	MV Unit 3 - DF - Run 2	MV Unit 3 - DF - Run 3		BLANK
	PRL ID:	PR212732	PR212733	PR212734	PR212735		CP210790B
Compound	**DL µg**	**µg**	**µg**	**µg**	**µg**		**µg**
Trichlorobenzenes	0.05	ND	0.672	1.36	1.03		ND
Tetrachlorobenzenes	0.05	ND	0.165	0.312	0.275		ND
Pentachlorobenzene	0.05	ND	ND	ND	ND		ND
Hexachlorobenzene	0.01	ND	ND	ND	ND		ND
Surrogate Recoveries (%)							
13C6-Hexachlorobenzene		92	60	64	76		64

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		36	44	44	44		32
13C6-Tetrachlorophenol		32	32	48	48		40
13C6-Pentachlorophenol		52	28	48	40		28

ND - none detected

QC REPORT - SPIKE

Client:	A. Lanfranco & Associates	**Date Extracted:**	30-Aug-21
Contact:	Mark Lanfranco	**Date Analysed:**	14-Sep-21

Client ID: SPIKE
PRL ID: CP210791S

Compound	LOF µg	µg	Recovery
Trichlorobenzenes	2.0	2.49	125%
Tetrachlorobenzenes	3.0	3.69	123%
Pentachlorobenzene	1.0	1.30	130%
Hexachlorobenzene	1.0	1.28	128%
Trichlorophenols	1.0	0.91	91%
Tetrachlorophenols	1.0	1.29	129%
Pentachlorophenol	1.0	0.69	69%

LOF - level of fortification

Acronyms used in reporting dioxins and furans:

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

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

Acceptable recoveries for surrogates	**EPA 1613**	
	Min (%)	**Max (%)**
$^{13}C_{12}$ -2,3,7,8-TCDD	25	164
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	25	181
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	32	141
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	28	130
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	23	140
$^{13}C_{12}$ -OCDD	17	157
$^{13}C_{12}$ -2,3,7,8-TCDF	24	169
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	24	185
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	21	178
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	26	152
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	26	123
$^{13}C_{12}$ -1,2,3,7,8,9-HxCDF	29	147
$^{13}C_{12}$ -2,3,4,6,7,8-HxCDF	28	136
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	28	143
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	26	138

Acceptable recoveries for Polycyclic Aromatic Hydrocarbon Standards in Environmental Samples

	Surrogate Recovery	
	Min (%)	**Max (%)**
Naphthalene-d8	0	135
Biphenyl-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

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

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: 20-Aug-21

EMAIL: mark.lanfranco@alanfranco.com

CLIENT: Metro Vancouver WTE

SOURCE: Unit - 3

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
MV Unit 3 - DF - Blank	PR21 2732	18-Aug-21		5	X	X		X	X				X	
MV Unit 3 - DF - Run 1	2733	18-Aug-21		5	X	X		X	X				X	
MV Unit 3 - DF - Run 2	2734	19-Aug-21		5	X	X		X	X				X	
MV Unit 3 - DF - Run 3	2735	19-Aug-21		5	X	X		X	X				X	

Sampler's Signature	Relinquished by:	Company	Date	Time	Received by:
					ED

Comments	Method of Shipment	Waybill No.:	Rec'd for PRL:	Date	Time
					3:20
	Shipment Condition	Temp.:	Cooler Opened By:		
					20Aug21

APPENDIX 2

COMPUTER OUTPUTS OF MEASURED and CALCULATED DATA

Client:	Metro Vancouver	**Date:**	18-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	1 PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:30 - 12:32

Dioxin Concentration:	**0.7**	**pg/dscm**	0.0003	gr/dscf
	0.4	**pg/dscm**	0.0002	gr/Acf
	0.6	pg/dscm (@ 11% O2)	0.0003	gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.2546	dscm	114.938	dscf
Total Sample Time:	240.0	minutes		
Average Isokineticity:	102.4	%		

Flue Gas Characteristics

Moisture:	15.03	%		
Temperature	150.0	oC	302.1	oF
Flow	1097.2	dscm/min	38749	dscf/min
	18.29	dscm/sec	645.8	dscf/sec
	1927.9	Acm/min	68083	Acf/min
Velocity	12.615	m/sec	41.39	f/sec
Gas Analysis	8.86	% O2	10.88	% CO2
	30.094	Mol. Wt (g/gmole) Dry	28.276	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:**	18-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	1 PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:30 - 12:32

Control Unit (Y)	0.9885
Nozzle Diameter (in.)	0.2463
Pitot Factor	0.8461
Baro. Press. (in. Hg)	30.09
Static Press. (in. H2O)	-15.75
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	10.75	9.00
Trav 2	11.00	8.72
Average =	**10.88**	**8.86**

Condensate Collection:

Impinger 1 (grams)	411.0
Impinger 2 (grams)	4.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	17.0
Total Gain (grams)	**432.0**

Collection:

D/F TEQ (ng)	**0.0023**

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	657.888							
1	1	5.0	660.720	0.480	1.09	71	71	296	1.5	102.3
		10.0	663.560	0.480	1.09	71	71	295	1.5	102.6
	2	15.0	666.490	0.510	1.16	71	71	295	4.7	102.7
		20.0	669.410	0.510	1.15	71	71	296	4.7	102.4
	3	25.0	672.160	0.450	1.02	72	72	295	8.4	102.4
		30.0	674.910	0.450	1.02	72	72	295	8.4	102.4
	4	35.0	677.540	0.410	0.93	73	73	294	12.5	102.3
		40.0	680.180	0.410	0.94	74	74	294	12.5	102.5
	5	45.0	682.790	0.400	0.91	75	75	296	17.7	102.5
		50.0	685.400	0.400	0.91	75	75	296	17.7	102.5
	6	55.0	688.080	0.420	0.96	76	76	296	25.2	102.5
		60.0	690.760	0.420	0.96	76	76	297	25.2	102.6
	7	65.0	692.870	0.260	0.59	77	77	299	45.6	102.5
		70.0	694.980	0.260	0.59	78	78	299	45.6	102.3
	8	75.0	697.050	0.250	0.57	79	79	299	53.2	102.2
		80.0	699.120	0.250	0.57	79	79	299	53.2	102.2
	9	85.0	700.970	0.200	0.46	79	79	301	58.3	102.2
		90.0	702.830	0.200	0.46	80	80	301	58.3	102.6
	10	95.0	704.780	0.220	0.50	80	80	301	62.5	102.5
		100.0	706.730	0.220	0.50	80	80	301	62.5	102.5
	11	105.0	708.630	0.210	0.48	80	80	301	66.1	102.3
		110.0	710.530	0.210	0.48	81	81	301	66.1	102.1
	12	115.0	712.390	0.200	0.46	81	81	300	69.4	102.3
		120.0	714.250	0.200	0.46	81	81	300	69.4	102.3
		0.0	714.250							
2	1	5.0	716.340	0.250	0.58	83	83	300	1.5	102.5
		10.0	718.510	0.270	0.62	83	83	302	1.5	102.5
	2	15.0	720.590	0.250	0.57	83	83	303	4.7	102.2
		20.0	722.720	0.260	0.60	84	84	303	4.7	102.4
	3	25.0	724.810	0.250	0.57	84	84	304	8.4	102.6
		30.0	726.980	0.270	0.62	84	84	304	8.4	102.5
	4	35.0	729.110	0.260	0.60	84	84	305	12.5	102.6
		40.0	731.280	0.270	0.62	85	85	306	12.5	102.4
	5	45.0	733.410	0.260	0.59	85	85	308	17.7	102.6
		50.0	735.500	0.250	0.57	85	85	307	17.7	102.6
	6	55.0	737.670	0.270	0.62	86	86	307	25.2	102.3
		60.0	739.680	0.230	0.53	86	86	306	25.2	102.6
	7	65.0	742.480	0.450	1.03	86	86	306	45.6	102.3
		70.0	745.280	0.450	1.03	86	86	306	45.6	102.3
	8	75.0	748.260	0.510	1.17	86	86	307	53.2	102.4
		80.0	751.300	0.530	1.21	86	86	308	53.2	102.5
	9	85.0	754.310	0.520	1.19	87	87	309	58.3	102.3
		90.0	757.270	0.500	1.15	87	87	309	58.3	102.6
	10	95.0	760.280	0.520	1.19	87	87	309	62.5	102.3
		100.0	763.270	0.510	1.17	87	87	308	62.5	102.6
	11	105.0	766.290	0.520	1.19	87	87	308	66.1	102.6
		110.0	769.620	0.630	1.45	88	88	308	66.1	102.7
	12	115.0	772.920	0.620	1.42	88	88	310	69.4	102.7
		120.0	776.110	0.580	1.33	88	88	310	69.4	102.6
			Average:	0.364	0.831	81.0	81.0	302.1		102.4

Client:	Metro Vancouver	**Date:**	19-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	2 PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:36 - 12:38

Dioxin Concentration:	**3.68**	**pg/dscm**	0.0016	gr/dscf
	2.0	**pg/dscm**	0.0009	gr/Acf
	3.18	pg/dscm (@ 11% O2)	0.0014	gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.5888	dscm	126.737	dscf
Total Sample Time:	240.0	minutes		
Average Isokineticity:	103.1	%		

Flue Gas Characteristics

Moisture:	15.90	%		
Temperature	152.8	oC	307.1	oF
Flow	1099.1	dscm/min	38815	dscf/min
	18.32	dscm/sec	646.9	dscf/sec
	1986.5	Acm/min	70154	Acf/min
Velocity	12.999	m/sec	42.65	f/sec
Gas Analysis	9.46	% O2	10.18	% CO2
	30.006	Mol. Wt (g/gmole) Dry	28.098	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:**	19-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	2 PCDD-PCDF
Source:	Unit 3	**Run Time:**	08:36 - 12:38

Control Unit (Y)	0.9885
Nozzle Diameter (in.)	0.2575
Pitot Factor	0.8461
Baro. Press. (in. Hg)	30.00
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	10.25	9.42
Trav 2	10.10	9.50
Average =	**10.18**	**9.46**

Condensate Collection:

Impinger 1 (grams)	484.0
Impinger 2 (grams)	8.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	16.9
Total Gain (grams)	**508.9**

Collection:

D/F TEQ (ng) **0.0132**

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	782.250							
1	1	5.0	785.100	0.400	1.08	70	70	300	1.5	104.7
		10.0	788.020	0.420	1.14	71	71	301	1.5	104.6
	2	15.0	790.870	0.400	1.08	72	72	301	4.7	104.4
		20.0	793.660	0.380	1.03	72	72	301	4.7	104.8
	3	25.0	796.650	0.440	1.19	74	74	300	8.4	104.0
		30.0	799.690	0.450	1.22	74	74	300	8.4	104.5
	4	35.0	802.620	0.420	1.14	75	75	300	12.5	104.1
		40.0	805.540	0.420	1.14	76	76	300	12.5	103.5
	5	45.0	808.730	0.500	1.36	77	77	302	17.7	103.7
		50.0	811.990	0.520	1.41	78	78	303	17.7	103.8
	6	55.0	815.120	0.480	1.30	78	78	304	25.2	103.7
		60.0	818.240	0.480	1.30	79	79	305	25.2	103.3
	7	65.0	820.790	0.320	0.87	80	80	307	45.6	103.2
		70.0	823.260	0.300	0.81	80	80	309	45.6	103.4
	8	75.0	825.520	0.250	0.68	80	80	308	53.2	103.5
		80.0	827.680	0.230	0.62	81	81	309	53.2	103.0
	9	85.0	829.800	0.220	0.60	81	81	309	58.3	103.4
		90.0	831.920	0.220	0.60	82	82	308	58.3	103.1
	10	95.0	833.940	0.200	0.54	82	82	307	62.5	103.0
		100.0	835.960	0.200	0.54	83	83	307	62.5	102.8
	11	105.0	837.980	0.200	0.54	83	83	307	66.1	102.8
		110.0	839.950	0.190	0.51	83	83	307	66.1	102.8
	12	115.0	841.920	0.190	0.51	84	84	308	69.4	102.7
		120.0	843.830	0.180	0.49	84	84	308	69.4	102.3
								.		
		0.0	843.830							
2	1	5.0	846.220	0.280	0.76	83	83	308	1.5	102.9
		10.0	848.790	0.320	0.87	84	84	309	1.5	103.4
	2	15.0	851.130	0.270	0.73	84	84	309	4.7	102.5
		20.0	853.600	0.300	0.81	85	85	308	4.7	102.4
	3	25.0	856.160	0.320	0.87	84	84	311	8.4	103.1
		30.0	858.720	0.320	0.87	83	83	310	8.4	103.2
	4	35.0	861.200	0.300	0.81	83	83	311	12.5	103.4
		40.0	863.770	0.320	0.87	84	84	312	12.5	103.6
	5	45.0	866.160	0.280	0.76	84	84	310	17.7	102.8
		50.0	868.630	0.300	0.81	85	85	311	17.7	102.6
	6	55.0	871.110	0.300	0.81	85	85	311	25.2	103.0
		60.0	873.590	0.300	0.81	86	86	310	25.2	102.7
	7	65.0	876.660	0.460	1.25	85	85	311	45.6	103.1
		70.0	879.790	0.480	1.30	86	86	311	45.6	102.7
	8	75.0	883.170	0.560	1.52	85	85	311	53.2	102.9
		80.0	886.620	0.580	1.57	86	86	312	53.2	103.1
	9	85.0	890.110	0.600	1.63	85	85	313	58.3	102.8
		90.0	893.620	0.600	1.63	86	86	313	58.3	103.2
	10	95.0	897.060	0.580	1.57	86	86	314	62.5	102.9
		100.0	900.430	0.560	1.52	87	87	314	62.5	102.4
	11	105.0	903.740	0.540	1.46	86	86	308	66.1	102.2
		110.0	906.990	0.520	1.41	86	86	305	66.1	102.1
	12	115.0	910.080	0.470	1.27	87	87	300	69.4	101.5
		120.0	913.110	0.450	1.22	87	87	299	69.4	101.6
			Average:	0.375	1.017	81.7	81.7	307.1		103.1

Client:	Metro Vancouver	**Date:**	19-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	3 - PCDD-PCDF
Source:	Unit 3	**Run Time:**	12:57 - 17:00

Dioxin Concentration:	**3.2**	**pg/dscm**	0.0014	gr/dscf
	1.7	pg/Acm	0.0008	gr/Acf
	2.8	pg/dscm (@ 11% O2)	0.0012	gr/dscf (@ 11% O2)

Emission Rate: see D/F data Table 2

Sample Gas Volume:	3.6826	dscm	130.051	dscf
Total Sample Time:	240.0	minutes		
Average Isokineticity:	104.1	%		

Flue Gas Characteristics

Moisture:	16.22	%		
Temperature	154.1	oC	309.5	oF
Flow	1117.7	dscm/min	39472	dscf/min
	18.63	dscm/sec	657.9	dscf/sec
	2037.9	Acm/min	71968	Acf/min
Velocity	13.335	m/sec	43.75	f/sec
Gas Analysis	9.74	% O2	9.80	% CO2
	29.957	Mol. Wt (g/gmole) Dry	28.018	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:**	19-Aug-21
Jobsite:	WTE (Burnaby, BC)	**Run:**	3 - PCDD-PCDF
Source:	Unit 3	**Run Time:**	12:57 - 17:00

Control Unit (Y)	0.9885
Nozzle Diameter (in.)	0.2575
Pitot Factor	0.8450
Baro. Press. (in. Hg)	29.99
Static Press. (in. H2O)	-19.60
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	10.42	8.88
Trav 2	9.17	10.60
Average =	**9.80**	**9.74**

Condensate Collection:

Impinger 1 (grams)	510.0
Impinger 2 (grams)	8.0
Impinger 3 (grams)	0.0
Impinger 4 (grams)	16.8
Total Gain (grams)	**534.8**

Collection:

D/F TEQ (ng)	**0.0117**

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	913.650							
1	1	5.0	916.880	0.500	1.37	86	86	305	1.5	103.9
		10.0	920.100	0.500	1.35	86	86	314	1.5	104.2
	2	15.0	923.380	0.520	1.41	86	86	315	4.7	104.1
		20.0	926.660	0.520	1.41	86	86	315	4.7	104.1
	3	25.0	929.820	0.480	1.30	86	86	311	8.4	104.1
		30.0	932.980	0.480	1.30	86	86	310	8.4	104.0
	4	35.0	936.050	0.450	1.23	87	87	309	12.5	104.1
		40.0	939.150	0.460	1.26	87	87	308	12.5	103.9
	5	45.0	942.260	0.460	1.26	87	87	306	17.7	104.1
		50.0	945.410	0.470	1.29	88	88	305	17.7	104.1
	6	55.0	948.490	0.450	1.24	88	88	306	25.2	104.1
		60.0	951.530	0.440	1.21	88	88	307	25.2	103.9
	7	65.0	954.040	0.300	0.82	88	88	306	45.6	103.8
		70.0	956.590	0.310	0.85	88	88	307	45.6	103.8
	8	75.0	958.930	0.260	0.72	89	89	306	53.2	103.7
		80.0	961.270	0.260	0.72	89	89	306	53.2	103.7
	9	85.0	963.470	0.230	0.63	89	89	306	58.3	103.6
		90.0	965.720	0.240	0.66	89	89	305	58.3	103.7
	10	95.0	968.020	0.250	0.69	89	89	306	62.5	103.9
		100.0	970.320	0.250	0.69	89	89	306	62.5	103.9
	11	105.0	972.470	0.220	0.60	89	89	307	66.1	103.6
		110.0	974.630	0.220	0.61	89	89	306	66.1	104.0
	12	115.0	976.690	0.200	0.55	90	90	307	69.4	103.9
		120.0	978.750	0.200	0.55	90	90	306	69.4	103.8
		0.0	978.750							
2	1	5.0	981.290	0.300	0.84	90	90	298	1.5	104.1
		10.0	983.890	0.320	0.88	90	90	309	1.5	103.9
	2	15.0	986.400	0.300	0.82	89	89	311	4.7	103.9
		20.0	988.910	0.300	0.82	90	90	312	4.7	103.8
	3	25.0	991.460	0.310	0.85	90	90	312	8.4	103.7
		30.0	994.170	0.350	0.96	90	90	313	8.4	103.8
	4	35.0	996.590	0.280	0.76	90	90	314	12.5	103.7
		40.0	999.100	0.300	0.82	90	90	314	12.5	103.9
	5	45.0	1001.610	0.300	0.82	90	90	314	17.7	103.9
		50.0	1004.160	0.310	0.84	90	90	315	17.7	103.9
	6	55.0	1006.580	0.280	0.76	90	90	314	25.2	103.7
		60.0	1008.970	0.270	0.74	91	91	312	25.2	104.0
	7	65.0	1012.090	0.410	1.26	91	91	312	45.6	110.3
		70.0	1015.650	0.600	1.64	91	91	313	45.6	104.2
	8	75.0	1019.170	0.590	1.61	91	91	315	53.2	104.0
		80.0	1022.660	0.570	1.58	92	92	306	53.2	104.1
	9	85.0	1026.170	0.580	1.59	92	92	311	58.3	104.1
		90.0	1029.650	0.570	1.57	92	92	311	58.3	104.1
	10	95.0	1033.220	0.600	1.65	92	92	312	62.5	104.2
		100.0	1036.760	0.590	1.62	92	92	312	62.5	104.2
	11	105.0	1040.310	0.560	1.54	92	92	312	66.1	107.2
		110.0	1043.440	0.490	1.35	93	93	310	66.1	100.7
	12	115.0	1046.710	0.500	1.38	93	93	309	69.4	104.1
		120.0	1049.880	0.470	1.30	93	93	308	69.4	104.0
			Average:	0.392	1.078	89.4	89.4	309.5		104.1

APPENDIX 3

FIELD DATA SHEETS

A. Lanfranco and Associates Inc.

SH

CLIENT: Metro Van WTE	NOZZLE: G247	DIAMETER, IN. 0.2463	
SOURCE: Unit 3	PROBE: 7C	Cp 0.8461	
PARAMETER / RUN No: D/F Run 1	PORT LENGTH		
DATE: 18 Aug 2021	STATIC PRESSURE, IN. H2O: -15.75		
OPERATOR: LA JC	STACK DIAMETER		
CONTROL UNIT: CAE AH	Y 0.9885	STACK HEIGHT	
	ΔH@ 1.879		
BAROMETRIC PRESSURE, IN. Hg: 30.09	INITIAL LEAK TEST: 0.022@15"		
ASSUMED MOISTURE, Bw: 15%	FINAL LEAK TEST		

IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)
Imp. #1	0	411	
Imp. #2	100	104	
Imp. #3	0	0	
Imp. #4	Gel		
Imp. #5			
Imp. #6			
Upstream Diameters			
Downstream Diameters			

Testo 1

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	O_2 Vol. %	NOx ppm	CO ppm	XAD Temp °F
	830	657.888													
1		660.72	0.48	1.09	71	296	251	250	55	5					
1		663.86	0.48	1.09	71	295					10.0	10.0	90	36	41
2		666.49	0.51	1.16	71	295	253	253	54	5					
2		669.41	0.51	1.15	71	296									
3		672.16	0.45	1.02	72	295	253	252	53	5					
3		674.91	0.45	1.02	72	295					10.5	9.5	63	50	48
4		677.54	0.41	0.93	73	294	253	252	53	5					
4		680.18	0.41	0.94	74	294									
5		682.79	0.40	0.91	75	296	251	253	51	5					
5		685.40	0.40	0.91	75	296					11.0	8.5	91	49	47
6		688.09	0.42	0.96	76	296	252	252	52	5					
6		690.76	0.42	0.96	76	297									
7		692.87	0.26	0.59	77	299	251	250	53	4					
7		694.98	0.26	0.59	78	299					11.0	9.0	81	47	41
8		697.05	0.25	0.57	79	299	253	252	53	4					
8		699.12	0.25	0.57	79	299									
9		700.97	0.20	0.46	79	301	252	251	55	4					
9		702.83	0.20	0.46	80	301					11.0	8.5	80	29	48
10		704.78	0.22	0.50	80	301	251	250	56	4					
10		706.73	0.22	0.50	80	301									
11		708.63	0.21	0.48	80	301	251	251	56	4					
11		710.53	0.21	0.48	81	301					11.0	8.5	83	43	41
12		712.39	0.20	0.46	81	300	252	250	56	4					
12	1030	714.25	0.20	0.46	81	300									

Init L/C start: 656.820

A. Lanfranco and Associates Inc.

CLIENT	Metro Van WTF				NOZZLE	DIAMETER, IN.				IMPINGER	INITIAL	FINAL	TOTAL GAIN						
SOURCE	Unit 3				PROBE	Cp				VOLUMES	(mL)	(mL)	(mL)						
PARAMETER / RUN No	DIF Run 1 con't									Imp. #1									
DATE	18 Aug 2021				PORT LENGTH					Imp. #2									
OPERATOR:	LA JC				STATIC PRESSURE, IN. H2O					Imp. #3									
CONTROL UNIT	Y				STACK DIAMETER					Imp. #4									
	ΔH@				STACK HEIGHT					Imp. #5									
BAROMETRIC PRESSURE, IN. Hg										Imp. #6									
ASSUMED MOISTURE, Bw					INITIAL LEAK TEST					Upstream Diameters									
					FINAL LEAK TEST 0.002 @15"					Downstream Diameters									

Test 1

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites		NO_x ppm	CO ppm	XAD Temp °F
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %			
	1032	714.25													
1		716.34	0.25	0.58	83	300	254	251	56	4					42
1		718.51	0.27	0.62	83	302									
2		720.59	0.25	0.57	83	303	253	250	56	4	11.0	8.6	82	50	
2		722.72	0.26	0.60	84	303									
3		724.81	0.25	0.57	84	304	250	250	57	4					41
3		726.98	0.27	0.62	84	304	2								
4		729.11	0.26	0.60	84	305	251	251	56	5	11.0	8.4	81	50	41
4		731.28	0.27	0.62	85	306									
5		733.41	0.26	0.59	85	308	250	251	58	5					
5		735.50	0.25	0.57	85	307									
6		737.67	0.27	0.62	86	307	250	250	59	5	11.0	8.3	80	44	41
6		739.68	0.23	0.53	86	306									
7		742.48	0.45	1.03	86	306	250	250	60	4					
7		745.28	0.45	1.03	86	306									
8		748.26	0.51	1.17	86	307	251	251	57	6	11.0	9.1	91	33	42
8		751.30	0.53	1.21	86	308									
9		754.31	0.52	1.19	87	309	251	251	58	6					
9		757.27	0.50	1.15	87	309									
10		760.28	0.52	1.19	87	309	253	251	58	6	11.0	8.4	85	59	40
10		763.27	0.51	1.17	87	308									
11		766.29	0.52	1.19	87	308	252	251	56	6					
11		769.62	0.63	1.45	88	308									
12		772.92	0.62	1.42	88	310	250	250	57	7	11.0	9.5	115	59	41
12	1232	~~776.11~~ 776.11	0.58	1.33	88	310									

Final leak check end: 776.77~~0~~ 69

$\sqrt{4.51}$ 2.71 ΔH

S.H.

A. Lanfranco and Associates Inc.

CLIENT	MVRD	NOZZLE ~~.245~~ TC	DIAMETER, IN. ~~.2444~~ 0.2575	IMPINGER	INITIAL	FINAL	TOTAL GAIN
		PROBE	Cp .8461	VOLUMES	(mL)	(mL)	(mL)
SOURCE	Unit #3			Imp. #1	0	484	484
PARAMETER / RUN No	2 PCDD/PCDF	PORT LENGTH		Imp. #2	100	108	8
DATE	Aug. 19/21	STATIC PRESSURE, IN. H2O	−19.00	Imp. #3	0	—	
OPERATOR:	C.L. + S.B.	STACK DIAMETER	70.9"	Imp. #4			
CONTROL UNIT	AL1 Y .9885	STACK HEIGHT	30'	Imp. #5			
	ΔH@			Imp. #6			
BAROMETRIC PRESSURE, IN. Hg	30.00	INITIAL LEAK TEST	0.005 @ 15"	Upstream Diameters			
ASSUMED MOISTURE, Bw	15%	FINAL LEAK TEST	0.002 @ 15"	Downstream Diameters			

5 min Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites CO_2 Vol. %	O_2 Vol. %	XAD
	08:36	782.250											
1 4		785.10	.40	1.08	70	300	250	250	58	4			42
1 9		788.02	.42	1.14	71	301							
2 14		790.87	.40	1.08	72	301	250	250	60	4	10.0	10.0	44
2 19		793.66	.38	1.03	72	301							
3 24		796.65	.44	1.19	74	300	250	250	60	4			48
3 29		799.69	.45	1.22	74	300							
4 34		802.62	.42	1.14	75	300	250	250	58	5			44
4 39		805.54	.42	1.14	76	300					10.0	10.0	
5 44		808.73	.50	1.36	77	302	250	250	56	5			42
5 49		811.99	.52	1.41	78	303							
6 54		815.12	.48	1.30	78	304	250	250	54	5			42
6 59		818.24	.48	1.30	79	305							
7 64		820.79	.32	.87	80	307	250	250	55	6	10.0	9.5	45
7 69		823.26	.30	.81	80	309							
8 74		825.52	.25	.68	80	308	250	250	56	6			44
8 79		827.68	.23	.62	81	309							
9 84		829.80	.22	.60	81	309	250	250	58	6			44
9 89		831.92	.22	.60	82	308					10.5	9.0	
10 94		833.94	.20	.54	82	307	250	250	58	6			46
10 99		835.96	.20	.54	83	307							
11 104		837.98	.20	.54	83	307	250	250	57	4			48
11 109		839.95	.19	.51	83	307							
12 114		841.92	.19	.51	84	308	250	250	58	4	10.5	9.0	42
12 119		843.83	.18	.49	84	308							
1		846.22	.28	.76	83	308	250	250	56	4			44
1		848.79	.32	.87	84	309					10.5	9.0	
2		851.13	.27	.73	84	309	250	250	58	4			44
2		853.60	.30	.81	85	308							

√4.51 271ΔH

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CLIENT	MVRD			NOZZLE	G245	DIAMETER, IN.	.2447		IMPINGER VOLUMES	INITIAL (mL)	FINAL (mL)	TOTAL GAIN (mL)					
SOURCE	Unit #3			PROBE	7C	Cp	.8461		Imp. #1								
PARAMETER / RUN No	2 PCDD/PCDF Cont.			PORT LENGTH					Imp. #2								
DATE	Aug. 19 '21			STATIC PRESSURE, IN. H2O			-19.00		Imp. #3								
OPERATOR:	J.C.L & S.B			STACK DIAMETER			70.9"		Imp. #4								
CONTROL UNIT	ALI	Y	.9885	STACK HEIGHT			30'		Imp. #5								
		ΔH@							Imp. #6								
BAROMETRIC PRESSURE, IN. Hg	30.00			INITIAL LEAK TEST	REFER TO				Upstream Diameters								
ASSUMED MOISTURE, Bw	15%			FINAL LEAK TEST	OTHER DATA SHEET				Downstream Diameters								

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites		XAD	
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %		
	CONTINUED	853.60												
3		856.16	.32	.87	84	311	250	250	55	4			45	
3		858.72	.32	.87	83	310					10.5	9.0		
4		861.20	.30	.81	83	311	250	250	56	4			46	
4		863.77	.30	.87	84	312								
5		866.16	.28	.76	84	310	250	250	56	4			46	
5		868.63	.30	.81	85	311					10.0	10.0		
6		871.11	.30	.81	85	311	250	250	58	4			45	
6		873.59	.30	.81	86	310								
7		876.63	.46	.125	85	311	250	250	60	5			46	
7		879.79	.46	.130	86	311								
8		883.17	.56	.152	85	311	250	250	58	5	10.0	9.5	45	
8		886.62	.58	.157	86	312								
9		890.11	.60	.163	85	313	250	250	56	6			46	
9		893.62	.60	.163	86	312								
10		897.05	.58	.157	86	314	250	250	58	7	10.0	9.0	48	
10		900.43	.56	.150	87	314								
11		903.71	.54	.146	86	308	250	250	58	7			50	
11		906.99	.52	.141	86	305								
12		910.08	.47	.127	81	300	250	250	60	7	10.0	10.0	52	
12	12:38	913.11	.45	.122	87	299								

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FH.

CLIENT	Metro Van WTE			NOZZLE	P	DIAMETER, IN.	0.275		IMPINGER	INITIAL	FINAL	TOTAL GAIN					
PROBE	ALG-MRD 1	Cp	0.8456						VOLUMES	(mL)	(mL)	(mL)					
SOURCE	Unit 3								Imp. #1	0	510						
PARAMETER / RUN No	DF Run 3			PORT LENGTH					Imp. #2	100	108						
DATE	19 Aug 2021			STATIC PRESSURE, IN. H2O			-19.6"		Imp. #3	0							
OPERATOR:	LA JC			STACK DIAMETER					Imp. #4	Gel							
CONTROL UNIT	CAE AH	Y	0.9885	STACK HEIGHT					Imp. #5								
		ΔH@	1.879						Imp. #6								
BAROMETRIC PRESSURE, IN. Hg	29.99			INITIAL LEAK TEST	0.002@15"				Upstream Diameters								
ASSUMED MOISTURE, Bw	15%			FINAL LEAK TEST					Downstream Diameters								

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F					Pump Vac. IN. Hg	Fyrites		NO_x ppm	CO ppm	RAD Temp °F
					Dry Gas Outlet	Stack	Probe	Box	Impinger Exit		CO_2 Vol. %	O_2 Vol. %			
1	1257	913.650													
1		916.88	0.50	1.37	86	305	250	252	60	6					41
1		920.10	0.50	1.35	86	314					10.5	8.5	77	51	
2		923.38	0.52	1.41	86	315	251	250	57	7					41
2		926.66	0.52	1.41	86	315									
3		929.82	0.48	1.30	86	311	251	250	56	7					41
3		932.98	0.46	1.30	86	310					11.0	8.1	77	95	
4		936.05	0.45	1.23	87	309	251	251	57	7					42
4		939.15	0.46	1.26	87	309									
5		942.26	0.46	1.26	87	306	251	250	56	7					42
5		945.41	0.47	1.29	88	305					10.5	8.5	89	56	
5		948.49	0.45	1.24	88	306	250	251	56	7					42
6		951.53	0.44	1.21	88	307									
7		954.04	0.30	0.82	88	306	251	250	58	7					42
7		956.59	0.31	0.85	88	307					10.0	9.7	67	51	
8		959.93	0.26	0.72	89	306	251	250	59	7					43
8		961.27	0.26	0.72	89	306									
9		963.47	0.23	0.63	89	306	251	250	60	6					41
9		965.72	0.24	0.66	89	305					10.0	9.5	62	53	
10		968.02	0.25	0.69	89	306	252	250	60	6					42
10		970.32	0.25	0.69	89	306									
11		972.47	0.22	0.60	89	307	250	250	61	5					41
11		974.63	0.22	0.61	89	306					10.5	9.0	72	60	
12		976.69	0.20	0.55	90	307	250	251	61	5					
12	1457	978.75	0.20	0.55	90	306									

Initial L/C start: 913.444

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CLIENT Metro Von WTE	NOZZLE DIAMETER, IN.	IMPINGER	INITIAL / FINAL / TOTAL GAIN
SOURCE Unit 3	PROBE Cp	VOLUMES	(mL) / (mL) / (mL)
PARAMETER / RUN No DF Run 3 (con't)		Imp. #1	
DATE 19 Aug 2021	PORT LENGTH	Imp. #2	
OPERATOR: LA JC	STATIC PRESSURE, IN. H2O	Imp. #3	
CONTROL UNIT Y	STACK DIAMETER	Imp. #4	
ΔH@	STACK HEIGHT	Imp. #5	
BAROMETRIC PRESSURE, IN. Hg		Imp. #6	
ASSUMED MOISTURE, Bw	INITIAL LEAK TEST	Upstream Diameters	
	FINAL LEAK TEST 0.002 @ 15"	Downstream Diameters	

Point	Clock Time	Dry Gas Meter ft³	Pitot ΔP IN. H_2O	Orifice ΔH IN. H_2O	Temperature °F: Dry Gas Outlet	Stack	Probe	Box	Impinger Exit	Pump Vac. IN. Hg	Fyrites: CO_2 Vol. %	Fyrites: O_2 Vol. %	NOx PPm	CO PPM	XAD TEMP
	15:00	978.75													
1		981.29	0.30	0.87	90	293	251	247	58	7	9	10.8	72	49	41
1		983.89	0.32	0.88	90	309									
2		986.40	0.30	0.82	89	311	251	249	57	7					41
2		988.91	0.30	0.82	90	312									
3		991.46	0.31	0.85	90	312	252	252	58	7	9.5	10.2	68	64	41
3		994.17	0.35	0.96	90	313									
4		996.59	0.28	0.76	90	314	251	250	58	6					41
4		999.10	0.30	0.82	90	314									
5		1001.61	0.30	0.82	90	314	251	247	58	6	9	10.7	72	44	42
5		4.16	0.31	0.84	90	315									
6		6.58	0.27	0.76	90	314	251	252	59	6					42
6		8.97	0.27	0.74	91	312									
7		12.09	0.41	1.26	91	312	251	251	58	8	9.5	10.2	70	65	41
7		15.65	~~0.57~~ 0.60	1.64	91	313									
8		19.17	0.59	1.61	91	315	252	248	55	9					42
8		22.66	0.57	1.58	92	306									
9		26.17	0.55	1.54	92	311	251	251	56	9	9	11.0	78	71	41
9		29.65	0.57	1.57	92	311									
10		33.22	0.60	1.65	92	312	252	251	55	9					41
10		36.76	0.59	1.62	92	312									
11		40.31	0.56	1.54	92	312	251	249	56	9	9	10.4	84	40	42
11		43.44	0.49	1.35	93	310									
12		46.71	0.50	1.38	93	309	251	251	57	8					41
12	17:00	49.88	0.47	1.30	93	306									

Final leak check 50.266

APPENDIX 4

CALIBRATION DATA and

CERTIFICATION

BAROMETER CALIBRATION FORM

Device	Cal Date	Pbar Env Canada		Device (inches of Hg)		Difference
		(kPa)	(inches of Hg)	Reading	Elevation Corrected	(Env Can - Elv Corr)
LA	29-Jun-21	100.7	29.74	29.61	29.68	0.06
DS	29-Jun-21	100.7	29.74	29.62	29.69	0.05
CL	29-Jun-21	100.7	29.74	29.63	29.70	0.04
ML	29-Jun-21	100.7	29.74	29.60	29.67	0.07
SB	29-Jun-21	100.7	29.74	29.62	29.69	0.05
SH	29-Jun-21	100.7	29.74	29.60	29.67	0.07
MG	29-Jun-21	100.7	29.74	29.65	29.72	0.02
SF	29-Jun-21	100.7	29.74	29.60	29.67	0.07
JG	29-Jun-21	100.7	29.74	29.65	29.72	0.02
JC	29-Jun-21	100.7	29.74	29.62	29.69	0.05
LF		101.8	30.07	30.08	30.15	-0.09

Calibrated by: Jeremy Gibbs Signature:  Date: 29-Jun-21

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

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EPA Method 5

Meter Box Calibration

English Meter Box Units, English K' Factor

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

Date: 29-Jun-21
Barometric Pressure: 29.63 (in. Hg)
Theoretical Critical Vacuum: 13.98 (in. Hg)

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

---------- DRY GAS METER READINGS ----------									-CRITICAL ORIFICE READINGS-					
		Volume	Volume	Volume	Initial Temps.		Final Temps.		Orifice	K' Orifice	Actual	-- Ambient Temperature --		
dH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Total (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
3.75	30.00	554.900	587.654	32.754	86.0	86.0	88.0	88.0	73	0.8185	18.0	81.0	93.0	87.0
1.90	31.00	588.300	612.913	24.613	88.0	88.0	90.0	90.0	63	0.5956	20.5	91.0	86.0	88.5
1.20	24.00	613.200	628.140	14.940	90.0	90.0	91.0	91.0	55	0.4606	22.0	89.0	90.0	89.5
0.68	41.00	628.400	647.782	19.382	91.0	91.0	91.0	91.0	48	0.3560	24.0	92.0	92.0	92.0
0.35	29.00	648.000	657.411	9.411	91.0	91.0	91.0	91.0	40	0.2408	25.0	95.0	93.0	94.0

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

--- DRY GAS METER ---		--------- ORIFICE ---------			-- DRY GAS METER --		--------- ORIFICE ---------			
VOLUME CORRECTED Vm(std) (cu ft)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (cu ft)	CALIBRATION FACTOR Y Value (number)	Variation (number)	CALIBRATION FACTOR dH@ Value (in H2O)	Value (mm H2O)	Variation (in H2O)	Ko (value)
31.589	894.6	31.108	881.0	32.556	0.985	-0.004	1.875	47.63	-0.003	0.701
23.543	666.7	23.359	661.5	24.514	0.992	0.004	1.793	45.53	-0.086	0.713
14.227	402.9	13.973	395.7	14.690	0.982	-0.006	1.891	48.04	0.013	0.702
18.417	521.6	18.408	521.3	19.440	1.000	0.011	1.801	45.74	-0.078	0.708
8.935	253.0	8.791	249.0	9.318	0.984	-0.005	2.033	51.64	0.154	0.677
				Average Y---------->	**0.9885**		**Average dH@----->**	**1.879**	**47.7**	**Average Ko----->**	**0.700**

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: Scott Ferguson Signature:  Date: June 29, 2021

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ENVIRONMENTAL CONSULTANTS

GLASS NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Justin Ching
Date: June 28, 2021

Signature: 

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
A	0.1250	0.1240	0.1245	0.0010	0.1245	0.0000845
G-165	0.1640	0.1655	0.1660	0.0020	0.1652	0.0001488
G-178	0.1780	0.1780	0.1790	0.0010	0.1783	0.0001735
J	0.1880	0.1880	0.1880	0.0000	0.1880	0.0001928
E	0.1880	0.1895	0.1882	0.0015	0.1886	0.0001939
Q	0.2070	0.2050	0.2060	0.0020	0.2060	0.0002315
L	0.2112	0.2120	0.2105	0.0015	0.2112	0.0002434
G-218	0.2180	0.2175	0.2190	0.0015	0.2182	0.0002596
G-223	0.2220	0.2230	0.2225	0.0010	0.2225	0.0002700
G-2231	0.2230	0.2230	0.2225	0.0005	0.2228	0.0002708
G-225	0.2245	0.2250	0.2240	0.0010	0.2245	0.0002749
G-2251	0.2230	0.2260	0.2245	0.0030	0.2245	0.0002749
P-18	0.2375	0.2370	0.2380	0.0010	0.2375	0.0003076
G-245	0.2440	0.2450	0.2450	0.0010	0.2447	0.0003265
G-247	0.2450	0.2470	0.2470	0.0020	0.2463	0.0003310
G-253	0.2525	0.2520	0.2525	0.0005	0.2523	0.0003473
P	0.2580	0.2570	0.2575	0.0010	0.2575	0.0003616
P-2	0.2787	0.2790	0.2785	0.0005	0.2787	0.0004237
G-280	0.2780	0.2800	0.2810	0.0030	0.2797	0.0004266
G-282	0.2810	0.2820	0.2840	0.0030	0.2823	0.0004348
G-287	0.2870	0.2880	0.2860	0.0020	0.2870	0.0004493
G-292	0.2922	0.2920	0.2926	0.0006	0.2923	0.0004659
G-304	0.3040	0.3050	0.3040	0.0010	0.3043	0.0005052
MV-01	0.3050	0.3045	0.3055	0.0010	0.3050	0.0005074
G-3072	0.3070	0.3070	0.3080	0.0010	0.3073	0.0005152
G-309	0.3110	0.3080	0.3080	0.0030	0.3090	0.0005208
G-310	0.3090	0.3105	0.3095	0.0015	0.3097	0.0005230
G-311	0.3120	0.3100	0.3110	0.0020	0.3110	0.0005275
G-316	0.3160	0.3160	0.3170	0.0010	0.3163	0.0005458
V-06	0.3200	0.3210	0.3210	0.0010	0.3207	0.0005608
P-27	0.3387	0.3385	0.3390	0.0005	0.3387	0.0006258
G-344	0.3440	0.3450	0.3440	0.0010	0.3443	0.0006467
G-345	0.3450	0.3450	0.3450	0.0000	0.3450	0.0006492
G-346	0.3450	0.3460	0.3460	0.0010	0.3457	0.0006517
G-366	0.3650	0.3670	0.3650	0.0020	0.3657	0.0007293
G-367	0.3675	0.3650	0.3670	0.0025	0.3665	0.0007326
P-14	0.3910	0.3935	0.3920	0.0025	0.3922	0.0008388
G-437	0.4350	0.4345	0.4355	0.0010	0.4350	0.0010321
G-468	0.4677	0.4670	0.4670	0.0007	0.4672	0.0011907
P-29	0.4680	0.4680	0.4690	0.0010	0.4683	0.0011963
P-7	0.4965	0.4940	0.4930	0.0035	0.4945	0.0013337
B	0.5015	0.5030	0.5025	0.0015	0.5023	0.0013763
G-540	0.5405	0.5400	0.5405	0.0005	0.5403	0.0015924

Where:

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

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

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

Pitot Tube Calibration

Date: 07-Jul-21
Pbar (in.Hg): 29.92

Temp (R): 530
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)
0.055	0.075	15.5	0.8478	0.0017
0.125	0.170	23.4	0.8489	0.0028
0.250	0.340	33.1	0.8489	0.0028
0.450	0.620	44.4	0.8434	0.0027
0.650	0.900	53.4	0.8413	0.0047
		Average :	0.8461	0.0030

Pitot ID: **ST 8A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.085	0.115	19.3	0.8511	0.0078
0.120	0.165	22.9	0.8443	0.0010
0.175	0.240	27.7	0.8454	0.0021
0.430	0.600	43.4	0.8381	0.0052
0.680	0.950	54.6	0.8376	0.0057
		Average :	0.8433	0.0044

Pitot ID: **7A**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.050	0.070	14.8	0.8367	0.0045
0.125	0.170	23.4	0.8489	0.0078
0.300	0.420	36.3	0.8367	0.0045
0.490	0.680	46.3	0.8404	0.0008
0.660	0.910	53.8	0.8431	0.0019
		Average :	0.8412	0.0039

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	13.2	0.8443	0.0037
0.105	0.145	21.5	0.8425	0.0019
0.150	0.210	25.6	0.8367	0.0039
0.330	0.450	38.0	0.8478	0.0072
0.480	0.680	45.9	0.8318	0.0088
		Average :	0.8406	0.0051

Pitot ID: **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	13.2	0.8443	0.0007
0.125	0.170	23.4	0.8489	0.0039
0.250	0.340	33.1	0.8489	0.0039
0.360	0.500	39.7	0.8400	0.0050
0.580	0.800	50.4	0.8430	0.0021
		Average :	0.8450	0.0031

Pitot ID: **ST 8C**

Reference Pitot (in H2O)	S-Type Pitot (in H2O)	Air Velocity (ft/s)	Pitot Coeff. Cp	Deviation (absolute)
0.065	0.090	16.9	0.8413	0.0027
0.150	0.210	25.6	0.8367	0.0019
0.270	0.370	34.4	0.8457	0.0071
0.465	0.650	45.1	0.8373	0.0013
0.650	0.920	53.4	0.8321	0.0065
		Average :	0.8386	0.0039

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	13.2	0.8443	0.0019
0.130	0.180	23.9	0.8413	0.0048
0.250	0.345	33.1	0.8427	0.0034
0.450	0.620	44.4	0.8434	0.0027
0.670	0.890	54.2	0.8590	0.0128
		Average :	0.8461	0.0051

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: Michael Goods Signature: _____ Date: July 7, 2021

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

QUARTZ NOZZLE DIAMETER CALIBRATION FORM

Calibrated by: Justin Ching
Date: June 28, 2021

Signature: 

Nozzle I.D.	d1 (inch)	d2 (inch)	d3 (inch)	difference (inch)	average dia. (inch)	average area (ft^2)
Q-218	0.2180	0.2185	0.2180	0.0005	0.2182	0.0002596
Q-254	0.2540	0.2540	0.2550	0.0010	0.2543	0.0003528
Q-279	0.2790	0.2790	0.2800	0.0010	0.2793	0.0004256
Q-312	0.3125	0.3125	0.3120	0.0005	0.3123	0.0005321
Q-314	0.3120	0.3150	0.3150	0.0030	0.3140	0.0005378
Q-345	0.3445	0.3450	0.3450	0.0005	0.3448	0.0006486
Q-379	0.3800	0.3795	0.3795	0.0005	0.3797	0.0007862
Q-401	0.4020	0.4020	0.4000	0.0020	0.4013	0.0008785
Q-408	0.4070	0.4095	0.4090	0.0025	0.4085	0.0009101
Q-409	0.4105	0.4090	0.4095	0.0015	0.4097	0.0009154
Q-4091	0.4080	0.4090	0.4100	0.0020	0.4090	0.0009124
Q-433	0.4340	0.4320	0.4330	0.0020	0.4330	0.0010226
Q-440	0.4395	0.4400	0.4400	0.0005	0.4398	0.0010551
Q-442	0.4420	0.4430	0.4420	0.0010	0.4423	0.0010672
Q-500	0.5000	0.5005	0.5005	0.0005	0.5003	0.0013654

Where:

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

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

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

A. LANFRANCO and ASSOCIATES INC.

ENVIRONMENTAL CONSULTANTS

TEMPERATURE CALIBRATION FORM

Calibrated by: Justin Ching

Date: 07-Jul-21

Signature: 

TEMPERATURE DEVICE CALIBRATIONS

Reference Device Model CL23A Calibrator			Temperature Settings (degrees F)													
			32		100		200		300		500		800		1700	
Device	**ALA #**	**Serial #**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**	**Reading**	**Variation**
Omega HH11A	3	300132	32.3	0.06%	99.3	-0.13%	200	0.00%	301	0.13%	498	-0.21%	798	-0.16%	1698	-0.09%
Omega HH11A	4	200167		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
Omega HH11A	6	600059	33.1	0.22%	100	0.00%	202	0.30%	302	0.26%	499	-0.10%	798	-0.16%	1697	-0.14%
TPI 341K	7	2.0315E+10	30.5	-0.31%	98.3	-0.30%	198.1	-0.29%	298	-0.26%	497	-0.31%	796.4	-0.29%	1693	-0.32%
TPI 341K	8	2.0313E+10	32.1	0.02%	99.3	-0.13%	200.5	0.08%	299.9	-0.01%	499.3	-0.07%	798.7	-0.10%	1696	-0.19%
Cont Cmpny	10	102008464	30.2	-0.37%	97.5	-0.45%	197.8	-0.33%	297.7	-0.30%	497.7	-0.24%	795.9	-0.33%	1693.8	-0.29%
Omega HH11	14	409426		-6.51%		-17.87%		-30.32%		-39.49%		-52.10%		-63.51%		-78.72%
TPI 341K	16	400120029	30.7	-0.26%	99	-0.18%	199.4	-0.09%	299.2	-0.11%	499.6	-0.04%	800.2	0.02%	1703	0.14%
TPI 341K	18	2.0329E+10	31	-0.20%	98.9	-0.20%	198.9	-0.17%	298.7	-0.17%	498.5	-0.16%	798.4	-0.13%	1698	-0.09%
TPI 341K	20	2.0329E+10	30	-0.41%	98.2	-0.32%	198.1	-0.29%	297.7	-0.30%	497.2	-0.29%	797.1	-0.23%	1696	-0.19%
TPI 341K	22	2.0329E+10	30.5	-0.31%	98.6	-0.25%	198.5	-0.23%	298.3	-0.22%	497.7	-0.24%	797.4	-0.21%	1696	-0.19%
Reference device is a NIST certified digital thermocouple calibrator																
Variation expressed as a percentage of the absolute temperature must be within 1.5 %																

Calibration Certificate

Date: 02-Aug-21
Calibrated by: Louis Agassiz
Authorizing Signature:

Insrtument Calibrated: Testo 1 (330-2LL)
Serial #: 03101345
Customer: **ALA**

Ambient Conditions: Temperature: 25 °C Barometric Pressure: 101.42 kPa Relative Humidity: 62%

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

O_2	Initial Evaluation				After Calibration				
Gas	Instrument Reading (vol %)	% Calibration Error	Pass/Fail	Notes	Instrument Reading (vol %)	% Calibration Error	Pass/Fail	Notes	Certified Value (vol %)
Zero	0.6	0.60	Pass		0.3	0.30	Pass		0
O_2	11.5	0.50	Pass		11.5	0.50	Pass		11.00
Ambient	20.9	0.05	Pass		21.0	0.05	Pass		20.95

Performance Specification: +/- 1% O_2 (absolute diff)

CO	Initial Evaluation				After Calibration				
Gas	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Certified Value (ppm)
Zero	0	0.0%	Pass		0	0.0%	Pass		0
1 Gas	500	6.0%	Fail	Recalibrated w	472	0.1%	Pass		472
2 Gas	1785	6.4%	Fail	2, 3, and 4	1910	0.2%	Pass		1907
3 Gas	1000	0.5%	Pass	gas	995	0.0%	Pass		995
4 Gas	267	11.1%	Fail		240	0.1%	Pass		240

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

NO	Initial Evaluation				After Calibration				
Gas	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Instrument Reading (ppm)	% Calibration Error	Pass/Fail	Notes	Certified Value (ppm)
Zero	0	0.0%	Pass		0	0.0%	Pass		0
1 Gas	452	4.5%	Pass	Recalibrated w	473	0.1%	Pass		473
2 Gas	104	3.6%	Pass	2 and 3 gas	100	0.4%	Pass		100.4
3 Gas	253	0.8%	Pass		255	0.0%	Pass		255
4 Gas	49	7.4%	Fail		46	0.8%	Pass		45.64

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

NIST Traceable Calibration Gases:

Cylinder	Cylinder ID Number	Certification Date	Expiration Date	Cylinder Pressure (PSI)	O_2 (Vol. %)	CO (ppm)	NO (ppm)
Zero Gas (N_2)	2735278Y	27-Jul-2020	26-Jul-2025	1000	0	0	0
1 Gas	SG9107852B	6-May-2021	5-May-2024	1780	-	471.5	473.4
2 Gas	XC004912B	10-Jun-2021	11-Jun-2029	1900	-	1907	100.4
3 Gas	DT0017994	10-Mar-2017	10-Mar-2025	300	-	995	255
4 Gas	CC428385	7-Apr-2021	8-Apr-2029	1600	-	240.3	45.64
O_2/CO_2	SX30844	16-Mar-2021	17-Mar-2029	1400	11.00	-	-

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

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

Select one of the following:

☒ Absence from conflict of interest

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

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

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

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

_____

_____

_____

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

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

Signature:

X _____

Print name: Carter Lanfranco

Witnessed by:

X _____

Print name: Mark Lanfranco

Date: Dec. 16, 2020

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

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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);

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

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Declaration

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

Select one of the following:

☒ Absence from conflict of interest

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

☐ Real or perceived conflict of interest

Description and nature of conflict(s):

_____

_____

_____

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

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

_____

_____

_____

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

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Signature:

X Daryl Sampson

Print name: Daryl Sampson

Witnessed by:

X _____

Print name: Mark Lanfranco

Date: Dec.18, 2020

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

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Conflict of Interest Disclosure Statement

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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:

_____

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_____

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Signature:

X _____

Print name: Mark Lanfranco

Witnessed by:

X _____

Print name: Carter Lanfranco

Date: Dec. 16, 2020

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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 Carter LanFranco

   Title Chief operations officer / 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:

   _____

   _____

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 _____

Print Name: Carter LanFranco

Date signed: Dec. 7/2020

Witnessed by:

X Shawn Harrington

Print Name: Shawn Harrington

[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 Daryl Sampson

   Title Senior Environmental Technician/Project Manager

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

   Name of Association: _____ Registration # _____

3. Brief description of professional services:

   Environmental consulting, specializing in air and atmospheric sciences

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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: Witnessed by:

X Daryl Sampson **X** _____

Print Name: Daryl Sampson Print Name: Louis Agassiz

Date signed: November 23, 2020

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

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

BRITISH COLUMBIA | Ministry of Environment and Climate Change Strategy

Declaration of Competency

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

1. Name of Qualified Professional 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*

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MOUNT ROYAL COLLEGE

Faculty of Continuing Education and Extension

Carter Lanfranco

has successfully completed

Stack Sampling

May 2009

Date

Norma D MacDonald

Dean
Faculty of Continuing Education and Extension

MOUNT ROYAL COLLEGE

Faculty of Continuing Education and Extension

Daryl Sampson

has successfully completed

The program of studies and is awarded the certificate in

STACK SAMPLING

May 2005
Date

Donna Spaulding
Dean
Faculty of Continuing Education and Extension