REPORT

ST MARYS CEMENT INC. (CANADA)

BOWMANVILLE, ONTARIO

COMPLIANCE SOURCE TESTING PROGRAM

RWDI #1804600

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SUBMITTED TO

Standards Development Branch
6th Floor
40 St. Claire Ave
Toronto, Ontario, M4V 1M2
source.testing@ontario.ca

CC:
St. Marys Cement Inc.
Luis Urbina
Environmental Manager
luis.urbina@vcimentos.com

SUBMITTED BY

Kirk Easto, d.E.T., QSTI
Senior Project Manager | Principal
kirk.easto@rwdi.com

RWDI
600 Southgate Drive
Guelph, Ontario N1G 4P6

T: 519.823.1311| ext. 2482
F: 519.823.1316

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EXECUTIVE SUMMARY

RWDI AIR Inc. (RWDI) has been retained by St. Marys Cement Inc. (Canada) (St Marys), to conduct emission sampling on the kiln exhaust at their facility in Bowmanville, Ontario. The purpose of this source sampling program is to demonstrate compliance with their Amended Environmental Compliance Approval No.0469-9YUNSK, dated November 25, 2015. As per the Environmental Compliance Approval (ECA) each parameter was tested in triplicate while running under two scenarios, conventional fuel (baseline) and conventional fuel with woodwaste (Low Carbon Fuel- LCF). A copy of the ECA is provided in **Appendix A**.

The Pre-Test Plan for this testing program was submitted August 21, 2017 to the Ontario Ministry of the Environment, Conservation and Parks (MECP). Approval for the testing program was granted by the MECP on September 11, 2017. A copy of the MECP approval letter can be found in **Appendix B**.

Testing was conducted on the kiln on September 30th, 2018 to October 9th, 2018, with the baseline completed from September 30th to October 2nd, 2019, and the LCF testing completed on October 5 and 9th, 2019. Acrolein testing was completed on February 27th and 28th 2019.

All sources were tested in accordance with referenced methodologies following the MECP approved Pre-Test Plan. A summary of all testing results can be found in the Tables section of the report with detailed sampling results in the Appendices.

All parameters tested meet the performance requirements and operating limits set out in the ECA as shown in Appendix K. No statistically significant change was determined between the baseline and LCF tests as described in Appendix M and Table 12.

Since source testing results for some contaminants were higher than the emission estimates in the original ESDM report, AERMOD modelling was completed for these contaminants and an updated Emission Summary Table was prepared. As shown in Table 13, the maximum modelled POI concentrations for all contaminants remain within their respective POI limits or screening levels. The following represents a summary of the stack testing results and compares the testing results to the in-stack limits set out in the Environmental Compliance Approval.

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1 INTRODUCTION

RWDI AIR Inc. (RWDI) has been retained by St. Marys Cement Inc. (Canada) (St Marys), to conduct emission sampling on the kiln exhaust at their facility in Bowmanville, Ontario. The purpose of this source sampling program is to demonstrate compliance with their Amended Environmental Compliance Approval No.0469-9YUNSK, dated November 25, 2015. As per the Environmental Compliance Approval (ECA) each parameter was tested in triplicate while running under two scenarios, conventional fuel (baseline) and conventional fuel with woodwaste (Low Carbon Fuel- LCF). A copy of the ECA is provided in **Appendix A**.

The Pre-Test Plan for this testing program was submitted August 21, 2017 to the Ontario Ministry of the Environment, Conservation and Parks (MECP). Approval for the testing program was granted by the MECP on September 11, 2017. During the initial testing dates, acrolein was inadvertently removed from the testing schedule. Acrolein was sampled later with approval from the MECP. A copy of the MECP approval letter and correspondence can be found in **Appendix B**.

Testing was conducted on the kiln on September 30th, 2018 to October 9th, 2018, with the baseline completed from September 30th to October 2nd, 2019, and the LCF testing completed on October 5 and 9th, 2019. Acrolein testing was completed on February 27th and 28th 2019.

This stack testing study consisted of the following parameters:

- Velocity, flow rate and temperature;
- Total Particulate Matter;
- Metals;
- Polyaromatic Hydrocarbons (PAH's) and Dioxins and furans (PCDD and PCDF's);
- Hydrogen Chloride;
- Volatile Organic Compounds (VOC);
- Ammonia
- Oxygen (O_2); and
- Carbon dioxide (CO_2).

The cement plant operates 12 months per year typically on 24 hours per day, 7 days per week schedule, with a theoretical maximum production capacity of 6300 tonnes of clinker per day. The normal operating capacity is between 5000-5500 tonnes of clinker per day.

2 SOURCE DESCRIPTION

2.1 Facility Description

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement.

2.2 Process Description

The plant primarily produces Portland cement by combining materials bearing calcium carbonate, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum and limestone to produce cement. Other operations at the Facility are ancillary operations such as comfort heating and emergency generators.

The simplified process flow diagram and site layout is attached.

2.2.1 Limestone Extraction

Limestone is extracted from the quarry by blasting various limestone benches. Up to 150 holes can be drilled along the blast face covering a maximum horizontal surface area of approximately 1,000 m^2 (i.e. 100,000 tonnes/blast). Blasting typically occurs between one to three times per week.

Front-end loaders transfer the fragmented stone from the blast face onto mining tractors. The fragmented stone is transported either to the Facility's underground primary crusher which feeds the primary surge pile (two bank rock storage piles) for the Facility or to the construction grade limestone stockpile.

2.2.2 Construction Grade Limestone Processing

The composition of limestone extracted from the quarry varies with depth and location. A portion of the extracted limestone is sorted, processed and transferred offsite by CBM Aggregates.

CBM Aggregates operates one front-end loader, one primary crusher and one secondary crusher/screen below grade in the quarry. Construction grade limestone from the construction grade storage pile in the quarry is transferred by a front-end loader into CBM's primary crusher. From this point material is conveyed to CBM's secondary crusher/screen and to the product stockpiles by a series of conveyors. The limestone is crushed into different material sizes (e.g. HL6, 19mm clear run, 19mm crusher run, 50mm clear run, 50mm crusher run and screenings). These processed materials are transported to an above grade storage/shipping area located south of the Facility.

The construction grade limestone processing area and storage/shipping area typically operates 12 hours per day, 7 days per week, with a maximum processing capacity of 300 tonnes/hour.

2.2.3 Cement Manufacturing Operations

Raw Material and Fuel Delivery and Storage

The main raw material (limestone) is supplied by the on-site limestone quarry. Limestone is transferred from the primary surge pile via an enclosed conveyor system to a secondary crusher/screen system which is controlled by baghouses. Processed limestone is then fed via enclosed conveyors to limestone storage silos.

Other raw materials (e.g. sand, iron, overburden and ash) are delivered by truck, additives (gypsum) and solid fuels (i.e. petroleum cokes) are delivered by ship. Gypsum and conventional solid fuel (i.e. petroleum coke and coal) are transported by truck to the plant from the dock. A small portion of the conventional solid fuels is delivered by truck via the main plant road. SMC's material/conventional fuel storage and handling operations at the dock area are approved under ECA # 6346-9DSL5P dated December 5, 2013.

Most raw materials are stored at the plant in storage silos or storage buildings. Conventional solid fuels from the dock are deposited into the fuel underground hopper from where they are transferred into the fuel storage silos.

Sorted and pre-processed (size reduced) clean wood and/or low carbon alternative fuel is approved for delivery by enclosed trucks and off-loaded into a storage and handling area inside a fully enclosed fuel building.

Raw Material Preparation

Limestone, sand, iron oxide, and overburden sources are proportionately fed from the raw material storage silos and storage building via an enclosed conveyor belt system to a raw mill. Emissions from the raw mill are controlled by the kiln feed baghouse, venting through the main kiln stack. In the raw mill, the raw materials are ground and mixed to a uniform particle size and dried. The raw mill uses the hot exhaust gases from the pre-heater tower to dry the raw meal. The dried raw meal is stored in the kiln feed silo.

Fuel Preparation

Conventional solid fuels are fed to the fuel milling system from the storage silos. Emissions are controlled by the fuel mill baghouse venting through the main kiln stack. Milled conventional fuel (fuel meal) is fed to the kiln burner and calciner burner through their individual fuel feed systems (i.e. two fuel meal silos and dust collectors).

When clean wood and/or low carbon alternative fuels are used, these fuels undergo additional size reduction inside the new fuel building. The homogenized fuel is then fed via a series of conveyors that feed the main kiln burner and/or the calciner burner. The burning zone temperature in the kiln and calciner are over 2,100°C and 1,375°C, respectively.

The low carbon fuel feed system is fully integrated with the plant control system to regulate and limit the fuel substitution rates into the kiln and/or calciner to maintain the required temperature profile and system conditions.

Clinker Production

Dried raw meal is fed, via air slides and bucket elevators, up to a dual string pre-heater tower consisting of a series of cyclones. As the raw meal progressively passes through a pre-heater string and its cyclones, it encounters progressively hotter gases from the kiln. Prior to being directed into the kiln, the pre-heated material is fed into a pre-calciner where the material temperature is raised to 850°C. In the kiln, the raw meal temperature is raised to over 1,500°C. The chemical reactions and physical processes transform the raw meal into clinker. Flue gases from the kiln pass through the pre-heater strings and the bypass stream and raw mill to the kiln baghouse and are exhausted to the atmosphere via the main kiln stack.

The clinker product is cooled by passing ambient air across the product. This air is directed into the kiln for use as combustion air. The clinker is then further cooled in a reciprocating grate cooler, which achieves a lower clinker discharge temperature by passing an additional quantity of air through the clinker. This additional air passes through the cooler baghouse prior to being exhausted to the atmosphere through the cooler stack.

Clinker exits the clinker cooler at an approximate temperature of 100°C to 200°C onto an enclosed conveyor system, which feeds one of four clinker storage silos. Cooled clinker from the clinker storage silos is conveyed to the roller press where it is pre-ground. Pre-ground clinker is then transferred into the cement finish mill feed silos.

Cement Production

Cement finishing is accomplished in three individual ball grinding mills. Clinker, limestone and gypsum are milled together to produce cement. The three finish mills are controlled by individual baghouses venting through two finish mill stacks.

The finished cement product is transferred into product storage silos. Product can then be dispatched via tanker truck or by ship.

In addition to finished cement product, the plant also ships clinker. Cement and clinker are transported to the dock using an enclosed conveyor system.

Other Associated Equipment/Operations

In an effort to reduce nitrogen oxides (NO_x) and sulphur dioxide (SO_2) emissions, the Facility uses a Selective Non-Catalytic NO_x Reduction (SNCR) ammonia solution injection system and hydrated limestone injection to reduce NO_x emissions and SO_2 emissions, respectively.

3 SAMPLING LOCATION

3.1 Sample Location Description

The sampling location on the kiln stack is located 84.5 metres above grade equipped with a proper sampling platform and four 90° offset sample ports. This sampling location is considered 'ideal' as per the Ontario Source Test Code Method 1 since the nearest flow disturbances were greater than eight (8) duct diameters downstream and two (2) duct diameters upstream. The stack height is 105 m, the diameter at the testing location is 5.48 m and the outside diameter is 5.68 m, including the layer of insulation.

Continuous emission monitoring for O_2 and CO_2 was performed at the same point on the stack platform. These measurements were taken from a single point near the center of the stack. These measurements were sampled continuously throughout the isokinetic testing.

4 SAMPLING METHODOLOGY

The following section provides an overview of the sampling methodologies used in this program. **Table 1**, located in the **Tables** section, summarizes the testing parameters and corresponding methodologies.

4.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following the Ontario Source Testing Code (OSTC) Method 2, "Determination of Stack Gas Velocity and Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type Pitot tube and incline manometer.

Volumetric flow rates were determined following the equal area method as outlined in OSTC Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in OSTC Method 3, "Determination of Molecular Weight of Dry Stack Gas". Stack moisture content was determined through direct condensation and according to OSTC Method 4, "Determination of Moisture Content of Stack Gas".

4.2 Sampling for Total Particulate Matter and Metals

The testing was performed in accordance with U.S. EPA Method 29 "Determination of Metals Emissions from Stationary Sources". Both TPM and metals (including mercury) were sampled concurrently using the same sampling train.

Sampling was conducted isokinetically using the required number of traverse points across the stack diameter. The sample was drawn through a glass lined sample probe and quartz fibre filter, which was maintained at a temperature of 120 ± 14ºC (248 ± 25ºF). The sample was then introduced into the impinger train. The impinger train included two (2) 5% HNO_3/10% H_2O_2 absorbing solution impingers, one (1) empty impinger, two (2) impingers containing acidified $KMnO_4$ solution and one (1) impinger containing silica gel. Particulate emissions are collected on the heated filter; gaseous emissions are collected in the hydrogen peroxide and acidified potassium permanganate solution impingers. Mercury is analyzed specifically in the permanganate solution and all metals including mercury are analyzed in the peroxide impingers.

For the isokinetic testing, a total of 32 points (eight (8) per traverse) were used. Sampling duration was 7.5 minutes per point (2.5 min readings) with a total sampling time per isokinetic test of 240 minutes.

Upon completion of the test, the sampling train was recovered, as in the procedures detailed in the reference method, and the samples were packaged for transport to Maxxam Analytical Services in Burlington, Ontario for analysis.

4.3 Sampling for Polyaromatic Hydrocarbons (PAH's) and Dioxin and Furan Congeners (PCDD/PCDF)

Sampling for polyaromatic hydrocarbons and dioxin and furan congeners was performed in accordance with Environment Canada Method 1/RM/2 (1/RM/2) "Measurement of Releases of Selected Semi-Volatile Organic Compounds from Stationary Sources". The dioxin and furan sampling was conducted in combination with PAH sampling from the Voluntary sampling program.

Sampling was conducted isokinetically using the required number of traverse points across the stack diameter. The sample was drawn through a glass lined sample probe and proofed glass fibre filter. Both of these were maintained at a temperature of 120 ± 14ºC (248 ± 25ºF).

The sample then passed through a water cooled condenser and an XAD-2 absorbent module. The temperature of the XAD-2 module was kept below 20°C. The stack gas sample was then introduced into the impinger train. The impinger train was configured as specified in the reference method.

All glassware and filters were cleaned and proofed in accordance with procedures in 1/RM/2 prior to use in the field. Cleaning, proofing and analysis were performed by Maxxam Analytical Services in Burlington, Ontario.

Upon completion of the test, the samples were kept cool and delivered to Maxxam Analytical Services. The filter, XAD-2 module, impinger catch, and all rinses were analysed for the PCDD/PCDF's using high resolution gas chromatography / mass spectrometry.

For the isokinetic testing, a total of 32 points (eight (8) per traverse) were used. Sampling duration was 7.5 minutes per point (2.5 min readings) with a total sampling time per isokinetic test of 240 minutes.

4.4 Sampling for Hydrogen Chloride and Ammonia

Sampling for hydrogen chloride and ammonia was completed following U.S. EPA Method 26 "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources - Non-Isokinetic Method". The sampling was conducted using a midget impinger sampling train. The sample was drawn through a glass lined probe, glass fibre filter and three-way stopcock which was maintained at a temperature of 120 ± 14ºC (248 ± 25ºF). The sample then entered the impinger train, which consisted of three impingers. The impingers included two 0.1N sulphuric acidic impingers, and one silica impinger to dry the sample air.

Upon completion of the testing, samples were kept cool and submitted to Maxxam Analytical Services in Burlington, Ontario for analysis.

4.5 Sampling for Volatile Organic Compounds

Sampling for volatile organic compounds (VOC) was conducted using a volatile organic sampling train (VOST) following U.S. EPA SW846 Method 0030. Sample gas was collected on a pair of adsorbent tubes, the first containing tenax, and the second, a combination of tenax/charcoal. Since there was no visible condensate in the knock out flask located after the first tube, it was not recovered for analysis. Each set of tubes was sampled over a 60-minute period at 0.25 L/min. Samples were then submitted to Maxxam Analytical Services for analysis.

Similar to PAH and PCDD/PCDF's testing, VOST tubes were "proofed" to ensure that there was no contamination before taking any samples.

4.6 Continuous Emissions Monitoring for O_2, CO_2

Testing for O_2 and CO_2 was accomplished using continuous emission monitors (CEM). The exhaust gas sample was withdrawn from a single point at the center of the duct using a stainless steel probe. The sample proceeded to a heated filter, where particulate matter was removed, and then transferred via a heated Teflon line to a sample conditioner. The Teflon line was heated above the condensation temperature of the exhaust gas stream. The sample conditioner removed any moisture in the exhaust. The sample was then routed through a manifold system and introduced to the individual CEM's for measurement.

Prior to testing, sample system bias checks and instrument linearity checks (calibration error) were completed. In addition, the analysers were calibrated (zeroed and span checked) at the completion of each run. A Campbell Scientific data logger system programmed to collect and record data at 1- second intervals. Average 1-minute concentrations were recorded from the 1-second measurements.

Measurements for all of the parameters were continuously monitored through-out the manual test methods (i.e. mercury and dioxin and furans).

4.7 Quality Assurance/Quality Control Activities

Applicable quality assurance measures were implemented during the sampling program to ensure the integrity of the results. These measures included detailed documentation of field data, equipment calibrations for all measured parameters, completion of Chain of Custody forms when submitting laboratory samples, and submission of field blank samples to the laboratories. **Table 2** presents a sample log and summarizes the sampling times, sample ID's, filter ID's, and XAD trap ID's.

Quality control procedures specific to the CEM monitoring included linearity checks, to determine the instrument performance, and reproducibility checks prior to its use in the field. Regular performance checks on the analyser were also carried out during the testing program by performing hourly zero checks and span calibration checks using primary gas standards. Sample system bias checks were also done. These checks were used to verify the ongoing accuracy of the monitor and sampling system over time. Pollutant-free (zero) air was introduced to perform the zero checks, followed by a known calibration (span) gas into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gas were recorded regularly during the tests.

All samplers are bench tested and calibrated in RWDI's Guelph office prior to field deployment and, in many cases, calibrated again in the field before use. For each sample collected with a Method 5 sampling train, both pre- and post- leak checks were conducted by plugging the inlet and drawing a vacuum of 380 mm of water for at least one minute. Dry gas meter reading leakage rates greater than 4% of the average sampling rate or 0.00057 m^3/min (0.02cfm), whichever is less, were unacceptable. Similar leak check procedures for the Pitot tube and pressure lines were conducted. A number of blanks are included in the methods and were submitted for analyses as well Chain of Custody forms were completed and submitted along with the samples to the laboratory. All sampling media was provided or prepared by the laboratory responsible for its subsequent analysis.

5 OPERATING CONDITIONS

Operating conditions during the sampling period were monitored by St. Marys personnel. Radio contact was kept between the process operators and the sampling team. A member of the RWDI sampling team contacted the operator before each test, to ensure that the process was at normal operating conditions. **Appendix K** contains the process information supplied by St. Marys personnel.

6 RESULTS

The average emission results for this study are presented in the Tables section of this report. A minimum of three (3) tests were performed for all of the parameters tested in the study. Detailed information for each test run can be found in the Appendices. Below is a table identifying each parameter, the corresponding table and appendices where the results are located.

Parameter	Table Baseline (a), LCF (b)	Appendix
Stack Gas Characteristics	3	C and D
Particulate Matter and Metals	4	C
Dioxins and Furan Isomers	5	D
PAH's	6	D
Hydrogen Chloride and Ammonia	7	F
VOC's	8	G
Acrolein	9	H
Oxygen and Carbon Dioxide	10	E
Emission Comparison to ESDM	11	n/a
Emission Comparison Baseline to LCF	12	n/a
Emission Summary Table	13	n/a

All field notes taken during this study are presented in Appendix L. All calibration information for the equipment used for this study is included in Appendix J. All laboratory results are included in Appendix I. Operating conditions, CEM monitoring records and performance requirements are provided in Appendix K.

6.1 Discussion of Results

The facility met all operating conditions (Condition 10.6 and Schedule F Conditions 6(2)(i)-(iii)). As presented in Tables K1 and K2, the hourly quantity of LCF used in the calciner approached but did not exceed the 4 tonnes/hr limit during the LCF source test. The clinker production rate during the baseline and LCF source tests remain within the normal range of 5000 – 5500 tonnes of clinker per day (hourly rolling average). The hourly quantity of conventional fuel used in the kiln and the hourly quantity of industrial by-product materials remain consistent between the baseline and LCF source tests. No fuel adjunct materials were used during the source tests.

The facility met all CEM requirements for the kiln stack (Condition 4.7, Condition 12.1 and Schedule F Condition 6(4)). As presented in Tables K3 and K4, all CEM monitoring parameters remain consistent between the baseline and LCF source tests. There was no increase in the normalized (based on clinker production) emissions of NOx and SO2 during the LCF source test as compared to the baseline test.

The facility met all CEM requirements for process conditions (Condition 12.2.1 and Schedule F Condition 6(4)). As presented in Tables K3 and K4, all CEM monitoring parameters remained consistent between the baseline and LCF tests and met the operational requirements set out in Schedule E of the ECA.

The facility met the in-stack performance limits for the use of LCF as set out in Condition 4.6 and Schedule B of the ECA as shown in Table K5.

Table 11 compares the emissions from the LCF test and to the emissions presented in the original ESDM report (Schedule F Condition 6(5)). Per Schedule F Condition 6(6), an assessment to determine if there were any statistically significant changes between the baseline and the LCF source tests was completed using the methodology described in Appendix M. Table 12 demonstrates that there are no statistically significant changes between the baseline and LCF tests.

Since source testing results for some contaminants were higher than the emission estimates in the original ESDM report, AERMOD modelling was completed for these contaminants and an updated Emission Summary Table was prepared. As shown in Table 13, the maximum modelled POI concentrations for all contaminants remain within their respective POI limits or screening levels.

7 CONCLUSIONS

Testing was successfully completed on September 30, 2018 to October 9, 2018 and from February 27 to February 29, 2019 (acrolein only). All sources were tested in accordance with referenced methodologies following the MECP approved Pre-Test Plan. All parameters tested meet the performance requirements and operating limits set out in the ECA. The maximum modelled POI concentrations for all contaminants remain within their respective POI limits or screening levels. No statistically significant change was determined between the baseline and LCF tests.

TABLES

Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests	Sampling Parameter	Sampling Method
Kiln	6	Velocity, Temperature and Flow Rate	OSTC [1] Methods 1-4
	6	Total Particulate Matter	OSTC [1] Methods 5
	6	Metals	U.S. EPA[2] Method 29
	6	Dioxins, furans, and dioxin-like PCBs	Environment Canada Method RM/2
	6	HCl and Ammonia	U.S. EPA[2] Method 26 (non-isokinetic)
	6	Volatile Organic Matter	U.S. EPA[2] SW 846 0030 VOST
	6	Oxygen	OSTC[1] Method 3A
	6	Carbon Dioxide	OSTC[1] Method 3A

Notes:

[1] OSTC - Ontario Source Testing Code - Version 3

[2] U.S. EPA - United States Environmental Protection Agency

Table 2A: Sampling Summary and Sample Log - Baseline

Kiln

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID	Lab Sample ID
Velocity / Metals / Mercury					
Test #1	30-Sep-18	12:06 PM	4:25 PM	18072358	HYV713
Test #2	1-Oct-18	8:57 AM	1:21 PM	18072359	HYV714
Test #3	2-Oct-18	8:08 AM	12:40 PM	18072360	HYV715
Velocity / Dioxins and Furans					
Test #1	30-Sep-18	12:06 PM	4:25 PM	XAD Trap #4	HZP289
Test #2	1-Oct-18	8:57 AM	1:21 PM	XAD Trap #9	HZP290
Test #3	2-Oct-18	8:08 AM	12:40 PM	XAD Trap #2	HZP291
HCl and Ammonia					
Test #1	30-Sep-18	1:10 PM	2:10 PM	NA	HYV992
Test #2	1-Oct-18	10:20 AM	11:20 AM	NA	HYW001
Test #3	2-Oct-18	10:30 AM	11:30 AM	NA	HYW002
VOST					
Test #1	30-Sep-18	12:10 PM	1:10 PM	Pair #9	HYT930
Test #2	1-Oct-18	11:20 AM	12:20 PM	Pair #8	HYT931
Test #3	2-Oct-18	9:30 PM	10:30 PM	Pair #7	HYT932
Acrolein					
Test #1	28-Feb-19	11:32 AM	1:32 PM	NA	JCF266/7
Test #2	28-Feb-19	3:04 PM	4:34 PM	NA	JCF268/9
Test #3	28-Feb-19	4:39 PM	6:09 PM	NA	JCF270/1

Table 2B: Sampling Summary and Sample Log - LCF

Kiln

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID	Lab Sample ID
Velocity / Metals / Mercury					
Test #1	5-Oct-18	8:44 AM	1:58 PM	18072361	HZU868
Test #2	9-Oct-18	9:25 AM	1:51 PM	18072362	HZU869
Test #3	9-Oct-18	2:36 PM	6:54 PM	18072363	HZU871
Velocity / Dioxins and Furans					
Test #1	5-Oct-18	8:44 AM	1:58 PM	XAD Trap #6	IAC222
Test #2	9-Oct-18	9:25 AM	1:51 PM	XAD Trap #7	IAC223
Test #3	9-Oct-18	2:36 PM	6:54 PM	XAD Trap #8	IAC224
HCl and Ammonia					
Test #1	5-Oct-18	9:10 AM	10:10 AM	NA	HZU875
Test #2	9-Oct-18	10:20 AM	11:20 AM	NA	HZU876
Test #3	9-Oct-18	11:30 AM	12:30 PM	NA	HZU877
VOST					
Test #1	5-Oct-18	10:30 AM	11:30 AM	Pair #1	HZV219
Test #2	9-Oct-18	12:30 PM	1:30 PM	Pair #4	HZV220
Test #3	9-Oct-18	1:40 PM	2:40 PM	Pair #3	HZV221
Acrolein					
Test #1	27-Feb-19	9:04 AM	11:04 AM	NA	JCF122/3
Test #2	27-Feb-19	11:09 AM	1:09 PM	NA	JCF124/263
Test #3	28-Feb-19	9:00 AM	11:00 AM	NA	JCF264/5

Table 3A: Sampling Summary - Flow Characteristics - Baseline

Kiln

Stack Gas Parameter		Test No. 1			Test No. 2			Test No. 3			TOTAL AVERAGE
		Metals	D and F[1]	Average	Metals	D and F[1]	Average	Metals	D and F[1]	Average	Average
Testing Date		30-Sep-18			1-Oct-18			2-Oct-18			-
Stack Temperature	°F	260	267	264	250	257	254	248	256	252	**256**
	°C	127	131	129	121	125	123	120	124	122	**125**
Moisture	%	7.0%	7.7%	7.4%	7.4%	7.8%	7.6%	7.6%	8.0%	7.8%	**7.6%**
Velocity	ft/s	53.93	56.96	55.45	55.25	58.14	56.70	54.75	57.63	56.19	**56.11**
	m/s	16.44	17.36	16.90	16.84	17.72	17.28	16.69	17.57	17.13	**17.10**
Actual Flow Rate	CFM	823,395	869,692	846544	843,498	877,677	860588	835,857	879,943	857,900	**855,010**
Referenced Flow Rate[2]	CFM	577,690	598,946	588318	597,680	610,575	604128	592,326	599,482	595,904	**596,117**
	m^3/s	273	283	278	282	288	285	279	283	281	**281**
Sampling Isokinetic Rate	%	101	102	102	100	99	100	101	101	101	**101**

***Notes*:**

[1] D and F = Dioxins, Furans, and Dioxin-like PCBs

[2] Referenced flow rate expressed as dry at 101.3 kPa, 25 °C, and Actual Oxygen

Detailed sampling results including individual test results can be found in Appendix C and D

Table 3B: Sampling Summary - Flow Characteristics - LCF

Kiln

Stack Gas Parameter		Test No. 1			Test No. 2			Test No. 3			TOTAL AVERAGE
		Mercury	D and F[1]	Average	Mercury	D and F[1]	Average	Mercury	D and F[1]	Average	Average
Testing Date		5-Oct-18			9-Oct-18			9-Oct-18			-
Stack Temperature	°F	258	266	262	253	259	256	257	264	261	**260**
	°C	126	130	128	123	126	124	125	129	127	**126**
Moisture	%	7.8%	7.7%	7.8%	9.6%	9.7%	9.7%	9.5%	9.9%	9.7%	**9.0%**
Velocity	ft/s	56.19	58.12	57.16	53.67	54.56	54.12	52.99	53.35	53.17	**54.81**
	m/s	17.13	17.71	17.42	16.36	16.63	16.49	16.15	16.26	16.21	**16.71**
Actual Flow Rate	CFM	857,983	887,438	872711	819,489	833,091	826290	809,077	814,494	811,786	**836,929**
Referenced Flow Rate[2]	CFM	578,828	612,042	595435	545,805	559,491	552648	536,588	537,473	537,031	**561,705**
	m^3/s	273	289	281	258	264	261	253	254	253	**265**
Sampling Isokinetic Rate	%	101	102	102	103	103	103	104	102	103	**103**

Notes:

[1] D and F = Dioxins, Furans, and Dioxin-like PCBs

[2] Referenced flow rate expressed as dry at 101.3 kPa, 25 °C, and Actual Oxygen

Detailed sampling results including individual test results can be found in Appendix C and D

Table 4A: Mercury and Metals - Averaged Results - Baseline

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
Particulate	**(mg/m^3)**	**11% O_2 (mg/m^3)**	**(mg/s)**
Total Particulate Matter	7.30	12.4	2020
Metals	**($\mu g/m^3$)**	**($\mu g/m^3$)**	**(mg/s)**
Combined Train Aluminum (Al)	219	371	60.7
Combined Train Antimony (Sb)	< 1.56	< 2.64	< 0.436
Combined Train Arsenic (As)	< 0.501	< 0.849	< 0.139
Combined Train Barium (Ba)	6.40	10.8	1.780
Combined Train Beryllium (Be)	< 0.094	< 0.159	< 0.0262
Combined Train Boron (B)	< 19.1	< 32.4	< 5.30
Combined Train Cadmium (Cd)	0.113	0.192	0.032
Combined Train Calcium (Ca)	2520	4271	702
Combined Train Chromium (Cr)	< 1.91	< 3.24	< 0.53
Combined Train Cobalt (Co)	< 0.740	< 1.25	< 0.20
Combined Train Copper (Cu)	1.18	2.00	0.327
Combined Train Iron (Fe)	164	278	45.6
Combined Train Lead (Pb)	4.28	7.25	1.19
Combined Train Magnesium (Mg)	108	183	30.1
Combined Train Manganese (Mn)	6.18	10.5	1.71
Combined Train Molybdenum (Mo)	3.21	5.44	0.89
Combined Train Nickel (Ni)	1.87	3.17	0.518
Combined Train Phosphorus (P)	< 47.9	< 81.2	< 13.4
Combined Train Potassium (K)	386	654	107
Combined Train Selenium (Se)	< 1.04	< 1.76	< 0.291
Combined Train Silver (Ag)	< 1.32	< 2.24	< 0.36
Combined Train Strontium (Sr)	5.01	8.49	1.39
Combined Train Thallium (Tl)	< 0.148	< 0.251	< 0.041
Combined Train Tin (Sn)	30.2	51.2	8.41
Combined Train Titanium (Ti)	13.3	22.5	3.68
Combined Train Vanadium (V)	< 0.365	< 0.62	< 0.102
Combined Train Zinc (Zn)	< 9.53	< 16.2	< 2.64
Mercury	**($\mu g/m^3$)**	**($\mu g/m^3$)**	**(mg/s)**
Total Mercury	1.45	2.46	0.403

Notes:

[1] Sampling followed U.S. EPA Method 29 (Mercury)

[2] All referenced concentration values are expressed at 101.3kPa, 25 ^{o} C,

[3] Average of three tests

[4] When laboratory analysis was below the detection limit, the Reportable Detection Limit (RDL) was used to calculate the concentration and emission rate

Detailed sampling results including individual test results can be found in Appendix C

Table 4B: Mercury and Metals - Averaged Results - LCF

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
Particulate	**(mg/m^3)**	**11% O_2 (mg/m^3)**	**(mg/s)**
Total Particulate Matter	4.7	8.0	1220
Metals	**($\mu g/m^3$)**	**($\mu g/m^3$)**	**(mg/s)**
Combined Train Aluminum (Al)	120	203	31.4
Combined Train Antimony (Sb)	< 2.06	< 3.49	< 0.538
Combined Train Arsenic (As)	< 0.550	< 0.93	< 0.144
Combined Train Barium (Ba)	5.04	8.54	1.31
Combined Train Beryllium (Be)	< 0.12	< 0.21	< 0.032
Combined Train Boron (B)	< 20.6	< 34.9	< 5.38
Combined Train Cadmium (Cd)	< 0.127	< 0.215	< 0.033
Combined Train Calcium (Ca)	1170	1983	305
Combined Train Chromium (Cr)	< 2.06	< 3.5	< 0.538
Combined Train Cobalt (Co)	< 0.14	< 0.2	< 0.036
Combined Train Copper (Cu)	< 1.17	< 2.0	< 0.306
Combined Train Iron (Fe)	98.60	167.1	25.9
Combined Train Lead (Pb)	3.19	5.41	0.832
Combined Train Magnesium (Mg)	49.8	84.4	13
Combined Train Manganese (Mn)	3.08	5.22	0.802
Combined Train Molybdenum (Mo)	3.34	5.66	0.871
Combined Train Nickel (Ni)	3.09	5.24	0.792
Combined Train Phosphorus (P)	< 63.2	< 107.1	< 16.5
Combined Train Potassium (K)	261	442.4	68.4
Combined Train Selenium (Se)	< 1.38	< 2.34	< 0.359
Combined Train Silver (Ag)	< 0.165	< 0.28	< 0.043
Combined Train Strontium (Sr)	2.53	4.29	0.663
Combined Train Thallium (Tl)	< 0.165	< 0.28	< 0.043
Combined Train Tin (Sn)	26.7	45.3	6.93
Combined Train Titanium (Ti)	8.61	14.6	2.25
Combined Train Vanadium (V)	< 0.412	< 0.70	< 0.108
Combined Train Zinc (Zn)	< 7.62	< 12.9	< 1.98
Mercury	**($\mu g/m^3$)**	**($\mu g/m^3$)**	**(mg/s)**
Total Mercury	1.44	2.44	0.382

Notes:

[1] Sampling followed U.S. EPA Method 29 (Mercury)

[2] All referenced concentration values are expressed at 101.3kPa, 25 ^{o} C,

[3] Average of three tests

[4] When laboratory analysis was below the detection limit, the Reportable Detection Limit (RDL) was used to calculate the concentration and emission rate

Detailed sampling results including individual test results can be found in Appendix C

Table 5A: Dioxins and Furans - Averaged Results - Baseline

Kiln Baseline	Average Concentration	Average Concentration @25 °C and 11 % O_2	Reg 419 Toxic Equivalency Factors		
			TEF	TEF Concentration	TEF Emission Rate
Parameter	**(pg/m^3)**	**(pg/m^3)**		**(pg TEQ/m^3)**	**(pg/s)**
2,3,7,8-Tetra CDD*	4.10	6.95	1.00	7.00	1150
1,2,3,7,8-Penta CDD	2.20	3.73	1.00	3.79	625
1,2,3,4,7,8-Hexa CDD	1.70	2.88	0.10	0.290	47.9
1,2,3,6,7,8-Hexa CDD	1.67	2.83	0.10	0.285	47.0
1,2,3,7,8,9-Hexa CDD	1.55	2.63	0.10	0.265	43.7
1,2,3,4,6,7,8-Hepta CDD	2.26	3.83	0.01	0.0386	6.37
1,2,3,4,6,7,8,9-Octa CDD	4.31	7.31	0.0003	0.00221	0.364
2,3,7,8-Tetra CDF**	2.60	4.41	0.10	0.446	73.5
1,2,3,7,8-Penta CDF	1.78	3.02	0.03	0.0911	15.0
2,3,4,7,8-Penta CDF	1.80	3.05	0.30	0.911	150
1,2,3,4,7,8-Hexa CDF	1.59	2.69	0.10	0.271	44.8
1,2,3,6,7,8-Hexa CDF	1.31	2.22	0.10	0.224	36.9
2,3,4,6,7,8-Hexa CDF	1.72	2.92	0.10	0.294	48.5
1,2,3,7,8,9-Hexa CDF	1.71	2.90	0.10	0.292	48.2
1,2,3,4,6,7,8-Hepta CDF	1.73	2.93	0.01	0.030	4.87
1,2,3,4,7,8,9-Hepta CDF	1.93	3.27	0.01	0.0329	5.44
1,2,3,4,6,7,8,9-Octa CDF	2.52	4.27	0.0003	0.0129	2.13
33'44'-TetraCB-(77)***	17.3	29.3	0.0001	0.00295	0.487
344'5-TetraCB-(81)	17.0	28.8	0.0003	0.00871	1.44
233'44'-PentaCB-(105)	39.8	67.5	0.00003	0.00204	0.336
2344'5-PentaCB-(114)	9.86	16.7	0.00003	0.000505	0.0833
23'44'5-PentaCB-(118)	87.4	148	0.00003	0.00448	0.739
23'44'5'-PentaCB-(123)	10.9	18.5	0.00003	0.000558	0.0921
33'44'5-PentaCB-(126)	9.26	15.7	0.1	1.58	261
HexaCB-(156)+(157)	18.8	31.9	0.00003	0.000963	0.159
23'44'55'-HexaCB-(167)	14.4	24.4	0.00003	0.000737	0.122
33'44'55'-HexaCB-(169)	15.4	26.1	0.03	0.789	130
233'44'55'-HeptaCB-(189)	18.0	30.5	0.00003	0.0009	0.152
			Total Toxic Equivalency	16.6	2740

Notes:

[1] Sampling followed Environment Canada Method RM/2 (Dioxin and Furans)

[2] All referenced concentration values are expressed at 101.3kPa, 25 ^{o} C, and 11% Oxygen

[3] Average of three tests

[4] When laboratory analysis was below the detection limit, this detection limit was used to calculate the concentration and emission rate.

**CCD = Chloro Dibenzo-p-Dioxin,*

***CDF = chlorodibenzo-p-furan*

****CB = chlorobenzene*

Detailed sampling results including individual test results can be found in Appendix D

Table 5B: Dioxins and Furans - Averaged Results - LCF

Incinerator	Average Concentration	Average Concentration @25 °C and 11 % O_2	Reg 419 Toxic Equivalency Factors		
			TEF	TEF Concentration	TEF Emission Rate
Parameter	**(pg/m^3)**	**(pg/m^3)**		**(pg TEQ/m^3)**	**(pg/s)**
2,3,7,8-Tetra CDD*	2.00	3.39	1.00	3.40	538
1,2,3,7,8-Penta CDD	2.20	3.73	1.00	3.61	574
1,2,3,4,7,8-Hexa CDD	1.80	3.05	0.10	0.299	47.4
1,2,3,6,7,8-Hexa CDD	1.75	2.97	0.10	0.294	46.6
1,2,3,7,8,9-Hexa CDD	1.65	2.80	0.10	0.277	44.0
1,2,3,4,6,7,8-Hepta CDD	1.81	3.07	0.01	0.0304	4.82
1,2,3,4,6,7,8,9-Octa CDD	2.62	4.44	0.0003	0.00132	0.209
2,3,7,8-Tetra CDF**	2.60	4.41	0.10	0.440	69.8
1,2,3,7,8-Penta CDF	1.70	2.88	0.03	0.0856	13.6
2,3,4,7,8-Penta CDF	1.70	2.88	0.30	0.871	138
1,2,3,4,7,8-Hexa CDF	1.69	2.86	0.10	0.284	45.0
1,2,3,6,7,8-Hexa CDF	1.49	2.53	0.10	0.250	39.7
2,3,4,6,7,8-Hexa CDF	1.83	3.10	0.10	0.307	48.8
1,2,3,7,8,9-Hexa CDF	1.77	3.00	0.10	0.297	47.2
1,2,3,4,6,7,8-Hepta CDF	1.70	2.88	0.01	0.0285	4.53
1,2,3,4,7,8,9-Hepta CDF	1.97	3.34	0.01	0.0331	5.25
1,2,3,4,6,7,8,9-Octa CDF	1.89	3.20	0.0003	0.00951	1.51
33'44'-TetraCB-(77)***	30.4	51.5	0.0001	0.0051	0.810
344'5-TetraCB-(81)	30.4	51.5	0.0003	0.0153	2.43
233'44'-PentaCB-(105)	49.7	84.2	0.00003	0.0025	0.397
2344'5-PentaCB-(114)	18.7	31.7	0.00003	0.000941	0.149
23'44'5-PentaCB-(118)	156	264	0.00003	0.00785	1.25
23'44'5'-PentaCB-(123)	20.6	34.9	0.00003	0.00104	0.165
33'44'5-PentaCB-(126)	17.5	29.7	0.1	2.94	466
HexaCB-(156)+(157)	22.4	38.0	0.00003	0.00113	0.179
23'44'55'-HexaCB-(167)	21.6	36.6	0.00003	0.00109	0.173
33'44'55'-HexaCB-(169)	23.5	39.8	0.03	1.18	188
233'44'55'-HeptaCB-(189)	31.5	53.4	0.00003	0.00159	0.252
			Total Toxic Equivalency	14.7	2330

Notes:

[1] Sampling followed Environment Canada Method RM/2 (Dioxin and Furans)

[2] All referenced concentration values are expressed at 101.3kPa, 25 ^{o} C, and 11% Oxygen

[3] Average of three tests

[4] When laboratory analysis was below the detection limit, this detection limit was used to calculate the concentration and emission rate.

**CCD = Chloro Dibenzo-p-Dioxin,*

***CDF = chlorodibenzo-p-furan*

****CB = chlorobenzene*

Detailed sampling results including individual test results can be found in Appendix D

Table 6A: PAH - Averaged Results - Baseline

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
PAH	**(µg/m³)**	**(µg/m³)**	**(µg/s)**
1-Methylnaphthalene	79.8	135	22693
1-Methylphenanthrene	0.224	0.380	63.8
2-Chloronaphthalene	1.38	2.34	394
2-Methylanthracene	< 0.0765	< 0.130	< 21.8
2-Methylnaphthalene	111	188	31711
3-Methylcholanthrene	< 0.0765	< 0.130	< 21.8
7,12-Dimethylbenzo(a)anthracene	< 0.306	< 0.519	< 87.0
9,10-Dimethylanthracene	< 0.0765	< 0.130	< 21.8
9-Methylphenanthrene	0.515	0.873	146.6
Acenaphthene	1.580	2.678	451
Acenaphthylene	1.97	3.34	562
Anthracene	0.15	0.25	42
Benzo(a)anthracene	0.077	0.130	21.8
Benzo(a)fluorene	< 0.0765	< 0.130	< 21.8
Benzo(a)pyrene	< 0.0765	< 0.130	< 21.8
Benzo(b)fluoranthene	< 0.0765	< 0.130	< 21.8
Benzo(b)fluorene	< 0.08	< 0.130	< 21.8
Benzo(e)pyrene	< 0.0765	< 0.130	< 21.8
Benzo(g,h,i)perylene	< 0.0765	< 0.130	< 21.8
Benzo(k)fluoranthene	< 0.0765	< 0.130	< 21.8
Biphenyl	< 35.2000	< 59.661	< 10006
Chrysene	< 0.0765	< 0.130	< 21.8
Coronene	< 0.0765	< 0.130	< 21.8
Dibenzo(a,c)anthracene	< 0.0765	< 0.130	< 21.8
Fluoranthene	< 0.0765	< 0.130	< 21.8
Fluorene	0.7550	1.28	215
Indeno(1,2,3-cd)pyrene	< 0.0765	< 0.130	< 21.8
m-Terphenyl	0.0765	0.130	21.8
Naphthalene	< 191.0000	< 324	< 54198
o-Terphenyl	0.0866	0.15	24.7
Perylene	< 0.0765	< 0.130	< 21.8
Phenanthrene	< 3.2	< 5.475	< 919.4
Picene	0.0765	0.1	21.8
p-Terphenyl	< 0.08	< 0.1	< 21.8
Pyrene	0.08	0.1	21.8
Tetralin	< 49.70	< 84.2	< 14135
Triphenylene	0.08	0.130	21.8
1,2,3,4-Tetrachlorobenzene	< 0.08	< 0.130	< 21.8
1,2,3,5+1,2,4,5-Tetrachlorobenzen	< 0.08	< 0.130	< 21.8
1,2,3-Trichlorobenzene	0.46	0.773	130.5
1,2,4-Trichlorobenzene	< 0.40	< 0.680	< 114.1
1,2-Dichlorobenzene	< 1.7600	< 2.983	< 498.9
1,3,5-Trichlorobenzene	< 0.0841	< 0.143	< 23.9
1,3-Dichlorobenzene	0.541	0.917	154
1,4-Dichlorobenzene	0.418	0.708	119
Hexachlorobenzene	0.08	0.13	21.8
Pentachlorobenzene	< 0.0765	< 0.130	< 21.8
2,3,4,5-Tetrachlorophenol	0.077	0.130	21.8
2,3,4,6-Tetrachlorophenol	0.077	0.130	21.8
2,3,4-Trichlorophenol	< 0.0765	< 0.130	< 21.8
2,3,5,6-Tetrachlorophenol	< 0.0765	< 0.130	< 21.8
2,3,5-Trichlorophenol	< 0.0765	< 0.130	< 21.8
2,3,6-Trichlorophenol	< 0.0765	< 0.130	< 21.8
2,3-Dichlorophenol	< 0.0765	< 0.130	< 21.8
2,4 + 2,5-Dichlorophenol	< 0.0765	< 0.130	< 21.8
2,4,5-Trichlorophenol	< 0.0765	< 0.130	< 21.8
2,4,6-Trichlorophenol	< 0.0765	< 0.130	< 21.8
2,6-Dichlorophenol	< 0.0765	< 0.130	< 21.8
2-Chlorophenol	< 1.8300	< 3.102	< 521
3,4,5-Trichlorophenol	< 0.0765	< 0.130	< 21.8
3,4-Dichlorophenol	< 0.0765	< 0.130	< 21.8
3,5-Dichlorophenol	< 0.0765	< 0.130	< 21.8
3-Chlorophenol	0.287	0.486	81.6
4-Chlorophenol	< 0.4120	< 0.698	< 117
Pentachlorophenol	< 0.0765	< 0.130	< 21.8

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, and 25°C)

'<' indicates that laboratory results were below the detection limit. The detection limit was used to calculate the concentration and emission rate.

Table 6B: PAH - Averaged Results - LCF

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
PAH	**(µg/m³)**	**(µg/m³)**	**(µg/s)**
1-Methylnaphthalene	99.1	168	26623
1-Methylphenanthrene	1.13	1.91	300
2-Chloronaphthalene	2.05	3.47	551
2-Methylanthracene	< 0.0797	< 0.135	< 21.4
2-Methylnaphthalene	144	243	38612
3-Methylcholanthrene	< 0.0797	< 0.135	< 21.4
7,12-Dimethylbenzo(a)anthracene	< 0.319	< 0.540	< 85.4
9,10-Dimethylanthracene	< 0.0797	< 0.135	< 21.4
9-Methylphenanthrene	2.72	4.615	723.8
Acenaphthene	2.60	4.41	703.3
Acenaphthylene	3.90	6.61	1048
Anthracene	0.33	0.56	88.4
Benzo(a)anthracene	0.0797	0.135	21.4
Benzo(a)fluorene	< 0.0797	< 0.135	< 21.4
Benzo(a)pyrene	< 0.0797	< 0.135	< 21.4
Benzo(b)fluoranthene	< 0.0797	< 0.135	< 21.4
Benzo(b)fluorene	< 0.0797	< 0.135	< 21.4
Benzo(e)pyrene	< 0.0797	< 0.135	< 21.4
Benzo(g,h,i)perylene	< 0.0797	< 0.135	< 21.4
Benzo(k)fluoranthene	< 0.0797	< 0.135	< 21.4
Biphenyl	< 39.8	< 67.396	< 10782
Chrysene	< 0.0797	< 0.135	< 21.4
Coronene	< 0.0797	< 0.135	< 21.4
Dibenzo(a,c)anthracene	< 0.0797	< 0.135	< 21.4
Fluoranthene	0.155	0.262	41.2
Fluorene	2.07	3.51	552
Indeno(1,2,3-cd)pyrene	< 0.0797	< 0.135	< 21.4
m-Terphenyl	0	0	21
Naphthalene	< 211.5	< 358.502	< 57155
o-Terphenyl	0.2	0.3	50
Perylene	< 0.0797	< 0.135	< 21.4
Phenanthrene	< 12.50	< 21.181	< 3342
Picene	0.080	0.135	21.4
p-Terphenyl	< 0.0797	< 0.135	< 21.4
Pyrene	< 0.0850	< 0.144	< 22.8
Tetralin	< 45.8977	< 77.8	< 12315
Triphenylene	0.0797	0.135	21.4
1,2,3,4-Tetrachlorobenzene	0.0797	0.135	21.4
1,2,3,5+1,2,4,5-Tetrachlorobenzen	0.0797	0.14	21.4
1,2,3-Trichlorobenzene	< 0.5600	< 0.949	< 149
1,2,4-Trichlorobenzene	0.571	0.97	153
1,2-Dichlorobenzene	1.661	2.82	446
1,3,5-Trichlorobenzene	< 0.0797	< 0.135	< 21.4
1,3-Dichlorobenzene	< 0.788	< 1.335	< 212
1,4-Dichlorobenzene	< 0.695	< 1.178	< 187
Hexachlorobenzene	< 0.0797	< 0.135	< 21.4
Pentachlorobenzene	< 0.0797	< 0.135	< 21.4
2,3,4,5-Tetrachlorophenol	< 0.0797	< 0.135	< 21.4
2,3,4,6-Tetrachlorophenol	< 0.0797	< 0.135	< 21.4
2,3,4-Trichlorophenol	< 0.0797	< 0.135	< 21.4
2,3,5,6-Tetrachlorophenol	< 0.0797	< 0.135	< 21.4
2,3,5-Trichlorophenol	0.080	0.135	21.4
2,3,6-Trichlorophenol	< 0.0797	< 0.135	< 21.4
2,3-Dichlorophenol	< 0.0797	< 0.135	< 21.4
2,4 + 2,5-Dichlorophenol	< 0.140	< 0.237	< 37.0
2,4,5-Trichlorophenol	0.08	0.14	21.4
2,4,6-Trichlorophenol	< 0.0797	< 0.135	< 21.4
2,6-Dichlorophenol	< 0.0815	< 0.138	< 21.8
2-Chlorophenol	< 4.59	< 7.778	< 1216
3,4,5-Trichlorophenol	0.0797	0.135	21.4
3,4-Dichlorophenol	0.0797	0.135	21.4
3,5-Dichlorophenol	< 0.0797	< 0.135	< 21.4
3-Chlorophenol	0.987	1.67	261
4-Chlorophenol	< 0.953	< 1.615	< 252
Pentachlorophenol	< 0.0797	< 0.135	< 21.4

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, and 25°C)

'<' indicates that laboratory results were below the detection limit. The detection limit was used to calculate the concentration and emission rate.

Table 7A: HCl and Ammonia - Averaged Results - Baseline

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	(mg/m^3)	(mg/m^3)	(g/s)
Hydrochloric Acid	5.18	8.78	1.45
Ammonia (NH_3)	21.2	35.9	5.95

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of isokentic tests conducted that day

Lab results for Ammonium converted to ammonia used molecular wts (17/18)

Table 7B: HCl and Ammonia - Averaged Results - LCF

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	(mg/m^3)	(mg/m^3)	(g/s)
Hydrochloric Acid	4.05	6.86	1.07
Ammonia (NH_3)	20.2	34.2	5.31

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of isokentic tests conducted that day

Lab results for Ammonium converted to ammonia used molecular wts (17/18)

Table 8A: Volatile Organic Compound - Averaged Results - Baseline

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	($\mu g/m^3$)	($\mu g/m^3$)	(mg/s)
Dichlorodifluoromethane (FREON 12)	< 1.07	< 1.81	< 0.302
Chloromethane	260	441	73.1
Vinyl Chloride	< 0.7	< 1.18	< 0.196
Bromomethane	< 14.6	< 24.7	< 4.10
Chloroethane	29.3	49.7	8.22
Trichlorofluoromethane (FREON 11)	< 0.537	< 0.910	< 0.151
Acetone (2-Propanone)	348.99	592	98.2
1,1-Dichloroethylene	< 0.590	< 1.00	< 0.166
Methylene Chloride(Dichloromethane)	< 1.02	< 1.73	< 0.287
1,1-Dichloroethane	< 0.644	< 1.09	< 0.181
trans-1,2-Dichloroethylene	< 0.537	< 0.910	< 0.151
cis-1,2-Dichloroethylene	< 0.537	< 0.910	< 0.151
Chloroform	< 0.590	< 1.00	< 0.166
1,2-Dichloroethane	< 0.376	< 0.637	< 0.106
Methyl Ethyl Ketone (2-Butanone)	< 1.930	< 3.27	< 0.543
1,1,1-Trichloroethane	< 0.751	< 1.27	< 0.211
Carbon Tetrachloride	< 0.858	< 1.45	< 0.241
Benzene	863	1463	244.0
1,1,2-Trichloroethane	< 0.858	< 1.45	< 0.241
1,2-Dichloropropane	< 0.590	< 1.00	< 0.166
Trichloroethylene	< 0.590	< 1.00	< 0.166
Bromodichloromethane	< 0.590	< 1.00	< 0.166
Dibromochloromethane	< 0.483	< 0.819	< 0.136
Toluene	497.0	842	140.0
Ethylene Dibromide	< 0.537	< 0.910	< 0.151
Tetrachloroethylene	< 0.966	< 1.64	< 0.272
Chlorobenzene	19.9	33.7	5.60
1,1,1,2-Tetrachloroethane	< 0.537	< 0.91	< 0.151
Ethylbenzene	115	195	32.3
m / p-Xylene	435	737	123
Styrene	121	205	34.2
o-Xylene	171	290	48.2
Bromoform	< 0.751	< 1.27	< 0.211
1,1,2,2-Tetrachloroethane	< 0.751	< 1.27	< 0.211
1,3-Butadiene	237	401.69	66.8
Trichlorotrifluoroethane	< 18.4	< 31.19	< 5.210
Mesitylene	685	1161	193.0
Cumene	< 231	< 391.5	< 64.1

Notes:

'<' indicates that the laboratory results were less than the Reportable Detection Limit (RDL). This RDL was used to calculate the concentration and emission rate.
[1] Sample volume, volumetric flow rate, and concentration based on dry referenced conditions (101.3 kPa, 25 °C, and Actual Oxygen)
[2] Average of the measured volumetric flow rates from isokinetic testing that day

Table 8A: Volatile Organic Compound - Averaged Results - LCF

Kiln

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	($\mu g/m^3$)	($\mu g/m^3$)	(mg/s)
Dichlorodifluoromethane (FREON 12)	< 1.09	< 1.85	< 0.288
Chloromethane	256	434	67.7
Vinyl Chloride	< 2.1	< 3.56	< 0.579
Bromomethane	< 17.3	< 29.3	< 4.62
Chloroethane	26.5	44.9	7.03
Trichlorofluoromethane (FREON 11)	< 0.544	< 0.922	< 0.144
Acetone (2-Propanone)	307	521	81.8
1,1-Dichloroethylene	< 0.598	< 1.01	< 0.159
Methylene Chloride(Dichloromethane)	< 1.03	< 1.75	< 0.274
1,1-Dichloroethane	< 0.653	< 1.11	< 0.173
trans-1,2-Dichloroethylene	< 0.544	< 0.922	< 0.144
cis-1,2-Dichloroethylene	< 0.544	< 0.922	< 0.144
Chloroform	< 0.598	< 1.01	< 0.159
1,2-Dichloroethane	< 0.381	< 0.646	< 0.101
Methyl Ethyl Ketone (2-Butanone)	< 1.958	< 3.32	< 0.519
1,1,1-Trichloroethane	< 0.762	< 1.29	< 0.202
Carbon Tetrachloride	< 0.870	< 1.47	< 0.231
Benzene	1031	1747	268.4
1,1,2-Trichloroethane	< 0.870	< 1.47	< 0.231
1,2-Dichloropropane	< 0.598	< 1.01	< 0.159
Trichloroethylene	< 0.598	< 1.01	< 0.159
Bromodichloromethane	< 0.598	< 1.01	< 0.159
Dibromochloromethane	< 0.490	< 0.831	< 0.130
Toluene	594.1	1007	154.2
Ethylene Dibromide	< 0.540	< 0.915	< 0.144
Tetrachloroethylene	< 0.979	< 1.66	< 0.259
Chlorobenzene	30.9	52.4	8.18
1,1,1,2-Tetrachloroethane	< 0.544	< 0.92	< 0.144
Ethylbenzene	146	247	38.2
m / p-Xylene	564	956	148
Styrene	179	303	46.9
o-Xylene	213	361	55.7
Bromoform	< 0.762	< 1.29	< 0.202
1,1,2,2-Tetrachloroethane	< 0.762	< 1.29	< 0.202
1,3-Butadiene	116	196.88	31.8
Trichlorotrifluoroethane	< 1.36	< 2.31	< 0.360
Mesitylene	694	1177	184.0
Cumene	< 39.7	< 67.3	< 10.3

Notes:

'<' indicates that the laboratory results were less than the Reportable Detection Limit (RDL). This RDL was used to calculate the concentration and emission rate.

[1] Sample volume, volumetric flow rate, and concentration based on dry referenced conditions (101.3 kPa, 25 °C, and Actual Oxygen)

[2] Average of the measured volumetric flow rates from isokinetic testing that day

Table 9A: Acrolein - Averaged Results - Baseline

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	($\mu g/m^3$)	($\mu g/m^3$)	(mg/s)
Acrolein	61.1	104	18.0

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of measurements conducted that day

Table 9B: Acrolein - Averaged Results - LCF

Parameter	Concentration	Concentration @ 11% O_2	Emission Rate
	($\mu g/m^3$)	($\mu g/m^3$)	(mg/s)
Acrolein	65.5	111	17.2

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of measurements conducted that day

Table 10A- Oxygen and Carbon Dioxide Results - Baseline

Kiln

Averaged Results	
O_2 (%)	CO_2 (%)
15.1	11.8

Test ID: 1	Date:	30-Sep-18
Time	**O_2 (%)**	**CO_2 (%)**
12:06 to 16:25	15.3	11.4

Test ID: 2	Date:	1-Oct-18
Time	**O_2 (%)**	**CO_2 (%)**
8:57 to 12:16	14.9	11.9

Test ID: 3	Date:	2-Oct-18
Time	**O_2 (%)**	**CO_2 (%)**
8:08 to 12:29	15.1	12.2

Note:

[1] Sampling followed OSTC Method 3A (Oxygen and Carbon Dioxide)

Table 10B- Oxygen and Carbon Dioxide Results - LCF

Kiln

Averaged Results	
O_2 (%)	CO_2 (%)
15.0	11.8

Test ID: 1	Date:	30-Sep-18
Time	**O_2 (%)**	**CO_2 (%)**
8:44 to 13:55	14.8	12.1

Test ID: 2	Date:	1-Oct-18
Time	**O_2 (%)**	**CO_2 (%)**
9:35 to 13:52	15.1	11.6

Test ID: 3	Date:	2-Oct-18
Time	**O_2 (%)**	**CO_2 (%)**
14:36 to 18:57	15.1	11.8

Note:

[1] Sampling followed OSTC Method 3A (Oxygen and Carbon Dioxide)

Table 11 - Comparison of Source Testing Results to Original ESDM Report

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		Source Test higher than ESDM?	Updated Site-Wide POI Concentration (ug/m^3)	Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit ($\mu g/m^3$)	Regulation Schedule #	Percent of Ministry POI Limit (%)
		Low Carbon Alternative Fuel (LCF) Substitution								
		Original ESDM Estimate	Source Testing LCF (Oct 2018)							
Filterable Total Particulate Matter and Metals										
PM	PM	5.12E+00	1.22E+00	No	n/a	24 hr	24 hr	120	Standard	n/a
Aluminum	7429-90-5	1.02E-01	3.14E-02	No	n/a	24 hr	24 hr	12	SL-JSL	n/a
Aluminum Oxide (1)	1344-28-1	1.93E-01	5.93E-02	No	n/a	24 hr	24 hr	120	Guideline	n/a
Antimony	7440-36-0	< 1.58E-04	< 5.38E-04	No	n/a	24 hr	24 hr	25	Standard	n/a
Arsenic	7440-38-2	5.98E-04	< 1.44E-04	No	n/a	24 hr	24 hr	0.3	Guideline	n/a
Barium	7440-39-3	< 1.08E-03	1.31E-03	Yes	2.52E-02	24 hr	24 hr	10	Guideline	0.3%
Beryllium	7440-41-7	< 2.93E-05	< 3.23E-05	No	n/a	24 hr	24 hr	0.01	Standard	n/a
Boron	7440-42-8	2.76E-03	< 5.38E-03	No	n/a	24 hr	24 hr	120	Standard	n/a
Cadmium	7440-43-9	< 1.33E-04	< 3.32E-05	No	n/a	24 hr	24 hr	0.025	Standard	n/a
Chromium	7440-47-3	< 9.84E-04	< 5.38E-04	No	n/a	24 hr	24 hr	0.5	Standard	n/a
Cobalt	7440-48-4	< 2.43E-04	< 3.58E-05	No	n/a	24 hr	24 hr	0.1	Guideline	n/a
Copper	7440-50-8	5.18E-03	< 3.06E-04	No	n/a	24 hr	24 hr	50	Standard	n/a
Iron	7439-89-6	6.96E-02	2.59E-02	No	n/a	24 hr	24 hr	4	Standard	n/a
Lead	7439-92-1	< 7.95E-03	8.32E-04	No	n/a	24 hr	24 hr	0.5	Standard	n/a
Lead	7439-92-1	< 7.95E-03	8.32E-04	No	n/a	24 hr	30 day	0.2	Standard	n/a
Manganese	7439-96-5	2.42E-03	8.02E-04	No	n/a	24 hr	24 hr	0.4	Standard	n/a
Magnesium	7439-95-4	4.54E-02	1.30E-02	No	n/a	24 hr	24 hr	72	SL-MD	n/a
Magnesium Oxide(1)	1309-48-4	2.74E-02	2.16E-02	No	n/a	24 hr	24 hr	120	Standard	n/a
Molybdenum	7439-98-7	< 6.83E-04	8.71E-04	Yes	1.21E-03	24 hr	24 hr	120	Guideline	0.001%
Mercury	7439-97-6	3.59E-04	3.82E-04	Yes	5.90E-04	24 hr	24 hr	2	Standard	0.03%
Nickel	7440-02-0	1.37E-03	7.92E-04	No	n/a	24 hr	24 hr	2	Standard	n/a
Nickel	7440-02-0	1.37E-03	7.92E-04	No	n/a	24 hr	Annual	0.4	Standard	n/a
Nickel	7440-02-0	1.37E-03	7.92E-04	No	n/a	Annual	Annual	0.04	Standard	n/a
Phosphorus	7723-14-0	3.72E-01	< 1.65E-02	No	n/a	24 hr	24 hr	0.5	SL-MD	n/a
Potassium	7440-09-7	< 6.72E-02	6.84E-02	Yes	9.52E-02	24 hr	24 hr	1	SL-JSL	9.5%
Selenium	7782-49-2	< 1.28E-03	< 3.59E-04	No	n/a	24 hr	24 hr	10	Guideline	n/a
Silver	7440-22-4	< 2.00E-04	< 4.31E-05	No	n/a	24 hr	24 hr	1	Standard	n/a
Strontium	7440-24-6	2.07E-03	6.63E-04	No	n/a	24 hr	24 hr	120	Guideline	n/a
Sulphur	7704-34-9	5.30E+01	0.00E+00	No	n/a	24 hr	24 hr	2.5	SL-JSL	n/a
Thallium	7440-28-0	< 1.51E-04	< 4.31E-05	No	n/a	24 hr	24 hr	0.5	SL-JSL	n/a
Tin	7440-31-5	1.06E-03	6.93E-03	Yes	1.00E-02	24 hr	24 hr	10	Standard	0.1%
Titanium	7440-32-6	< 2.77E-03	2.25E-03	No	n/a	24 hr	24 hr	120	Standard	n/a
Vanadium	7440-62-2	2.14E-04	< 1.08E-04	No	n/a	24 hr	24 hr	2	Standard	n/a
Zinc	7440-66-6	9.31E-03	< 1.98E-03	No	n/a	24 hr	24 hr	120	Standard	n/a
Gaseous Contaminants					**#N/A**	**24 hr**	**24 hr**			**n/a**
Nitrogen Oxides	10102-44-0	1.44E+02	9.36E+01	No	n/a	1 hr	1 hr	400	Standard	n/a
Nitrogen Oxides	10102-44-0	1.44E+02	9.36E+01	No	n/a	24 hr	24 hr	200	Standard	n/a
Sulphur dioxide	7446-09-5	1.35E+02	1.42E+02	Yes	5.15E+02	1 hr	1 hr	690	Standard	74.6%
Sulphur dioxide	7446-09-5	1.35E+02	1.42E+02	Yes	2.23E+02	24 hr	24 hr	275	Standard	81.2%

Table 11 - Comparison of Source Testing Results to Original ESDM Report

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		Source Test higher than ESDM?	Updated Site-Wide POI Concentration (ug/m^3)	Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit ($\mu g/m^3$)	Regulation Schedule #	Percent of Ministry POI Limit (%)
		Low Carbon Alternative Fuel (LCF) Substitution								
		Original ESDM Estimate	Source Testing LCF (Oct 2018)							
Filterable Total Particulate Matter and Metals										
Hydrogen Chloride & Ammonium					**#N/A**	**24 hr**	**24 hr**	**#N/A**		**n/a**
Hydrochloric Acid	7647-01-0	1.68E+00	1.10E+00	No	n/a	24 hr	24 hr	20	Standard	n/a
Ammonia	7664-41-7	4.60E+00	5.30E+00	Yes	7.38E+00	24 hr	24 hr	100	Standard	7.4%
Polycyclic Aromatic Hydrocarbons					**#N/A**	**24 hr**	**24 hr**	**#N/A**		**n/a**
Hexachlorobenzene	118-74-1	< 1.30E-05	< 2.14E-05	No	n/a	24 hr	24 hr	0.011	SL-JSL	n/a
1-Methylnaphthalene	90-12-0	1.10E-02	2.66E-02	Yes	3.70E-02	24 hr	24 hr	35.5	SL-JSL	0.1%
1-Methylphenanthrene	832-69-9	2.00E-04	3.00E-04	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
2-Chloronaphthalene	91-58-7	2.20E-04	5.51E-04	Yes	7.67E-04	24 hr	24 hr	1	SL-JSL	0.1%
2-Methylanthracene	613-12-7	< 1.30E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
2-Methylnaphthalene	91-57-6	2.10E-02	3.86E+04	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
3-Methylcholanthrene	56-49-5	< 2.60E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
7,12-Dimethylbenzo(a)anthracene	57-97-6	< 1.30E-05	< 8.54E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
9,10-Dimethylanthracene	781-43-1	< 5.10E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Acenaphthene	83-32-9	< 7.24E-05	7.03E-04	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Acenaphthylene	208-96-8	5.86E-04	1.05E-03	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Anthracene	120-12-7	< 9.38E-05	8.84E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(a)anthracene	56-55-3	< 7.00E-06	2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(a)fluorene	238-84-6	< 1.30E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(a)pyrene	50-32-8	< 3.05E-05	< 2.14E-05	No	n/a	24 hr	24 hr	0.005	Standard	n/a
Benzo(a)pyrene	50-32-8	< 3.05E-05	< 2.14E-05	No	n/a	24 hr	Annual	0.0001	Standard	n/a
Benzo(a)pyrene	50-32-8	< 3.05E-05	< 2.14E-05	No	n/a	Annual	Annual	0.00001	Standard	n/a
Benzo(b)fluoranthene	205-99-2	< 7.33E-06	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(b)fluorene	30777-19-6	< 1.30E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(e)pyrene	192-97-2	< 1.30E-05	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(g,h,i)perylene	191-24-2	< 7.46E-06	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Benzo(k)fluoranthene	207-08-9	< 6.73E-06	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Biphenyl	92-52-4	3.00E-03	< 1.08E-02	No	n/a	1 hr	1 hr	60	Guideline	n/a
Chrysene	218-01-9	< 6.75E-06	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Coronene	191-07-1	< 1.30E-05	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Fluoranthene	206-44-0	< 7.88E-05	4.12E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Fluorene	86-73-7	3.51E-04	5.52E-04	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Indeno(1,2,3-cd)pyrene	193-39-5	< 7.21E-06	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
m-Terphenyl	92-44-4	< 1.30E-04	2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Naphthalene	91-20-3	1.89E-02	< 5.72E-02	No	n/a	24 hr	10 min	50	Guideline	n/a
Naphthalene	91-20-3	1.89E-02	< 5.72E-02	No	n/a	24 hr	24 hr	22.5	Guideline	n/a
o-terphenyl	84-15-1	< 1.30E-04	4.99E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Perylene	198-55-0	< 1.30E-05	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Phenanthrene	85-01-8	1.96E-03	< 3.34E-03	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
p-Terphenyl	92-94-4	< 1.30E-04	< 2.14E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Pyrene	129-00-0	< 9.83E-05	< 2.28E-05	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Tetralin	119-64-2	8.20E-03	< 1.23E-02	No	n/a	24 hr	24 hr	151.5	SL-JSL	n/a
9-methylphenanthrene	883-20-5	5.56E-04	7.24E-04	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a
Dioxins and Furans										
TOTAL Dioxin and Furans (TEQ)	CDD	3.07E-09	9.86E-10	No	n/a	24 hr	24 hr	n/a	Standard	n/a

Table 11 - Comparison of Source Testing Results to Original ESDM Report

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		Source Test higher than ESDM?	Updated Site-Wide POI Concentration ($\mu g/m^3$)	Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit ($\mu g/m^3$)	Regulation Schedule #	Percent of Ministry POI Limit (%)
		Low Carbon Alternative Fuel (LCF) Substitution								
		Original ESDM Estimate	Source Testing LCF (Oct 2018)							
Filterable Total Particulate Matter and Metals										
Volatile Organic Compounds										
Chloromethane	74-87-3	1.24E-02	6.77E-02	Yes	9.42E-02	24 hr	24 hr	320	Standard	0.03%
Vinyl Chloride	75-01-4	4.00E-03	< 5.79E-04	No	n/a	24 hr	24 hr	1	Standard	n/a
Bromomethane	74-83-9	5.04E-03	< 4.62E-03	No	n/a	24 hr	24 hr	1350	Guideline	n/a
Chloroethane	75-00-3	7.12E-03	7.03E-03	No	n/a	24 hr	24 hr	5600	Standard	n/a
Acetone (2-Propanone)	67-64-1	4.01E-02	8.18E-02	Yes	1.14E-01	24 hr	24 hr	11880	Standard	0.001%
1,1-Dichloroethylene	75-35-4	< 1.60E-03	< 1.59E-04	No	n/a	24 hr	24 hr	10	Standard	n/a
Methylene Chloride (Dichloromethane)	75-09-2	< 5.97E-03	< 2.74E-04	No	n/a	24 hr	24 hr	220	Standard	n/a
1,1-Dichloroethane	75-34-3	< 1.64E-03	< 1.73E-04	No	n/a	24 hr	24 hr	165	Standard	n/a
trans-1,2-Dichloroethylene	156-60-5	< 1.64E-03	< 1.44E-04	No	n/a	24 hr	24 hr	105	Guideline	n/a
Chloroform	67-66-3	< 1.90E-03	< 1.59E-04	No	n/a	24 hr	24 hr	1	Standard	n/a
1,2-Dichloroethane	107-06-2	< 1.09E-03	< 1.01E-04	No	n/a	24 hr	24 hr	2	Standard	n/a
Methyl Ethyl Ketone (2-Butanone)	78-93-3	< 5.80E-03	< 5.19E-04	No	n/a	24 hr	24 hr	1000	Standard	n/a
1,1,1-Trichloroethane	71-55-6	< 2.75E-03	< 2.02E-04	No	n/a	24 hr	24 hr	115000	Standard	n/a
Carbon Tetrachloride	56-23-5	< 2.88E-03	< 2.31E-04	No	n/a	24 hr	24 hr	2.4	Standard	n/a
Benzene	71-43-2	2.02E-01	2.68E-01	Yes	3.73E-01	24 hr	24 hr	100	Standard	0.4%
Benzene	71-43-2	2.02E-01	2.68E-01	Yes	7.22E-03	24 hr	Annual	4.5	Standard	0.2%
Benzene	71-43-2	2.02E-01	2.68E-01	Yes	7.22E-03	Annual	Annual	0.45	Standard	1.6%
1,1,2-Trichloroethane	79-00-5	< 2.46E-03	< 2.31E-04	No	n/a	24 hr	24 hr	0.3	SL-JSL	n/a
1,2-Dichloropropane	78-87-5	< 1.95E-03	< 1.59E-04	No	n/a	24 hr	24 hr	2400	Guideline	n/a
Trichloroethylene	79-01-6	< 1.92E-03	< 1.59E-04	No	n/a	24 hr	24 hr	12	Standard	n/a
Bromodichloromethane	75-27-4	< 1.64E-03	< 1.59E-04	No	n/a	24 hr	24 hr	350	SL-JSL	n/a
Dibromochloromethane	124-48-1	< 1.64E-03	< 1.30E-04	No	n/a	24 hr	24 hr	0.2	SL-JSL	n/a
Toluene	108-88-3	1.31E-01	1.54E-01	Yes	2.15E-01	24 hr	24 hr	2000	Guideline	0.01%
Tetrachloroethylene	127-18-4	< 3.63E-03	< 2.59E-04	No	n/a	24 hr	24 hr	360	Standard	n/a
Chlorobenzene	108-90-7	5.81E-03	8.18E-03	Yes	4.13E-02	1 hr	10 min	4500	Guideline	0.001%
Chlorobenzene	108-90-7	5.81E-03	8.18E-03	Yes	2.17E-02	1 hr	1 hr	3500	Guideline	0.001%
Ethylbenzene	100-41-4	2.03E-02	3.82E-02	Yes	1.93E-01	1 hr	10 min	1900	Guideline	0.01%
Styrene	100-42-5	2.55E-02	4.69E-02	Yes	6.53E-02	24 hr	24 hr	400	Standard	0.02%
Xylenes	1330-20-7	1.81E-01	2.04E-01	Yes	1.03E+00	1 hr	10 min	3000	Guideline	0.03%
Xylenes	1330-20-7	1.81E-01	2.04E-01	Yes	2.83E-01	24 hr	24 hr	730	Guideline	0.04%
Bromoform	75-25-2	< 2.46E-03	< 2.02E-04	No	n/a	24 hr	24 hr	55	Guideline	n/a
1,1,2,2-Tetrachloroethane	79-34-5	< 2.46E-03	< 2.02E-04	No	n/a	24 hr	24 hr	0.1	SL-JSL	n/a
2,4,6-Trichlorophenol	88-06-2	2.04E-07	< 2.14E-05	No	n/a	24 hr	24 hr	1.5	SL-JSL	n/a
2-Chlorophenol	95-57-8	2.22E-07	< 1.22E-03	No	n/a	24 hr	24 hr	18	SL-JSL	n/a
Acrolein	107-02-8	3.70E-02	1.72E-02	No	n/a	1 hr	1 hr	4.5	Standard	n/a
Acrolein	107-02-8	3.70E-02	1.72E-02	No	n/a	24 hr	24 hr	0.4	Standard	n/a
Trichlorofluoromethane	75-69-4	3.80E-04	< 1.44E-04	No	n/a	24 hr	24 hr	6000	Guideline	n/a

(1) Emission rate calculated based on metal emission rate and molecular weight ratios

Molecular Weight (g/mol)	
Aluminum	26.98
Aluminum Oxide	101.96
Magnesium	24.305
Magnesium Oxide	40.305

		1 hr	24 hr	Annual
Unit Dispersion Factor	Original ESDM	2.73E+00	1.35E+00	-
	Source Testing LCF Baseline (Oct 2018)	2.61E+00	1.37E+00	2.61E-02
	Source Testing LCF(Oct 2018)	2.65E+00	1.39E+00	2.69E-02

Table 12 - Comparison of Conventional Fuel (Baseline) Testing Results to Low Carbon Fuel Testing Results

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		LCF higher than Conventional Fuel?	Updated POI Concentration (µg/m^3)		Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit (µg/m^3)	Percent of Ministry POI Limit (%)		Statistically Significant?
		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)				Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)	
Filterable Total Particulate Matter and Metals												
PM	PM	2.02E+00	1.22E+00	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
0	7429-90-5	6.07E-03	3.14E-02	Yes	8.30E-03	4.37E-02	24 hr	24 hr	12	0.1%	0.4%	No
Aluminum Oxide[(1)]	1344-28-1	1.15E-02	5.93E-02	Yes	1.57E-02	8.26E-02	24 hr	24 hr	120	0.01%	0.1%	No
Antimony	7440-36-0	< 4.36E-04	< 5.38E-04	No	n/a	n/a	24 hr	24 hr	25	n/a	n/a	No
Arsenic	7440-38-2	< 1.39E-04	< 1.44E-04	No	n/a	n/a	24 hr	24 hr	0.3	n/a	n/a	No
Barium	7440-39-3	1.78E-03	1.31E-03	No	n/a	n/a	24 hr	24 hr	10	n/a	n/a	No
Beryllium	7440-41-7	< 2.62E-05	< 3.23E-05	No	n/a	n/a	24 hr	24 hr	0.01	n/a	n/a	No
Boron	7440-42-8	< 5.30E-03	< 5.38E-03	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
Cadmium	7440-43-9	3.15E-05	< 3.32E-05	No	n/a	n/a	24 hr	24 hr	0.025	n/a	n/a	No
Chromium	7440-47-3	5.30E-04	< 5.38E-04	No	n/a	n/a	24 hr	24 hr	0.5	n/a	n/a	No
Cobalt	7440-48-4	< 2.03E-04	< 3.58E-05	No	n/a	n/a	24 hr	24 hr	0.1	n/a	n/a	No
Copper	7440-50-8	3.27E-04	< 3.06E-04	No	n/a	n/a	24 hr	24 hr	50	n/a	n/a	No
Iron	7439-89-6	4.56E-02	2.59E-02	No	n/a	n/a	24 hr	24 hr	4	n/a	n/a	No
Lead	7439-92-1	1.19E-03	8.32E-04	No	n/a	n/a	24 hr	24 hr	0.5	n/a	n/a	No
Lead	7439-92-1	1.19E-03	8.32E-04	No	n/a	n/a	24 hr	30 day	0.2	n/a	n/a	No
Manganese	7439-96-5	1.71E-03	8.02E-04	No	n/a	n/a	24 hr	24 hr	0.4	n/a	n/a	No
Magnesium	7439-95-4	3.01E-02	1.30E-02	No	n/a	n/a	24 hr	24 hr	72	n/a	n/a	No
Magnesium Oxide[(1)]	1309-48-4	4.99E-02	2.16E-02	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
Molybdenum	7439-98-7	8.93E-04	8.71E-04	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
Mercury	7439-97-6	4.03E-04	3.82E-04	No	n/a	n/a	24 hr	24 hr	2	n/a	n/a	No
Nickel	7440-02-0	5.18E-04	7.92E-04	Yes	6.29E-02	6.29E-02	24 hr	24 hr	2	3%	3%	No
Nickel	7440-02-0	5.18E-04	7.92E-04	Yes	7.07E-03	7.07E-03	24 hr	Annual	0.4	2%	2%	No
Nickel	7440-02-0	5.18E-04	7.92E-04	Yes	7.07E-03	7.07E-03	Annual	Annual	0.04	18%	18%	No
Phosphorus	7723-14-0	< 1.34E-02	< 1.65E-02	No	n/a	n/a	24 hr	24 hr	0.5	n/a	n/a	No
Potassium	7440-09-7	1.07E-01	6.84E-02	No	n/a	n/a	24 hr	24 hr	1	n/a	n/a	No
Selenium	7782-49-2	< 2.91E-04	< 3.59E-04	No	n/a	n/a	24 hr	24 hr	10	n/a	n/a	No
Silver	7440-22-4	< 3.60E-04	< 4.31E-05	No	n/a	n/a	24 hr	24 hr	1	n/a	n/a	No
Strontium	7440-24-6	1.39E-03	6.63E-04	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
Thallium	7440-28-0	< 4.12E-05	< 4.31E-05	No	n/a	n/a	24 hr	24 hr	0.5	n/a	n/a	No
Tin	7440-31-5	8.41E-03	6.93E-03	No	n/a	n/a	24 hr	24 hr	10	n/a	n/a	No
Titanium	7440-32-6	3.68E-03	2.25E-03	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No
Vanadium	7440-62-2	< 1.02E-04	< 1.08E-04	No	n/a	n/a	24 hr	24 hr	2	n/a	n/a	No
Zinc	7440-66-6	< 2.64E-03	< 1.98E-03	No	n/a	n/a	24 hr	24 hr	120	n/a	n/a	No

Table 12 - Comparison of Conventional Fuel (Baseline) Testing Results to Low Carbon Fuel Testing Results

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		LCF higher than Conventional Fuel?	Updated POI Concentration (µg/m^3)		Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit (µg/m^3)	Percent of Ministry POI Limit (%)		Statistically Significant?
		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)				Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)	
Filterable Total Particulate Matter and Metals												
Gaseous Contaminants												
Nitrogen Oxides	10102-44-0	8.97E+01	9.36E+01	Yes	3.07E+02	3.40E+02	1 hr	1 hr	400	77%	85%	Yes
Nitrogen Oxides	10102-44-0	8.97E+01	9.36E+01	Yes	1.41E+02	1.47E+02	24 hr	24 hr	200	70%	74%	Yes
Sulphur dioxide	7446-09-5	1.43E+02	1.42E+02	No	n/a	n/a	1 hr	1 hr	690	n/a	n/a	No
Sulphur dioxide	7446-09-5	1.43E+02	1.42E+02	No	n/a	n/a	24 hr	24 hr	275	n/a	n/a	No
Hydrogen Chloride & Ammonia												
Hydrochloric Acid	7647-01-0	1.50E+00	1.10E+00	No	n/a	n/a	24 hr	24 hr	20	n/a	n/a	No
Ammonia	7664-41-7	6.00E+00	5.30E+00	No	n/a	n/a	24 hr	24 hr	100	n/a	n/a	No
Polycyclic Aromatic Hydrocarbons												
Hexachlorobenzene	118-74-1	2.18E-05	< 2.14E-05	No	n/a	n/a	24 hr	24 hr	0.011	n/a	n/a	No
1-Methylnaphthalene	90-12-0	2.27E-02	2.66E-02	Yes	3.10E-02	3.70E-02	24 hr	24 hr	35.5	0.1%	0.1%	No
1-Methylphenanthrene	832-69-9	6.38E-11	3.00E-04	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
2-Chloronaphthalene	91-58-7	3.94E-04	5.51E-04	Yes	5.39E-04	7.67E-04	24 hr	24 hr	1	0.1%	0.1%	No
2-Methylanthracene	613-12-7	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
2-Methylnaphthalene	91-57-6	3.17E-02	3.86E+04	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
3-Methylcholanthrene	56-49-5	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
7,12-Dimethylbenzo(a)anthracene	57-97-6	< 8.70E-05	< 8.54E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
9,10-Dimethylanthracene	781-43-1	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Acenaphthene	83-32-9	4.51E-04	7.03E-04	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Acenaphthylene	208-96-8	5.62E-04	1.05E-03	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Anthracene	120-12-7	4.20E-05	8.84E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(a)anthracene	56-55-3	2.18E-05	2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(a)fluorene	238-84-6	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(a)pyrene	50-32-8	< 2.18E-05	< 2.14E-05	No	n/a	n/a	24 hr	24 hr	0.005	n/a	n/a	No
Benzo(a)pyrene	50-32-8	< 2.18E-05	< 2.14E-05	No	n/a	n/a	24 hr	Annual	0.0001	n/a	n/a	No
Benzo(a)pyrene	50-32-8	< 2.18E-05	< 2.14E-05	No	n/a	n/a	Annual	Annual	0.00001	n/a	n/a	No
Benzo(b)fluoranthene	205-99-2	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(b)fluorene	30777-19-6	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(e)pyrene	192-97-2	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(g,h,i)perylene	191-24-2	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Benzo(k)fluoranthene	207-08-9	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Biphenyl	92-52-4	< 1.00E-02	< 1.08E-02	No	n/a	n/a	1 hr	1 hr	60	n/a	n/a	No
Chrysene	218-01-9	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Coronene	191-07-1	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Fluoranthene	206-44-0	< 2.18E-05	4.12E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Fluorene	86-73-7	2.15E-04	5.52E-04	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Indeno(1,2,3-cd)pyrene	193-39-5	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
m-Terphenyl	92-44-4	2.18E-05	2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Naphthalene	91-20-3	< 5.42E-02	< 5.72E-02	No	n/a	n/a	24 hr	10 min	50	n/a	n/a	No
Naphthalene	91-20-3	< 5.42E-02	< 5.72E-02	No	n/a	n/a	24 hr	24 hr	22.5	n/a	n/a	No
o-terphenyl	84-15-1	2.47E-05	4.99E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No

Table 12 - Comparison of Conventional Fuel (Baseline) Testing Results to Low Carbon Fuel Testing Results

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		LCF higher than Conventional Fuel?	Updated POI Concentration (µg/m^3)		Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit (µg/m^3)	Percent of Ministry POI Limit (%)		Statistically Significant?
		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)				Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)	
Filterable Total Particulate Matter and Metals												
Perylene	198-55-0	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Phenanthrene	85-01-8	< 9.19E-04	< 3.34E-03	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
p-Terphenyl	92-94-4	< 2.18E-05	< 2.14E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Pyrene	129-00-0	2.18E-05	< 2.28E-05	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Tetralin	119-64-2	< 1.41E-02	< 1.23E-02	No	n/a	n/a	24 hr	24 hr	151.5	n/a	n/a	No
9-methylphenanthrene	883-20-5	1.47E-04	7.24E-04	n/a	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Dioxins and Furans												
TOTAL Dioxin and Furans (TEQ)	CDD	1.61E-09	9.86E-10	No	n/a	n/a	24 hr	24 hr	n/a	n/a	n/a	No
Volatile Organic Compounds												
Chloromethane	74-87-3	7.31E-02	6.77E-02	No	n/a	n/a	24 hr	24 hr	320	n/a	n/a	No
Vinyl Chloride	75-01-4	< 1.96E-04	< 5.79E-04	No	n/a	n/a	24 hr	24 hr	1	n/a	n/a	No
Bromomethane	74-83-9	< 4.10E-03	< 4.62E-03	No	n/a	n/a	24 hr	24 hr	1350	n/a	n/a	No
Chloroethane	75-00-3	8.22E-03	7.03E-03	No	n/a	n/a	24 hr	24 hr	5600	n/a	n/a	No
Acetone (2-Propanone)	67-64-1	9.82E-02	8.18E-02	No	n/a	n/a	24 hr	24 hr	11880	n/a	n/a	No
1,1-Dichloroethylene	75-35-4	< 1.66E-04	< 1.59E-04	No	n/a	n/a	24 hr	24 hr	10	n/a	n/a	No
Methylene Chloride (Dichloromethane)	75-09-2	< 2.87E-04	< 2.74E-04	No	n/a	n/a	24 hr	24 hr	220	n/a	n/a	No
1,1-Dichloroethane	75-34-3	< 1.81E-04	< 1.73E-04	No	n/a	n/a	24 hr	24 hr	165	n/a	n/a	No
trans-1,2-Dichloroethylene	156-60-5	< 1.51E-04	< 1.44E-04	No	n/a	n/a	24 hr	24 hr	105	n/a	n/a	No
Chloroform	67-66-3	< 1.66E-04	< 1.59E-04	No	n/a	n/a	24 hr	24 hr	1	n/a	n/a	No
1,2-Dichloroethane	107-06-2	< 1.06E-04	< 1.01E-04	No	n/a	n/a	24 hr	24 hr	2	n/a	n/a	No
Methyl Ethyl Ketone (2-Butanone)	78-93-3	< 5.43E-04	< 5.19E-04	No	n/a	n/a	24 hr	24 hr	1000	n/a	n/a	No
1,1,1-Trichloroethane	71-55-6	< 2.11E-04	< 2.02E-04	No	n/a	n/a	24 hr	24 hr	115000	n/a	n/a	No
Carbon Tetrachloride	56-23-5	< 2.41E-04	< 2.31E-04	No	n/a	n/a	24 hr	24 hr	2.4	n/a	n/a	No
Benzene	71-43-2	2.44E-01	2.68E-01	Yes	3.33E-01	3.73E-01	24 hr	24 hr	100	0.3%	0.4%	No
Benzene	71-43-2	2.44E-01	2.68E-01	Yes	3.33E-01	3.73E-01	24 hr	Annual	4.5	7.4%	8.3%	No
Benzene	71-43-2	2.44E-01	2.68E-01	Yes	6.37E-03	7.22E-03	Annual	Annual	0.45	1.4%	1.6%	No
1,1,2-Trichloroethane	79-00-5	< 2.41E-04	< 2.31E-04	No	n/a	n/a	24 hr	24 hr	0.3	n/a	n/a	No
1,2-Dichloropropane	78-87-5	< 1.66E-04	< 1.59E-04	No	n/a	n/a	24 hr	24 hr	2400	n/a	n/a	No
Trichloroethylene	79-01-6	< 1.66E-04	< 1.59E-04	No	n/a	n/a	24 hr	24 hr	12	n/a	n/a	No
Bromodichloromethane	75-27-4	< 1.66E-04	< 1.59E-04	No	n/a	n/a	24 hr	24 hr	350	n/a	n/a	No
Dibromochloromethane	124-48-1	< 1.36E-04	< 1.30E-04	No	n/a	n/a	24 hr	24 hr	0.2	n/a	n/a	No
Toluene	108-88-3	1.40E-01	1.54E-01	Yes	1.91E-01	2.15E-01	24 hr	24 hr	2000	0.01%	0.01%	No
Tetrachloroethylene	127-18-4	< 2.72E-04	< 2.59E-04	No	n/a	n/a	24 hr	24 hr	360	n/a	n/a	No
Chlorobenzene	108-90-7	5.60E-03	8.18E-03	Yes	2.79E-02	4.13E-02	1 hr	10 min	4500	0.001%	0.001%	No
Chlorobenzene	108-90-7	5.60E-03	8.18E-03	Yes	1.46E-02	2.17E-02	1 hr	1 hr	3500	0.0004%	0.001%	No
Ethylbenzene	100-41-4	3.23E-02	3.82E-02	Yes	1.61E-01	1.93E-01	1 hr	10 min	1900	0.01%	0.01%	No
Styrene	100-42-5	3.42E-02	4.69E-02	Yes	4.67E-02	6.53E-02	24 hr	24 hr	400	0.01%	0.02%	No
Xylenes	1330-20-7	1.71E-01	2.04E-01	Yes	8.52E-01	1.03E+00	1 hr	10 min	3000	0.03%	0.03%	No

Table 12 - Comparison of Conventional Fuel (Baseline) Testing Results to Low Carbon Fuel Testing Results

Contaminant	CAS Number	Kiln Stack Emission Rate (g/s)		LCF higher than Conventional Fuel?	Updated POI Concentration (µg/m^3)		Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit (µg/m^3)	Percent of Ministry POI Limit (%)		Statistically Significant?
		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)		Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)				Source Testing Conventional Fuel (Oct 2018)	Source Testing LCF (Oct 2018)	
Filterable Total Particulate Matter and Metals												
Bromoform	75-25-2	< 2.11E-04	< 2.02E-04	No	n/a	n/a	24 hr	24 hr	55	n/a	n/a	No
1,1,2,2-Tetrachloroethane	79-34-5	< 2.11E-04	< 2.02E-04	No	n/a	n/a	24 hr	24 hr	0.1	n/a	n/a	No
2,4,6-Trichlorophenol	88-06-2	< 2.18E-05	< 2.14E-05	No	n/a	n/a	24 hr	24 hr	1.5	n/a	n/a	No
2-Chlorophenol	95-57-8	< 5.21E-04	< 1.22E-03	No	n/a	n/a	24 hr	24 hr	18	n/a	n/a	No
Acrolein	107-02-8	1.80E-02	1.72E-02	No	n/a	n/a	1 hr	1 hr	4.5	n/a	n/a	No
Acrolein	107-02-8	1.80E-02	1.72E-02	No	n/a	n/a	24 hr	24 hr	0.4	n/a	n/a	No
Trichlorofluoromethane	75-69-4	< 1.51E-04	< 1.44E-04	No	n/a	n/a	24 hr	24 hr	6000	n/a	n/a	No

(1) Emission rate calculated based on metal emission rate and molecular weight ratios

Molecular Weight (g/mol)	
Aluminum	26.98
Aluminum Oxide	101.96
Magnesium	24.305
Magnesium Oxide	40.305

		1 hr	24 hr	Annual
Unit Dispersion Factor	Original ESDM	2.50E+00	1.30E+00	1.78E-02
	Source Testing LCF Baseline (Oct 2018)	2.61E+00	1.37E+00	2.61E-02
	Source Testing LCF(Oct 2018)	2.65E+00	1.39E+00	2.69E-02

Table 13: Emission Summary Table

Contaminant Name	CAS #	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration (ug/m^3)	Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit ($µg/m^3$)	Limiting Effect	Regulation Schedule #	Percentage of Ministry POI Limit (%)
PM	PM	1.21E+01	AERMOD	6.96E+01	24 hr	24 hr	120	Visibility	Standard	58.0%
Nitrogen Oxides	10102-44-0	1.44E+02	AERMOD	3.52E+02	1 hr	1 hr	400	Health	Standard	88.0%
Nitrogen Oxides	10102-44-0	1.44E+02	AERMOD	1.44E+02	24 hr	24 hr	200	Health	Standard	71.8%
Sulphur Dioxide	7446-09-5	1.43E+02	AERMOD	4.89E+02	1 hr	1 hr	690	Health & Vegetation	Standard	70.9%
Sulphur Dioxide	7446-09-5	1.43E+02	AERMOD	2.24E+02	24 hr	24 hr	275	Health & Vegetation	Standard	81.5%
Carbon Monoxide	630-08-0	4.45E+01	AERMOD	8.12E+02	1 hr	0.5 hr	6000	Health	Standard	13.5%
Ammonia	7664-41-7	6.00E+00	AERMOD	8.20E+00	24 hr	24 hr	100	Health	Standard	8.2%
Hydrochloric Acid	7647-01-0	1.68E+00	AERMOD	2.26E+00	24 hr	24 hr	20	Health	Standard	11.3%
Aluminum	7429-90-5	3.14E-02	AERMOD	4.37E-02	24 hr	24 hr	12	Health	SL-JSL	0.4%
Aluminum Oxide	1344-28-1	1.93E-01	AERMOD	2.61E-01	24 hr	24 hr	120	Particulate	Guideline	0.2%
Antimony	7440-36-0	7.02E-04	AERMOD	1.73E-03	24 hr	24 hr	25	Health	Standard	0.007%
Arsenic	7440-38-2	7.46E-04	AERMOD	1.09E-03	24 hr	24 hr	0.3	Health	Guideline	0.4%
Barium	7440-39-3	4.00E-03	AERMOD	2.52E-02	24 hr	24 hr	10	Health	Guideline	0.3%
Beryllium	7440-41-7	4.23E-05	AERMOD	6.00E-05	24 hr	24 hr	0.01	Health	Standard	0.6%
Cadmium	7440-43-9	1.78E-04	AERMOD	2.50E-04	24 hr	24 hr	0.025	Health	Standard	1.0%
Chromium	7440-47-3	1.33E-03	AERMOD	3.33E-03	24 hr	24 hr	0.5	Health	Standard	0.7%
Cobalt	7440-48-4	3.46E-04	AERMOD	2.49E-03	24 hr	24 hr	0.1	Health	Guideline	2.5%
Iron	7439-89-6	4.56E-02	AERMOD	6.23E-02	24 hr	24 hr	4	Health	Standard	1.6%
Ferric Oxide	1309-37-1	3.27E-01	AERMOD	2.99E+00	24 hr	24 hr	25	Soiling	Standard	12.0%
Lead	7439-92-1	8.16E-03	AERMOD	1.13E-02	24 hr	24 hr	0.5	Health	Standard	2.3%
Lead	7439-92-1	8.16E-03	AERMOD	4.35E-03	24 hr	30 day	0.2	Health	Standard	2.2%
Manganese	7439-96-5	2.10E-02	AERMOD	5.40E-02	24 hr	24 hr	0.4	Health	Standard	13.5%
Mercury	7439-97-6	4.21E-04	AERMOD	6.10E-04	24 hr	24 hr	2	Health	Standard	0.03%
Nickel	7440-02-0	4.12E-03	AERMOD	6.29E-02	24 hr	24 hr	2	Health	Standard	3.1%
Nickel	7440-02-0	4.12E-03	AERMOD	7.07E-03	24 hr	Annual	0.4	Health	Standard	1.8%
Nickel	7440-02-0	4.12E-03	AERMOD	7.07E-03	Annual	Annual	0.04	Health	Standard	17.7%
Selenium	7782-49-2	1.32E-03	AERMOD	1.89E-03	24 hr	24 hr	10	Health	Guideline	0.02%
Silver	7440-22-4	1.60E-02	AERMOD	2.16E-02	24 hr	24 hr	1	Health	Standard	2.2%
Tin	7440-31-5	8.56E-03	AERMOD	1.19E-02	24 hr	24 hr	10	Health	Standard	0.1%
Vanadium	7440-62-2	6.20E-04	AERMOD	8.59E-03	24 hr	24 hr	2	Health	Standard	0.4%
Benzene	71-43-2	2.68E-01	AERMOD	3.73E-01	24 hr	24 hr	100	Health	Standard	0.4%
Benzene	71-43-2	2.68E-01	AERMOD	7.22E-03	24 hr	Annual	4.5	Health	Standard	0.2%
Benzene	71-43-2	2.68E-01	AERMOD	7.22E-03	Annual	Annual	0.45	Health	Standard	1.6%
Dioxins, Furans and Dioxin-like PCBs	CDD	3.07E-09	AERMOD	4.14E-09	24 hr	24 hr	0.0000001	Health	Schedule 3	4.1%
Acrolein	107-02-8	3.70E-02	AERMOD	5.40E-03	1 hr	1 hr	4.5	Health	Standard	0.1%
Acrolein	107-02-8	3.70E-02	AERMOD	5.00E-02	24 hr	24 hr	0.4	Health	Standard	12.5%
Benzo(a)pyrene	50-32-8	3.05E-05	AERMOD	4.12E-05	24 hr	24 hr	0.005	Health	URT/DAV	0.8%
Benzo(a)pyrene	50-32-8	3.05E-05	AERMOD	8.30E-07	24 hr	Annual	0.0001	Health	AAV	0.8%
Benzo(a)pyrene	50-32-8	3.05E-05	AERMOD	8.30E-07	Annual	Annual	0.00001	Health	Standard	8.3%
Naphthalene	91-20-3	5.72E-02	AERMOD	2.89E-01	1 hr	10 min	50	Odour	Guideline	0.6%
Naphthalene	91-20-3	5.72E-02	AERMOD	7.95E-02	24 hr	24 hr	22.5	Health	Guideline	0.4%

APPENDIX A

Ministry of the Environment, Conservation and Parks
Central Region
York Durham District Office
230 Westney Road South, 5th Floor
Ajax ON L1S 7J5
Toll-Free : 1-800-376-4547
Telephone.: 905-427-5600
Fax: 905-427-5602

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région du Centrel
Bureau de district de York Durham
230 route Westney sud, 5e étage
Ajax ON L1S 7J5
Sans frais : 1-800-376-4547
Téléphone : 905 427-5600
Télécopieur : 905 427-5602

Ontario

July 31, 2018

Dear Luis,

Thank you for your letter dated May 5, 2018 requesting an extension to the date by which source testing at St. Marys Cement Bowmanville of the combustion of alternative fuels was to be conducted.

You stated that the reason for the delay in being able to conduct the source testing is due to the inability to consistently burn alternative fuels due to problems with the wood supply. You've requested an extension until the end of September 2018, by which time your wood supplier is expected to be fully operational and thereby able to supply St. Marys with a consistent supply of wood.

Condition No. 11.1 of ECA No. 0469-9YUNSK reads as follows and affords me the authority to accommodate such a request:

> 11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln,* or within a time frame as directed or agreed to in writing by the *District Manager.*

Based on the above request and rationale provided, I hereby extend the date by which the first *Source Testing* shall be conducted to no later than October 31, 2018.

If you require any further information, please contact Provincial Officer Kim Lendvay directly at 905-427-5628 or kim.lendvay@ontario.ca.

Kind regards,

Celeste Dugas
Manager
York Durham District

Copy: Kim Lendvay

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Notice No. 1
Issue Date: June 21, 2017

St. Marys Cement Inc. (Canada)
400 Waverley Road South
Clarington, Ontario
L1C 3K3

Site Location: Bowmanville Cement Plant
400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 0469-9YUNSK issued on November 25, 2015 for a cement manufacturing facility , as follows:

Schedule E in Environmental Compliance Approval number 0469-9YUNSK issued on November 25, 2015:

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels,* based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

has been revoked and replaced by the following Schedule E:

SCHEDULE E

ALTERNATIVE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than 4 tonnes per hour.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	N.A.

All in accordance with the Environmental Compliance Approval amendment application dated May 10, 2017 submitted by St. Marys Cement Inc. (Canada) and signed by Chris Richards, Environmental Manager.

All other terms and conditions in the Approval remain unchanged.

This Notice shall constitute part of the approval issued under Approval No. 0469-9YUNSK dated November 25, 2015.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall

state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 21st day of June, 2017

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Notice No. 2
Issue Date: May 8, 2018

St. Marys Cement Inc. (Canada)
55 Industrial St, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Cement Plant
400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 0469-9YUNSK issued on November 25, 2015 for a cement manufacturing facility , as follows:

The following Conditions:

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

are revoked and replaced by the following Conditions:

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln,* or within a time frame as directed or agreed to in writing by the *District Manager*.

11.2 Subsequent *Source Testing* shall be conducted once every calendar year, or within a time frame as directed or agreed to in writing by the *District Manager,* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in that calendar year.

All in accordance with the Environmental Compliance Approval amendment application dated April 4, 2018 submitted by St. Marys Cement Inc. (Canada) and signed by Ruben Plaza, Environmental Manager.

All other terms and conditions in the Approval remain unchanged.

This Notice shall constitute part of the approval issued under Approval No. 0469-9YUNSK dated November 25, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 8th day of May, 2018

Ian Greason, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Chris Sabaziotis, BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverley Road
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Description Section

A cement manufacturing facility, consisting of the following processes and support units:

- quarry operations - limestone extraction, processing and shipping;
- raw material and fuel processing, storage and handling;
- clinker production- kiln and calciner operations;
- cement production including ball mills, cement storage and shipping;

including the *Equipment* and any other ancillary and support processes and activities, operating at a *Facility Production Limit* of up to a **clinker production rate of 2.4 million tonnes per year,** discharging to the air as described in the *Original ESDM Report.*

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acceptable Point of Impingement Concentration"* means a concentration accepted by the *Ministry* as not likely to cause an adverse effect for a *Compound of Concern* that,

   (a) has no *Ministry Point of Impingement Limit* and no *Jurisdictional Screening Level*, or

   (b) has a concentration at a *Point of Impingement* that exceeds the *Jurisdictional Screening Level*.

   With respect to the *Original ESDM Report*, the *Acceptable Point of Impingement Concentration* for a *Compound of Concern* mentioned above is the concentration set out in the *Original ESDM Report.*

2. "*Acoustic Assessment Report"* means the report, prepared in accordance with *Publication NPC-233* and Appendix A of the *Basic Comprehensive User Guide*, by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014 submitted in support of the application, that documents all sources of noise emissions and *Noise Control Measures* present at the *Facility*, as updated in accordance with Condition 5 of this *Approval.*

3. "*Acoustic Assessment Summary Table"* means a table prepared in accordance with the *Basic Comprehensive User Guide* summarising the results of the *Acoustic Assessment Report*, as updated in accordance with Condition 5 of this *Approval.*

4. "*Alternative Fuels"* means Woodwaste as defined in *O.Reg. 347* and *Low Carbon Alternative Fuels.*

5. "*Approval"* means this entire Environmental Compliance Approval and any *Schedules* to it.

6. "*Baseline Conditions"* means operating conditions which include the use of *Conventional Fuel, Fuel Adjunct Materials* and *Industrial By-Product Materials* in the *Cement Kiln.*

7. "*Basic Comprehensive User Guide"* means the *Ministry* document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended.

8. "*Best Management Practices Plan"* means the document titled "St. Marys Cement Inc., Cement Plant Operations - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions" Revision 2, dated February, 2014, as amended.

9. "*CAEAL"* means the Canadian Association for Environmental Analytical Laboratories.

10. "*Cement Kiln"* means the cement kiln and the calciner, firing *Conventional Fuels, Alternative Fuels* and *Fuel Adjunct Materials*, described in the *Company's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

11. "*CEM System"* means the continuous monitoring and recording system used to measure the emissions and operational parameters of the *Cement Kiln.*

12. "*Company"* means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the *Facility* and includes any successors and assigns in accordance with section 19 of the *EPA.*

13. "*Compound of Concern"* means a contaminant described in paragraph 4 subsection 26 (1) of *O. Reg. 419/05;* namely, a contaminant that is discharged from the *Facility* in an amount that is not negligible.

14. "*Conventional Fuels"* means solid fuels including petroleum coke and coal for regular firing and also includes diesel, propane and natural gas for preheating during start-up.

15. "*Description Section"* means the section on page one of this *Approval* describing the *Company's* operations and the *Equipment* located at the *Facility* and specifying the *Facility Production Limit* for the *Facility*.

16. "*Director"* means a person appointed for the purpose of section 20.3 of the *EPA* by the *Minister* pursuant to section 5 of the *EPA.*

17. "*District Manager"* means the District Manager of the appropriate local district office of the *Ministry,* where the *Facility* is geographically located.

18. "*Emission Summary Table"* means a table described in paragraph 14 of subsection 26 (1) of *O. Reg. 419/05;* namely a table in the *ESDM Report* that compares the *Point of Impingement* concentration for each *Compound of Concern* to the corresponding *Ministry Point of Impingement Limit, Acceptable Point of Impingement Concentration,* or *Jurisdictional Screening Level.*

19. "*Environmental Assessment Act"* means the Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended.

20. "*EPA"* means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

21. "*Equipment"* means equipment or processes described in the *ESDM Report,* this *Approval* and in the *Schedules* referred to herein and any other equipment or processes.

22. "*Equipment with Specific Operational Limits"* means the *Cement Kiln* and any *Equipment* directly involved in the thermal oxidation of waste or waste derived fuels, fume incinerators or any other *Equipment* that is specifically referenced in any published *Ministry* document that outlines specific operational guidance that must be considered by the *Director* in issuing an *Approval.*

23. "*ESDM Report"* means the most current Emission Summary and Dispersion Modelling Report that describes the *Facility.* The *ESDM Report* is based on the *Original ESDM Report* and is updated after the issuance of this *Approval* in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document.*

24. "*Facility"* means the entire operation located on the *Property* where the *Equipment* is located.

25. "*Facility Production Limit"* means the production limit placed by the *Director* on the main product(s) or raw materials used by the *Facility.*

26. "*Fuel Adjunct Materials"* means solid fuel, wholly used at the *Facility,* as supplementary fuels to coal and petroleum coke for firing the *Cement Kiln* , such as but not limited to carbon dust, metallurgical coke and carbon black, but which does not include *Alternative Fuels.*

27. "*Industrial By-Product Materials"* means industrial by-product materials such as but not limited to iron slag from smelting industry, fly ash from coal fired generating plants, ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the *Facility* as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process and which do not serve as fuel for the *Cement Kiln.*

28. "*Jurisdictional Screening Level"* means a screening level for a *Compound of Concern* that is listed in the *Ministry* publication titled "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality", dated February 2008, as amended.

29. "*Log"* means a document that contains a record of each change that is required to be made to the *ESDM Report* and *Acoustic Assessment Report,* including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a *Point of Impingement* and all changes to information associated with a *Modification* to the *Facility* that satisfies Condition 2.

30. "*Low Carbon Alternative Fuels"* means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under *O.Reg 347,* and contains:

    (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    (b) less than 5% treated wood;
    (c) less than or equal to 1% total halogen content; and
    (d) less than 25% moisture by weight;

31. "*Manager"* means the Manager, Technology Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this *Approval.*

32. "*Maximum Emissions Scenario"* means maximum emissions scenario as outlined in the *Original ESDM Report.*

33. "*Minister"* means the Minister of the Environment and Climate Change or such other member of the Executive Council as may be assigned the administration of the *EPA* under the Executive Council Act.

34. "*Ministry* " means the ministry of the *Minister*.

35. "*Ministry Point of Impingement Limit"* means the applicable Standard set out in Schedule 2 or 3 of *O. Reg. 419/05* or a limit set out in the *Ministry* publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution - Local Air Quality (including Schedule 6 of *O. Reg. 419/05* on Upper Risk Thresholds", dated April 2012, as amended.

36. "*Modification"* means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the *Facility* that may discharge or alter the rate or manner of discharge of a *Compound of Concern* to the air or discharge or alter noise or vibration emissions from the *Facility*.

37. "*Noise Control Measures"* means measures to reduce the noise emissions from the *Facility* and/or *Equipment* including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers.

38. "*O. Reg. 347"* means Ontario Regulation 347, General - Waste Management, as amended.

39. "*O. Reg. 419/05"* means Ontario Regulation 419/05, Air Pollution – Local Air Quality, as amended.

40. "*Original ESDM Report"* means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document* by BCX Environmental Consulting and dated May 10, 2014 submitted in support of the application, and includes any changes to the report made up to the date of issuance of this *Approval*.

41. "*Point of Impingement"* has the same meaning as in section 2 of *O. Reg. 419/05*.

42. "*Point of Reception"* means Point of Reception as defined by *Publication NPC-300*.

43. "*Pre-Test Plan"* means a plan for the *Source Testing* including the information required in Section 5 of the *Source Testing Code*.

44. "*Procedure Document"* means *Ministry* guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009, as amended.

45. "*Processes with Significant Environmental Aspects"* means the *Equipment* which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of *O. Reg. 419/05* and the *Procedure Document*.

46. "*Property"* means the entire property excluding all operations in the dock area.

47. "*Publication NPC-207"* means the *Ministry* draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the *Ministry*, August 1978, as amended.

48. "*Publication NPC-233"* means the *Ministry* Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended.

49. "*Publication NPC-300"* means the *Ministry* Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, August 2013, as amended.

50. "*Schedules"* means the following schedules attached to this *Approval* and forming part of this *Approval* namely:

    Schedule A - Supporting Documentation
    Schedule B - Performance Requirements - In-Stack Emission Limits
    Schedule C - Process Dust Control Equipment Operational Requirements
    Schedule D - Material Analysis Contaminants
    Schedule E - *Alternative Fuels* Operational Requirements
    Schedule F - Procedure for *Source Testing*
    Schedule G - Test Sources and Test Contaminants - *Source Testing*
    Schedule H - *CEM System* Requirements - Opacity

51. "*Source Testing"* means sampling and testing to measure emissions resulting from operating the test sources under conditions which yield the worst case emissions within the approved operating range of the test sources which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

52. "*Source Testing Code"* means the Ontario Source Testing Code, dated June 2010, prepared by the *Ministry*, as amended.

53. "*Toxicologist"* means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants.

54. "*Written Summary Form"* means the electronic questionnaire form, available on the *Ministry* website, and supporting documentation, that documents the activities undertaken at the *Facility* in the previous calendar year.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL

1.1 Except as otherwise provided by this *Approval*, the *Facility* shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this *Approval* and in accordance with the following *Schedules* attached hereto:

Schedule A - Supporting Documentation
Schedule B - Performance Requirements - In-Stack Emission Limits
Schedule C - Process Dust Control Equipment Operational Requirements
Schedule D - Material Analysis Contaminants
Schedule E - *Alternative Fuels* Operational Requirements
Schedule F - Procedure for *Source Testing*
Schedule G - Test Sources and Test Contaminants - *Source Testing*
Schedule H - *CEM System* Requirements - Opacity

2. LIMITED OPERATIONAL FLEXIBILITY

2.1 Pursuant to section 20.6 (1) of the *EPA* and subject to Conditions 2.2 and 2.3 of this *Approval*, future construction, alterations, extensions or replacements are approved in this *Approval* if the future construction, alterations, extensions or replacements are *Modifications* to the *Facility* that:

(a) are within the scope of the operations of the *Facility* as described in the *Description Section* of this *Approval;*

(b) do not result in an increase of the *Facility Production Limit* above the level specified in the *Description Section* of this *Approval;* and

(c) result in compliance with the performance limits as specified in Condition 4.

2.2 Condition 2.1 does not apply to,

(a) the addition of any new *Equipment with Specific Operational Limits* or to the *Modification* of any existing *Equipment with Specific Operational Limits* at the *Facility;*

(b) *Modifications* to the *Facility* that would be subject to the *Environmental Assessment Act;* and

(c) *Modifications* to the *Facility* that would alter the type of *Alternative Fuels* or increase the quantity of *Alternative Fuels* specified in **Schedule E** of this *Approval.*

2.3 Condition 2.1 of this *Approval* shall expire ten (10) years from the date of this *Approval*, unless this *Approval* is revoked prior to the expiry date. The *Company* may apply for renewal of Condition 2.1 of this *Approval* by including an *ESDM Report* and an *Acoustic Assessment Report* that describes the *Facility* as of the date of the renewal application.

3. REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION*

3.1 Prior to making a *Modification* to the *Facility* that satisfies Condition 2.1 (a) and (b), the *Company* shall prepare a proposed update to the *ESDM Report* to reflect the proposed *Modification*.

3.2 The *Company* shall request approval of an *Acceptable Point of Impingement Concentration* for a *Compound of Concern* if the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and a proposed update to an *ESDM Report* indicates that one of the following changes with respect to the concentration of the *Compound of Concern* may occur:

(a) The *Compound of Concern* was not a *Compound of Concern* in the previous version of the *ESDM Report* and

(i) the concentration of the *Compound of Concern* is higher than the *Jurisdictional Screening Level* for the contaminant; or

(ii) there is no *Jurisdictional Screening Level* for the contaminant.

(b) The concentration of the *Compound of Concern* in the updated *ESDM Report* is higher than:

(i) the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

3.3 The request required by Condition 3.2 shall propose a concentration for the *Compound of Concern* and shall contain an assessment, performed by a *Toxicologist*, of the likelihood of the proposed concentration causing an adverse effect at *Points of Impingement*.

3.4 If the request required by Condition 3.2 is a result of a proposed *Modification* described in Condition 3.1, the *Company* shall submit the request, in writing, to the *Director* at least 30 days prior to commencing to make the *Modification*. The *Director* shall provide written confirmation of receipt of this request to the *Company*.

3.5 If a request is required to be made under Condition 3.2 in respect of a proposed *Modification* described in Condition 3.1, the *Company* shall not make the *Modification* mentioned in Condition 3.1 unless the request is approved in writing by the *Director*.

3.6 If the *Director* notifies the *Company* in writing that the *Director* does not approve the request, the *Company* shall,

(a) revise and resubmit the request; or

(b) notify the *Director* that it will not be making the *Modification*.

3.7 The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.

3.8 If the *Director* approves the request, the *Company* shall update the *ESDM Report* to reflect the *Modification.*

3.9 Condition 3 does not apply if Condition 2.1 has expired.

4. PERFORMANCE LIMITS

4.1. Subject to Condition 4.2, the *Company* shall not discharge or cause or permit the discharge of a *Compound of Concern* into the air if,

(a) the *Compound of Concern* has a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the *Ministry Point of Impingement Limit;* or

(b) the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the higher of,

(i) if an *Acceptable Point of Impingement Concentration* exists the most recent *Acceptable Point of Impingement Concentration,* and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

4.2 Condition 4.1 does not apply if the *Ministry Point of Impingement Limit* has a 10-minute averaging period and no ambient monitor indicates an exceedance at a *Point of Impingement* where human activities regularly occur at a time when those activities regularly occur.

4.3 The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in *Ministry Publications NPC-300.*

4.4 The *Company* shall ensure that the vibration emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-207.*

4.5 The *Company* shall operate any *Equipment with Specific Operational Limits* approved by this *Approval* in accordance with the *Original ESDM Report.*

4.6 The *Company* shall ensure that at all times when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* the discharge from the *Cement Kiln* complies with the performance requirements specified in **Schedule B** of this *Approval.*

4.7 The *Company* shall ensure that there is no increase in the emissions of sulphur dioxide and oxides of nitrogen when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* as demonstrated by the *CEM System.*

5. DOCUMENTATION REQUIREMENTS

5.1. The *Company* shall maintain an up-to-date *Log.*

5.2. No later than April 30 in each year, the *Company* shall update the *Acoustic Assessment Report* and shall update the *ESDM Report* in accordance with section 26 of *O. Reg. 419/05* so that the information in the reports is accurate as of December 31 in the previous year.

5.3. The *Company* shall make the *Emission Summary Table* (see section 27 of *O. Reg. 419/05)* and *Acoustic Assessment Summary Table* available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the *Facility*.

5.4 The *Company* shall, within three (3) months after the expiry of Condition 2.1 of this *Approval,* update the *ESDM Report* and the *Acoustic Assessment Report* such that the information in the reports is accurate as of the date that Condition 2.1 of this *Approval* expired.

5.5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

6. REPORTING REQUIREMENTS

6.1 Subject to Condition 6.2, the *Company* shall provide the *Director* no later than July 31 of each year, a *Written Summary Form* to be submitted through the *Ministry's* website that shall include the following:

(a) a declaration of whether the *Facility* was in compliance with section 9 of the *EPA, O. Reg. 419/05* and the conditions of this *Approval;*

(b) a summary of each *Modification* satisfying Condition 2.1 (a) and (b) that took place in the previous calendar year that resulted in a change in the previously calculated concentration at a *Point of Impingement* for any *Compound of Concern* or resulted in a change in the sound levels reported in the *Acoustic Assessment Summary Table* at any *Point of Reception.*

6.2 Condition 6.1 does not apply if Condition 2.1 has expired.

7. OPERATION AND MAINTENANCE

7.1 The *Company* shall prepare, update as necessary and implement, not later than six (6) months from the date of this *Approval,* operating procedures and maintenance programs for all *Processes with Significant Environmental Aspects,* which shall specify as a minimum:

(a) frequency of inspections and scheduled preventative maintenance;

(b) procedures to prevent upset conditions;

(c) procedures to minimize all fugitive emissions;

(d) procedures to prevent and/or minimize odorous emissions;

(e) procedures to prevent and/or minimize noise emissions;

(f) acceptable ranges of the static pressure drop for the process dust control equipment listed in **Schedule C** of this *Approval;*

(g) program to monitor and record the pressure differential across each of the primary dust collectors as specified in **Schedule C** of this *Approval,* including the frequency of measurement and procedures to investigate and correct the cause of any anomalous measurements of the static pressure drop;

(h) list of management and supervisory personnel responsible for the operation and maintenance of process dust control equipment specified in **Schedule C** of this *Approval;* and

(i) procedures for record keeping activities relating to the operation and maintenance programs.

7.2 The company shall maintain and update to keep current, a list of all process dust control equipment, including the following details:

Source identification; Production building/area served; Process/location served; Stack gas flow rate; Filter area; Stack diameter and Stack height above grade.

7.3 The *Company* shall ensure that all *Processes with Significant Environmental Aspects* are operated and maintained in accordance with this *Approval,* the operating procedures and maintenance programs.

8.0 START-UPS, SHUTDOWN AND UPSET PROCEDURES

8.1 The *Company* shall update as necessary, not later than six (6) months from the date of issue of this *Approval,* operating procedures which address kiln start-ups, shut down and any upset conditions.

9.0 MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

The *Company* shall ensure that a material analysis program to measure and record the concentration of contaminants for the following material is implemented:

9.1 *Industrial By-Product Material* or *Fuel Adjunct Material*

(a) For each material used as *Fuel Adjunct Materials,* the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D** on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(b) For each material used as *Industrial By-Product Materials*, the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D**, on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(c) At any time, should the *Company* either independently or through other sources reasonably expect other metal/metal hydrides not outlined under **Schedule D** to be present in any material at greater than the trace concentrations, the *Company* shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the *Company* shall ensure that the *Point of Impingement* concentrations of metal/metal hydrides identified in (c) above do not exceed the respective limit based on the *Maximum Emissions Scenario.*

(e) The *Company* shall limit the accumulation of *Industrial By-Product Materials* and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

(f) The *Company* shall ensure that any *Industrial By-Product Material* stored at the *Facility* which the *Company* determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an *Industrial By-Product Material* becomes unusable, the *Company* shall advise the *District Manager* in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

10.0 *ALTERNATIVE FUELS*

10.1 The *Company* shall ensure that the *Facility/Equipment* is properly designed and operated at all times while firing *Alternative Fuels* and comply with the operational requirements set out in **Schedule E** of this *Approval.*

10.2 The *Company* shall, in consultation with the *District Manager*, update as necessary and implement, not later than three (3) months from the date of first firing of *Alternative Fuels* in the *Cement Kiln,* operating procedures provided in section 8 of the Design and Operations Report specified in **Schedule A** of this *Approval,* which addresses *Alternate Fuels* start-up and shut-down, emergency and contingency measures and termination of *Alternative Fuel* processing. *Alternative Fuels* shall be fired in accordance with these operating procedures and shall only be fired once the *Cement Kiln* has achieved normal operation, temperatures and production and shall be introduced only in the high-temperature combustion zones of the kiln and the calciner.

10.3 The firing of *Alternative Fuels* shall be stopped (following appropriate procedures) if:

(a) the temperature, residual oxygen or pressure as measured by the specified measuring equipment do not meet the operational requirements outlined in **Schedule E** of this *Approval* for more than four (4) consecutive hours; or

(b) the measuring equipment such as the *CEM System* for one or more of the parameters specified in condition 10.3 (a) are down or malfunctioning for more than four (4) consecutive hours.

10.4 Analysis and Criteria for Acceptance

(a) A *Low Carbon Alternative Fuels* testing protocol over a minimum six (6) month period shall be implemented in accordance with sections 6.1.3 and 10.3 of the Design and Operations Report specified in **Schedule A** of this *Approval*, to establish consistency in the *Low Carbon Alternative Fuels* characteristics.

(b) After the successful completion of the testing protocol described in condition 10.4 (a), the *Company* shall update the procedure as necessary for sampling and analysis titled "Alternative Low-Carbon Fuel Sampling Methodology, Revision 1" provided as Appendix G of the Design and Operations Report. The updated procedure shall be provided to the *District Manager* not later than two (2) months before the planned first use of *Alternative Fuels* at the *Facility*.

(c) During the regular use of *Alternative Fuels*, the *Company* shall conduct sampling and analysis in accordance with the updated sampling and analysis procedure in condition 10.4 (b).

10.5 If the results of the analysis specified in condition 10.4 (c) indicate that emission rates of contaminants from the Kiln Stack are higher than the maximum emission rates identified in the *Maximum Emission Scenario*, the *Company* shall update the *ESDM Report* with the emission rates derived from this analysis.

10.6 The *Company* shall record the following data during *Cement Kiln* Operation:

(a) hourly combined raw feed;

(b) *Fuel Adjunct Material* and *Industrial By-Product Material* for relevant period;

(c) hourly *Alternative Fuels* and *Conventional Fuels* firing rates in the kiln and calciner;

(d) hourly clinker production; and

(e) records of incidents specified in condition 10.3 of this *Approval.*

11. SOURCE TESTING

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

11.3 The *District Manager* may relax the frequency and/or scope of *Source Testing* if the results of the annual *Source Testing* indicate that the emissions and *Point of Impingement* concentrations of *Compounds of Concern* are insignificant when substituting a portion of *Conventional Fuel* with *Alternative Fuels.*

12. CONTINUOUS EMISSIONS MONITORING

12.1 Continuous Emissions Monitoring in the Kiln Stack

(a) The *Company* shall ensure that the existing *CEM System* is fully operational at all times to continuously monitor the following parameters in the exhaust gas stream from the Kiln Stack:

(i) Nitrogen Oxides
(ii) Sulphur Dioxide
(iii) Opacity

(b) The *CEM System* for nitrogen oxides and sulphur dioxide shall comply with the requirements of O.Reg. 194/05 – Industry Emissions – Nitrogen Oxides and Sulphur Dioxide, as amended from time to time.

(c) The *CEM System* for monitoring opacity shall comply with the requirements outlined in **Schedule H.**

12.2 Continuous Emissions Monitoring of Process Conditions

12.2.1 The *Company* shall install, operate and maintain a *CEM System* to continuously monitor:

(a) the concentration of residual oxygen and carbon monoxide in the backend of the kiln and calciner down comer duct;

(b) the temperatures of gases leaving the kiln at a point where the gas temperature reaches a minimum of 1000 Deg. C for a period of not less than 6 seconds;

(c) the temperatures of gases leaving the calciner at a point where the gas temperature reaches a minimum of 850 Deg. C for not less than 3 seconds; and

(d) Total Hydrocarbon (as methane) in the gases leaving the Kiln Stack.

12.2.2 The *Company* shall submit to the *Manager,* not later than ninety (90) days prior to the first use of *Alternative Fuels* in the *Cement Kiln,* a detailed continuous monitoring plan, complete with specifications for the *CEM System* for the parameters specified in condition 12.2.1 of this *Approval.* The *Company* shall finalize the continuous monitoring plan in consultation with the *Manager.*

12.2.3 The *Company* shall ensure that the *CEM System* specified in condition 12.2.1 are installed, commissioned, operated and maintained in accordance with the finalized monitoring plan referenced in condition 12.2.2 prior to the first use of *Alternative Fuels*.

12.3 Continuous Emissions Monitoring Documentation

12.3.1 The *Company* shall prepare and retain on site monthly reports of the data monitored during the preceding month by the *CEM System,* summarizing the following as a minimum:

(a) the daily minimum, maximum and average readings for the parameters specified in condition 12 of this *Approval;*

(b) the type and hourly firing rate of fuels used during the period the readings were taken;

(c) the percent availability of the *CEM System* for the parameters specified in condition 12 of this *Approval.*

(d) operational status (on/off) of the raw mill and the fuel mill.

12.3.2 The *Company* shall establish the normal operating total hydrocarbons range for *Baseline Conditions.* After the first use of any of the *Alternative Fuels,* the *Company* shall, at a minimum on a quarterly basis, review the *CEM System* monthly reports and identify and investigate any anomalous total hydrocarbons data. The investigations report shall be prepared and retained on site.

12.3.3 The *Company* shall retain on site, all raw data generated by the *CEM System.*

13. FUGITIVE EMISSIONS CONTROL

13.1 The *Company* shall update as necessary and implement the *Best Management Practices Plan* for the control of fugitive dust emissions.

Documentation Requirements - *Best Management Practices Plan*

13.2 The *Company* shall record and retain such records, each time a specific preventative and control measure described in the *Best Management Practices Plans* is implemented. The *Company* shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

14. COMPLAINTS RECORDING AND REPORTING

14.1 If at any time, the *Company* receives an environmental complaint from the public regarding the operation of the *Equipment* approved by this *Approval,* the *Company* shall take the following steps:

(a) Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.

(b) Notify the *District Manager* of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the *District Manager.*

(c) Initiate appropriate steps to determine all possible causes of the complaint and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint attributable to the operations at the *Facility.*

(d) Complete and retain on-site a report written within one (1) week of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

15. RECORD KEEPING REQUIREMENTS

15.1 Any information pertaining to compliance with the *EPA, Regulation 419/05* and this *Approval* requested by any employee in or agent of the *Ministry,* concerning the *Facility* and its operation under this *Approval,* including, but not limited to, any records required to be kept by this *Approval,* shall be provided to the employee in or agent of the *Ministry,* upon request, in a timely manner.

15.2 Unless otherwise specified in this *Approval,* the *Company* shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this *Approval,* including,

(a) a copy of the *Original ESDM Report* and each updated version*;*

(b) a copy of each version of the *Acoustic Assessment Report;*

(c) supporting information used in the emission rate calculations performed in the *ESDM Reports* and *Acoustic Assessment Reports;*

(d) the records in the *Log;*

(e) copies of each *Written Summary Form* provided to the *Ministry* under Condition 6.1 of this *Approval;*

(f) records of maintenance, repair and inspection of *Equipment* related to all *Processes with Significant Environmental Aspects;*

(g) all records related to environmental complaints made by the public as required by Condition 14 of this *Approval;*

(h) records related to *Source Testing* events specified under section titled "Source Testing" of this *Approval;*

(i) records related to the operation of the *CEM System* specified under section titled "Continuous Emission Monitoring" of this *Approval;*

(j) records related to the preventative and control measures implemented as specified under section titled "Fugitive Emissions Control" of this *Approval;* and

(k) records related to sampling and analysis specified under sections titled "Material Analysis and Criteria of Acceptance" and "Alternative Fuels" of this *Approval.*

16. REVOCATION OF PREVIOUS APPROVALS

This *Approval* replaces and revokes all Certificates of Approval (Air) issued under section 9 *EPA* and Environmental Compliance Approvals issued under Part II.1 *EPA* to the *Facility* in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

SCHEDULE A

Supporting Documentation

(a) Application for Environmental Compliance Approval (Air & Noise), dated May 9, 2014, signed by Ruben Plaza and submitted by the C*ompany.*

(b) Emission Summary and Dispersion Modelling Report, prepared by BCX Environmental Consulting and dated May 10, 2014.

(c) Additional air emissions and dispersion modelling related information provided by BCX Environmental Consulting dated April 1, 2015, May 26 & 27, 2015 and July 23, 2015.

(d) Report titled "Bowmanville Cement Plant - Design and Operations Report, Environmental Compliance Approval for Regular Use of Low Carbon Alternative fuel (Woody Biomass)", prepared by HDR Engineering and dated May 2014.

(e) Acoustic Assessment Report, prepared by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014.

SCHEDULE B

Performance Requirements- In-Stack Emission Limits

Parameter	Kiln Stack Emission Limit	Verification of Compliance
Particulate Matter (PM)	50 mg/Rm^3	Results from compliance source testing
Cadmium (Cd)	7 µg/Rm3	Results from compliance source testing
Lead (Pb)	60 µg/Rm3	Results from compliance source testing
Mercury (Hg)	20 µg/Rm3	Results from compliance source testing
Dioxins and Furans	80 pg/Rm^3 as ITEQ	Results from compliance source testing; results expressed as I-TEQ.
Hydrochloric Acid (HCl)	27 mg/Rm^3	Results from compliance source testing
Opacity	In accordance with s. 46 of *O.Reg 419/05*	Calculated as the rolling arithmetic average of 6 minutes of data measured by a *CEM System* that provides data at least once every minute.

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
µg/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs) in 2005, and adopted by Ontario in April 2012.

SCHEDULE C

PROCESS DUST CONTROL EQUIPMENT OPERATIONAL REQUIREMENTS

Primary Dust Control Equipment

Primary dust control equipment includes the Kiln Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse and Finish Mill Baghouses.

The static pressure drop across the primary dust control equipment filter bag compartments shall be measured and recorded continuously by the *Facility's* automated control system.

Secondary Dust Control Equipment

Secondary dust control equipment includes all other fabric filter dust collectors which are not primary dust control equipment.

The static pressure drop across the secondary dust control equipment filter bag compartments shall be measured and recorded at least quarterly.

Where applicable, the static pressure drop must be referenced to the value recorded during previous testing. In the absence of previous testing values, the parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible.

SCHEDULE D

MATERIAL ANALYSIS CONTAMINANTS

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium
17. Total Halogens

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels*, based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

SCHEDULE F

Procedure for *Source Testing*

1. The *Company* shall submit, not later than three (3) months prior to the *Source Testing*, to the *Manager* a *Pre-Test Plan* for the *Source Testing* required under this *Approval*. The *Company* shall finalize the *Pre-Test Plan* in consultation with the *Manager*.

2. The first *Source Testing* shall be carried out for the following individual fuel firing scenarios at the maximum approved fuel firing rate in the kiln and the calciner. The characteristics of *Low Carbon Alternative Fuels* used during *Source Testing* shall be within the range established under Condition 10.4 - Analysis and Criteria for Acceptance of this *Approval:*

   (1) *Baseline Conditions;*
   (2) Approved substitution rate of *Conventional Fuels* with *Low Carbon Alternative Fuels;* and/or
   (3) Approved substitution rate of *Conventional Fuels* with Woodwaste as defined under *O.Reg.347*.

3. Subsequent annual *Source Testing* as described in condition 11.2 of this *Approval* shall be carried out for the maximum approved substitution rate of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347*, as applicable.

4. The *Company* shall not commence the *Source Testing* required under this *Approval* until the *Manager* has approved the *Pre-Test Plan.*

5. The *Company* shall notify the *Manager*, the *District Manager* and the *Director* in writing of the location, date and time of any impending *Source Testing* required by this *Approval*, at least fifteen (15) days prior to the *Source Testing.*

6. The *Company* shall submit a report (hardcopy and electronic format) on the *Source Testing* to the *Manager and* the *District Manager* not later than four (4) months after completing the *Source Testing*, or not later than a time frame agreed in writing with the *Manager*. The report shall be in the format described in the *Source Testing Code*, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions at the time of *Source Testing* and other information including but not limited to:

      (i) clinker production rate in tonnes/hour;
      (ii) *Conventional fuel, Low Carbon Alternative Fuels* and/or Woodwaste firing rate in tonnes/hour separately in the kiln and calciner;
      (iii) quantity and type of *Fuel Adjunct Materials* and *Industrial By-Product Materials* used; and
      (iv) any other records that may affect the *Source Testing* results;

SCHEDULE F (Continued)

Procedure for *Source Testing*

(3) results of *Source Testing,* including the emission rate, emission concentration and relevant emission factor of the Test Contaminants;

(4) a summary of all records of the *CEM System* available for the parameters specified in condition 12 of this *Approval* at the time of *Source Testing;*

(5) a summary table that compares the *Source Testing* results to the emission estimates described in the *Company* 's application, the *ESDM Report* and the Performance Limits; and

(6) a comparison of stack analysis data between use of *Conventional fuel, Low Carbon Alternative Fuels* and Woodwaste for the first *Source Testing* of the relevant material; and a description and explanation of any statistically significant changes in emissions of the Test Contaminants, resulting from the use of *Alternative Fuel,* relative to *Baseline Conditions.*

7. The *Company* shall ensure that the *Source Testing* report is made available and easily accessible for review by the public at the *Facility,* immediately after the document is submitted to the *Ministry.*

8. The *Director* may not accept the results of the *Source Testing* if:

(1) the *Source Testing Code* or the requirements of the *Manager* were not followed;

(2) the *Company* did not notify the *District Manager,* the *Manager* and the *Director* of the *Source Testing;* or

(3) the *Company* failed to provide a complete report on the *Source Testing.*

9. If the *Director* does not accept the results of the *Source Testing,* the *Director* may require re-testing. If re-testing is required, the *Pre-Test Plan* strategies need to be revised and submitted to the *Manager* for approval. The actions taken to minimize the possibility of the *Source Testing* results not being accepted by the *Director* must be noted in the revision.

10. If the *Source Testing* results are higher than the emission estimates in the *Company's ESDM Report,* the *Company* shall update their *ESDM Report* in accordance with Section 26 of *O. Reg. 419/05* with the results from the *Source Testing* report and make these records available for review by staff of the *Ministry* upon request. The updated Emission Summary Table from the updated *ESDM Report* shall be submitted with the report on the *Source Testing.*

SCHEDULE G

Test Sources and Test Contaminants - *Source Testing*

Test Sources

Source ID	Description	Frequency
Kiln Stack	Main stack serving the *Cement Kiln*	In accordance with condition 11 of this *Approval.* The schedule between two consecutive tests should not be less than six (6) months

Test Contaminants

Total Suspended Particulate Matter
Ammonia
Hydrogen Chloride

Metals		Volatile Organic Matter
Cd	Cadmium	Acetone
Be	Beryllium	Acrolein
Pb	Lead	Benzene
Mo	Molybdenum	Bromodichloromethane
Cr	Chromium	Bromoform
Ni	Nickel	Bromomethane
V	Vanadium	Butadiene, 1,3 -
Al	Aluminum	Butanone, 2 -
Ti	Titanium	Carbon Tetrachloride
Mg	Magnesium	Chloroform
B	Boron	Cumene
Ba	Barium	Dibromochloromethane
P	Phosphorus	Dichlorodifluoromethane
K	Potassium	Dichloroethane, 1,2 -
Hg	Mercury	Dichloroethene, Trans - 1,2
As	Arsenic	Dichloroethene, 1,1 -
Zn	Zinc	Dichloropropane, 1,2 -
Sb	Antimony	Ethylbenzene
Mn	Manganese	Ethylene Dibromide
Co	Cobalt	Mesitylene
Se	Selenium	Methylene Chloride
Cu	Copper	Styrene
Ag	Silver	Tetrachloroethene
Sn	Tin	Toluene
Sr	Strontium	Trichloroethane, 1,1,1 -
Tl	Thalium	Trichloroethene
Fe	Iron	Trichloroethylene, 1,1,2 -
		Trichlorotrifluoroethane
		Trichlorofluoromethane
		Xylenes, M-, P- and O
		Vinyl Chloride

SCHEDULE G (Continued)

Polycyclic Organic Matter
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene *
Benzo(e)pyrene
Biphenyl
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
Dibenzo(a,h)anthracene
Dibenzo(a,e)pyrene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
M-terphenyl
O-terphenyl
P-terphenyl
Triphenylene

* Benzo(a)Pyrene (B(a)P) standard and upper Risk Threshold (URT) are considered surrogate for all POMs that do not have their own standards or guidelines. For O.Reg.419/05 reporting, before July 2016, if the existing guideline is exceeded, B(a)P as a surrogate will be assessed against the URT. After July 1, 2016, it will be assessed against the new standard.

SCHEDULE G (Continued)
Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of the isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MOE publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 and as noted below.

Example:

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO_{2005} Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1

12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003

27	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

NOTE:

* Sum of toxicity equivalents of individual isomers

The TEF scheme is intended to be used with isomer specific analytical results. In cases where results are reported by congener group only, staff at *Ministry's* Standards Development Branch shall be contacted for appropriate procedures to convert non-isomer specific data to TEQs.

SCHEDULE H
CEM System Requirements - Opacity

INSTALLATION: The *CEM System* shall be installed at an accessible location where the measurements are representative of the total emissions from the Kiln Main Stack, and shall meet the following installation specifications:

	PARAMETERS	SPECIFICATION
1	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
3	Detection angle of view:	≤ 5 degrees
4	Angle of projection:	≤ 5 degrees
5	Range (percent of opacity):	0 -100

PERFORMANCE: The *CEM System* for opacity monitoring shall meet the following minimum performance specifications for the following parameters.

	PARAMETERS	SPECIFICATION
1	Span Value (percent opacity):	2 times the average normal opacity of the source
2	Calibration Error:	≤ 3 percent opacity
3	Attenuation Calibration:	≤ 2 percent opacity
4	Response Time (95 percent response to a step change)	≤ 10 seconds
5	Schedule for Zero and Calibration Checks:	daily minimum
6	Procedure for Zero and Calibration Checks:	all system components checked
7	Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8	Span Calibration Drift (24-hours):	≤ 2 percent opacity
9	Conditioning Test Period:	≥ 168 hours without corrective maintenance
10	Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION: The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the periods of the operation of the Equipment. The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER: The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY: The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter.

The reasons for the imposition of these terms and conditions are as follows:

GENERAL

1. Condition No. 1 is included to require the *Approval* holder to build, operate and maintain the *Facility* in accordance with the Supporting Documentation in Schedule A considered by the *Director* in issuing this *Approval.*

LIMITED OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION* AND *PERFORMANCE LIMITS*

2. Condition Nos. 2, 3 and 4 are included to limit and define the *Modifications* permitted by this *Approval,* and to set out the circumstances in which the *Company* shall request approval of an *Acceptable Point of Impingement Concentration* prior to making *Modifications.* The holder of the *Approval* is approved for operational flexibility for the *Facility* that is consistent with the description of the operations included with the application up to the *Facility Production Limit.* In return for the operational flexibility, the *Approval* places performance based limits that cannot be exceeded under the terms of this *Approval. Approval* holders will still have to obtain other relevant approvals required to operate the *Facility,* including requirements under other environmental legislation such as the *Environmental Assessment Act.*

DOCUMENTATION REQUIREMENTS

3. Condition No. 5 is included to require the *Company* to maintain ongoing documentation that demonstrates compliance with the *Performance Limits* of this *Approval* and allows the *Ministry* to monitor on-going compliance with these *Performance Limits.* The *Company* is required to have an up to date *ESDM Report* and *Acoustic Assessment Report* that describe the *Facility* at all times and make the *Emission Summary Table* and *Acoustic Assessment Summary Table* from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the *Facility.*

REPORTING REQUIREMENTS

4. Condition No. 6 is included to require the *Company* to provide a yearly *Written Summary Form* to the *Ministry,* to assist the *Ministry* with the review of the site's compliance with the *EPA,* the regulations and this *Approval.*

OPERATION AND MAINTENANCE

5. Condition Nos. 7, 8, 9 and 10 and are included to require the *Company* to properly operate and maintain the *Processes with Significant Environmental Aspects* to minimize the impact to the environment from these processes.

TESTING

6. Condition Nos. 11 and 12 are included to require the *Company* to gather and retain accurate information so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

FUGITIVE EMISSIONS CONTROL

7. Condition No. 13 is included to emphasize that the *Equipment* and *Facility* must be maintained and operated in accordance with a procedure that will result in compliance with the *EPA, Regulation 419/05* and this *Approval* and to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

COMPLAINTS RECORDING AND REPORTING

9. Condition No. 14 is included to require the *Company* to respond to any environmental complaints regarding the operation of the *Equipment,* according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

RECORD KEEPING REQUIREMENTS

10. Condition No. 15 is included to require the *Company* to retain all documentation related to this *Approval* and provide access to employees in or agents of the *Ministry,* upon request, so that the *Ministry* can determine if a more detailed review of compliance with the *Performance Limits* is necessary.

REVOCATION OF PREVIOUS APPROVALS

11. Condition No. 16 is included to identify that this *Approval* replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3779-9BMQW4 issued on December 5, 2013.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with

respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, M. Sc., P.Eng., BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverley Road
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Description Section

A cement manufacturing facility, consisting of the following processes and support units:

- quarry operations - limestone extraction, processing and shipping;
- raw material and fuel processing, storage and handling;
- clinker production- kiln and calciner operations;
- cement production including ball mills, cement storage and shipping;

including the *Equipment* and any other ancillary and support processes and activities, operating at a *Facility Production Limit* of up to a **clinker production rate of 2.4 million tonnes per year,** discharging to the air as described in the *Original ESDM Report.*

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acceptable Point of Impingement Concentration"* means a concentration accepted by the *Ministry* as not likely to cause an adverse effect for a *Compound of Concern* that,

   (a) has no *Ministry Point of Impingement Limit* and no *Jurisdictional Screening Level*, or

   (b) has a concentration at a *Point of Impingement* that exceeds the *Jurisdictional Screening Level*.

   With respect to the *Original ESDM Report*, the *Acceptable Point of Impingement Concentration* for a *Compound of Concern* mentioned above is the concentration set out in the *Original ESDM Report.*

2. "*Acoustic Assessment Report"* means the report, prepared in accordance with *Publication NPC-233* and Appendix A of the *Basic Comprehensive User Guide*, by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014 submitted in support of the application, that documents all sources of noise emissions and *Noise Control Measures* present at the *Facility*, as updated in accordance with Condition 5 of this *Approval.*

3. "*Acoustic Assessment Summary Table"* means a table prepared in accordance with the *Basic Comprehensive User Guide* summarising the results of the *Acoustic Assessment Report*, as updated in accordance with Condition 5 of this *Approval.*

4. "*Alternative Fuels"* means Woodwaste as defined in *O.Reg. 347* and *Low Carbon Alternative Fuels.*

5. "*Approval"* means this entire Environmental Compliance Approval and any *Schedules* to it.

6. "*Baseline Conditions"* means operating conditions which include the use of *Conventional Fuel, Fuel Adjunct Materials* and *Industrial By-Product Materials* in the *Cement Kiln.*

7. "*Basic Comprehensive User Guide"* means the *Ministry* document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended.

8. "*Best Management Practices Plan"* means the document titled "St. Marys Cement Inc., Cement Plant Operations - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions" Revision 2, dated February, 2014, as amended.

9. "*CAEAL"* means the Canadian Association for Environmental Analytical Laboratories.

10. "*Cement Kiln"* means the cement kiln and the calciner, firing *Conventional Fuels, Alternative Fuels* and *Fuel Adjunct Materials*, described in the *Company's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

11. "*CEM System"* means the continuous monitoring and recording system used to measure the emissions and operational parameters of the *Cement Kiln.*

12. "*Company"* means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the *Facility* and includes any successors and assigns in accordance with section 19 of the *EPA.*

13. "*Compound of Concern"* means a contaminant described in paragraph 4 subsection 26 (1) of *O. Reg. 419/05;* namely, a contaminant that is discharged from the *Facility* in an amount that is not negligible.

14. "*Conventional Fuels"* means solid fuels including petroleum coke and coal for regular firing and also includes diesel, propane and natural gas for preheating during start-up.

15. "*Description Section"* means the section on page one of this *Approval* describing the *Company's* operations and the *Equipment* located at the *Facility* and specifying the *Facility Production Limit* for the *Facility*.

16. "*Director"* means a person appointed for the purpose of section 20.3 of the *EPA* by the *Minister* pursuant to section 5 of the *EPA.*

17. "*District Manager"* means the District Manager of the appropriate local district office of the *Ministry,* where the *Facility* is geographically located.

18. "*Emission Summary Table"* means a table described in paragraph 14 of subsection 26 (1) of *O. Reg. 419/05;* namely a table in the *ESDM Report* that compares the *Point of Impingement* concentration for each *Compound of Concern* to the corresponding *Ministry Point of Impingement Limit, Acceptable Point of Impingement Concentration,* or *Jurisdictional Screening Level.*

19. "*Environmental Assessment Act"* means the Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended.

20. "*EPA"* means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

21. "*Equipment"* means equipment or processes described in the *ESDM Report,* this *Approval* and in the *Schedules* referred to herein and any other equipment or processes.

22. "*Equipment with Specific Operational Limits"* means the *Cement Kiln* and any *Equipment* directly involved in the thermal oxidation of waste or waste derived fuels, fume incinerators or any other *Equipment* that is specifically referenced in any published *Ministry* document that outlines specific operational guidance that must be considered by the *Director* in issuing an *Approval.*

23. "*ESDM Report"* means the most current Emission Summary and Dispersion Modelling Report that describes the *Facility.* The *ESDM Report* is based on the *Original ESDM Report* and is updated after the issuance of this *Approval* in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document.*

24. "*Facility"* means the entire operation located on the *Property* where the *Equipment* is located.

25. "*Facility Production Limit"* means the production limit placed by the *Director* on the main product(s) or raw materials used by the *Facility.*

26. "*Fuel Adjunct Materials"* means solid fuel, wholly used at the *Facility,* as supplementary fuels to coal and petroleum coke for firing the *Cement Kiln* , such as but not limited to carbon dust, metallurgical coke and carbon black, but which does not include *Alternative Fuels.*

27. "*Industrial By-Product Materials"* means industrial by-product materials such as but not limited to iron slag from smelting industry, fly ash from coal fired generating plants, ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the *Facility* as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process and which do not serve as fuel for the *Cement Kiln.*

28. "*Jurisdictional Screening Level"* means a screening level for a *Compound of Concern* that is listed in the *Ministry* publication titled "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality", dated February 2008, as amended.

29. "*Log"* means a document that contains a record of each change that is required to be made to the *ESDM Report* and *Acoustic Assessment Report,* including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a *Point of Impingement* and all changes to information associated with a *Modification* to the *Facility* that satisfies Condition 2.

30. "*Low Carbon Alternative Fuels"* means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under *O.Reg 347,* and contains:

    (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    (b) less than 5% treated wood;
    (c) less than or equal to 1% total halogen content; and
    (d) less than 25% moisture by weight;

31. "*Manager"* means the Manager, Technology Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this *Approval.*

32. "*Maximum Emissions Scenario"* means maximum emissions scenario as outlined in the *Original ESDM Report.*

33. "*Minister"* means the Minister of the Environment and Climate Change or such other member of the Executive Council as may be assigned the administration of the *EPA* under the Executive Council Act.

34. "*Ministry* " means the ministry of the *Minister*.

35. "*Ministry Point of Impingement Limit"* means the applicable Standard set out in Schedule 2 or 3 of *O. Reg. 419/05* or a limit set out in the *Ministry* publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution - Local Air Quality (including Schedule 6 of *O. Reg. 419/05* on Upper Risk Thresholds", dated April 2012, as amended.

36. "*Modification"* means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the *Facility* that may discharge or alter the rate or manner of discharge of a *Compound of Concern* to the air or discharge or alter noise or vibration emissions from the *Facility*.

37. "*Noise Control Measures"* means measures to reduce the noise emissions from the *Facility* and/or *Equipment* including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers.

38. "*O. Reg. 347"* means Ontario Regulation 347, General - Waste Management, as amended.

39. "*O. Reg. 419/05"* means Ontario Regulation 419/05, Air Pollution – Local Air Quality, as amended.

40. "*Original ESDM Report"* means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document* by BCX Environmental Consulting and dated May 10, 2014 submitted in support of the application, and includes any changes to the report made up to the date of issuance of this *Approval*.

41. "*Point of Impingement"* has the same meaning as in section 2 of *O. Reg. 419/05*.

42. "*Point of Reception"* means Point of Reception as defined by *Publication NPC-300*.

43. "*Pre-Test Plan"* means a plan for the *Source Testing* including the information required in Section 5 of the *Source Testing Code*.

44. "*Procedure Document"* means *Ministry* guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009, as amended.

45. "*Processes with Significant Environmental Aspects"* means the *Equipment* which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of *O. Reg. 419/05* and the *Procedure Document*.

46. "*Property"* means the entire property excluding all operations in the dock area.

47. "*Publication NPC-207"* means the *Ministry* draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the *Ministry*, August 1978, as amended.

48. "*Publication NPC-233"* means the *Ministry* Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended.

49. "*Publication NPC-300"* means the *Ministry* Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, August 2013, as amended.

50. "*Schedules"* means the following schedules attached to this *Approval* and forming part of this *Approval* namely:

    Schedule A - Supporting Documentation
    Schedule B - Performance Requirements - In-Stack Emission Limits
    Schedule C - Process Dust Control Equipment Operational Requirements
    Schedule D - Material Analysis Contaminants
    Schedule E - *Alternative Fuels* Operational Requirements
    Schedule F - Procedure for *Source Testing*
    Schedule G - Test Sources and Test Contaminants - *Source Testing*
    Schedule H - *CEM System* Requirements - Opacity

51. "*Source Testing"* means sampling and testing to measure emissions resulting from operating the test sources under conditions which yield the worst case emissions within the approved operating range of the test sources which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

52. "*Source Testing Code"* means the Ontario Source Testing Code, dated June 2010, prepared by the *Ministry*, as amended.

53. "*Toxicologist"* means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants.

54. "*Written Summary Form"* means the electronic questionnaire form, available on the *Ministry* website, and supporting documentation, that documents the activities undertaken at the *Facility* in the previous calendar year.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL

1.1 Except as otherwise provided by this *Approval*, the *Facility* shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this *Approval* and in accordance with the following *Schedules* attached hereto:

Schedule A - Supporting Documentation
Schedule B - Performance Requirements - In-Stack Emission Limits
Schedule C - Process Dust Control Equipment Operational Requirements
Schedule D - Material Analysis Contaminants
Schedule E - *Alternative Fuels* Operational Requirements
Schedule F - Procedure for *Source Testing*
Schedule G - Test Sources and Test Contaminants - *Source Testing*
Schedule H - *CEM System* Requirements - Opacity

2. LIMITED OPERATIONAL FLEXIBILITY

2.1 Pursuant to section 20.6 (1) of the *EPA* and subject to Conditions 2.2 and 2.3 of this *Approval*, future construction, alterations, extensions or replacements are approved in this *Approval* if the future construction, alterations, extensions or replacements are *Modifications* to the *Facility* that:

(a) are within the scope of the operations of the *Facility* as described in the *Description Section* of this *Approval;*

(b) do not result in an increase of the *Facility Production Limit* above the level specified in the *Description Section* of this *Approval;* and

(c) result in compliance with the performance limits as specified in Condition 4.

2.2 Condition 2.1 does not apply to,

(a) the addition of any new *Equipment with Specific Operational Limits* or to the *Modification* of any existing *Equipment with Specific Operational Limits* at the *Facility;*

(b) *Modifications* to the *Facility* that would be subject to the *Environmental Assessment Act;* and

(c) *Modifications* to the *Facility* that would alter the type of *Alternative Fuels* or increase the quantity of *Alternative Fuels* specified in **Schedule E** of this *Approval.*

2.3 Condition 2.1 of this *Approval* shall expire ten (10) years from the date of this *Approval*, unless this *Approval* is revoked prior to the expiry date. The *Company* may apply for renewal of Condition 2.1 of this *Approval* by including an *ESDM Report* and an *Acoustic Assessment Report* that describes the *Facility* as of the date of the renewal application.

3. REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION*

3.1 Prior to making a *Modification* to the *Facility* that satisfies Condition 2.1 (a) and (b), the *Company* shall prepare a proposed update to the *ESDM Report* to reflect the proposed *Modification*.

3.2 The *Company* shall request approval of an *Acceptable Point of Impingement Concentration* for a *Compound of Concern* if the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and a proposed update to an *ESDM Report* indicates that one of the following changes with respect to the concentration of the *Compound of Concern* may occur:

(a) The *Compound of Concern* was not a *Compound of Concern* in the previous version of the *ESDM Report* and

(i) the concentration of the *Compound of Concern* is higher than the *Jurisdictional Screening Level* for the contaminant; or

(ii) there is no *Jurisdictional Screening Level* for the contaminant.

(b) The concentration of the *Compound of Concern* in the updated *ESDM Report* is higher than:

(i) the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

3.3 The request required by Condition 3.2 shall propose a concentration for the *Compound of Concern* and shall contain an assessment, performed by a *Toxicologist*, of the likelihood of the proposed concentration causing an adverse effect at *Points of Impingement*.

3.4 If the request required by Condition 3.2 is a result of a proposed *Modification* described in Condition 3.1, the *Company* shall submit the request, in writing, to the *Director* at least 30 days prior to commencing to make the *Modification*. The *Director* shall provide written confirmation of receipt of this request to the *Company*.

3.5 If a request is required to be made under Condition 3.2 in respect of a proposed *Modification* described in Condition 3.1, the *Company* shall not make the *Modification* mentioned in Condition 3.1 unless the request is approved in writing by the *Director*.

3.6 If the *Director* notifies the *Company* in writing that the *Director* does not approve the request, the *Company* shall,

(a) revise and resubmit the request; or

(b) notify the *Director* that it will not be making the *Modification*.

3.7 The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.

3.8 If the *Director* approves the request, the *Company* shall update the *ESDM Report* to reflect the *Modification.*

3.9 Condition 3 does not apply if Condition 2.1 has expired.

4. PERFORMANCE LIMITS

4.1. Subject to Condition 4.2, the *Company* shall not discharge or cause or permit the discharge of a *Compound of Concern* into the air if,

(a) the *Compound of Concern* has a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the *Ministry Point of Impingement Limit;* or

(b) the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the higher of,

(i) if an *Acceptable Point of Impingement Concentration* exists the most recent *Acceptable Point of Impingement Concentration,* and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

4.2 Condition 4.1 does not apply if the *Ministry Point of Impingement Limit* has a 10-minute averaging period and no ambient monitor indicates an exceedance at a *Point of Impingement* where human activities regularly occur at a time when those activities regularly occur.

4.3 The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in *Ministry Publications NPC-300.*

4.4 The *Company* shall ensure that the vibration emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-207.*

4.5 The *Company* shall operate any *Equipment with Specific Operational Limits* approved by this *Approval* in accordance with the *Original ESDM Report.*

4.6 The *Company* shall ensure that at all times when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* the discharge from the *Cement Kiln* complies with the performance requirements specified in **Schedule B** of this *Approval.*

4.7 The *Company* shall ensure that there is no increase in the emissions of sulphur dioxide and oxides of nitrogen when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* as demonstrated by the *CEM System.*

5. DOCUMENTATION REQUIREMENTS

5.1. The *Company* shall maintain an up-to-date *Log.*

5.2. No later than April 30 in each year, the *Company* shall update the *Acoustic Assessment Report* and shall update the *ESDM Report* in accordance with section 26 of *O. Reg. 419/05* so that the information in the reports is accurate as of December 31 in the previous year.

5.3. The *Company* shall make the *Emission Summary Table* (see section 27 of *O. Reg. 419/05)* and *Acoustic Assessment Summary Table* available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the *Facility*.

5.4 The *Company* shall, within three (3) months after the expiry of Condition 2.1 of this *Approval,* update the *ESDM Report* and the *Acoustic Assessment Report* such that the information in the reports is accurate as of the date that Condition 2.1 of this *Approval* expired.

5.5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

6. REPORTING REQUIREMENTS

6.1 Subject to Condition 6.2, the *Company* shall provide the *Director* no later than July 31 of each year, a *Written Summary Form* to be submitted through the *Ministry's* website that shall include the following:

(a) a declaration of whether the *Facility* was in compliance with section 9 of the *EPA, O. Reg. 419/05* and the conditions of this *Approval;*

(b) a summary of each *Modification* satisfying Condition 2.1 (a) and (b) that took place in the previous calendar year that resulted in a change in the previously calculated concentration at a *Point of Impingement* for any *Compound of Concern* or resulted in a change in the sound levels reported in the *Acoustic Assessment Summary Table* at any *Point of Reception.*

6.2 Condition 6.1 does not apply if Condition 2.1 has expired.

7. OPERATION AND MAINTENANCE

7.1 The *Company* shall prepare, update as necessary and implement, not later than six (6) months from the date of this *Approval,* operating procedures and maintenance programs for all *Processes with Significant Environmental Aspects,* which shall specify as a minimum:

(a) frequency of inspections and scheduled preventative maintenance;

(b) procedures to prevent upset conditions;

(c) procedures to minimize all fugitive emissions;

(d) procedures to prevent and/or minimize odorous emissions;

(e) procedures to prevent and/or minimize noise emissions;

(f) acceptable ranges of the static pressure drop for the process dust control equipment listed in **Schedule C** of this *Approval;*

(g) program to monitor and record the pressure differential across each of the primary dust collectors as specified in **Schedule C** of this *Approval,* including the frequency of measurement and procedures to investigate and correct the cause of any anomalous measurements of the static pressure drop;

(h) list of management and supervisory personnel responsible for the operation and maintenance of process dust control equipment specified in **Schedule C** of this *Approval;* and

(i) procedures for record keeping activities relating to the operation and maintenance programs.

7.2 The company shall maintain and update to keep current, a list of all process dust control equipment, including the following details:

Source identification; Production building/area served; Process/location served; Stack gas flow rate; Filter area; Stack diameter and Stack height above grade.

7.3 The *Company* shall ensure that all *Processes with Significant Environmental Aspects* are operated and maintained in accordance with this *Approval,* the operating procedures and maintenance programs.

8.0 START-UPS, SHUTDOWN AND UPSET PROCEDURES

8.1 The *Company* shall update as necessary, not later than six (6) months from the date of issue of this *Approval,* operating procedures which address kiln start-ups, shut down and any upset conditions.

9.0 MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

The *Company* shall ensure that a material analysis program to measure and record the concentration of contaminants for the following material is implemented:

9.1 *Industrial By-Product Material* or *Fuel Adjunct Material*

(a) For each material used as *Fuel Adjunct Materials,* the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D** on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(b) For each material used as *Industrial By-Product Materials*, the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D**, on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(c) At any time, should the *Company* either independently or through other sources reasonably expect other metal/metal hydrides not outlined under **Schedule D** to be present in any material at greater than the trace concentrations, the *Company* shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the *Company* shall ensure that the *Point of Impingement* concentrations of metal/metal hydrides identified in (c) above do not exceed the respective limit based on the *Maximum Emissions Scenario.*

(e) The *Company* shall limit the accumulation of *Industrial By-Product Materials* and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

(f) The *Company* shall ensure that any *Industrial By-Product Material* stored at the *Facility* which the *Company* determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an *Industrial By-Product Material* becomes unusable, the *Company* shall advise the *District Manager* in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

10.0 *ALTERNATIVE FUELS*

10.1 The *Company* shall ensure that the *Facility/Equipment* is properly designed and operated at all times while firing *Alternative Fuels* and comply with the operational requirements set out in **Schedule E** of this *Approval.*

10.2 The *Company* shall, in consultation with the *District Manager*, update as necessary and implement, not later than three (3) months from the date of first firing of *Alternative Fuels* in the *Cement Kiln,* operating procedures provided in section 8 of the Design and Operations Report specified in **Schedule A** of this *Approval,* which addresses *Alternate Fuels* start-up and shut-down, emergency and contingency measures and termination of *Alternative Fuel* processing. *Alternative Fuels* shall be fired in accordance with these operating procedures and shall only be fired once the *Cement Kiln* has achieved normal operation, temperatures and production and shall be introduced only in the high-temperature combustion zones of the kiln and the calciner.

10.3 The firing of *Alternative Fuels* shall be stopped (following appropriate procedures) if:

(a) the temperature, residual oxygen or pressure as measured by the specified measuring equipment do not meet the operational requirements outlined in **Schedule E** of this *Approval* for more than four (4) consecutive hours; or

(b) the measuring equipment such as the *CEM System* for one or more of the parameters specified in condition 10.3 (a) are down or malfunctioning for more than four (4) consecutive hours.

10.4 Analysis and Criteria for Acceptance

(a) A *Low Carbon Alternative Fuels* testing protocol over a minimum six (6) month period shall be implemented in accordance with sections 6.1.3 and 10.3 of the Design and Operations Report specified in **Schedule A** of this *Approval*, to establish consistency in the *Low Carbon Alternative Fuels* characteristics.

(b) After the successful completion of the testing protocol described in condition 10.4 (a), the *Company* shall update the procedure as necessary for sampling and analysis titled "Alternative Low-Carbon Fuel Sampling Methodology, Revision 1" provided as Appendix G of the Design and Operations Report. The updated procedure shall be provided to the *District Manager* not later than two (2) months before the planned first use of *Alternative Fuels* at the *Facility*.

(c) During the regular use of *Alternative Fuels*, the *Company* shall conduct sampling and analysis in accordance with the updated sampling and analysis procedure in condition 10.4 (b).

10.5 If the results of the analysis specified in condition 10.4 (c) indicate that emission rates of contaminants from the Kiln Stack are higher than the maximum emission rates identified in the *Maximum Emission Scenario*, the *Company* shall update the *ESDM Report* with the emission rates derived from this analysis.

10.6 The *Company* shall record the following data during *Cement Kiln* Operation:

(a) hourly combined raw feed;

(b) *Fuel Adjunct Material* and *Industrial By-Product Material* for relevant period;

(c) hourly *Alternative Fuels* and *Conventional Fuels* firing rates in the kiln and calciner;

(d) hourly clinker production; and

(e) records of incidents specified in condition 10.3 of this *Approval.*

11. SOURCE TESTING

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

11.3 The *District Manager* may relax the frequency and/or scope of *Source Testing* if the results of the annual *Source Testing* indicate that the emissions and *Point of Impingement* concentrations of *Compounds of Concern* are insignificant when substituting a portion of *Conventional Fuel* with *Alternative Fuels.*

12. CONTINUOUS EMISSIONS MONITORING

12.1 Continuous Emissions Monitoring in the Kiln Stack

(a) The *Company* shall ensure that the existing *CEM System* is fully operational at all times to continuously monitor the following parameters in the exhaust gas stream from the Kiln Stack:

(i) Nitrogen Oxides
(ii) Sulphur Dioxide
(iii) Opacity

(b) The *CEM System* for nitrogen oxides and sulphur dioxide shall comply with the requirements of O.Reg. 194/05 – Industry Emissions – Nitrogen Oxides and Sulphur Dioxide, as amended from time to time.

(c) The *CEM System* for monitoring opacity shall comply with the requirements outlined in **Schedule H.**

12.2 Continuous Emissions Monitoring of Process Conditions

12.2.1 The *Company* shall install, operate and maintain a *CEM System* to continuously monitor:

(a) the concentration of residual oxygen and carbon monoxide in the backend of the kiln and calciner down comer duct;

(b) the temperatures of gases leaving the kiln at a point where the gas temperature reaches a minimum of 1000 Deg. C for a period of not less than 6 seconds;

(c) the temperatures of gases leaving the calciner at a point where the gas temperature reaches a minimum of 850 Deg. C for not less than 3 seconds; and

(d) Total Hydrocarbon (as methane) in the gases leaving the Kiln Stack.

12.2.2 The *Company* shall submit to the *Manager,* not later than ninety (90) days prior to the first use of *Alternative Fuels* in the *Cement Kiln,* a detailed continuous monitoring plan, complete with specifications for the *CEM System* for the parameters specified in condition 12.2.1 of this *Approval.* The *Company* shall finalize the continuous monitoring plan in consultation with the *Manager.*

12.2.3 The *Company* shall ensure that the *CEM System* specified in condition 12.2.1 are installed, commissioned, operated and maintained in accordance with the finalized monitoring plan referenced in condition 12.2.2 prior to the first use of *Alternative Fuels*.

12.3 Continuous Emissions Monitoring Documentation

12.3.1 The *Company* shall prepare and retain on site monthly reports of the data monitored during the preceding month by the *CEM System,* summarizing the following as a minimum:

(a) the daily minimum, maximum and average readings for the parameters specified in condition 12 of this *Approval;*

(b) the type and hourly firing rate of fuels used during the period the readings were taken;

(c) the percent availability of the *CEM System* for the parameters specified in condition 12 of this *Approval.*

(d) operational status (on/off) of the raw mill and the fuel mill.

12.3.2 The *Company* shall establish the normal operating total hydrocarbons range for *Baseline Conditions.* After the first use of any of the *Alternative Fuels,* the *Company* shall, at a minimum on a quarterly basis, review the *CEM System* monthly reports and identify and investigate any anomalous total hydrocarbons data. The investigations report shall be prepared and retained on site.

12.3.3 The *Company* shall retain on site, all raw data generated by the *CEM System.*

13. FUGITIVE EMISSIONS CONTROL

13.1 The *Company* shall update as necessary and implement the *Best Management Practices Plan* for the control of fugitive dust emissions.

Documentation Requirements - *Best Management Practices Plan*

13.2 The *Company* shall record and retain such records, each time a specific preventative and control measure described in the *Best Management Practices Plans* is implemented. The *Company* shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

14. COMPLAINTS RECORDING AND REPORTING

14.1 If at any time, the *Company* receives an environmental complaint from the public regarding the operation of the *Equipment* approved by this *Approval,* the *Company* shall take the following steps:

(a) Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.

(b) Notify the *District Manager* of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the *District Manager.*

(c) Initiate appropriate steps to determine all possible causes of the complaint and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint attributable to the operations at the *Facility.*

(d) Complete and retain on-site a report written within one (1) week of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

15. RECORD KEEPING REQUIREMENTS

15.1 Any information pertaining to compliance with the *EPA, Regulation 419/05* and this *Approval* requested by any employee in or agent of the *Ministry,* concerning the *Facility* and its operation under this *Approval,* including, but not limited to, any records required to be kept by this *Approval,* shall be provided to the employee in or agent of the *Ministry,* upon request, in a timely manner.

15.2 Unless otherwise specified in this *Approval,* the *Company* shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this *Approval,* including,

(a) a copy of the *Original ESDM Report* and each updated version*;*

(b) a copy of each version of the *Acoustic Assessment Report;*

(c) supporting information used in the emission rate calculations performed in the *ESDM Reports* and *Acoustic Assessment Reports;*

(d) the records in the *Log;*

(e) copies of each *Written Summary Form* provided to the *Ministry* under Condition 6.1 of this *Approval;*

(f) records of maintenance, repair and inspection of *Equipment* related to all *Processes with Significant Environmental Aspects;*

(g) all records related to environmental complaints made by the public as required by Condition 14 of this *Approval;*

(h) records related to *Source Testing* events specified under section titled “Source Testing” of this *Approval;*

(i) records related to the operation of the *CEM System* specified under section titled “Continuous Emission Monitoring” of this *Approval;*

(j) records related to the preventative and control measures implemented as specified under section titled “Fugitive Emissions Control” of this *Approval;* and

(k) records related to sampling and analysis specified under sections titled “Material Analysis and Criteria of Acceptance” and “Alternative Fuels” of this *Approval.*

16. REVOCATION OF PREVIOUS APPROVALS

This *Approval* replaces and revokes all Certificates of Approval (Air) issued under section 9 *EPA* and Environmental Compliance Approvals issued under Part II.1 *EPA* to the *Facility* in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

SCHEDULE A

Supporting Documentation

(a) Application for Environmental Compliance Approval (Air & Noise), dated May 9, 2014, signed by Ruben Plaza and submitted by the C*ompany.*

(b) Emission Summary and Dispersion Modelling Report, prepared by BCX Environmental Consulting and dated May 10, 2014.

(c) Additional air emissions and dispersion modelling related information provided by BCX Environmental Consulting dated April 1, 2015, May 26 & 27, 2015 and July 23, 2015.

(d) Report titled "Bowmanville Cement Plant - Design and Operations Report, Environmental Compliance Approval for Regular Use of Low Carbon Alternative fuel (Woody Biomass)", prepared by HDR Engineering and dated May 2014.

(e) Acoustic Assessment Report, prepared by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014.

SCHEDULE B

Performance Requirements- In-Stack Emission Limits

Parameter	Kiln Stack Emission Limit	Verification of Compliance
Particulate Matter (PM)	50 mg/Rm^3	Results from compliance source testing
Cadmium (Cd)	7 µg/Rm3	Results from compliance source testing
Lead (Pb)	60 µg/Rm3	Results from compliance source testing
Mercury (Hg)	20 µg/Rm3	Results from compliance source testing
Dioxins and Furans	80 pg/Rm^3 as ITEQ	Results from compliance source testing; results expressed as I-TEQ.
Hydrochloric Acid (HCl)	27 mg/Rm^3	Results from compliance source testing
Opacity	In accordance with s. 46 of *O.Reg 419/05*	Calculated as the rolling arithmetic average of 6 minutes of data measured by a *CEM System* that provides data at least once every minute.

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
µg/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs) in 2005, and adopted by Ontario in April 2012.

SCHEDULE C

PROCESS DUST CONTROL EQUIPMENT OPERATIONAL REQUIREMENTS

Primary Dust Control Equipment

Primary dust control equipment includes the Kiln Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse and Finish Mill Baghouses.

The static pressure drop across the primary dust control equipment filter bag compartments shall be measured and recorded continuously by the *Facility's* automated control system.

Secondary Dust Control Equipment

Secondary dust control equipment includes all other fabric filter dust collectors which are not primary dust control equipment.

The static pressure drop across the secondary dust control equipment filter bag compartments shall be measured and recorded at least quarterly.

Where applicable, the static pressure drop must be referenced to the value recorded during previous testing. In the absence of previous testing values, the parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible.

SCHEDULE D

MATERIAL ANALYSIS CONTAMINANTS

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium
17. Total Halogens

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels*, based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

SCHEDULE F

Procedure for *Source Testing*

1. The *Company* shall submit, not later than three (3) months prior to the *Source Testing*, to the *Manager* a *Pre-Test Plan* for the *Source Testing* required under this *Approval*. The *Company* shall finalize the *Pre-Test Plan* in consultation with the *Manager*.

2. The first *Source Testing* shall be carried out for the following individual fuel firing scenarios at the maximum approved fuel firing rate in the kiln and the calciner. The characteristics of *Low Carbon Alternative Fuels* used during *Source Testing* shall be within the range established under Condition 10.4 - Analysis and Criteria for Acceptance of this *Approval:*

   (1) *Baseline Conditions;*
   (2) Approved substitution rate of *Conventional Fuels* with *Low Carbon Alternative Fuels;* and/or
   (3) Approved substitution rate of *Conventional Fuels* with Woodwaste as defined under *O.Reg.347*.

3. Subsequent annual *Source Testing* as described in condition 11.2 of this *Approval* shall be carried out for the maximum approved substitution rate of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347*, as applicable.

4. The *Company* shall not commence the *Source Testing* required under this *Approval* until the *Manager* has approved the *Pre-Test Plan.*

5. The *Company* shall notify the *Manager*, the *District Manager* and the *Director* in writing of the location, date and time of any impending *Source Testing* required by this *Approval*, at least fifteen (15) days prior to the *Source Testing.*

6. The *Company* shall submit a report (hardcopy and electronic format) on the *Source Testing* to the *Manager and* the *District Manager* not later than four (4) months after completing the *Source Testing*, or not later than a time frame agreed in writing with the *Manager*. The report shall be in the format described in the *Source Testing Code*, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions at the time of *Source Testing* and other information including but not limited to:

      (i) clinker production rate in tonnes/hour;
      (ii) *Conventional fuel, Low Carbon Alternative Fuels* and/or Woodwaste firing rate in tonnes/hour separately in the kiln and calciner;
      (iii) quantity and type of *Fuel Adjunct Materials* and *Industrial By-Product Materials* used; and
      (iv) any other records that may affect the *Source Testing* results;

SCHEDULE F (Continued)

Procedure for *Source Testing*

(3) results of *Source Testing,* including the emission rate, emission concentration and relevant emission factor of the Test Contaminants;

(4) a summary of all records of the *CEM System* available for the parameters specified in condition 12 of this *Approval* at the time of *Source Testing;*

(5) a summary table that compares the *Source Testing* results to the emission estimates described in the *Company* 's application, the *ESDM Report* and the Performance Limits; and

(6) a comparison of stack analysis data between use of *Conventional fuel, Low Carbon Alternative Fuels* and Woodwaste for the first *Source Testing* of the relevant material; and a description and explanation of any statistically significant changes in emissions of the Test Contaminants, resulting from the use of *Alternative Fuel,* relative to *Baseline Conditions.*

7. The *Company* shall ensure that the *Source Testing* report is made available and easily accessible for review by the public at the *Facility,* immediately after the document is submitted to the *Ministry.*

8. The *Director* may not accept the results of the *Source Testing* if:

(1) the *Source Testing Code* or the requirements of the *Manager* were not followed;

(2) the *Company* did not notify the *District Manager,* the *Manager* and the *Director* of the *Source Testing;* or

(3) the *Company* failed to provide a complete report on the *Source Testing.*

9. If the *Director* does not accept the results of the *Source Testing,* the *Director* may require re-testing. If re-testing is required, the *Pre-Test Plan* strategies need to be revised and submitted to the *Manager* for approval. The actions taken to minimize the possibility of the *Source Testing* results not being accepted by the *Director* must be noted in the revision.

10. If the *Source Testing* results are higher than the emission estimates in the *Company's ESDM Report,* the *Company* shall update their *ESDM Report* in accordance with Section 26 of *O. Reg. 419/05* with the results from the *Source Testing* report and make these records available for review by staff of the *Ministry* upon request. The updated Emission Summary Table from the updated *ESDM Report* shall be submitted with the report on the *Source Testing.*

SCHEDULE G

Test Sources and Test Contaminants - *Source Testing*

Test Sources

Source ID	Description	Frequency
Kiln Stack	Main stack serving the *Cement Kiln*	In accordance with condition 11 of this *Approval.* The schedule between two consecutive tests should not be less than six (6) months

Test Contaminants

Total Suspended Particulate Matter
Ammonia
Hydrogen Chloride

Metals		Volatile Organic Matter
Cd	Cadmium	Acetone
Be	Beryllium	Acrolein
Pb	Lead	Benzene
Mo	Molybdenum	Bromodichloromethane
Cr	Chromium	Bromoform
Ni	Nickel	Bromomethane
V	Vanadium	Butadiene, 1,3 -
Al	Aluminum	Butanone, 2 -
Ti	Titanium	Carbon Tetrachloride
Mg	Magnesium	Chloroform
B	Boron	Cumene
Ba	Barium	Dibromochloromethane
P	Phosphorus	Dichlorodifluoromethane
K	Potassium	Dichloroethane, 1,2 -
Hg	Mercury	Dichloroethene, Trans - 1,2
As	Arsenic	Dichloroethene, 1,1 -
Zn	Zinc	Dichloropropane, 1,2 -
Sb	Antimony	Ethylbenzene
Mn	Manganese	Ethylene Dibromide
Co	Cobalt	Mesitylene
Se	Selenium	Methylene Chloride
Cu	Copper	Styrene
Ag	Silver	Tetrachloroethene
Sn	Tin	Toluene
Sr	Strontium	Trichloroethane, 1,1,1 -
Tl	Thalium	Trichloroethene
Fe	Iron	Trichloroethylene, 1,1,2 -
		Trichlorotrifluoroethane
		Trichlorofluoromethane
		Xylenes, M-, P- and O
		Vinyl Chloride

SCHEDULE G (Continued)

Polycyclic Organic Matter
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene *
Benzo(e)pyrene
Biphenyl
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
Dibenzo(a,h)anthracene
Dibenzo(a,e)pyrene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
M-terphenyl
O-terphenyl
P-terphenyl
Triphenylene

* Benzo(a)Pyrene (B(a)P) standard and upper Risk Threshold (URT) are considered surrogate for all POMs that do not have their own standards or guidelines. For O.Reg.419/05 reporting, before July 2016, if the existing guideline is exceeded, B(a)P as a surrogate will be assessed against the URT. After July 1, 2016, it will be assessed against the new standard.

SCHEDULE G (Continued)
Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of the isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MOE publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 and as noted below.

Example:

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO_{2005} Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1

12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003

27	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

NOTE:

* Sum of toxicity equivalents of individual isomers

The TEF scheme is intended to be used with isomer specific analytical results. In cases where results are reported by congener group only, staff at *Ministry's* Standards Development Branch shall be contacted for appropriate procedures to convert non-isomer specific data to TEQs.

SCHEDULE H
CEM System Requirements - Opacity

INSTALLATION: The *CEM System* shall be installed at an accessible location where the measurements are representative of the total emissions from the Kiln Main Stack, and shall meet the following installation specifications:

	PARAMETERS	SPECIFICATION
1	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
3	Detection angle of view:	≤ 5 degrees
4	Angle of projection:	≤ 5 degrees
5	Range (percent of opacity):	0 -100

PERFORMANCE: The *CEM System* for opacity monitoring shall meet the following minimum performance specifications for the following parameters.

	PARAMETERS	SPECIFICATION
1	Span Value (percent opacity):	2 times the average normal opacity of the source
2	Calibration Error:	≤ 3 percent opacity
3	Attenuation Calibration:	≤ 2 percent opacity
4	Response Time (95 percent response to a step change)	≤ 10 seconds
5	Schedule for Zero and Calibration Checks:	daily minimum
6	Procedure for Zero and Calibration Checks:	all system components checked
7	Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8	Span Calibration Drift (24-hours):	≤ 2 percent opacity
9	Conditioning Test Period:	≥ 168 hours without corrective maintenance
10	Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION: The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the periods of the operation of the Equipment. The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER: The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY: The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter.

The reasons for the imposition of these terms and conditions are as follows:

GENERAL

1. Condition No. 1 is included to require the *Approval* holder to build, operate and maintain the *Facility* in accordance with the Supporting Documentation in Schedule A considered by the *Director* in issuing this *Approval.*

LIMITED OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION* AND *PERFORMANCE LIMITS*

2. Condition Nos. 2, 3 and 4 are included to limit and define the *Modifications* permitted by this *Approval,* and to set out the circumstances in which the *Company* shall request approval of an *Acceptable Point of Impingement Concentration* prior to making *Modifications.* The holder of the *Approval* is approved for operational flexibility for the *Facility* that is consistent with the description of the operations included with the application up to the *Facility Production Limit.* In return for the operational flexibility, the *Approval* places performance based limits that cannot be exceeded under the terms of this *Approval. Approval* holders will still have to obtain other relevant approvals required to operate the *Facility,* including requirements under other environmental legislation such as the *Environmental Assessment Act.*

DOCUMENTATION REQUIREMENTS

3. Condition No. 5 is included to require the *Company* to maintain ongoing documentation that demonstrates compliance with the *Performance Limits* of this *Approval* and allows the *Ministry* to monitor on-going compliance with these *Performance Limits.* The *Company* is required to have an up to date *ESDM Report* and *Acoustic Assessment Report* that describe the *Facility* at all times and make the *Emission Summary Table* and *Acoustic Assessment Summary Table* from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the *Facility.*

REPORTING REQUIREMENTS

4. Condition No. 6 is included to require the *Company* to provide a yearly *Written Summary Form* to the *Ministry,* to assist the *Ministry* with the review of the site's compliance with the *EPA,* the regulations and this *Approval.*

OPERATION AND MAINTENANCE

5. Condition Nos. 7, 8, 9 and 10 and are included to require the *Company* to properly operate and maintain the *Processes with Significant Environmental Aspects* to minimize the impact to the environment from these processes.

TESTING

6. Condition Nos. 11 and 12 are included to require the *Company* to gather and retain accurate information so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

FUGITIVE EMISSIONS CONTROL

7. Condition No. 13 is included to emphasize that the *Equipment* and *Facility* must be maintained and operated in accordance with a procedure that will result in compliance with the *EPA, Regulation 419/05* and this *Approval* and to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

COMPLAINTS RECORDING AND REPORTING

9. Condition No. 14 is included to require the *Company* to respond to any environmental complaints regarding the operation of the *Equipment,* according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

RECORD KEEPING REQUIREMENTS

10. Condition No. 15 is included to require the *Company* to retain all documentation related to this *Approval* and provide access to employees in or agents of the *Ministry,* upon request, so that the *Ministry* can determine if a more detailed review of compliance with the *Performance Limits* is necessary.

REVOCATION OF PREVIOUS APPROVALS

11. Condition No. 16 is included to identify that this *Approval* replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3779-9BMQW4 issued on December 5, 2013.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with

respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, M. Sc., P.Eng., BCX Environmental Consulting

APPENDIX B

Ministry of the Environment & Climate Change
Standards Development Branch

40 St. Clair Avenue West
Toronto ON M4V 1M2
www.ene.gov.on.ca

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction de l'élaboration des normes
40, avenue St. Clair ouest
Toronto, ON M4V 1M2
www.ene.gov.on.ca

Via email: kirk.easto@rwdi.com
File No.: CR:SA:109555:17

2017/09/11

Mr. Kirk Easto
RWDI Air Inc.
600 Southgate Dr.
Guelph, Ontario
N1G 4P6

Re.: Pre Test Plan for source testing to be conducted at St. Marys Cement Inc. (Bowmanville facility). Amended Environmental Compliance Approval No. 0469-9YUNSK.

Dear Mr. Easto:

We reviewed your pre-test plan (RWDI Project 1702401), dated 2017/08/21, and pre-test plan addendum email, dated 2017/09/11, prepared and submitted on behalf of St. Marys Cement Inc. (SMC), and referring to source testing to be conducted at SMC's Bowmanville facility.

The testing is required by Condition 11 of the Environmental Compliance Approval No. 0469-9YUNSK, issued on 2015/11/25.

***Target Source*:**

- Cement Clinker Kiln (two modes: conventional fuel and conventional fuel with woodwaste).

***Target contaminants*:**

- Total Suspended Particulate Matter (TSP),
- Metals (27 selected metals, as listed in the ECA's Schedule "G"),
- Semivolatile Organic Compounds (17 dioxins and furans isomers, 12 dioxin-like PCBs, and 39 selected PAHs) listed in ECA's Schedule "G",
- Volatile Organic Compounds (29 selected VOCs, as listed in the ECA's Schedule "G"),
- Aldehydes (acrolein),
- Hydrogen chloride (HCl),
- Ammonia,
- Nitrogen oxides (NOx), and
- Combustion gases (oxygen and CO_2).

***Reference methods*:**

1. TSP: OSTC Method ON-5,
2. $PM_{2.5}$/PM_{10}: US EPA 40CFR60 Method 201A,
3. PM condensable: US EPA 40CFR60 Method 202,
4. Metals: US EPA 40CFR60 Method 29,
5. SVOCs: Environment Canada's Report EPS 1/RM/2,
6. VOCs: US EPA SW-846 Method 0030,
7. Aldehydes: State of California Method CARB 430 (with Ashland modification),
8. HCl & Ammonia: US EPA 40CFR60 Method 26A,
9. NOx: SMC CEM,
10. SO_2: SMC CEM,
11. O_2:/CO_2: US EPA 40CFR60 Method3A,
12. 14. THC: SMC CEM, and
15. Stack Gas Parameters: Ontario Source Testing Code's Method ON-1 to ON-4.

Notes:

The sampling strategy for the determination of acrolein has been defined in the pre-test plan addendum.

The description of the VOCs sampling has been provided in the pre-test plan addendum.

NOx, SO_2, oxygen, THC and opacity will be monitored by SMC CEMS, and the emissions included in the final report.

***Brief Process Description*:**

St. Marys Cement operates a dry process cement manufacturing plant, located on Waverly Road, Bowmanville, Ontario.

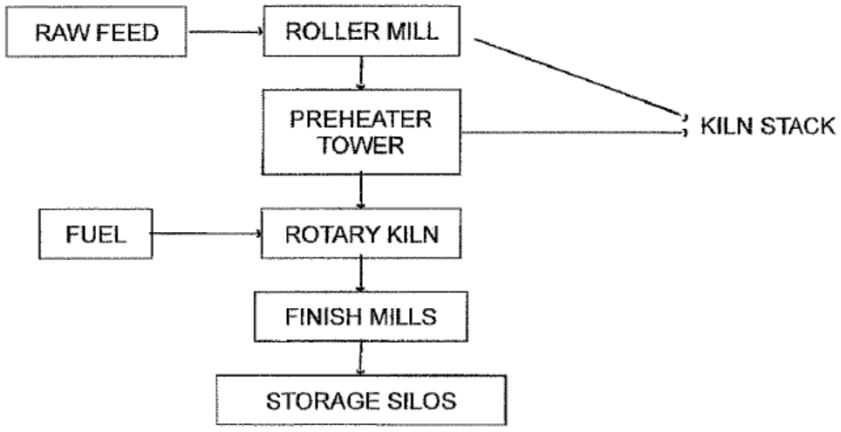
The cement plant operates 12 months per year typically on 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,300 tonnes of clinker per day.

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker.

The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement.

With the exception of a bypass stream, flue gases from the kiln pass through the pre-heater strings and raw mill to the main baghouse, and exhausted to the atmosphere are vented to the atmosphere via the main kiln stack, having an exit diameter of 5.48 metres, extending 105 metres above grade.

Simplified process flow diagram of the plant



***Operating Conditions during the source testing program*:**

It is indicated in the pre-test plan that during the sampling program, SMC will be operating as close to maximum production as possible. The normal production rate for the facility is 5,700 tonnes/day of clinker.

SMC personnel will monitor the Kiln Feed Uniformity Index throughout the program and operational parameters such as kiln RPM, kiln temperature and process variability.

The process parameters to be monitored and recorded include:

- Hourly combined raw feed;
- Hourly Alternative Fuels and Conventional Fuels firing rates in the kiln and calciner;
- Hourly clinker production;
- The concentration of the oxygen and Carbon Monoxide in the backend of the kiln and calciner down comer duct;
- Temperature of the gases leaving the kiln, with a calculation of residence time at 1000ºC;
- Temperature of the gases leaving the calciner, with a calculation of residence time at 850ºC;
- SMC CEMs printouts (oxygen, opacity, NOx, SO_2, THC).

Our review indicated that the proposed reference methodologies, sampling strategies, and process data monitoring/collection are acceptable.

We noted that testing is targeted to be conducted in October or November 2017. Please provide the sampling schedule at least two weeks prior to conducting the source testing, to the MOECC's York-Durham District Office, and to the Technology Standards Section.

Just a reminder that the source testing report is required to be submitted only in electronic format to the Technology Standards Section; and in electronic and hardcopy formats to the MOECC's York-Durham District Office.

(Doc.Mgmt # 5AA090126)

If you have any questions with regard to this assessment, I can be reached by phone at 416-327-6403, or by email at guillermo.azocar@ontario.ca.

Sincerely yours,



Guillermo Azocar
Source Assessment Specialist
Technology Standards Section

cc: C. Richards – St. Marys Cement Inc. (via email: chris.richards@vcimentos.com)
K. Lendvay – MOECC York-Durham District Office
(via email: kim.lendvay@ontario.ca)
S. Agarwal – MOECC EAB (via email: sushant.agarwal@ontario.ca)
T. Alexan Gorgy – MOECC SDB TSS (via email: tamer.alexangorgy@ontario.ca)
C. Ruddy -MOECC SDB TSS (via email: caitlyn.ruddy@ontario.ca)

File AQ-02 (St. Mary's Cement Inc. - Bowmanville)

Kirk Easto

From: Kirk Easto
Sent: Monday, September 11, 2017 9:45 AM
To: Azocar, Guillermo (MOECC)
Cc: Chris Richards; Joe Frost; Kim Moore; Lendvay, Kim (MOECC); Alexan Gorgy, Tamer (MOECC); Ruddy, Caitlyn (MOECC)
Subject: RE: 1702401 St. Marys Bowmanville Pre-Test Plan Review

Hello Guillermo,

I apologise for the missed information. Please see below

Sampling for Acrolein

Aldehyde (acrolein) sampling will be conducted following procedures outlined in the Ashland Specialty Chemical Company method "Sampling and Analysis of Short Chain Aldehydes from a Lawnmower Engine". The procedure is similar to CARB Method 430, as this method is based on chemistry using dinitrophenylhydrazine (DNPH) to capture acrolein in air. Acrolein reacts with DNPH in an acidic solution and is continuously extracted out by toluene. During sampling, the toluene breaks up into small droplets; this allows a liquid-liquid extraction removing any hydrazones in the aqueous solution.

Gas samples will be extracted from the stack using a Teflon probe connected to three mini-impingers containing acidified dinitrophenylhydrazine (DNPH), toluene and water (2 ml DNPH-HCl, 2 mL toluene and 10 ml deionized water). Triplicate samples will be collected at a sampling rate of 0.3L/min. Stack gas will be collected until the first impinger receives enough carbonyl containing compounds (aldehydes and ketones) to consume the DNPH reagent causing the lower water phase to turn clear, or to a maximum of two hours.

VOST Sampling

As the expected VOC concentrations are low. One pair of tubes will make up one test, and three tests will be performed. Each set of tubes will be sampled over a 60-minute period at a rate of 0.25 L/min. Samples will then be submitted to Maxxam Analytical Services for analysis.To ensure that no breakthrough has occurred through the VOST tubes, one test will involve analysing the tubes separately

Kirk

Kirk Easto, d.E.T. | Field Group Leader
RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 2482 | Fax: (519) 823-1316 | Mobile: (705) 772-5944
rwdi.com

From: Azocar, Guillermo (MOECC) [mailto:Guillermo.Azocar@ontario.ca]
Sent: September-11-17 9:30 AM
To: Kirk Easto
Cc: Chris Richards; Joe Frost; Kim Moore; Lendvay, Kim (MOECC); Alexan Gorgy, Tamer (MOECC); Ruddy, Caitlyn (MOECC)
Subject: RE: 1702401 St. Marys Bowmanville Pre-Test Plan Review
Importance: High

Good morning Kirk,

I am reviewing RWDI's pre-test plan (RWDI Project 1702401), dated 2017/08/21, prepared and submitted on behalf of St. Marys Cement Inc. (SMC), and referring to source testing to be conducted at SMC's Bownmanville facility (Cement Clinker kiln).

The testing is required by Condition 11 of the Environmental Compliance Approval No. 0469-9YUNSK, issued on 2015/11/25.

In order to complete the review of the pre-test plan, we need you to provide an addendum to the pre-test plan providing the reference method and sampling strategy for the determination of acrolein.

Acrolein is listed as one of the VOCs to be tested; but the method US EPA SW-846 Method 0030 is not suitable for the determination of acrolein.

In addition, we need details on the sampling strategy to be used for the determination of VOCs (eg., sampling rate, number of pair of traps per test-run, sampling time, etc.).

Regards,

Guillermo Azocar
Source Assessment Specialist
Technology Standards Section
Standards Development Branch

Ministry of the Environment & Climate Change
40 St. Clair Ave. W., 7th Floor
Toronto, ON M4V 1M2

Tel.: 416-327-6403
E-mail: guillermo.azocar@ontario.ca

From: Kim Moore [mailto:Kim.Moore@rwdi.com]
Sent: August-21-17 3:08 PM
To: Source Testing (MOECC); Dugas, Celeste (MOECC)
Cc: Kirk Easto; Chris Richards; Joe Frost
Subject: 1702401 St. Marys Bowmanville Pre-Test Plan

Please find attached the Pre-Test Plan for the St Marys Cement Bowmanville plant scheduled for October or November of 2017. If you have any questions please contact Kirk Easto.

Regards,
Kim

Kim Moore | Senior Administrative Assistant
RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 3034 | Fax: (519) 823-1316
rwdi.com

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Kirk Easto

From: Azocar, Guillermo (MECP) <Guillermo.Azocar@ontario.ca>
Sent: Tuesday, February 12, 2019 7:25 PM
To: Kirk Easto
Cc: Joe Frost; Lendvay, Kim (MECP); Luis Urbina; Grant, Cathy (MECP); Fullerton, Bill (MECP)
Subject: RE: Request for Extension on Report Submission for Source Sampling ECA # 0469-9YUNSK, St. Marys Cement Bowmanville
Attachments: image001.png

Good afternoon Kirk,

We would like the acrolein testing results to be included with the October 2018 testing results into a single report.

Typically, two months are given for the submission of a report, including the dispersion modelling completed and reported.

As there are some uncertainty on when the acrolein testing will actually take place, the deadline for the submission of the report shall be determined by when the acrolein testing is completed; this is based on the premise that the acrolein testing will take place no later than one month after the release of this email.

With the acrolein included, the reports deadline is two months after the completion of the acrolein testing.

If within a month (March 11, 2019), the acrolein testing had not taken place, RWDI shall proceed at finalizing the report by April 12, 2019; and update us on the status of the acrolein testing and the factors that had prevented RWDI from completing the testing. At that time, we will determine what strategy will be followed regarding the acrolein testing and its eventual reporting.

Regards,

Guillermo Azocar
Source Assessment Specialist
Tecnology Standards Section
Standards Development Branch
Ministry of the Environment, Parks and Conservation.-

Sent with BlackBerry Work
(www.blackberry.com)

From: Kirk Easto <Kirk.Easto@rwdi.com<mailto:Kirk.Easto@rwdi.com>>
Date: Tuesday, Feb 12, 2019, 17:37
To: Luis Urbina <luis.urbina@vcimentos.com<mailto:luis.urbina@vcimentos.com>>, Azocar, Guillermo (MECP) <Guillermo.Azocar@ontario.ca<mailto:Guillermo.Azocar@ontario.ca>>, Lendvay, Kim (MECP) <Kim.Lendvay@ontario.ca<mailto:Kim.Lendvay@ontario.ca>>
Cc: Joe Frost <Joe.Frost@rwdi.com<mailto:Joe.Frost@rwdi.com>>
Subject: Request for Extension on Report Submission for Source Sampling ECA #0469-9YUNSK, St. Marys Cement Bowmanville

Guillermo and Kim,

In a follow up to my email sent on February 7, 2019, where I explained the acrolein parameter was not sampled in October and will be sampled as soon as the kiln conditions can be matched to the October testing (Feb 13 to 20). We are also requesting an extension to the 4 month timeframe for the submission of the stack testing report. The original due date would have been tomorrow, however we are requesting an extension of 1(one) month to allow for the submission of the report.

Please let us know if this is acceptable .

Thank-you

Kirk

[Description: Description: Description: RWDI logo]

Kirk Easto, d.E.T., QSTI | Principal, Field Services Area Leader RWDI
600 Southgate Drive, Guelph, ON N1G 4P6 Canada
Tel: (519) 823-1311 ext 2482 | Fax: (519) 823-1316 | Mobile:705 772 5944
rwdi.com<https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.rwdi.com%2F&data=02%7C01%7CGuillermo.Azocar%40ontario.ca%7C91140a8299dd4541a6e508d6913aa3bb%7Ccddc1229ac2a4b97b78a0e5cacb5865c%7C0%7C1%7C636856078373763973&sdata=7kuwJv5yvT7qNsHHA%2FAqN6uezsBzr%2FA13mlaumTyMew%3D&reserved=0>

_____
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_____

APPENDIX C



TPM and Metals Sampling Results
Baseline

Test :	Test #1			Test #2			Test #3			AVERAGE RESULTS	
Sample Volume (Rm^3) [1] :	3.77			3.84			3.87				
Stack Flow Rate (Rm^3/s) [1] :	272.6			282.0			279.5			278.0	
Parameter	**Lab Data**	**Concentration**	**Emission Rate**	**Lab Data**	**Concentration**	**Emission Rate**	**Lab Data**	**Concentration**	**Emission Rate**	**Concentration**	**Emission Rate**
Particulate	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg/m^3)**	**(mg/s)**
Particulate in Acetone Rinse	25.2	-	-	10.1	-	-	5.6	-	-	-	-
Particulate on Filter	1.00	-	-	14.9	-	-	26.5	-	-	-	-
Total Particulate Matter	26.2	6.9	1890	25.0	6.5	1830	32.1	8.3	2320	7.3	2020
Metals	**(ug)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**($\mu g/m^3$)**	**(mg/s)**
Combined Train Aluminum (Al)	875	232	63.2	803	209	58.9	830	215	60.0	219	60.7
Combined Train Antimony (Sb)	< ND	< 0.80	< 0.2	< ND	< 1.95	< 0.550	< ND	< 1.94	< 0.542	< 1.56	< 0.436
Combined Train Arsenic (As)	1.76	0.47	0.127	< ND	< 0.52	< 0.147	< ND	< 0.52	< 0.145	< 0.501	< 0.139
Combined Train Barium (Ba)	27.3	7.24	1.970	26.3	7	1.930	19.8	5.12	1.430	6.40	1.78
Combined Train Beryllium (Be)	< ND	< 0.05	< 0.013	< ND	< 0.12	< 0.033	< ND	< 0.12	< 0.033	< 0.09	< 0.0262
Combined Train Boron (B)	69	18.30	4.99	< ND	< 19.50	< 5.50	< ND	< 19.40	< 5.420	< 19.1	< 5.30
Combined Train Cadmium (Cd)	0.35	0.093	0.025	0.47	0.12	0.035	0.48	0.12	0.035	0.113	0.032
Combined Train Calcium (Ca)	9870	2620	713	8520	2220	625	10600	2740	766	2520	702
Combined Train Chromium (Cr)	6.9	1.83	0.499	< ND	< 1.95	< 0.550	< ND	< 1.94	< 0.542	< 1.91	< 0.53
Combined Train Cobalt (Co)	7.24	1.92	0.5230	0.71	0.19	0.05210	< ND	< 0.12	< 0.03250	< 0.74	< 0.20
Combined Train Copper (Cu)	4.9	1.30	0.354	4.6	1.20	0.338	4.0	1.03	0.289	1.18	0.327
Combined Train Iron (Fe)	645	171	46.6	519	135	38.10	720	186	52.0	164	45.6
Combined Train Lead (Pb)	16.3	4.32	1.18	17.4	4.53	1.280	15.4	3.98	1.110	4.28	1.19
Combined Train Magnesium (Mg)	429	114	31.0	391	102	28.7	424	110	30.6	108	30.1
Combined Train Manganese (Mn)	27.6	7.32	1.99	24.8	6.45	1.820	18.4	4.76	1.330	6.18	1.7
Combined Train Molybdenum (Mo)	12.4	3.29	0.896	12.2	3.17	0.895	12.3	3.18	0.889	3.21	0.89
Combined Train Nickel (Ni)	8.8	2.33	0.636	6.9	1.80	0.506	5.7	1.47	0.412	1.87	0.518
Combined Train Phosphorus (P)	92	24.40	6.650	< ND	< 59.90	< 16.9	< ND	< 59.50	< 16.6	< 48	< 13.4
Combined Train Potassium (K)	1520	403	110	1460	380.0	107	1450	375	105	386	107
Combined Train Selenium (Se)	< ND	< 0.53	< 0.144	< ND	< 1.30	< 0.367	< ND	< 1.29	< 0.361	< 1.04	< 0.291
Combined Train Silver (Ag)	13.3	3.53	0.961	1.02	0.27	0.0749	< ND	< 0.16	< 0.043	< 1.32	< 0.36
Combined Train Strontium (Sr)	20.2	5.35	1.460	17.3	4.50	1.27	20.0	5.17	1.450	5.0	1.39
Combined Train Thallium (Tl)	0.50	0.13	0.036	< ND	< 0.16	< 0.044	< ND	< 0.16	< 0.043	< 0.148	< 0.04
Combined Train Tin (Sn)	114	30.20	8.240	125	32.50	9.170	108	27.90	7.810	30.2	8.41
Combined Train Titanium (Ti)	52.1	13.80	3.760	48.7	12.70	3.570	51.4	13.30	3.720	13.3	3.68
Combined Train Vanadium (V)	1.20	0.32	0.087	< ND	< 0.39	< 0.110	< ND	< 0.39	< 0.1080	< 0.365	< 0.102
Combined Train Zinc (Zn)	53	14.0	3.830	31	8.07	2.280	< ND	< 6.47	< 1.810	< 9.53	< 2.64
Mercury	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**($\mu g/m^3$)**	**(mg/s)**
Total Mercury (Hg)	3.988	1.06	0.288	6.576	1.71	0.483	6.07	1.57	0.439	1.45	0.403

Notes :

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3 kPa and 25 °C)

Concentration and Emission Rate has been reported to 3 significant figures.

***'<'** indicates that laboratory results were below the detection limit. The Reportable Detection Limit (RDL) was used to calculate the concentration and emission rate.*

TPM and Metals Sampling
Kiln - Baseline

Facility: St. Mary's Cement				**Operator:** JG	
City: Bowmanville				**Entered by:** WC	
Source: Main Stack				**Checked by:** KNE	
Reference Method: US EPA Method 5/29					
DATA INPUTS	**Symbol**	**Units**	**Test #1** TPM/Metals	**Test #2** TPM/Metals	**Test #3** TPM/Metals
Date			30-Sep-18	1-Oct-18	2-Oct-18
Start Time			12:06 PM	8:57 AM	8:08 AM
End Time			4:25 PM	1:21 PM	12:40 PM
Round Stack, Diameter (Inside)	d_s	in	216	216	216
Standard Temperature	T_s	°F	77	77	77
Standard Pressure	P_s	in.Hg	29.92	29.92	29.92
Nozzle Diameter	D_n	in	0.211	0.211	0.211
Average Stack Temperature	T_s	°F	260	250	248
Average Meter Temperature	T_m	°F	73	69	71
Barometric Pressure	P_{bar}	" Hg	30.3	30.3	30.3
Stack Static Pressure	P_g	" H_2O	-0.4	-0.4	-0.4
Average Delta H	dH	" H_2O	1.66	1.66	1.66
Average Velocity Head (root mean square)	dP_{rms}	" H_2O	0.731	0.777	0.766
Pitot Coefficient	C_p	-	0.824	0.824	0.824
	Pitot ID :		RWDI 7'-1		
Gas Sample Volume	V_m	ft^3	130.59	132.06	133.41
DGM Calibration Factor	Y	-	0.998	0.998	0.998
	DGM ID:		Console E		
Total Sampling Time	min	minutes	216	216	216
Stack Gas Oxygen Concentration	O_2	%	15.3	14.9	15.1
Stack Gas Carbon Dioxide Concentration	CO_2	%	11.4	11.9	12.2
Impinger Gain	W_w	g	209.3	226	235

TPM and Metals Sampling

Facility:	St. Mary's Cement	**Operator:**	JG
City:	Bowmanville	**Entered by:**	WC
Source:	Main Stack	**Checked by:**	KNE
Reference Method:	US EPA Method 5/29		

Emissions Calculations	**Symbol**	**Units**	**Test #1** TPM / Metals	**Test #2** TPM / Metals	**Test #3** TPM / Metals	**AVERAGE** TPM / Metals
Nozzle Area	A_n	ft²	2.43E-04	2.43E-04	2.43E-04	
Stack Area	A_s	ft²	254.47	254.47	254.47	
Average Stack Temperature	T_s	°R	720	710	708	713
Average DGM Temperature	T_m	°R	533	529	531	
Sample Volume at Reference Conditions	V_{mStd}	ft³	133.31	135.78	136.63	
	V_{mmstd}	**m³**	**3.77**	**3.84**	**3.87**	
Vol. of Water Vapour	V_{wStd}	ft³	10.05	10.86	11.29	
Water Fraction	B_{ws}		7.0%	7.4%	7.6%	7.3%
Molecular Weight, dry	M_d	g/mole	30.54	30.60	30.66	30.60
Molecular Weight, wet	M_w	g/mole	29.66	29.67	29.69	29.67
Absolute Stack Pressure	P_s	in. Hg	30.27	30.27	30.27	30.27
Stack Gas Velocity	U_s	ft/s	53.93	55.25	54.75	54.64
	U_{sm}	**m/s**	**16.44**	**16.84**	**16.69**	16.65
Actual Gas Flow Rate	Q_{act}	acf/min	823,395	843,498	835,857	834,250
Dry Gas Flow Rate (dry, ref)	Q_{ref}	dscf/min	577,690	597,680	592,326	589,232
	Q_{mref}	**m³/min**	**16354**	**16920**	**16769**	16,681
	Qmref (Actual O_2)	**m³/s**	**272.57**	**282.01**	**279.48**	278.02
Isokinetic Rate	I	%	101	100	101	101

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #1

Operator: JDG
Entered by: WC
Checked by: KNE
Test Date 30-Sep-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- East												
Pre-Test Leak Check =		<0.02 at 12" Hg										
1	0	0.790	0.85	34.63	331	249	246	39	65	0	112	58.67
	2.5	0.790	0.83	36.10	300	247	245	43	65	0	93	57.51
	5	0.790	0.85	37.35	300	252	252	39	65	0	99	57.51
2	7.5	0.790	0.87	38.68	280	250	251	38	65	0	99	56.75
	10	0.790	0.88	40.03	280	250	251	38	66	0	100	56.75
	12.5	0.790	0.88	41.40	280	251	251	38	67	0	99	56.75
3	15	0.790	0.90	42.76	275	250	251	39	68	0	100	56.56
	17.5	0.790	0.90	44.14	275	250	250	39	68	0	100	56.56
	20	0.790	0.90	45.52	275	250	250	39	68	0	100	56.56
4	22.5	0.790	0.90	46.90	270	250	248	40	69	0	101	56.36
	25	0.790	0.90	48.29	271	250	250	40	69	0	97	56.40
	27.5	0.790	0.90	49.63	270	249	250	40	69	0	101	56.36
5	30	0.750	0.88	51.02	270	248	249	40	70	0	100	54.92
	32.5	0.750	0.88	52.37	270	250	249	40	70	0	102	54.92
	35	0.750	0.88	53.74	270	250	250	39	70	0	100	54.92
6	37.5	0.750	0.88	55.09	264	248	249	40	71	0	99	54.69
	40	0.700	0.83	56.43	264	248	249	40	71	0	101	52.84
	42.5	0.700	0.83	57.76	263	248	249	40	72	0	101	52.80
7	45	0.630	0.75	59.09	263	251	250	39	72	0	102	50.09
	47.5	0.630	0.75	60.36	262	248	251	39	72	0	101	50.06
	50	0.630	0.75	61.62	262	250	251	39	72	0	101	50.06
8	52.5	0.630	0.75	62.88	261	250	252	40	72	0	100	50.02
	55	0.630	0.75	64.13	260	249	249	40	72	0	101	49.99
	57.5	0.630	0.75	65.39	260	249	250	40	72	0	101	49.99
	60			66.65								
1	0	0.630	0.75	66.65	261	253	253	44	72	0	101	50.02
	2.5	0.630	0.75	67.91	260	253	254	41	72	0	99	49.99
	5	0.630	0.75	69.15	259	250	249	45	73	0	104	49.95
2	7.5	0.630	0.75	70.45	260	250	252	45	73	0	103	49.99
	10	0.630	0.75	71.74	258	250	249	45	74	0	108	49.92
	12.5	0.630	0.75	73.10	256	251	252	40	74	0	91	49.85
3	15	0.630	0.75	74.25	257	250	249	40	74	0	100	49.88
	17.5	0.700	0.85	75.51	257	250	249	40	74	0	100	52.58
	20	0.700	0.85	76.84	258	251	251	41	76	0	99	52.62
4	22.5	0.700	0.85	78.15	258	251	251	41	76	0	101	52.62
	25	0.700	0.85	79.49	258	240	257	41	76	0	102	52.62
	27.5	0.700	0.85	80.84	258	251	250	41	76	0	102	52.62
5	30	0.730	0.85	82.20	258	250	251	41	76	0	101	53.73
	32.5	0.730	0.85	83.57	257	250	248	41	76	0	105	53.70
	35	0.730	0.85	85.00	256	250	252	41	76	0	99	53.66
6	37.5	0.750	0.90	86.34	256	249	247	41	74	0	101	54.39
	40	0.750	0.90	87.73	256	250	250	41	74	0	101	54.39
	42.5	0.750	0.90	89.11	254	251	252	41	74	0	100	54.31
7	45	0.750	0.90	90.49	257	249	252	41	74	0	101	54.43
	47.5	0.750	0.90	91.88	256	250	247	41	74	0	100	54.39
	50	0.750	0.90	93.25	250	251	252	41	74	0	101	54.16
8	52.5	0.800	0.96	94.64	255	250	254	41	74	0	100	56.13
	55	0.800	0.96	96.06	255	248	248	41	74	0	102	56.13
	57.5	0.800	0.96	97.50	254	250	253	42	74	0	100	56.09
	60			98.92								
1	0	0.830	1.00	98.92	260	250	250	40	73	0	102	57.38
	2.5	0.830	1.00	100.38	260	249	245	43	73	0	99	57.38
	5	0.830	1.00	101.80	260	251	245	42	74	0	101	57.38
2	7.5	0.830	1.00	103.26	260	251	246	40	74	0	101	57.38
	10	0.830	1.00	104.71	260	252	244	43	74	0	100	57.38
	12.5	0.830	1.00	106.15	260	255	253	40	74	0	102	57.38
3	15	0.830	1.00	107.62	260	246	246	40	74	0	100	57.38
	17.5	0.830	1.00	109.06	260	255	250	40	74	0	101	57.38
	20	0.830	1.00	110.51	260	255	250	40	74	0	103	57.38
4	22.5	0.750	0.90	111.99	255	253	245	45	74	0	100	54.35
	25	0.750	0.90	113.37	256	251	245	45	74	0	100	54.39
	27.5	0.750	0.90	114.74	257	248	247	42	74	0	101	54.43
5	30	0.750	0.90	116.13	256	251	249	42	74	0	101	54.39
	32.5	0.750	0.90	117.51	256	247	249	42	74	0	94	54.39
	35	0.750	0.90	118.80	257	252	248	42	74	0	106	54.43
6	37.5	0.750	0.90	120.25	256	250	248	42	74	0	101	54.39
	40	0.700	0.85	121.64	254	246	249	42	74	0	101	52.47
	42.5	0.700	0.85	122.98	256	250	251	43	74	0	105	52.55
7	45	0.700	0.85	124.37	256	250	251	43	74	0	102	52.55
	47.5	0.650	0.80	125.72	255	252	251	43	74	0	100	50.60
	50	0.600	0.73	127.00	253	247	250	42	74	0	102	48.55
8	52.5	0.600	0.73	128.25	253	249	250	45	74	0	102	48.55
	55	0.600	0.73	129.50	251	254	251	43	74	0	102	48.48
	57.5	0.600	0.73	130.76	251	251	245	43	74	0	102	48.48
	60			132.02								
1	0	0.600	0.73	132.02	251	251	248	45	73	0	102	48.48
	2.5	0.600	0.73	133.27	251	250	248	45	73	0	96	48.48
	5	0.600	0.73	134.45	251	252	249	43	74	0	108	48.48
2	7.5	0.600	0.73	135.78	252	249	249	43	74	0	102	48.51
	10	0.600	0.73	137.04	251	252	249	43	74	0	101	48.48
	12.5	0.650	0.80	138.29	250	253	252	42	74	0	104	50.42
3	15	0.750	0.90	139.62	252	246	252	43	74	0	100	54.24
	17.5	0.750	0.91	140.99	253	251	251	42	74	0	101	54.28
	20	0.700	0.85	142.38	254	248	248	43	74	0	102	52.47
4	22.5	0.750	0.91	143.74	253	251	248	43	74	0	101	54.28
	25	0.750	0.91	145.13	254	245	251	42	74	0	101	54.31
	27.5	0.750	0.91	146.52	253	250	250	43	74	0	100	54.28
5	30	0.750	0.91	147.89	254	251	249	43	74	0	102	54.31
	32.5	0.800	0.97	149.29	254	246	245	46	74	0	102	56.09
	35	0.800	0.97	150.74	254	247	249	44	74	0	101	56.09
6	37.5	0.800	0.97	152.18	254	249	252	44	74	0	102	56.09
	40	0.800	0.97	153.63	253	252	251	44	74	0	104	56.06
	42.5	0.800	0.97	155.10	253	254	250	44	74	0	101	56.06
7	45	0.800	0.97	156.53	254	250	251	44	74	0	103	56.09
	47.5	0.800	0.97	157.99	254	250	250	45	74	0	101	56.09
	50	0.800	0.97	159.42	253	252	251	45	74	0	103	56.06
8	52.5	0.800	0.97	160.88	256	249	251	45	74	0	102	56.17
	55	0.800	0.97	162.32	256	251	250	45	74	0	102	56.17
	57.5	0.800	0.97	163.76	256	251	251	45	74	0	103	56.17
	60			165.22								
Post-test Leak Check =		<0.02 at 5" Hg										
	Average	0.731	0.870	130.59	260	250	250	42	73		101	53.93

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #2

Operator: JDG
Entered by: WC
Checked by: KNE
Test Date 1-Oct-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- South												
Pre-Test Leak Check =		<0.01 at 12" Hg										
1	0	0.800	0.93	67.10	255	249	250	45	52	0	94	56.13
	2.5	0.800	0.93	68.37	255	250	250	44	52	0	97	56.13
	5	0.800	0.93	69.68	255	249	250	44	52	0	99	56.13
2	7.5	0.800	0.93	71.02	248	251	251	44	53	0	100	55.85
	10	0.800	0.93	72.38	248	252	250	44	53	0	99	55.85
	12.5	0.800	0.93	73.73	249	249	250	45	54	0	100	55.89
3	15	0.800	0.93	75.09	248	245	250	48	54	0	100	55.85
	17.5	0.800	0.93	76.45	250	246	250	46	56	0	99	55.93
	20	0.750	0.88	77.80	249	249	248	46	56	0	100	54.11
4	22.5	0.750	0.88	79.12	251	250	250	46	57	0	97	54.19
	25	0.750	0.88	80.41	250	250	250	45	57	0	99	54.15
	27.5	0.750	0.88	81.73	250	252	250	44	57	0	97	54.15
5	30	0.750	0.88	83.02	250	247	251	43	58	0	100	54.15
	32.5	0.750	0.88	84.35	250	246	245	42	58	0	100	54.15
	35	0.750	0.88	85.68	250	247	244	42	58	0	101	54.15
6	37.5	0.750	0.91	87.02	250	246	248	41	58	0	101	54.15
	40	0.750	0.91	88.37	251	250	250	41	58	0	101	54.19
	42.5	0.650	0.79	89.71	250	251	251	41	58	0	102	50.41
7	45	0.650	0.79	90.97	251	250	251	42	58	0	101	50.45
	47.5	0.610	0.73	92.22	250	249	258	42	58	0	102	48.84
	50	0.610	0.73	93.45	250	250	256	42	58	0	99	48.84
8	52.5	0.610	0.73	94.64	250	250	255	42	59	0	105	48.84
	55	0.610	0.73	95.90	248	253	249	42	60	0	106	48.77
	57.5	0.610	0.73	97.18	250	251	250	40	60	0	106	48.84
	60			98.46								
1	0	0.610	0.73	98.46	247	251	250	40	64	0	99	48.73
	2.5	0.610	0.73	99.67	250	252	250	39	64	0	100	48.84
	5	0.610	0.73	100.88	250	251	249	38	64	0	100	48.84
2	7.5	0.610	0.75	102.10	250	248	251	38	64	0	103	48.84
	10	0.610	0.75	103.35	250	249	249	39	66	0	102	48.84
	12.5	0.610	0.75	104.59	250	250	250	39	66	0	103	48.84
3	15	0.610	0.75	105.85	250	248	250	39	66	0	102	48.84
	17.5	0.750	0.90	107.09	248	253	250	39	66	0	97	54.08
	20	0.750	0.91	108.40	250	250	251	39	66	0	101	54.15
4	22.5	0.750	0.91	109.77	250	251	250	40	66	0	99	54.15
	25	0.750	0.91	111.11	250	250	250	40	66	0	102	54.15
	27.5	0.750	0.91	112.49	250	250	250	40	66	0	102	54.15
5	30	0.750	0.91	113.87	250	250	250	40	68	0	102	54.15
	32.5	0.750	0.91	115.25	250	249	251	40	68	0	92	54.15
	35	0.750	0.91	116.50	250	250	250	40	68	0	100	54.15
6	37.5	0.750	0.91	117.85	250	250	250	40	68	0	100	54.15
	40	0.850	1.02	119.20	250	250	250	40	68	0	98	57.65
	42.5	0.850	1.02	120.62	249	250	252	40	68	0	99	57.61
7	45	0.850	1.02	122.05	249	250	250	40	69	0	93	57.61
	47.5	0.850	1.02	123.40	251	250	250	41	69	0	102	57.69
	50	0.850	1.02	124.87	251	250	251	41	69	0	105	57.69
8	52.5	0.850	1.02	126.39	250	251	251	41	70	0	91	57.65
	55	0.850	1.02	127.71	250	251	249	41	70	0	98	57.65
	57.5	0.850	1.02	129.13	250	251	250	41	70	0	98	57.65
	60			130.55								
1	0	0.870	1.10	130.55	251	251	249	42	70	0	100	58.37
	2.5	0.870	1.10	132.02	251	247	251	42	71	0	101	58.37
	5	0.870	1.10	133.50	251	248	251	42	72	0	99	58.37
2	7.5	0.870	1.10	134.95	251	246	249	42	72	0	99	58.37
	10	0.870	1.10	136.40	250	251	249	42	73	0	90	58.32
	12.5	0.870	1.10	137.73	251	252	250	42	75	0	103	58.37
3	15	0.850	1.00	139.26	250	252	251	43	75	0	96	57.65
	17.5	0.850	1.00	140.66	250	250	249	43	75	0	97	57.65
	20	0.850	1.00	142.08	250	249	249	43	75	0	96	57.65
4	22.5	0.850	1.00	143.49	250	251	249	43	75	0	96	57.65
	25	0.850	1.00	144.89	254	251	251	43	75	0	97	57.81
	27.5	0.800	0.96	146.31	250	251	250	43	77	0	99	55.93
5	30	0.800	0.96	147.72	250	250	249	43	77	0	98	55.93
	32.5	0.800	0.96	149.12	252	248	251	44	77	0	101	56.01
	35	0.800	0.96	150.56	249	251	251	44	77	0	101	55.89
6	37.5	0.800	0.96	152.00	250	249	249	44	77	0	91	55.93
	40	0.800	0.96	153.30	249	250	251	44	77	0	99	55.89
	42.5	0.750	0.92	154.71	250	251	251	44	77	0	99	54.15
7	45	0.750	0.92	156.07	250	251	251	44	77	0	101	54.15
	47.5	0.750	0.92	157.46	252	251	251	44	77	0	101	54.23
	50	0.750	0.92	158.85	250	250	249	47	77	0	101	54.15
8	52.5	0.750	0.95	160.25	250	250	251	47	77	0	100	54.15
	55	0.750	0.95	161.63	250	250	251	47	77	0	100	54.15
	57.5	0.750	0.95	163.01	250	246	249	46	77	0	101	54.15
	60			164.41								
1	0	0.800	0.98	164.41	247	252	250	250	76	0	100	55.81
	2.5	0.800	0.98	165.83	249	248	249	249	77	0	100	55.89
	5	0.800	0.98	167.25	251	251	250	250	77	0	99	55.97
2	7.5	0.750	0.92	168.66	249	248	251	251	77	0	100	54.11
	10	0.800	0.98	170.04	249	249	249	249	77	0	102	55.89
	12.5	0.800	0.98	171.50	249	249	249	249	77	0	99	55.89
3	15	0.800	0.98	172.91	249	251	251	251	77	0	100	55.89
	17.5	0.800	0.98	174.33	249	251	250	250	77	0	103	55.89
	20	0.820	1.01	175.80	250	251	250	250	78	0	102	56.62
4	22.5	0.820	1.01	177.27	249	249	250	250	78	0	95	56.58
	25	0.820	1.01	178.64	250	252	250	250	78	0	98	56.62
	27.5	0.820	1.01	180.05	250	251	250	250	78	0	100	56.62
5	30	0.820	1.01	181.50	251	251	250	250	78	0	99	56.66
	32.5	0.850	1.04	182.93	249	250	250	250	78	0	99	57.61
	35	0.850	1.04	184.38	250	250	250	250	78	0	100	57.65
6	37.5	0.850	1.04	185.85	250	251	250	250	78	0	102	57.65
	40	0.850	1.00	187.35	250	251	250	250	78	0	101	57.65
	42.5	0.850	1.00	188.83	250	251	250	251	78	0	100	57.65
7	45	0.850	1.00	190.30	250	249	250	248	78	0	101	57.65
	47.5	0.850	1.00	191.79	250	249	251	248	78	0	100	57.65
	50	0.850	1.00	193.26	250	250	248	251	78	0	101	57.65
8	52.5	0.850	1.00	194.75	250	250	248	251	78	0	101	57.65
	55	0.850	1.00	196.23	248	250	251	251	78	0	99	57.57
	57.5	0.850	1.00	197.69	250	250	251	251	78	0	100	57.65
	60			199.16								
Post-test Leak Check =		<0.01 at 12" Hg										
	Average	0.777	0.938	132.06	250	250	250	94	69		100	55.25

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #3

Operator: JDG
Entered by: WC
Checked by: KNE
Test Date 2-Oct-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- South												
Pre-Test Leak Check =		<0.02 at 12" Hg										
1	0	0.790	0.97	345.89	245	252	251	43	55	0	121	55.36
	2.5	0.760	0.93	347.53	245	251	250	40	56	0	119	54.30
	5	0.840	1.00	349.12	245	252	250	40	56	0	100	57.09
2	7.5	0.820	0.98	350.52	246	249	250	40	56	0	102	56.44
	10	0.800	0.98	351.93	246	249	251	40	58	0	99	55.75
	12.5	0.800	0.98	353.29	252	250	251	40	58	0	101	55.99
3	15	0.750	0.91	354.67	246	250	250	41	58	0	100	53.98
	17.5	0.740	0.91	356.00	247	248	250	41	58	0	102	53.66
	20	0.750	0.92	357.35	247	250	250	40	61	0	101	54.02
4	22.5	0.750	0.92	358.70	247	258	250	40	61	0	101	54.02
	25	0.750	0.92	360.05	248	250	248	40	61	0	103	54.06
	27.5	0.750	0.92	361.43	249	250	248	41	61	0	104	54.09
5	30	0.710	0.87	362.82	249	249	249	41	61	0	102	52.63
	32.5	0.710	0.87	364.14	248	250	250	41	61	0	103	52.60
	35	0.710	0.87	365.48	248	250	250	40	61	0	105	52.60
6	37.5	0.710	0.87	366.84	248	250	248	40	61	0	100	52.60
	40	0.660	0.80	368.14	248	250	250	40	61	0	100	50.71
	42.5	0.660	0.80	369.40	247	250	250	40	61	0	105	50.67
7	45	0.660	0.80	370.72	248	247	250	40	61	0	102	50.71
	47.5	0.650	0.80	372.00	246	252	248	40	61	0	100	50.25
	50	0.600	0.74	373.25	245	250	250	41	61	0	103	48.25
8	52.5	0.600	0.74	374.48	245	250	250	41	61	0	102	48.25
	55	0.610	0.75	375.70	246	250	250	41	61	0	104	48.68
	57.5	0.610	0.75	376.95	245	246	250	41	61	0	103	48.65
	60			378.20								
1	0	0.840	0.87	378.20	243	251	245	43	61	0	100	57.01
	2.5	0.840	0.87	379.62	245	250	251	37	65	0	111	57.09
	5	0.840	0.87	381.20	245	249	250	37	65	0	104	57.09
2	7.5	0.800	0.87	382.68	246	249	251	37	65	0	85	55.75
	10	0.800	0.80	383.87	246	245	251	39	65	0	99	55.75
	12.5	0.840	0.80	385.25	247	251	250	39	68	0	98	57.17
3	15	0.840	0.87	386.66	245	250	250	39	68	0	103	57.09
	17.5	0.840	0.87	388.14	249	251	251	39	68	0	98	57.25
	20	0.800	0.87	389.54	247	247	250	39	68	0	101	55.79
4	22.5	0.800	0.87	390.96	246	249	250	40	68	0	101	55.75
	25	0.780	0.92	392.38	249	250	251	41	68	0	101	55.17
	27.5	0.780	0.92	393.78	250	250	251	41	68	0	99	55.20
5	30	0.720	0.93	395.15	249	252	250	40	68	0	102	53.00
	32.5	0.720	0.94	396.50	246	251	251	40	68	0	102	52.89
	35	0.720	0.94	397.86	246	251	250	40	73	0	100	52.89
6	37.5	0.720	0.94	399.20	246	252	250	40	73	0	100	52.89
	40	0.700	0.94	400.54	246	250	250	40	73	0	101	52.15
	42.5	0.700	0.94	401.87	247	249	249	41	73	0	101	52.19
7	45	0.700	0.94	403.21	247	249	250	41	73	0	101	52.19
	47.5	0.650	0.94	404.54	247	250	250	41	73	0	104	50.29
	50	0.620	0.94	405.87	247	249	250	41	73	0	100	49.11
8	52.5	0.620	0.94	407.12	248	249	251	41	73	0	101	49.15
	55	0.620	0.94	408.37	248	250	250	41	73	0	101	49.15
	57.5	0.620	0.94	409.62	249	250	250	41	73	0	101	49.18
	60			410.88			.					
1	0	0.860	1.10	410.88	247	251	245	42	73	0	102	57.84
	2.5	0.860	1.10	412.38	247	250	247	40	73	0	102	57.84
	5	0.860	1.10	413.88	247	249	250	40	73	0	95	57.84
2	7.5	0.860	1.10	415.27	247	249	250	40	73	0	94	57.84
	10	0.860	1.10	416.65	248	249	250	40	73	0	99	57.88
	12.5	0.860	1.10	418.10	248	251	251	41	73	0	90	57.88
3	15	0.820	1.00	419.42	249	250	250	41	73	0	109	56.56
	17.5	0.820	1.00	420.97	248	251	250	41	75	0	100	56.52
	20	0.840	1.00	422.40	247	247	250	41	75	0	101	57.17
4	22.5	0.840	1.00	423.87	246	249	251	41	76	0	79	57.13
	25	0.840	1.00	425.02	245	250	250	42	76	0	115	57.09
	27.5	0.840	1.00	426.70	245	250	250	42	76	0	103	57.09
5	30	0.800	0.98	428.20	249	252	245	44	76	0	99	55.87
	32.5	0.800	0.98	429.61	247	251	250	44	77	0	100	55.79
	35	0.800	0.98	431.03	247	251	250	44	77	0	101	55.79
6	37.5	0.720	0.88	432.47	247	252	250	44	79	0	99	52.93
	40	0.720	0.88	433.81	247	250	249	45	79	0	99	52.93
	42.5	0.720	0.88	435.15	249	249	250	45	79	0	98	53.00
7	45	0.660	0.81	436.48	248	249	250	45	79	0	101	50.71
	47.5	0.660	0.81	437.79	248	251	251	45	79	0	103	50.71
	50	0.660	0.81	439.12	249	252	251	45	79	0	100	50.75
8	52.5	0.660	0.81	440.42	249	249	250	45	79	0	101	50.75
	55	0.700	0.86	441.73	250	250	251	45	79	0	100	52.30
	57.5	0.700	0.86	443.07	247	250	250	45	79	0	102	52.19
	60			444.44								
1	0	0.700	0.86	444.44	249	250	250	50	78	0	100	52.26
	2.5	0.700	0.86	445.77	250	249	249	50	78	0	101	52.30
	5	0.700	0.86	447.12	249	249	249	50	78	0	99	52.26
2	7.5	0.700	0.86	448.44	249	250	250	48	80	0	99	52.26
	10	0.700	0.86	449.77	249	249	250	49	80	0	102	52.26
	12.5	0.700	0.86	451.13	249	249	250	49	80	0	101	52.26
3	15	0.780	0.96	452.48	251	249	250	49	80	0	98	55.24
	17.5	0.790	0.97	453.86	252	250	250	49	80	0	100	55.64
	20	0.790	0.97	455.28	252	250	250	49	80	0	102	55.64
4	22.5	0.840	1.00	456.72	252	250	251	49	80	0	99	57.37
	25	0.840	1.00	458.17	253	251	251	49	80	0	102	57.41
	27.5	0.840	1.00	459.66	252	250	250	49	80	0	99	57.37
5	30	0.840	1.00	461.11	253	248	250	50	80	0	103	57.41
	32.5	0.880	1.10	462.61	252	249	250	50	80	0	102	58.72
	35	0.880	1.10	464.13	253	251	250	50	80	0	100	58.76
6	37.5	0.900	1.10	465.63	252	246	250	50	80	0	101	59.38
	40	0.900	1.10	467.16	253	253	250	50	80	0	102	59.42
	42.5	0.900	1.10	468.70	253	252	250	50	80	0	101	59.42
7	45	0.900	1.10	470.22	253	246	250	50	80	0	114	59.42
	47.5	0.890	1.10	471.95	252	245	250	52	80	0	87	59.05
	50	0.890	1.10	473.26	253	250	250	52	80	0	101	59.09
8	52.5	0.860	1.10	474.78	252	251	250	52	80	0	101	58.05
	55	0.900	1.10	476.27	253	250	250	52	80	0	100	59.42
	57.5	0.900	1.10	477.78	252	250	250	52	80	0	100	59.38
	60			479.30								
Post-test Leak Check =		<0.01 at 12" Hg										
	Average	0.766	0.937	133.41	248	250	250	43	71		101	54.75

TPM and Metals Sampling Results
Kiln Stack with LCF

Test :	Test #1			Test #2			Test #3			AVERAGE RESULTS	
Sample Volume (Rm^3) [1] :	3.73			3.60			3.58				
Stack Flow Rate (Rm^3/s) [1] :	273.1			257.5			253.2			261.3	
Parameter	**Lab Data**	**Concentration**	**Emission Rate**	**Lab Data**	**Concentration**	**Emission Rate**	**Lab Data**	**Concentration**	**Emission Rate**	**Concentration**	**Emission Rate**
Particulate	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg)**	**(mg/m^3)**	**(mg/s)**	**(mg/m^3)**	**(mg/s)**
Particulate in Acetone Rinse	6.5	-	-	2.8	-	-	2.8	-	-	-	-
Particulate on Filter	11.7	-	-	12.5	-	-	14.7	-	-	-	-
Total Particulate Matter	18.2	4.9	1330	15.3	4.3	1090	17.5	4.9	1240	4.7	1220
Metals	**(ug)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**($\mu g/m^3$)**	**(mg/s)**
Combined Train Aluminum (Al)	453	121	33.1	405	112	28.9	454	127	32.1	120	31.4
Combined Train Antimony (Sb)	< 7.5	< 2	< 0.549	< 7.5	< 2.08	< 0.536	< 7.5	< 2.09	< 0.530	< 2.06	< 0.5380
Combined Train Arsenic (As)	< 2.0	< 0.54	< 0.146	< 2.0	< 0.56	< 0.143	< 2.0	< 0.56	< 0.141	< 0.550	< 0.144
Combined Train Barium (Ba)	17.0	4.55	1.24	18.0	5	1.290	20.0	5.58	1.410	5.04	1.31
Combined Train Beryllium (Be)	< 0.45	< 0.12	< 0.033	< 0.45	< 0.13	< 0.032	< 0.45	< 0.13	< 0.032	< 0.12	< 0.0323
Combined Train Boron (B)	< 75	< 20.1	< 5.49	< 75	< 20.80	< 5.360	< 75	< 20.90	< 5.30	< 20.6	< 5.38
Combined Train Cadmium (Cd)	< 0.45	< 0.12	< 0.033	< 0.45	< 0	< 0.032	0.49	0	0.035	< 0.127	< 0.03
Combined Train Calcium (Ca)	4850	1300	355	3840	1070.00	274	4050	1130	286	1170	305
Combined Train Chromium (Cr)	< 7.5	< 2.01	< 0.549	< 7.5	< 2.08	< 0.536	< 7.5	< 2.09	< 0.530	< 2.06	< 0.538
Combined Train Cobalt (Co)	< 0.45	< 0.12	< 0.033	< 0.45	< 0.13	< 0.0322	0.60	0.17	0.04240	< 0.14	< 0.0358
Combined Train Copper (Cu)	< 3.8	< 1.02	< 0.278	< 3.8	< 1.05	< 0.272	5.2	1.45	0.368	< 1.17	< 0.3060
Combined Train Iron (Fe)	437	117	32.0	299	83	21.4	343	95.80	24.2	98.60	25.9
Combined Train Lead (Pb)	11.8	3.16	0.863	9.4	2.61	0.672	13.6	3.8	0.961	3.19	0.83
Combined Train Magnesium (Mg)	183	49.0	13.4	167	46.30	11.9	194	54.20	13.7	49.8	13.0
Combined Train Manganese (Mn)	9.9	2.65	0.724	8.9	2.47	0.636	14.8	4.13	1.050	3.08	0.8020
Combined Train Molybdenum (Mo)	11.9	3.19	0.871	12.5	3.47	0.893	12.0	3.35	0.848	3.34	0.871
Combined Train Nickel (Ni)	4.6	1.23	0.337	4.7	1.30	0.336	24.1	6.73	1.70	3.09	0.792
Combined Train Phosphorus (P)	< 230	< 61.6	< 16.8	< 230	< 63.80	< 16.4	< 230	< 64.20	< 16.3	< 63.2	< 16.5
Combined Train Potassium (K)	1030	276	75.4	830	230	59.3	996	278	70.4	261	68.4
Combined Train Selenium (Se)	< 5.0	< 1.34	< 0.366	< 5.0	< 1.39	< 0.357	< 5.0	< 1.40	< 0.353	< 1.38	< 0.359
Combined Train Silver (Ag)	< 0.60	< 0.16	< 0.044	< 0.60	< 0.17	< 0.0429	< 0.60	< 0.17	< 0.042	< 0.165	< 0.043
Combined Train Strontium (Sr)	10.2	3	0.746	8.5	2.36	0.6070	9.0	2.51	0.636	2.53	0.6630
Combined Train Thallium (Tl)	< 0.60	< 0.16	< 0.044	< 0.60	< 0.17	< 0.043	< 0.60	< 0.17	< 0.042	< 0.165	< 0.0431
Combined Train Tin (Sn)	79.2	21.20	5.800	99.1	27.50	7.080	112	31.30	7.920	26.7	6.93
Combined Train Titanium (Ti)	34.3	9.19	2.510	31.6	8.77	2.260	28.2	7.87	1.990	8.61	2.3
Combined Train Vanadium (V)	< 1.5	< 0.40	< 0.110	< 1.5	< 0.42	< 0.1070	< 1.5	< 0.42	< 0.1060	< 0.412	< 0.108
Combined Train Zinc (Zn)	< 25	< 6.70	< 1.830	< 25	< 6.94	< 1.790	33	9.21	2.330	< 7.62	< 1.98
Mercury	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**(µg)**	**($\mu g/m^3$)**	**(mg/s)**	**($\mu g/m^3$)**	**(mg/s)**
Total Hg	8.04	2.15	0.589	4.30	1.19	0.307	3.53	0.98	0.249	1.44	0.382

Notes :
[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3 kPa and 25 °C)
***'<'** indicates that laboratory results were below the detection limit. The Reportable Detection Limit (RDL) was used to calculate the concentration and emission rate.*
Concentration and Emission Rate has been reported to 3 significant figures.

TPM and Metals Sampling
Kiln Stack with LCF

Facility: St. Mary's Cement				**Operator:** JG	
City: Bowmanville				**Entered by:** DO	
Source: Main Stack				**Checked by:** KNE	
Reference Method: US EPA Method 5/29					
DATA INPUTS	**Symbol**	**Units**	**Test #1** TPM/Metals	**Test #2** TPM/Metals	**Test #3** TPM/Metals
Date			5-Oct-18	9-Oct-18	9-Oct-18
Start Time			8:44 AM	9:25 AM	2:36 PM
End Time			1:58 PM	1:52 PM	6:54 PM
Round Stack, Diameter (Inside)	d_s	in	216	216	216
Standard Temperature	T_s	°F	77	77	77
Standard Pressure	P_s	in.Hg	29.92	29.92	29.92
Nozzle Diameter	D_n	in	0.210	0.210	0.210
Average Stack Temperature	T_s	°F	258	253	257
Average Meter Temperature	T_m	°F	71	80	95
Barometric Pressure	P_{bar}	" Hg	29.3	29.3	29.3
Stack Static Pressure	P_g	" H_2O	-0.7	-0.7	-0.7
Average Delta H	dH	" H_2O	1.66	1.66	1.66
Average Velocity Head (root mean square)	dP_{rms}	" H_2O	0.770	0.704	0.681
Pitot Coefficient	C_p	-	0.824	0.824	0.824
	Pitot ID :		RWDI 7'-1		
Gas Sample Volume	V_m	ft^3	133.21	130.71	133.49
DGM Calibration Factor	Y	-	0.998	0.998	0.998
	DGM ID:				
Total Sampling Time	min	minutes	216	216	216
Stack Gas Oxygen Concentration	O_2	%	14.8	15.1	15.1
Stack Gas Carbon Dioxide Concentration	CO_2	%	12.1	11.6	11.8
Impinger Gain	W_w	g	231.2	282	276.4

TPM and Metals Sampling

Facility:	St. Mary's Cement	**Operator:**	JG
City:	Bowmanville	**Entered by:**	DO
Source:	Main Stack	**Checked by:**	KNE
Reference Method:	US EPA Method 5/29		

Emissions Calculations	**Symbol**	**Units**	**Test #1** TPM / Metals	**Test #2** TPM / Metals	**Test #3** TPM / Metals	**AVERAGE** TPM / Metals
Nozzle Area	A_n	ft²	2.41E-04	2.41E-04	2.41E-04	
Stack Area	A_s	ft²	254.47	254.47	254.47	
Average Stack Temperature	T_s	°R	718	713	717	716
Average DGM Temperature	T_m	°R	531	540	555	
Sample Volume at Reference Conditions	V_{mStd}	ft³	131.89	127.35	126.54	
	V_{mmstd}	**m³**	**3.73**	**3.60**	**3.58**	
Vol. of Water Vapour	V_{wStd}	ft³	11.10	13.54	13.27	
Water Fraction	B_{ws}		7.8%	9.6%	9.5%	9.0%
Molecular Weight, dry	M_d	g/mole	30.63	30.56	30.60	30.60
Molecular Weight, wet	M_w	g/mole	29.65	29.36	29.40	29.47
Absolute Stack Pressure	P_s	in. Hg	29.25	29.25	29.25	29.25
Stack Gas Velocity	U_s	ft/s	56.19	53.67	52.99	54.29
	U_{sm}	**m/s**	**17.13**	**16.36**	**16.15**	16.55
Actual Gas Flow Rate	Q_{act}	acf/min	857,983	819,489	809,077	828,850
Dry Gas Flow Rate (dry, ref)	Q_{ref}	dscf/min	578,828	545,805	536,588	553,740
	Q_{mref}	**m³/min**	**16387**	**15452**	**15191**	15,676
	Qmref (Actual O_2)	**m³/s**	**273.11**	**257.53**	**253.18**	261.27
Isokinetic Rate	I	%	101	103	104	102

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #1

Operator: JDG
Entered by: DO
Checked by: KNE
5-Oct-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- East												
Pre-Test Leak Check =		<0.02 at 10" Hg										
1	0	0.850	0.99	525.78	254	250	250	43	52	0	100	58.83
	2.5	0.850	1.00	527.18	256	249	250	42	52	0	102	58.92
	5	0.850	1.00	528.60	256	250	247	41	52	0	103	58.92
2	7.5	0.850	1.00	530.04	256	251	250	40	60	0	98	58.92
	10	0.850	1.00	531.43	256	249	250	37	60	0	101	58.92
	12.5	0.850	1.00	532.87	256	250	250	37	60	0	101	58.92
3	15	0.850	1.00	534.30	256	250	249	37	63	0	113	58.92
	17.5	0.800	0.95	535.91	258	250	251	37	63	0	100	57.24
	20	0.800	0.95	537.29	257	250	254	38	64	0	99	57.20
4	22.5	0.800	0.95	538.66	259	250	250	38	65	0	104	57.28
	25	0.750	0.92	540.11	258	251	251	39	66	0	100	55.42
	27.5	0.750	0.92	541.46	257	250	250	38	66	0	99	55.38
5	30	0.750	0.92	542.79	257	250	250	38	66	0	99	55.38
	32.5	0.750	0.92	544.13	257	250	250	38	66	0	102	55.38
	35	0.750	0.92	545.50	256	250	248	39	66	0	100	55.34
6	37.5	0.750	0.92	546.85	256	249	247	39	66	0	99	55.34
	40	0.750	0.92	548.19	255	251	249	39	67	0	101	55.30
	42.5	0.750	0.92	549.56	257	250	250	40	67	0	101	55.38
7	45	0.620	0.74	550.92	255	249	248	40	67	0	99	50.28
	47.5	0.620	0.75	552.14	255	250	248	40	67	0	102	50.28
	50	0.620	0.75	553.39	255	251	249	40	67	0	102	50.28
8	52.5	0.620	0.75	554.64	255	251	250	40	68	0	102	50.28
	55	0.620	0.75	555.90	255	250	254	40	68	0	101	50.28
	57.5	0.620	0.75	557.15	255	249	249	40	68	0	103	50.28
	60			558.42								
1	0	0.600	0.72	558.42	255	250	250	42	69	0	99	49.46
	2.5	0.600	0.72	559.62	255	250	250	41	69	0	104	49.46
	5	0.700	0.86	560.88	255	250	250	41	70	0	94	53.43
2	7.5	0.720	0.88	562.12	255	250	250	41	71	0	94	54.19
	10	0.720	0.88	563.38	255	250	247	41	72	0	93	54.19
	12.5	0.720	0.88	564.63	255	250	249	41	72	0	93	54.19
3	15	0.720	0.88	565.87	255	250	249	41	72	0	96	54.19
	17.5	0.720	0.88	567.15	255	250	250	41	72	0	101	54.19
	20	0.770	0.96	568.50	255	249	249	43	72	0	95	56.03
4	22.5	0.800	1.05	569.82	255	250	251	43	72	0	94	57.12
	25	0.800	1.05	571.14	255	249	250	41	72	0	89	57.12
	27.5	0.800	1.05	572.40	255	250	250	41	72	0	101	57.12
5	30	0.800	1.05	573.83	255	250	257	42	72	0	99	57.12
	32.5	0.800	1.05	575.23	256	251	250	42	73	0	101	57.16
	35	0.800	1.05	576.66	257	250	249	42	73	0	103	57.20
6	37.5	0.800	1.05	578.12	256	251	251	42	72	0	102	57.16
	40	0.800	1.05	579.56	256	251	250	42	73	0	102	57.16
	42.5	0.800	1.05	581.00	256	250	250	42	72	0	101	57.16
7	45	0.800	1.05	582.43	255	250	250	43	73	0	102	57.12
	47.5	0.800	1.05	583.87	255	255	250	44	73	0	101	57.12
	50	0.800	1.05	585.30	256	251	247	43	74	0	101	57.16
8	52.5	0.800	1.05	586.73	255	249	250	43	74	0	97	57.12
	55	0.800	1.05	588.10	255	249	247	43	72	0	106	57.12
	57.5	0.800	1.05	589.60	254	250	250	43	72	0	101	57.08
	60			591.02								
1	0	0.830	1.05	591.03	255	250	250	41	73	0	97	58.18
	2.5	0.830	1.08	592.43	256	251	242	42	72	0	101	58.22
	5	0.830	1.08	593.88	255	249	241	44	72	0	104	58.18
2	7.5	0.830	1.08	595.37	256	251	236	40	72	0	96	58.22
	10	0.830	1.10	596.75	256	246	236	40	73	0	104	58.22
	12.5	0.830	1.08	598.24	256	246	241	40	73	0	99	58.22
3	15	0.820	1.08	599.66	256	255	243	39	73	0	99	57.87
	17.5	0.820	1.08	601.08	256	255	243	38	73	0	99	57.87
	20	0.820	1.08	602.50	255	251	249	37	73	0	133	57.83
4	22.5	0.820	1.08	604.40	255	248	250	38	74	0	103	57.83
	25	0.820	1.08	605.88	255	250	254	38	74	0	103	57.83
	27.5	0.820	1.00	607.35	255	250	247	36	74	0	100	57.83
5	30	0.820	1.00	608.78	255	250	247	38	74	0	104	57.83
	32.5	0.820	1.00	610.27	255	251	249	37	74	0	101	57.83
	35	0.820	1.00	611.72	255	251	245	37	74	0	100	57.83
6	37.5	0.820	1.00	613.16	255	249	247	37	74	0	105	57.83
	40	0.700	0.90	614.66	255	245	247	37	74	0	101	53.43
	42.5	0.700	0.90	616.00	255	245	245	37	74	0	101	53.43
7	45	0.700	0.86	617.34	250	250	250	38	74	0	100	53.24
	47.5	0.700	0.86	618.67	250	251	250	38	74	0	100	53.24
	50	0.700	0.86	620.00	265	250	250	38	74	0	100	53.80
8	52.5	0.700	0.86	621.32	273	251	251	40	74	0	100	54.10
	55	0.700	0.86	622.64	273	251	251	40	74	0	100	54.10
	57.5	0.700	0.86	623.95	290	252	251	40	74	0	102	54.72
	60			625.27								
1	0	0.700	0.86	625.27	292	251	254	40	72	0	103	54.79
	2.5	0.800	0.92	626.60	287	251	250	41	72	0	98	58.38
	5	0.800	0.92	627.95	277	249	247	46	72	0	104	57.99
2	7.5	0.800	0.92	629.40	275	249	251	43	72	0	99	57.91
	10	0.800	0.92	630.78	270	249	249	43	74	0	96	57.71
	12.5	0.800	0.92	632.13	264	250	249	44	74	0	96	57.47
3	15	0.760	0.92	633.48	265	251	250	44	74	0	100	56.06
	17.5	0.760	0.95	634.85	262	249	247	45	77	0	101	55.94
	20	0.760	0.95	636.24	262	249	251	45	77	0	101	55.94
4	22.5	0.760	0.95	637.63	262	250	251	45	77	0	100	55.94
	25	0.760	0.95	639.01	266	252	247	47	77	0	101	56.10
	27.5	0.760	0.95	640.40	256	250	252	46	77	0	100	55.71
5	30	0.760	0.95	641.79	258	250	252	46	77	0	100	55.79
	32.5	0.800	1.05	643.18	257	250	252	46	77	0	105	57.20
	35	0.800	1.05	644.67	257	250	252	40	77	0	94	57.20
6	37.5	0.800	1.05	646.01	255	249	251	40	77	0	105	57.12
	40	0.800	1.05	647.50	255	249	251	40	78	0	100	57.12
	42.5	0.800	1.05	648.93	250	250	253	47	79	0	100	56.92
7	45	0.800	1.05	650.37	252	249	29	45	79	0	100	57.00
	47.5	0.800	1.05	651.80	252	250	248	45	80	0	107	57.00
	50	0.800	1.05	653.34	252	250	251	45	80	0	95	57.00
8	52.5	0.800	1.05	654.70	252	250	251	45	80	0	99	57.00
	55	0.800	1.05	656.12	251	247	248	44	80	0	101	56.96
	57.5	0.800	1.05	657.57	251	248	248	44	80	0	100	56.96
	60			659.00								
Post-test Leak Check =		<0.01 at 9" Hg										
	Average	0.770	0.964	133.21	258	250	247	41	71		101	56.19

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #2

Operator: JDG
Entered by: DO
Checked by: KNE
9-Oct-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- South												
Pre-Test Leak Check =		<0.01 at 12" Hg										
1	0	0.740	0.91	693.17	255	249	250	40	72	0	107	55.21
	2.5	0.740	0.95	694.60	255	250	250	40	72	0	103	55.21
	5	0.740	0.95	695.97	252	249	250	56	72	0	103	55.09
2	7.5	0.740	0.95	697.35	253	251	251	55	73	0	102	55.13
	10	0.700	0.90	698.72	254	250	252	50	73	0	102	53.66
	12.5	0.700	0.90	700.05	252	250	252	55	74	0	104	53.58
3	15	0.700	0.90	701.41	253	252	247	56	74	0	103	53.62
	17.5	0.700	0.90	702.76	253	250	249	56	75	0	105	53.62
	20	0.700	0.90	704.13	253	251	251	56	75	0	104	53.62
4	22.5	0.700	0.90	705.49	253	251	247	56	74	0	103	53.62
	25	0.750	0.95	706.84	254	250	251	56	75	0	103	55.54
	27.5	0.750	0.93	708.23	252	250	251	56	75	0	103	55.46
5	30	0.750	0.93	709.62	253	251	251	56	76	0	102	55.50
	32.5	0.700	0.90	711.00	253	251	250	56	76	0	104	53.62
	35	0.700	0.90	712.36	253	250	250	56	76	0	103	53.62
6	37.5	0.700	0.90	713.71	253	249	252	56	76	0	103	53.62
	40	0.700	0.90	715.06	252	250	251	56	77	0	103	53.58
	42.5	0.700	0.90	716.41	253	250	247	56	77	0	103	53.62
7	45	0.650	0.85	717.77	254	250	252	57	77	0	18	51.71
	47.5	0.650	0.85	718.00	253	249	247	56	77	0	191	51.67
	50	0.650	0.85	720.42	254	249	253	55	77	0	105	51.71
8	52.5	0.650	0.83	721.75	253	249	247	55	78	0	102	51.67
	55	0.650	0.83	723.04	253	20	249	56	78	0	102	51.67
	57.5	0.620	0.79	724.34	253	250	250	57	78	0	102	50.46
	60			725.61								
1	0	0.620	0.79	725.61	253	250	251	55	69	0	103	50.46
	2.5	0.620	0.79	726.87	253	252	248	56	69	0	104	50.46
	5	0.620	0.79	728.14	252	249	250	55	70	0	106	50.43
2	7.5	0.630	0.79	729.43	252	249	250	55	71	0	104	50.83
	10	0.620	0.79	730.71	253	250	251	55	72	0	104	50.46
	12.5	0.620	0.79	731.99	252	249	253	55	72	0	103	50.43
3	15	0.700	0.90	733.25	252	249	247	55	72	0	105	53.58
	17.5	0.700	0.90	734.62	253	249	251	55	72	0	104	53.62
	20	0.700	0.90	735.97	251	251	249	56	72	0	107	53.54
4	22.5	0.700	0.90	737.37	252	249	251	55	72	0	100	53.58
	25	0.660	0.85	738.67	251	250	251	56	72	0	105	51.99
	27.5	0.660	0.85	740.00	251	250	251	56	72	0	103	51.99
5	30	0.660	0.85	741.31	251	250	251	56	72	0	104	51.99
	32.5	0.660	0.85	742.63	251	250	250	56	73	0	103	51.99
	35	0.700	0.90	743.94	252	250	250	56	73	0	100	53.58
6	37.5	0.700	0.90	745.24	252	250	250	56	72	0	108	53.58
	40	0.700	0.90	746.65	253	251	247	57	73	0	104	53.62
	42.5	0.700	0.90	748.01	252	250	251	57	72	0	105	53.58
7	45	0.700	0.90	749.38	252	249	250	58	73	0	105	53.58
	47.5	0.700	0.90	750.75	253	250	249	58	73	0	104	53.62
	50	0.700	0.90	752.11	255	248	250	58	74	0	90	53.69
8	52.5	0.700	0.90	753.29	252	250	248	58	74	0	117	53.58
	55	0.700	0.90	754.82	253	250	250	58	72	0	112	53.62
	57.5	0.700	0.90	756.28	252	250	250	58	72	0	97	53.58
	60			757.54								
1	0	0.750	0.96	757.57	251	250	250	50	80	0	104	55.42
	2.5	0.750	0.96	759.00	251	250	250	55	81	0	101	55.42
	5	0.750	0.96	760.38	252	249	249	58	82	0	103	55.46
2	7.5	0.750	0.96	761.79	252	250	250	58	82	0	100	55.46
	10	0.750	0.96	763.17	251	249	249	55	83	0	101	55.42
	12.5	0.750	0.96	764.56	252	249	249	54	83	0	102	55.46
3	15	0.750	0.96	765.97	253	249	250	53	83	0	101	55.50
	17.5	0.750	0.96	767.36	251	249	251	53	83	0	101	55.42
	20	0.750	0.96	768.75	252	250	250	53	83	0	103	55.46
4	22.5	0.750	0.96	770.17	252	250	250	53	83	0	100	55.46
	25	0.750	0.96	771.54	252	246	250	52	84	0	101	55.46
	27.5	0.650	0.85	772.93	253	248	251	53	84	0	104	51.67
5	30	0.650	0.85	774.26	252	248	252	53	84	0	104	51.63
	32.5	0.650	0.85	775.60	252	249	246	53	84	0	102	51.63
	35	0.650	0.85	776.91	252	251	247	53	84	0	102	51.63
6	37.5	0.650	0.85	778.22	251	251	249	53	84	0	104	51.60
	40	0.650	0.85	779.55	250	251	248	53	84	0	103	51.56
	42.5	0.650	0.85	780.88	252	252	251	55	84	0	103	51.63
7	45	0.650	0.85	782.20	252	252	251	55	84	0	102	51.63
	47.5	0.600	0.80	783.51	251	250	250	54	85	0	104	49.57
	50	0.600	0.80	784.80	250	249	248	55	85	0	104	49.54
8	52.5	0.550	0.73	786.09	251	250	249	55	85	0	101	47.46
	55	0.550	0.73	787.29	250	251	251	55	84	0	102	47.43
	57.5	0.550	0.73	788.50	252	250	247	55	84	0	103	47.50
	60			789.72								
1	0	0.750	0.96	789.79	251	250	250	55	84	0	96	55.42
	2.5	0.750	0.96	791.12	253	250	250	59	84	0	102	55.50
	5	0.750	0.96	792.53	253	249	248	58	84	0	103	55.50
2	7.5	0.750	0.96	793.95	254	251	253	57	85	0	101	55.54
	10	0.750	0.96	795.34	255	251	251	57	86	0	101	55.58
	12.5	0.800	1.05	796.74	256	249	251	57	86	0	102	57.44
3	15	0.800	1.05	798.19	255	249	250	57	86	0	102	57.40
	17.5	0.800	1.05	799.65	256	252	251	59	88	0	103	57.44
	20	0.800	1.05	801.12	255	250	250	58	88	0	103	57.40
4	22.5	0.800	1.05	802.59	251	250	250	58	88	0	101	57.24
	25	0.800	1.05	804.04	255	250	250	58	89	0	103	57.40
	27.5	0.750	0.96	805.51	256	250	250	58	89	0	102	55.62
5	30	0.750	0.96	806.93	253	251	252	58	90	0	102	55.50
	32.5	0.750	0.96	808.35	253	251	252	58	90	0	101	55.50
	35	0.750	0.96	809.76	252	251	251	59	91	0	103	55.46
6	37.5	0.750	0.96	811.20	252	251	251	59	91	0	102	55.46
	40	0.750	0.96	812.63	251	49	250	60	92	0	103	55.42
	42.5	0.750	0.96	814.07	251	249	250	60	92	0	99	55.42
7	45	0.750	0.96	815.46	252	249	249	61	92	0	101	55.46
	47.5	0.750	0.96	816.87	252	251	250	61	93	0	101	55.46
	50	0.750	0.96	818.28	255	250	249	62	93	0	102	55.58
8	52.5	0.750	0.96	819.71	252	250	249	62	93	0	101	55.46
	55	0.750	0.96	821.13	251	250	250	62	93	0	101	55.42
	57.5	0.750	0.96	822.54	253	250	250	62	93	0	103	55.50
	60			823.98								
Post-test Leak Check =		<0.01 at 12" Hg										
	Average	0.704	0.906	130.71	253	245	250	56	80		103	53.67

TPM and Metals Sampling

Facility: St. Mary's Cement
City: Bowmanville
Source: Main Stack
Reference Method: US EPA Method 5/29
Run: Metals Test #3

Operator: JDG
Entered by: DO
Checked by: KNE
9-Oct-18

Pt.	Time (min)	Velocity Press. ("H_2O)	Orifice Press. ("H_2O)	Meter Volume (^oF)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	Vac Pressure ("Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- South												
Pre-Test Leak Check =		<0.02 at 12" Hg										
1	0	0.750	1.00	824.25	252	250	251	64	91	0	106	55.42
	2.5	0.750	1.00	825.73	252	250	251	65	91	0	103	55.42
	5	0.750	1.00	827.17	250	246	251	57	91	0	104	55.34
2	7.5	0.750	1.00	828.63	250	249	250	56	90	0	105	55.34
	10	0.750	1.00	830.10	253	250	251	55	91	0	105	55.46
	12.5	0.750	1.00	831.56	252	250	255	55	92	0	104	55.42
3	15	0.700	0.95	833.02	252	250	250	55	92	0	105	53.54
	17.5	0.700	0.95	834.44	251	250	250	55	92	0	105	53.50
	20	0.700	0.95	835.86	253	249	251	55	92	0	104	53.58
4	22.5	0.700	0.95	837.26	253	250	249	56	93	0	106	53.58
	25	0.700	0.94	838.70	254	250	248	55	92	0	104	53.62
	27.5	0.700	0.94	840.10	255	250	249	55	92	0	104	53.65
5	30	0.700	0.94	841.50	255	250	250	55	92	0	105	53.65
	32.5	0.700	0.94	842.92	258	250	245	55	93	0	105	53.77
	35	0.700	0.95	844.34	257	251	255	55	93	0	104	53.73
6	37.5	0.700	0.95	845.75	257	249	250	55	94	0	104	53.73
	40	0.700	0.95	847.16	256	250	250	55	94	0	106	53.69
	42.5	0.700	0.95	848.59	257	250	248	56	94	0	104	53.73
7	45	0.700	0.95	849.99	258	250	249	56	94	0	107	53.77
	47.5	0.650	0.87	851.43	258	250	250	56	94	0	106	51.81
	50	0.650	0.87	852.81	257	250	250	56	94	0	103	51.78
8	52.5	0.650	0.87	854.15	257	250	250	56	94	0	105	51.78
	55	0.650	0.87	855.52	258	250	251	56	93	0	105	51.81
	57.5	0.650	0.87	856.89	258	250	250	56	93	0	105	51.81
	60			858.26								
1	0	0.650	0.87	858.26	258	250	250	56	93	0	105	51.81
	2.5	0.650	0.87	859.63	258	250	248	59	92	0	104	51.81
	5	0.650	0.87	860.98	258	250	253	58	92	0	105	51.81
2	7.5	0.650	0.87	862.34	257	250	251	58	93	0	106	51.78
	10	0.600	0.80	863.72	256	250	250	59	94	0	104	49.71
	12.5	0.600	0.80	865.02	256	251	250	60	94	0	103	49.71
3	15	0.650	0.87	866.31	258	250	250	60	94	0	104	51.81
	17.5	0.650	0.87	867.66	256	250	251	60	94	0	103	51.74
	20	0.650	0.87	869.00	257	250	251	61	94	0	105	51.78
4	22.5	0.650	0.87	870.37	257	250	251	61	94	0	104	51.78
	25	0.700	0.92	871.72	250	250	251	61	94	0	103	53.47
	27.5	0.700	0.92	873.12	250	250	251	61	94	0	103	53.47
5	30	0.700	0.93	874.52	250	250	251	61	94	0	106	53.47
	32.5	0.700	0.94	875.96	257	250	249	63	94	0	105	53.73
	35	0.700	0.94	877.38	257	250	250	63	95	0	104	53.73
6	37.5	0.700	0.94	878.79	257	250	250	63	95	0	105	53.73
	40	0.700	0.94	880.21	257	250	250	63	95	0	104	53.73
	42.5	0.700	0.94	881.62	256	250	250	64	95	0	103	53.69
7	45	0.700	0.94	883.02	257	251	250	64	96	0	105	53.73
	47.5	0.700	0.94	884.45	256	250	251	65	96	0	104	53.69
	50	0.700	0.94	885.86	257	250	251	65	96	0	103	53.73
8	52.5	0.700	0.94	887.26	257	250	251	66	96	0	102	53.73
	55	0.700	0.94	888.65	257	250	251	67	96	0	110	53.73
	57.5	0.700	0.94	890.14	256	251	250	67	96	0	95	53.69
	60			891.43								
1	0	0.650	0.87	891.44	255	250	250	69	95	0	103	51.70
	2.5	0.650	0.87	892.79	255	250	250	69	95	0	104	51.70
	5	0.650	0.87	894.15	256	251	250	62	95	0	105	51.74
2	7.5	0.650	0.87	895.52	257	249	253	61	95	0	104	51.78
	10	0.650	0.87	896.88	257	249	250	60	96	0	105	51.78
	12.5	0.650	0.87	898.25	258	251	251	59	96	0	102	51.81
3	15	0.650	0.87	899.59	257	248	250	58	96	0	105	51.78
	17.5	0.700	0.94	900.97	258	251	251	58	96	0	104	53.77
	20	0.700	0.95	902.38	257	251	248	57	96	0	105	53.73
4	22.5	0.700	0.95	903.81	256	250	246	57	96	0	105	53.69
	25	0.700	0.93	905.23	257	250	249	57	96	0	103	53.73
	27.5	0.700	0.93	906.63	257	251	246	57	96	0	104	53.73
5	30	0.700	0.93	908.04	257	251	246	57	96	0	105	53.73
	32.5	0.700	0.93	909.46	257	251	249	57	96	0	103	53.73
	35	0.650	0.87	910.86	257	249	250	57	96	0	105	51.78
6	37.5	0.650	0.87	912.24	257	250	249	57	97	0	103	51.78
	40	0.650	0.87	913.59	256	250	251	57	97	0	103	51.74
	42.5	0.650	0.87	914.94	256	250	252	57	97	0	103	51.74
7	45	0.600	0.80	916.29	255	250	248	57	97	0	107	49.67
	47.5	0.600	0.80	917.64	256	250	250	58	97	0	101	49.71
	50	0.600	0.80	918.91	256	250	250	58	97	0	104	49.71
8	52.5	0.600	0.80	920.22	256	250	255	58	97	0	103	49.71
	55	0.600	0.80	921.52	255	250	247	58	97	0	104	49.67
	57.5	0.600	0.80	922.83	255	250	247	59	97	0	102	49.67
	60			924.12								
1	0	0.600	0.80	924.13	255	250	257	59	97	0	103	49.67
	2.5	0.600	0.80	925.43	256	250	249	61	97	0	105	49.71
	5	0.600	0.80	926.75	255	250	252	60	96	0	104	49.67
2	7.5	0.600	0.80	928.06	255	249	251	60	96	0	104	49.67
	10	0.600	0.80	929.37	255	249	251	60	96	0	104	49.67
	12.5	0.600	0.80	930.68	255	250	251	60	96	0	104	49.67
3	15	0.650	0.87	931.99	258	250	249	60	96	0	104	51.81
	17.5	0.650	0.87	933.35	258	250	254	60	96	0	102	51.81
	20	0.650	0.87	934.69	259	250	254	60	96	0	104	51.85
4	22.5	0.650	0.87	936.05	260	251	247	60	97	0	103	51.88
	25	0.750	1.00	937.40	261	249	251	61	97	0	105	55.77
	27.5	0.750	1.00	938.87	262	251	249	61	97	0	106	55.81
5	30	0.750	1.00	940.35	265	250	250	61	97	0	103	55.92
	32.5	0.750	1.00	941.79	260	250	251	61	97	0	105	55.73
	35	0.750	1.00	943.26	262	251	250	61	97	0	105	55.81
6	37.5	0.750	1.00	944.73	262	251	250	61	97	0	103	55.81
	40	0.750	1.00	946.18	259	250	254	62	97	0	103	55.69
	42.5	0.750	1.00	947.63	259	250	251	62	97	0	104	55.69
7	45	0.750	1.00	949.09	259	249	252	62	97	0	102	55.69
	47.5	0.750	1.00	950.53	260	250	251	62	97	0	104	55.73
	50	0.750	1.00	951.99	260	250	251	62	97	0	103	55.73
8	52.5	0.750	1.00	953.44	259	248	247	60	97	0	102	55.69
	55	0.750	1.00	954.88	260	250	250	59	97	0	103	55.73
	57.5	0.750	1.00	956.33	259	251	251	59	97	0	102	55.69
	60			957.76								
Post-test Leak Check =		<0.01 at 12" Hg										
	Average	0.681	0.912	133.49	257	250	250	59	95		104	52.99

APPENDIX D

Sampling Results - Polycyclic Aromatic Hydrocarbons (PAH's)

Source: Main Stack - LCF

Test :	Test #1			Test #2			Test #3			AVERAGE RESULTS		
Sample Volume (Rm^3) [1] :	4.03			3.74			3.56					
Stack Flow Rate (Rm^3/s) [1] :	288.8			264.0			253.6			268.8		
	(µg)	($µg/m^3$)	(µg/s)	(µg)	($µg/m^3$)	(µg/s)	(µg)	($µg/m^3$)	(µg/s)	($µg/m^3$)		(µg/s)
1-Methylnaphthalene	392.00	97.4	28100	371.00	99.3	26200	359.00	101	25500	99.1	<	26600
1-Methylphenanthrene	2.94	0.7	211	5.76	1.5	407	3.96	1	282	1.1	<	300
2-Chloronaphthalene	8.22	2.0	590	8.16	2.2	576	6.84	2	487	2.1	<	551
2-Methylanthracene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2-Methylnaphthalene	592.00	147.0	42500	527.00	141.0	37200	508.00	143	36200	144.0	<	38600
3-Methylcholanthrene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
7,12-Dimethylbenzo(a)anthracene	< 1.20	0.3	86.1	< 1.20	0.3	84.8	< 1.20	0	85.4	< 0.3	<	85
9,10-Dimethylanthracene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
9-Methylphenanthrene	7.08	1.8	508	13.70	3.7	968	9.78	3	696	2.7	<	724
Acenaphthene	12.10	3.0	868	8.76	2.3	619	8.76	2	623	2.6	<	703
Acenaphthylene	15.10	3.8	1080	16.40	4.4	1160	12.70	4	904	3.9	<	1050
Anthracene	1.44	0.4	103	0.42	0.1	29.7	1.86	1	132	0.3	<	88
Benzo(a)anthracene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(a)fluorene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(a)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(b)fluoranthene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(b)fluorene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(e)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(g,h,i)perylene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Benzo(k)fluoranthene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Biphenyl	196	48.7	14100	137	36.7	9680	121	34	8610	39.8	<	10800
Chrysene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Coronene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Dibenzo(a,c)anthracene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Fluoranthene	0.48	0.1	34.4	0.72	0.2	50.9	0.54	0	38.4	0.2	<	41
Fluorene	6.00	1.5	430	9.24	2.5	653	8.04	2	572	2.1	<	552
Indeno(1,2,3-cd)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
m-Terphenyl	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Naphthalene	980.00	243.0	70300	712.00	190.0	50300	715.00	201	50900	212.0	<	57200
o-Terphenyl	0.90	0.2	64.6	0.66	0.2	46.6	0.54	0	38.4	0.2	<	50
Perylene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Phenanthrene	41.10	10.2	2950	57.50	15.4	4060	42.40	12	3020	12.5	<	3340
Picene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
p-Terphenyl	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Pyrene	< 0.30	0.1	21.5	0.36	0.1	25.4	< 0.30	0	21.3	< 0.1	<	23
Tetralin	178.00	44.2	12800	169.00	45.2	11900	172.00	48	12200	45.9	<	12300
Triphenylene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
1,2,3,4-Tetrachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
1,2,3,5+1,2,4,5-Tetrachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
1,2,3-Trichlorobenzene	1.30	0.3	93.2	3.74	1.0	264	1.27	0	90.4	0.6	<	149
1,2,4-Trichlorobenzene	2.01	0.5	144	2.27	0.6	160	2.16	1	154	0.6	<	153
1,2-Dichlorobenzene	6.57	1.6	471	6.18	1.7	436	6.05	2	431	1.7	<	446
1,3,5-Trichlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
1,3-Dichlorobenzene	3.25	0.8	233	2.95	0.8	208	2.73	1	194	0.8	<	212
1,4-Dichlorobenzene	2.89	0.7	207	2.30	0.6	162	2.68	1	191	0.7	<	187
Hexachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
Pentachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,4,5-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,4,6-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,4-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,5,6-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3,6-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,3-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,4 + 2,5-Dichlorophenol	0.31	0.1	22.2	0.63	0.2	44.5	0.62	0	44.1	0.1	<	37
2,4,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,4,6-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
2,6-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	0.32	0	22.8	< 0.1	<	22
2-Chlorophenol	11.90	3.0	854	18.80	5.0	1330	20.60	6	1470	4.6	<	1220
3,4,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
3,4-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
3,5-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21
3-Chlorophenol	2.25	0.6	161	4.45	1.2	314	4.32	1	307	1.0	<	261
4-Chlorophenol	2.22	0.6	159	4.43	1.2	313	4.00	1	285	1.0	<	252
Pentachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	21.2	< 0.30	0	21.3	< 0.1	<	21

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, and 25 °C)

***'<'** indicates that laboratory results were below the detection limit. The detection limit was used to calculate the concentration and emission rate.*

Concentration and Emission Rate has been reported to 3 significant figures.

Sampling Results - Dioxins and Furans

Source: Main Stack - LCF

Test :	Test #1			Test #2			Test #3			Average Concentration	Average Concentration @25 °C and 11 % O_2	Reg 419 Toxic Equivalency Factors		
Sample Volume (m^3) [1] :	4.03			3.74			3.56					TEF	TEF Concentration	TEF Emission Rate
Stack Flow Rate (m^3/s) [1] :	288.8			264.0			253.6							
	(pg)	(pg/m^3)	(pg/s)	(pg)	(pg/m^3)	(pg/s)	(pg)	(pg/m^3)	(pg/s)	(pg/m^3)	(pg/m^3)		(pg TEQ/m^3)	(pg/s)
2,3,7,8-Tetra CDD *	< 6.9	1.71	495	< 7.2	1.93	509	< 8.6	2.41	612	2.0	3.39	1	3.4	538
1,2,3,7,8-Penta CDD *	< 7.4	1.84	531	< 9.2	2.46	650	< 7.7	2.16	548	2.2	3.61	1	3.61	574
1,2,3,4,7,8-Hexa CDD *	< 6.6	1.6	473	< 6.9	1.85	487	< 6.6	1.85	470	1.8	2.99	0.1	0.299	47.4
1,2,3,6,7,8-Hexa CDD *	< 6.5	1.61	466	< 6.8	1.82	480	< 6.5	1.82	463	1.75	2.94	0.1	0.294	46.6
1,2,3,7,8,9-Hexa CDD *	< 6.1	1.52	438	< 6.4	1.71	452	< 6.1	1.71	434	1.65	2.77	0.1	0.277	44
1,2,3,4,6,7,8-Hepta CDD *	< 7.0	1.74	502	< 6.9	1.85	487	< 6.6	1.85	470	1.81	3.04	0.01	0.0304	4.82
1,2,3,4,6,7,8,9-Octa CDD *	9.5	2.36	681	8.8	2.35	622	11.2	3.14	797	2.62	4.40	0.0003	0.00132	0.209
2,3,7,8-Tetra CDF **	< 8.7	2.2	624	7.3	1.95	516	13.4	3.76	954	2.6	4.40	0.1	0.44	69.8
1,2,3,7,8-Penta CDF **	< 6.4	1.59	459	< 6.3	1.69	445	< 6.5	1.82	463	1.7	2.85	0.03	0.0856	13.6
2,3,4,7,8-Penta CDF **	< 6.5	1.6	466	< 6.4	1.71	452	< 6.6	1.85	470	1.7	2.90	0.3	0.871	138
1,2,3,4,7,8-Hexa CDF **	< 6.5	1.6	466	< 6.7	1.79	473	< 5.9	1.66	420	1.69	2.84	0.1	0.284	45
1,2,3,6,7,8-Hexa CDF **	4.3	1.07	308	< 6.6	1.77	466	< 5.8	1.63	413	1.49	2.50	0.1	0.25	39.7
2,3,4,6,7,8-Hexa CDF **	< 7.0	1.74	502	< 7.3	1.95	516	< 6.4	1.8	455	1.83	3.07	0.1	0.307	48.8
1,2,3,7,8,9-Hexa CDF **	< 8.0	1.99	574	4.8	1.28	339	< 7.3	2.05	520	1.77	2.97	0.1	0.297	47.2
1,2,3,4,6,7,8-Hepta CDF **	< 7.8	1.9	559	< 5.9	1.58	417	< 5.6	1.57	399	1.7	2.85	0.01	0.0285	4.53
1,2,3,4,7,8,9-Hepta CDF **	< 7.2	1.79	516	< 7.7	2.06	544	< 7.3	2.05	520	1.97	3.31	0.01	0.0331	5.25
1,2,3,4,6,7,8,9-Octa CDF **	< 7.7	1.9	552	< 7.2	1.93	509	< 6.5	1.82	463	1.89	3.17	0.003	0.00951	1.51
33'44'-TetraCB-(77)	< 130	32.3	9320	< 120	32.1	8480	< 96	26.9	6830	30.4	51.01	0.00010	0.0051	0.81
344'5-TetraCB-(81)	< 130	32.3	9320	< 120	32.1	8480	< 95	26.7	6760	30.4	51.01	0.00030	0.0153	2.43
233'44'-PentaCB-(105)	160	39.7	11500	220	58.9	15500	180	50.5	12800	49.7	83.39	0.000030	0.0025	0.397
2344'5-PentaCB-(114)	< 50	12.4	3590	< 92	24.6	6500	< 68	19.1	4840	18.7	31.38	0.000030	0.000941	0.149
23'44'5-PentaCB-(118)	470	117.0	33700	720	193	50900	570	160	40600	156	261.76	0.000030	0.00785	1.25
23'44'5'-PentaCB-(123)	< 55	13.7	3950	< 100	26.8	7060	< 76	21.3	5410	20.6	34.57	0.000030	0.00104	0.165
33'44'5-PentaCB-(126)	< 47	11.7	3370	< 86	23	6070	< 64	18	4550	17.5	29.36	0.10	2.94	466
HexaCB-(156)+(157)	< 100	24.8	7170	< 81	21.7	5720	< 74	20.8	5270	22.4	37.59	0.000030	0.00113	0.179
23'44'55'-HexaCB-(167)	< 99	24.6	7100	< 77	20.6	5440	< 70	19.6	4980	21.6	36.24	0.000030	0.00109	0.173
33'44'55'-HexaCB-(169)	< 110	27.3	7890	< 83	22.2	5860	< 75	21	5340	23.5	39.43	0.030	1.18	188
233'44'55'-HeptaCB-(189)	< 150	37.3	10800	< 88	23.5	6220	< 120	33.7	8540	31.5	52.86	0.000030	0.00159	0.252
											Total Toxic Equivalency →		14.7	2330

Notes :

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3 kPa and 25°C)

***'<'** indicates that laboratory results were below the Estimated Detection Limit (EDL) This detection limit was used to calculate the concentration and emission rate.*

Concentration and Emission Rate has been reported to 3 significant figures.

*CDD = chlorodibenzo-*p* -dioxin

**CDF = chlorodibenzo-*p* -furan

***CB = chlorobenzene

Semi-Volatile Organic Compounds Sampling

St. Mary's

Facility:	St. Mary's	**Operator:**	KE
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack - LCF	**Checked by:**	KNE
Reference Method:	Environment Canada 1/RM/2		

DATA INPUTS	**Symbol**	**Units**	**Test #1** SVOC	**Test #2** SVOC	**Test #3** SVOC
Date			5-Oct-18	9-Oct-18	9-Oct-18
Start Time			8:44 AM	9:25 AM	2:36 PM
End Time			1:58 PM	1:51 PM	6:54 PM
Round Stack, Diameter (Inside)	d_s	in	216	216	216
Standard Temperature	T_s	°F	77	77	77
Standard Pressure	P_s	" Hg	29.9	29.9	29.9
Nozzle Diameter	D_n	in	0.211	0.211	0.211
Average Stack Temperature	T_s	°F	266	259	264
Average Meter Temperature	T_m	°F	74	83	94
Barometric Pressure	P_{bar}	" Hg	30.3	29.8	29.6
Stack Static Pressure	P_g	" H_2O	-0.7	-0.7	-0.7
Average Delta H	dH	" H_2O	1.04	0.92	0.89
Average Velocity Head	dP_{rms}	" H_2O	0.82	0.71	0.67
Pitot Coefficient	C_p	-	0.838	0.838	0.838
	Pitot ID ->		RWDI 7' #3		
Gas Sample Volume	V_m	ft^3	140.19	134.50	132.02
DGM Calibration Factor	Y	-	0.993	0.993	0.993
	DGM ID ->		RWDI Console C and D		
Total Sampling Time	min	min	240	240	240
Stack Gas Oxygen Concentration	O_2	%	14.8	15.1	15.1
Stack Gas Carbon Dioxide Concentration	CO_2	%	12.1	11.6	11.8
Impinger Gain	W_w	g	248.8	295.8	288.5

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	KE
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack - LCF	**Checked by:**	KNE
Reference Method:	Environment Canada 1/RM/2		

Emissions Calculations	**Symbol**	**Units**	**Test #1** SVOC	**Test #2** SVOC	**Test #3** SVOC	**AVERAGE**
Nozzle Area	A_n	ft²	0.00024	0.00024	0.00024	
Stack Area	A_s	ft²	254.47	254.47	254.47	
Average Stack Temperature	T_s	°R	726	719	724	723
Average DGM Temperature	T_m	°R	534	543	554	
Sample Volume at Reference Conditions	V_{mStd}	ft³	142.26	132.08	125.92	
	V_{mmstd}	**m³**	**4.03**	**3.74**	**3.56**	
Vol. of Water Vapour	V_{wStd}	ft³	11.9424	14.1984	13.848	
Water Fraction	B_{ws}		7.7%	9.7%	9.9%	9.1%
Molecular Weight, dry	M_d	g/mole	30.63	30.56	30.60	30.60
Molecular Weight, wet	M_w	g/mole	29.65	29.34	29.35	29.45
Absolute Stack Pressure	P_s	" Hg	30.25	29.79	29.54	29.86
Stack Gas Velocity	U_s	ft/s	58.12	54.56	53.35	55.34
	U_{sm}	**m/s**	**17.72**	**16.63**	**16.26**	**16.87**
Actual Gas Flow Rate	Q_{act}	acf/min	887,438	833,091	814,494	845,008
Dry Gas Flow Rate (dry, ref)	Q_{ref}	dscf/min	612,042	559,491	537,473	569,669
	Q_{Rm}	m³/min	17327	15839	15216	16,127
	Qmref (Actual O_2)	**m³/s**	**288.78**	**263.99**	**253.60**	**268.8**
	Qmref (11% O_2)	**m³/sec**	**176.2**	**153.1**	**147.1**	**158.8**
Isokinetic Rate	I	%	102	103	102	102

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	KE
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack - LCF	**Checked by:**	KNE
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	5-Oct-18
Run:	Test 1		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/s)
Traverse 1- East													
Pre-Test Leak Check =		<0.02 at 10" Hg											
1	0	0.87	1.10	643.18	263	241	250	49	53	52	-	106	59.89
	2.5	0.87	1.10	644.70	263	239	257	48	54	39	-6	105	59.89
	5	0.87	1.10	646.20	263	235	257	48	57	39	-6	101	59.89
2	7.5	0.87	1.10	647.65	264	242	250	47	61	40	-6	103	59.94
	10	0.88	1.10	649.14	264	242	251	47	61	40	-6	102	60.28
	12.5	0.88	1.10	650.63	264	242	251	47	61	40	-6	101	60.28
3	15	0.88	1.10	652.10	265	242	251	47	61	40	-6	96	60.32
	17.5	0.88	1.10	653.50	264	254	251	44	65	41	-6	104	60.28
	20	0.88	1.10	655.03	265	238	245	44	65	41	-6	100	60.32
4	22.5	0.87	1.10	656.50	265	240	250	44	66	41	-6	102	59.98
	25	0.87	1.10	658.00	266	240	251	43	67	42	-6	101	60.02
	27.5	0.87	1.10	659.48	265	239	250	43	67	42	-6	88	59.98
5	30	0.87	1.10	660.77	266	240	251	43	67	42	-6	114	60.02
	32.5	0.87	1.10	662.45	265	238	247	43	68	42	-6	100	59.98
	35	0.87	1.10	663.92	265	239	250	44	69	44	-6	101	59.98
6	37.5	0.89	1.10	665.41	264	238	247	44	69	44	-6	100	60.62
	40	0.89	1.10	666.90	264	241	251	44	69	44	-6	103	60.62
	42.5	0.89	1.10	668.44	264	241	251	44	69	44	-6	99	60.62
7	45	0.81	1.00	669.92	264	241	255	44	69	44	-6	100	57.83
	47.5	0.81	1.00	671.35	264	239	251	44	69	44	-7	103	57.83
	50	0.80	1.00	672.81	264	240	250	46	71	48	-7	101	57.47
8	52.5	0.78	1.00	674.24	264	240	251	46	71	48	-7	101	56.75
	55	0.80	1.00	675.66	265	241	250	47	71	49	-7	102	57.51
	57.5	0.80	1.00	677.10	264	241	251	47	72	49	-7	100	57.47
	60	-	-	678.52	-	-	-	-	-	-	-	-	-
Traverse 2 - North													
1	0	0.80	1.00	678.52	265	240	248	47	72	45	-	104	57.51
	2.5	0.82	1.00	680.00	265	240	248	48	72	52	-7	97	58.23
	5	0.82	1.00	681.40	265	241	248	49	72	54	-7	102	58.23
2	7.5	0.82	1.00	682.87	266	239	250	49	72	54	-7	99	58.27
	10	0.82	1.00	684.30	266	239	249	50	72	54	-7	101	58.27
	12.5	0.82	1.00	685.75	266	240	250	50	72	54	-7	99	58.27
3	15	0.87	1.10	687.18	266	239	247	50	72	54	-7	101	60.02
	17.5	0.87	1.10	688.68	266	240	249	50	72	54	-7	99	60.02
	20	0.90	1.20	690.15	266	239	249	50	72	54	-8	102	61.05
4	22.5	0.87	1.10	691.68	266	240	251	50	72	54	-8	104	60.02
	25	0.87	1.10	693.22	264	238	248	50	72	54	-8	103	59.94
	27.5	0.87	1.10	694.75	264	238	248	50	72	54	-8	102	59.94
5	30	0.87	1.10	696.26	265	240	250	50	72	54	-8	102	59.98
	32.5	0.87	1.10	697.77	264	239	248	50	72	54	-8	103	59.94
	35	0.87	1.10	699.30	264	240	250	51	73	57	-8	102	59.94
6	37.5	0.87	1.10	700.81	265	241	250	51	73	57	-8	101	59.98
	40	0.90	1.20	702.31	265	240	251	51	73	57	-8	103	61.00
	42.5	0.90	1.20	703.87	265	240	251	51	73	51	-8	101	61.00
7	45	0.90	1.20	705.40	264	240	249	51	73	51	-8	103	60.96
	47.5	0.90	1.20	706.96	264	240	249	51	73	54	-8	103	60.96
	50	0.90	1.20	708.51	264	238	249	51	73	54	-8	102	60.96
8	52.5	0.87	1.10	710.05	263	240	245	51	74	54	-8	94	59.89
	55	0.87	1.10	711.45	263	240	248	51	74	54	-8	111	59.89
	57.5	0.87	1.10	713.11	263	240	248	51	74	55	-8	103	59.89
	60			714.64									
Traverse 3 - West													
1	0	0.82	1.00	714.64	263	236	251	50	70	59	-	101	58.15
	2.5	0.84	1.10	716.09	262	238	251	54	71	59	-8	102	58.81
	5	0.84	1.10	717.57	262	240	251	54	71	55	-8	102	58.81
2	7.5	0.84	1.10	719.05	265	241	251	54	71	44	-8	102	58.93
	10	0.84	1.00	720.54	265	240	249	54	71	44	-8	97	58.93
	12.5	0.84	1.00	721.95	265	240	249	50	73	44	-8	107	58.93
3	15	0.82	1.00	723.51	265	240	249	50	73	44	-8	99	58.23
	17.5	0.82	1.00	724.94	265	240	250	50	73	44	-8	100	58.23
	20	0.82	1.00	726.38	264	238	248	48	73	44	-8	98	58.19
4	22.5	0.78	1.00	727.80	264	238	251	48	73	44	-8	103	56.75
	25	0.79	1.00	729.25	263	241	251	48	73	44	-8	100	57.07
	27.5	0.80	1.00	730.67	264	241	251	48	73	44	-8	102	57.47
5	30	0.76	0.98	732.12	264	239	241	48	73	44	-8	101	56.02
	32.5	0.76	0.98	733.52	264	239	241	48	73	44	-8	102	56.02
	35	0.76	0.98	734.94	264	239	250	48	73	44	-8	103	56.02
6	37.5	0.76	0.98	736.37	265	237	249	48	73	44	-8	97	56.06
	40	0.70	0.90	737.72	266	237	250	48	73	44	-8	107	53.84
	42.5	0.70	0.90	739.15	266	237	251	46	76	45	-7	102	53.84
7	45	0.65	0.89	740.51	267	238	250	46	76	45	-7	103	51.91
	47.5	0.65	0.84	741.84	267	241	257	46	76	45	-7	102	51.91
	50	0.65	0.84	743.15	269	240	251	46	76	45	-7	103	51.99
8	52.5	0.64	0.83	744.48	272	240	250	46	76	45	-7	103	51.69
	55	0.64	0.83	745.80	290	240	250	46	76	45	-7	105	52.32
	57.5	0.62	0.79	747.12	295	237	250	46	76	45	-7	104	51.67
	60			748.41									
Traverse 4- East													
1	0	0.70	0.90	748.41	300	240	250	51	75	51	-	103	55.08
	2.5	0.70	0.90	749.76	284	241	251	51	75	51	-7	103	54.50
	5	0.70	0.90	751.12	283	240	249	55	77	55	-7	107	54.46
2	7.5	0.70	0.90	752.54	280	240	250	55	77	55	-7	104	54.35
	10	0.70	0.90	753.92	280	240	248	55	77	55	-7	102	54.35
	12.5	0.70	0.90	755.27	277	237	250	56	82	58	-7	108	54.24
3	15	0.80	1.00	756.72	272	239	250	55	81	48	-7	99	57.79
	17.5	0.80	1.00	758.15	271	239	250	55	81	48	-7	102	57.75
	20	0.76	0.98	759.62	270	241	250	55	81	48	-7	101	56.25
4	22.5	0.79	1.00	761.04	266	240	251	55	83	46	-7	102	57.19
	25	0.79	0.99	762.51	266	240	250	55	83	46	-7	97	57.19
	27.5	0.80	0.99	763.91	266	240	250	52	84	47	-7	100	57.55
5	30	0.82	1.00	765.37	264	240	251	52	84	47	-7	98	58.19
	32.5	0.82	1.00	766.82	264	238	251	52	84	47	-7	98	58.19
	35	0.82	1.00	768.27	263	239	249	52	84	47	-7	98	58.15
6	37.5	0.82	1.00	769.72	262	242	250	52	84	47	-7	97	58.11
	40	0.82	1.00	771.15	261	242	251	52	84	47	-7	99	58.07
	42.5	0.82	1.00	772.61	261	239	251	52	84	47	-7	101	58.07
7	45	0.86	1.20	774.10	261	239	249	50	87	50	-7	99	59.47
	47.5	0.86	1.20	775.61	260	242	251	50	87	50	-7	102	59.43
	50	0.86	1.20	777.16	260	240	250	50	87	50	-7	103	59.43
8	52.5	0.86	1.20	778.73	260	240	251	50	87	50	-7	101	59.43
	55	0.86	1.20	780.26	261	240	249	50	87	50	-7	101	59.47
	57.5	0.86	1.20	781.80	259	240	249	50	87	50	-7	103	59.38
	60			783.37									
Post-Test Leak Check =		<0.02 at 12" Hg											
	Average	0.82	1.04	140.19	266.30	239.78	249.84	49.19	73.56	48.15	-7.15	101.58	58.12

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	KE
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack - LCF	**Checked by:**	KNE
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	9-Oct-18
Run:	Test 2		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/s)
Traverse 1- East													
Pre-Test Leak Check =		<0.02 at 10" Hg											
1	0	0.77	1.00	783.72	259	240	250	69	76	65	-	109	56.92
	2.5	0.77	1.00	785.25	260	242	250	65	76	52	-5	102	56.96
	5	0.77	1.00	786.67	260	240	250	64	77	52	-5	102	56.96
2	7.5	0.77	1.00	788.10	260	240	250	62	77	53	-6	99	56.96
	10	0.76	0.98	789.49	260	237	250	62	77	53	-6	102	56.59
	12.5	0.75	0.95	790.91	260	237	250	61	78	55	-6	103	56.21
3	15	0.75	0.95	792.34	260	240	250	60	79	54	-6	102	56.21
	17.5	0.75	0.95	793.76	260	237	250	60	79	54	-6	102	56.21
	20	0.75	0.95	795.17	261	240	250	60	79	54	-6	102	56.25
4	22.5	0.76	0.96	796.58	260	240	250	60	79	54	-6	100	56.59
	25	0.77	1.00	797.98	260	240	250	60	82	57	-6	102	56.96
	27.5	0.80	1.00	799.42	260	236	249	60	82	57	-6	103	58.06
5	30	0.75	0.96	800.91	260	241	249	60	83	58	-6	103	56.21
	32.5	0.76	0.96	802.35	261	240	250	60	83	58	-6	101	56.63
	35	0.76	0.96	803.77	260	237	250	60	84	58	-6	103	56.59
6	37.5	0.76	0.96	805.22	260	231	248	60	84	58	-6	99	56.59
	40	0.75	0.95	806.61	261	237	251	61	85	59	-6	101	56.25
	42.5	0.76	0.95	808.02	260	238	251	61	85	59	-6	100	56.59
7	45	0.76	0.91	809.43	260	239	249	61	85	59	-6	98	56.59
	47.5	0.68	0.89	810.82	260	234	250	61	86	63	-6	102	53.53
	50	0.68	0.89	812.18	260	234	251	61	86	63	-6	103	53.53
8	52.5	0.69	0.90	813.56	261	229	251	61	86	65	-6	105	53.96
	55	0.70	0.91	814.98	260	229	251	58	87	54	-6	100	54.31
	57.5	0.70	0.91	816.34	260	230	251	58	87	54	-6	102	54.31
	60			817.73									
Traverse 2 - North													
1	0	0.70	0.91	817.73	260	226	250	58	88	58	-	104	54.31
	2.5	0.70	0.91	819.14	260	228	250	57	88	55	-6	101	54.31
	5	0.72	0.95	820.51	261	228	249	56	89	56	-6	103	55.12
2	7.5	0.72	0.95	821.93	260	236	254	56	89	54	-6	101	55.08
	10	0.72	0.95	823.33	260	234	250	56	89	55	-6	103	55.08
	12.5	0.72	0.95	824.75	259	231	250	56	89	55	-6	101	55.04
3	15	0.74	0.99	826.15	260	231	252	56	89	55	-6	104	55.84
	17.5	0.74	0.99	827.61	260	231	250	56	89	55	-6	102	55.84
	20	0.73	0.98	829.04	258	233	252	56	89	55	-6	103	55.38
4	22.5	0.73	0.98	830.48	258	228	250	58	88	55	-6	106	55.38
	25	0.74	0.98	831.96	258	229	251	58	89	55	-6	99	55.76
	27.5	0.74	0.98	833.35	258	225	251	58	89	55	-6	102	55.76
5	30	0.76	0.99	834.78	259	229	251	58	88	57	-6	102	56.55
	32.5	0.76	0.99	836.23	259	230	251	59	85	57	-6	102	56.55
	35	0.76	0.99	837.67	260	231	251	59	85	57	-6	104	56.59
6	37.5	0.76	0.99	839.14	260	228	251	59	85	57	-6	101	56.59
	40	0.76	0.99	840.57	260	232	250	59	85	58	-6	103	56.59
	42.5	0.78	0.99	842.02	260	236	250	59	85	58	-6	102	57.33
7	45	0.76	0.99	843.48	260	233	250	59	85	58	-6	105	56.59
	47.5	0.76	0.99	844.96	260	241	251	59	85	58	-6	103	56.59
	50	0.76	0.99	846.42	261	240	251	59	85	58	-6	99	56.63
8	52.5	0.76	0.99	847.82	260	241	251	59	85	58	-6	103	56.59
	55	0.76	0.99	849.28	260	240	249	59	85	58	-6	101	56.59
	57.5	0.76	0.99	850.71	260	240	249	59	85	58	-6	101	56.59
	60			852.14									
Traverse 3 - West													
1	0	0.76	0.99	852.14	260	242	252	70	83	62	-	104	56.59
	2.5	0.76	0.99	853.61	260	242	252	64	84	57	-7	104	56.59
	5	0.75	0.98	855.07	260	241	250	62	85	56	-7	103	56.21
2	7.5	0.75	0.98	856.52	260	240	251	62	82	56	-7	105	56.21
	10	0.75	0.98	857.98	260	240	250	60	85	56	-7	103	56.21
	12.5	0.75	0.98	859.42	261	240	250	60	85	56	-7	104	56.25
3	15	0.72	0.95	860.88	260	240	249	60	85	56	-7	103	55.08
	17.5	0.72	0.95	862.30	261	241	250	59	86	57	-7	103	55.12
	20	0.72	0.95	863.72	262	241	250	59	86	58	-7	108	55.15
4	22.5	0.72	0.95	865.20	262	240	250	59	86	58	-7	100	55.15
	25	0.72	0.95	866.58	262	239	252	59	86	58	-7	103	55.15
	27.5	0.72	0.95	868.00	262	240	251	59	86	58	-7	103	55.15
5	30	0.72	0.95	869.42	262	240	251	60	87	59	-7	104	55.15
	32.5	0.68	0.90	870.85	262	240	249	60	87	59	-7	105	53.60
	35	0.68	0.90	872.26	261	240	250	60	87	59	-7	101	53.56
6	37.5	0.68	0.90	873.61	261	240	250	60	87	59	-7	105	53.56
	40	0.72	0.95	875.02	261	240	251	60	87	59	-7	102	55.12
	42.5	0.72	0.95	876.42	261	240	251	62	87	63	-7	104	55.12
7	45	0.62	0.82	877.86	262	240	251	62	87	63	-7	105	51.18
	47.5	0.64	0.84	879.20	261	240	250	62	87	63	-7	102	51.96
	50	0.66	0.87	880.53	260	240	250	62	87	63	-7	107	52.73
8	52.5	0.64	0.85	881.94	262	240	250	62	87	63	-7	102	52.00
	55	0.64	0.85	883.26	261	240	251	62	87	64	-7	103	51.96
	57.5	0.64	0.85	884.60	262	240	251	62	87	64	-7	105	52.00
	60			885.97									
Traverse 4- South													
1	0	0.70	0.92	885.97	250	235	250	53	75	49	-	105	53.93
	2.5	0.72	0.87	887.38	257	240	250	53	75	46	-6	102	54.96
	5	0.67	0.82	888.76	257	240	250	53	75	46	-6	103	53.02
2	7.5	0.67	0.88	890.11	250	240	250	49	75	46	-6	100	52.76
	10	0.67	0.88	891.42	250	239	250	49	78	47	-6	109	52.76
	12.5	0.68	0.89	892.85	257	235	249	49	78	47	-6	104	53.42
3	15	0.70	0.90	894.22	257	235	249	49	78	47	-6	107	54.19
	17.5	0.70	0.90	895.65	257	232	250	49	78	47	-6	102	54.19
	20	0.70	0.90	897.02	257	242	250	49	78	47	-6	106	54.19
4	22.5	0.70	0.90	898.44	250	238	250	47	78	47	-6	105	53.93
	25	0.70	0.90	899.85	257	238	250	49	78	47	-6	101	54.19
	27.5	0.67	0.88	901.20	257	242	250	49	78	47	-6	108	53.02
5	30	0.65	0.87	902.62	257	240	249	49	78	47	-6	108	52.22
	32.5	0.66	0.87	904.01	257	238	250	49	78	47	-6	105	52.62
	35	0.66	0.87	905.38	258	240	250	49	78	47	-6	105	52.66
6	37.5	0.60	0.80	906.75	257	239	249	51	79	46	-6	107	50.17
	40	0.60	0.81	908.08	250	241	251	51	79	46	-6	104	49.93
	42.5	0.60	0.81	909.38	251	249	251	51	79	46	-6	106	49.96
7	45	0.56	0.71	910.70	252	249	251	51	79	46	-6	108	48.30
	47.5	0.56	0.75	912.00	253	245	251	51	79	46	-6	105	48.34
	50	0.56	0.75	913.27	257	249	251	51	79	46	-6	107	48.47
8	52.5	0.56	0.75	914.55	257	245	251	52	79	49	-6	104	48.47
	55	0.56	0.75	915.80	257	245	251	54	79	55	-6	105	48.47
	57.5	0.56	0.75	917.06	257	245	251	54	79	55	-6	97	48.47
	60			918.22									
Post-Test Leak Check =		<0.02 at 12" Hg											
	Average	0.71	0.92	134.50	258.95	237.67	250.32	57.61	82.90	55.08	-6.23	103.13	54.56

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	KE
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack - LCF	**Checked by:**	KNE
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	9-Oct-18
Run:	Test 3		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- West													
Pre-test Leak Check =		<0.02 at 10" Hg											
1	0	0.72	0.97	918.72	256	238	241	70	93	62	-	109	55.15
	2.5	0.72	0.97	920.25	259	238	241	71	90	44	-5	98	55.27
	5	0.7	0.87	921.62	259	241	252	69	91	45	-5	95	54.50
2	7.5	0.72	0.97	922.92	259	241	251	64	91	47	-5	103	55.27
	10	0.72	0.97	924.35	260	240	251	66	92	47	-5	102	55.31
	12.5	0.72	0.97	925.77	260	240	250	64	92	47	-5	103	55.31
3	15	0.7	0.93	927.20	260	240	250	65	93	48	-5	104	54.53
	17.5	0.7	0.93	928.63	260	240	251	65	93	48	-5	102	54.53
	20	0.7	0.93	930.03	261	240	250	65	93	48	-5	105	54.57
4	22.5	0.7	0.92	931.47	262	240	251	65	93	48	-5	103	54.61
	25	0.7	0.92	932.89	263	240	251	65	94	48	-5	102	54.65
	27.5	0.67	0.89	934.30	265	240	250	65	94	51	-5	102	53.54
5	30	0.67	0.89	935.68	265	231	250	65	94	52	-5	103	53.54
	32.5	0.67	0.89	937.07	265	239	251	66	94	52	-5	102	53.54
	35	0.7	0.94	938.45	267	239	252	66	94	56	-5	103	54.80
6	37.5	0.66	0.88	939.86	266	240	250	66	94	56	-5	104	53.17
	40	0.66	0.88	941.25	266	240	249	66	95	56	-5	102	53.17
	42.5	0.66	0.88	942.61	265	240	250	66	95	56	-5	104	53.14
7	45	0.56	0.75	944.00	266	241	251	66	95	50	-5	103	48.98
	47.5	0.56	0.75	945.27	267	240	249	66	95	56	-5	102	49.01
	50	0.56	0.75	946.52	267	241	250	66	95	58	-5	102	49.01
8	52.5	0.56	0.76	947.78	266	241	252	66	95	58	-5	104	48.98
	55	0.56	0.78	949.06	266	240	250	66	93	58	-5	109	48.98
	57.5	0.56	0.78	950.40	266	240	254	66	93	59	-5	103	48.98
	60			951.67									
Traverse 2- North													
1	0	0.62	0.82	951.67	266	239	250	66	93	60	-	107	51.54
	2.5	0.68	0.89	953.05	267	238	251	66	93	60	-5	104	54.01
	5	0.68	0.89	954.45	266	238	251	66	93	60	-5	107	53.97
2	7.5	0.58	0.77	955.89	265	239	250	66	93	60	-5	106	49.81
	10	0.58	0.77	957.21	265	239	250	66	93	49	-5	104	49.81
	12.5	0.58	0.77	958.51	265	240	250	65	93	49	-5	102	49.81
3	15	0.66	0.88	959.79	266	240	251	65	93	50	-5	102	53.17
	17.5	0.66	0.88	961.15	265	241	250	65	93	50	-5	101	53.14
	20	0.66	0.88	962.50	265	241	250	65	93	50	-5	101	53.14
4	22.5	0.66	0.88	963.84	266	240	250	64	96	50	-5	102	53.17
	25	0.66	0.88	965.20	266	240	250	64	96	50	-5	100	53.17
	27.5	0.66	0.88	966.54	265	239	250	64	96	51	-5	108	53.14
5	30	0.7	0.92	967.99	266	240	250	64	96	52	-5	93	54.76
	32.5	0.7	0.92	969.27	266	240	250	64	96	53	-5	101	54.76
	35	0.7	0.92	970.66	266	240	250	64	96	53	-5	101	54.76
6	37.5	0.7	0.92	972.05	265	240	249	64	96	53	-5	101	54.72
	40	0.7	0.92	973.45	265	240	249	64	96	53	-5	78	54.72
	42.5	0.7	0.92	974.52	266	240	249	64	96	53	-5	123	54.76
7	45	0.7	0.92	976.21	264	240	250	64	96	53	-5	103	54.68
	47.5	0.7	0.92	977.63	265	240	250	64	96	53	-5	101	54.72
	50	0.7	0.92	979.03	265	240	250	64	96	53	-5	105	54.72
8	52.5	0.7	0.92	980.48	265	240	250	64	96	53	-5	97	54.72
	55	0.7	0.92	981.82	265	240	250	64	96	52	-5	101	54.72
	57.5	0.7	0.92	983.22	265	240	250	64	96	51	-5	101	54.72
	60			984.62									
Traverse 3- West													
1	0	0.68	0.90	984.62	263	237	250	70	95	59	-	102	53.86
	2.5	0.68	0.90	986.01	263	237	250	70	95	59	-5	102	53.86
	5	0.68	0.90	987.40	263	239	250	70	95	51	-5	103	53.86
2	7.5	0.68	0.90	988.80	263	240	250	70	95	50	-5	103	53.86
	10	0.68	0.90	990.20	263	241	251	60	95	50	-5	103	53.86
	12.5	0.68	0.90	991.60	263	241	251	60	95	51	-5	103	53.86
3	15	0.66	0.88	993.00	263	241	251	60	95	51	-5	101	53.06
	17.5	0.66	0.88	994.36	263	241	251	61	95	51	-5	101	53.06
	20	0.66	0.88	995.72	264	240	251	61	95	51	-5	101	53.10
4	22.5	0.62	0.82	997.07	262	237	250	62	95	50	-5	102	51.39
	25	0.64	0.85	998.40	262	240	250	62	95	50	-5	102	52.22
	27.5	0.64	0.80	999.75	262	241	250	62	95	51	-5	104	52.22
5	30	0.6	0.80	1001.12	262	241	250	62	93	52	-5	100	50.56
	32.5	0.6	0.80	1002.40	262	241	250	62	93	52	-5	102	50.56
	35	0.6	0.80	1003.70	262	240	250	62	93	60	-5	102	50.56
6	37.5	0.6	0.80	1005.00	261	239	250	62	93	52	-5	102	50.52
	40	0.6	0.80	1006.30	262	240	250	62	93	52	-5	103	50.56
	42.5	0.6	0.80	1007.61	261	240	251	62	93	51	-5	102	50.52
7	45	0.56	0.75	1008.91	261	240	251	62	93	51	-5	106	48.81
	47.5	0.56	0.75	1010.22	262	239	249	62	93	51	-5	104	48.84
	50	0.56	0.75	1011.50	262	240	249	62	93	51	-5	103	48.84
8	52.5	0.56	0.75	1012.77	261	240	250	62	93	51	-5	104	48.81
	55	0.56	0.75	1014.05	261	240	250	62	93	51	-5	105	48.81
	57.5	0.56	0.75	1015.34	261	240	250	62	93	51	-5	104	48.81
	60			1016.62									
Traverse 4 - South													
1	0	0.56	0.75	16.62	261	239	240	71	96	52	-	103	48.81
	2.5	0.56	0.75	17.89	261	240	250	66	96	52	-5	101	48.81
	5	0.56	0.75	19.14	261	240	250	64	96	51	-5	106	48.81
2	7.5	0.60	0.80	20.45	261	240	250	64	96	51	-5	99	50.52
	10	0.60	0.80	21.72	263	241	250	64	96	52	-5	102	50.59
	12.5	0.60	0.80	23.02	263	240	251	64	96	51	-5	103	50.59
3	15	0.66	0.88	24.34	263	240	250	64	96	50	-5	99	53.06
	17.5	0.66	0.88	25.67	264	239	250	62	96	49	-5	101	53.10
	20	0.66	0.88	27.02	264	241	251	60	96	48	-5	99	53.10
4	22.5	0.74	0.98	28.35	266	240	250	61	96	48	-5	101	56.30
	25	0.74	0.98	29.78	267	240	250	61	96	49	-5	102	56.34
	27.5	0.74	0.98	31.23	267	240	249	61	96	49	-5	102	56.34
5	30	0.79	1.00	32.68	268	240	250	61	96	49	-5	103	58.25
	32.5	0.78	1.00	34.18	267	240	250	62	96	51	-5	102	57.84
	35	0.82	1.10	35.67	269	240	250	62	96	51	-5	102	59.39
6	37.5	0.82	1.10	37.19	267	240	250	63	96	53	-5	102	59.31
	40	0.80	1.10	38.71	265	239	249	63	96	51	-5	102	58.50
	42.5	0.80	1.10	40.22	266	239	250	63	96	51	-5	100	58.54
7	45	0.80	1.10	41.69	266	240	250	63	96	51	-5	102	58.54
	47.5	0.80	1.10	43.19	268	240	250	63	96	51	-5	104	58.62
	50	0.80	1.10	44.72	267	240	250	63	96	52	-5	104	58.58
8	52.5	0.80	1.10	46.25	266	238	250	63	96	51	-5	102	58.54
	55	0.80	1.10	47.75	267	242	250	63	96	53	-5	101	58.58
	57.5	0.80	1.10	49.24	266	241	250	64	96	56	-5	102	58.54
	60			50.74									
Post-test Leak Check =		<0.02 at 15" Hg											
	Average	0.67	0.89	132.02	264	240	250	64	94	52	-5	102	53

Sampling Results - Polycyclic Aromatic Hydrocarbons (PAH's)

Source: Main Stack Baseline

Test :	Test #1			Test #2			Test #3			AVERAGE RESULTS	
Sample Volume (Rm^3) [1] :	3.95			3.92			3.91				
Stack Flow Rate (Rm^3/s) [1] :	282.6			288.1			282.9			**284.5**	
	(µg)	**(µg/m³)**	**(µg/s)**	**(µg)**	**(µg/m³)**	**(µg/s)**	**(µg)**	**(µg/m³)**	**(µg/s)**	**(µg/m³)**	**(µg/s)**
1-Methylnaphthalene	322	81.6	23100	313	79.9	23000	304	77.8	22000	< 79.8	< 22700
1-Methylphenanthrene	0.96	0.2	68.8	1.02	0.3	75	0.66	0.2	47.8	0.224	< 64
2-Chloronaphthalene	4.08	1.0	292	7.32	1.9	538	4.86	1.2	352	1.38	< 394
2-Methylanthracene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2-Methylnaphthalene	448	114.0	32100	446	114.0	32800	418	107.0	30300	111.0	< 31700
3-Methylcholanthrene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
7,12-Dimethylbenzo(a)anthracene	< 1.2	0.3	85.9	< 1.2	0.3	88.2	< 1.2	0.3	86.9	< 0.306	< 87
9,10-Dimethylanthracene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
9-Methylphenanthrene	1.98	0.5	142	2.22	0.6	163	1.86	0.5	135	0.515	< 147
Acenaphthene	4.44	1.1	318	8.70	2.2	640	5.46	1.4	395	1.58	< 451
Acenaphthylene	6.30	1.6	451	9.84	2.5	723	7.08	1.8	513	1.97	< 562
Anthracene	0.66	0.2	47.3	0.60	0.2	44.1	0.48	0.1	34.7	0.148	< 42
Benzo(a)anthracene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(a)fluorene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(a)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(b)fluoranthene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(b)fluorene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(e)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(g,h,i)perylene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Benzo(k)fluoranthene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Biphenyl	138	35.0	9880	139	35.5	10200	137	35.1	9920	35.2	< 10000
Chrysene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Coronene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Dibenzo(a,c)anthracene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Fluoranthene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Fluorene	2.46	0.6	176	3.96	1.0	291	2.46	0.6	178	0.755	< 215
Indeno(1,2,3-cd)pyrene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
m-Terphenyl	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Naphthalene	788	200.0	56400	739	189.0	54300	716	183.0	51800	191.0	< 54200
o-Terphenyl	0.36	0.1	25.8	0.36	0.1	26.5	0.30	0.1	21.7	0.0866	< 25
Perylene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Phenanthrene	12.0	3.0	859	14.8	3.8	1090	11.2	2.9	811	3.23	< 919
Picene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
p-Terphenyl	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Pyrene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Tetralin	206	52.2	14800	191	48.7	14000	188	48.1	13600	49.7	< 14100
Triphenylene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
1,2,3,4-Tetrachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
1,2,3,5+1,2,4,5-Tetrachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
1,2,3-Trichlorobenzene	0.71	0.2	50.8	3.69	0.9	271	0.96	0.2	69.5	0.456	< 131
1,2,4-Trichlorobenzene	1.45	0.4	104	1.57	0.4	115	1.70	0.4	123	0.401	< 114
1,2-Dichlorobenzene	9.30	2.4	666	5.32	1.4	391	6.07	1.6	439	1.76	< 499
1,3,5-Trichlorobenzene	0.39	0.1	27.9	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0841	< 24
1,3-Dichlorobenzene	2.11	0.5	151	2.35	0.6	173	1.91	0.5	138	0.541	< 154
1,4-Dichlorobenzene	1.39	0.4	99.5	1.69	0.4	124	1.84	0.5	133	0.418	< 119
Hexachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
Pentachlorobenzene	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,4,5-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,4,6-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,4-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,5,6-Tetrachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3,6-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,3-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,4 + 2,5-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,4,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,4,6-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2,6-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
2-Chlorophenol	7.83	2.0	561	7.67	2.0	564	6.05	1.6	438	1.83	< 521
3,4,5-Trichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
3,4-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
3,5-Dichlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22
3-Chlorophenol	1.51	0.4	108	1.13	0.3	83.1	0.74	0.2	53.6	0.287	< 82
4-Chlorophenol	1.86	0.5	133	1.54	0.4	113	1.45	0.4	105	0.412	< 117
Pentachlorophenol	< 0.30	0.1	21.5	< 0.30	0.1	22.1	< 0.30	0.1	21.7	< 0.0765	< 22

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, and 25 °C)

***'<'** indicates that laboratory results were below the detection limit. The detection limit was used to calculate the concentration and emission rate.*

Concentration and Emission Rate has been reported to 3 significant figures.

Blank was not inlcuded in Lab Analysis

Sampling Results - Dioxins and Furans

Source: Main Stack Baseline

Test :	Test #1			Test #2			Test #3			Average Concentration	Average Concentration @25 °C and 11 % O_2	Reg 419 Toxic Equivalency Factors		
Sample Volume (m^3) [1] :	3.95			3.92			3.91					TEF	TEF Concentration	TEF Emission Rate
Stack Flow Rate (m^3/s) [1] :	282.6			288.1			282.9							
	(pg)	(pg/m^3)	(pg/s)	(pg)	(pg/m^3)	(pg/s)	(pg)	(pg/m^3)	(pg/s)	(pg/m^3)	(pg/m^3)		(pg TEQ/m^3)	(pg/s)
2,3,7,8-Tetra CDD *	< 13	3.29	931	< 17	4.34	1250	< 18	4.61	1300	4.1	6.96	1	7.0	1150
1,2,3,7,8-Penta CDD *	< 7.1	1.8	508	< 9.7	2.48	713	< 9.3	2.38	673	2.2	3.79	1	3.79	625
1,2,3,4,7,8-Hexa CDD *	< 6.5	1.7	466	< 6.5	1.66	478	< 7.0	1.79	507	1.7	2.90	0.1	0.29	47.9
1,2,3,6,7,8-Hexa CDD *	< 6.4	1.62	458	< 6.3	1.61	463	< 6.9	1.77	499	1.67	2.85	0.1	0.285	47
1,2,3,7,8,9-Hexa CDD *	< 6.0	1.52	430	< 5.9	1.51	434	< 6.4	1.64	463	1.55	2.65	0.1	0.265	43.7
1,2,3,4,6,7,8-Hepta CDD *	< 6.1	1.55	437	< 9.2	2.35	676	11.3	2.89	818	2.26	3.86	0.01	0.0386	6.37
1,2,3,4,6,7,8,9-Octa CDD *	26.1	6.61	1870	14.2	3.62	1040	10.5	2.69	760	4.31	7.36	0.0003	0.00221	0.364
2,3,7,8-Tetra CDF **	< 9.0	2.3	645	< 8.7	2.22	640	< 13	3.33	941	2.6	4.46	0.1	0.446	73.5
1,2,3,7,8-Penta CDF **	< 6.5	1.65	466	< 7.6	1.94	559	< 6.8	1.74	492	1.78	3.04	0.03	0.0911	15
2,3,4,7,8-Penta CDF **	< 6.5	1.7	466	< 7.6	1.94	559	< 6.9	1.77	499	1.8	3.04	0.3	0.911	150
1,2,3,4,7,8-Hexa CDF **	< 6.0	1.5	430	< 6.4	1.63	471	< 6.3	1.61	456	1.59	2.71	0.1	0.271	44.8
1,2,3,6,7,8-Hexa CDF **	4.3	1.09	308	< 6.3	1.61	463	4.8	1.23	347	1.31	2.24	0.1	0.224	36.9
2,3,4,6,7,8-Hexa CDF **	< 6.5	1.65	466	< 7.0	1.79	515	< 6.8	1.74	492	1.72	2.94	0.1	0.294	48.5
1,2,3,7,8,9-Hexa CDF **	< 7.5	1.9	537	4.8	1.22	353	< 7.8	2	565	1.71	2.92	0.1	0.292	48.2
1,2,3,4,6,7,8-Hepta CDF **	< 7.8	2.0	559	< 5.7	1.45	419	6.9	1.77	499	1.73	2.95	0.01	0.030	4.87
1,2,3,4,7,8,9-Hepta CDF **	< 8.0	2.03	573	< 7.4	1.89	544	< 7.3	1.87	528	1.93	3.29	0.01	0.0329	5.44
1,2,3,4,6,7,8,9-Octa CDF **	10.2	2.6	731	< 6.8	1.74	500	< 12.7	3.25	919	2.52	4.30	0.003	0.0129	2.13
33'44'-TetraCB-(77)	< 57	14.4	4080	< 73	18.6	5370	< 73	18.7	5280	17.3	29.53	0.0001	0.0029500	0.487
344'5-TetraCB-(81)	< 56	14.2	4010	< 72	18.4	5290	< 72	18.4	5210	17	29.02	0.0003	0.0087100	1.44
233'44'-PentaCB-(105)	220	55.8	15800	180	45.9	13200	69	17.7	4990	39.8	67.93	0.00003	0.0020400	0.336
2344'5-PentaCB-(114)	< 26	6.59	1860	< 56	14.3	4120	< 34	8.7	2460	9.86	16.83	0.00003	0.00050500	0.0833
23'44'5-PentaCB-(118)	460	117	32900	390	99.5	28700	180	46.1	13000	87.4	149.18	0.00003	0.0044800	0.739
23'44'5'-PentaCB-(123)	< 29	7.35	2080	< 62	15.8	4560	< 37	9.47	2680	10.9	18.61	0.00003	0.00055800	0.0921
33'44'5-PentaCB-(126)	< 25	6.34	1790	< 53	13.5	3900	< 31	7.93	2240	9.26	15.81	0.1	1.5800	261
HexaCB-(156)+(157)	91	23.1	6520	< 67	17.1	4930	< 63	16.1	4560	18.8	32.09	0.00003	0.00096300	0.159
23'44'55'-HexaCB-(167)	< 46	11.7	3290	< 63	16.1	4630	< 60	15.4	4340	14.4	24.58	0.00003	0.00073700	0.122
33'44'55'-HexaCB-(169)	< 49	12.4	3510	< 68	17.4	5000	< 64	16.4	4630	15.4	26.29	0.03	0.78900	130
233'44'55'-HeptaCB-(189)	< 46	11.7	3290	< 46	11.7	3380	< 120	30.7	8690	18	30.72	0.00003	0.00092200	0.152
											Total Toxic Equivalency →		16.6	2740

Notes :

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3 kPa and 25°C)

***'<'** indicates that laboratory results were below the Estimated Detection Limit (EDL) This detection limit was used to calculate the concentration and emission rate.*

Concentration and Emission Rate has been repo 3 significant figures.

*CDD = chlorodibenzo-*p* -dioxin

**CDF = chlorodibenzo-*p* -furan

***CB = chlorobenzene

Semi-Volatile Organic Compounds Sampling

St. Mary's

Facility:	St. Mary's	**Operator:**	ACS
City:	Bowmanville, ON	**Entered by:**	ACS
Source:	Main Stack Baseline	**Checked by:**	JDF
Reference Method:	Environment Canada 1/RM/2		

DATA INPUTS	**Symbol**	**Units**	**Test #1** SVOC	**Test #2** SVOC	**Test #3** SVOC
Date			30-Sep-18	1-Oct-18	2-Oct-18
Start Time			12:06 PM	8:57 AM	8:08 AM
End Time			4:25 PM	1:21 PM	12:40 PM
Round Stack, Diameter (Inside)	d_s	in	216	216	216
Standard Temperature	T_s	°F	77	77	77
Standard Pressure	P_s	" Hg	29.9	29.9	29.9
Nozzle Diameter	D_n	in	0.211	0.211	0.211
Average Stack Temperature	T_s	°F	267	257	256
Average Meter Temperature	T_m	°F	76	71	74
Barometric Pressure	P_{bar}	" Hg	30.3	29.8	29.6
Stack Static Pressure	P_g	" H_2O	-0.7	-0.7	-0.7
Average Delta H	dH	" H_2O	0.99	1.02	1.02
Average Velocity Head	dP_{rms}	" H_2O	0.78	0.81	0.80
Pitot Coefficient	C_p	-	0.838	0.838	0.838
	Pitot ID ->		RWDI 7' #3		
Gas Sample Volume	V_m	ft^3	137.93	137.93	139.49
DGM Calibration Factor	Y	-	0.993	0.993	0.993
	DGM ID ->		RWDI Console A		
Total Sampling Time	min	min	240	240	240
Stack Gas Oxygen Concentration	O_2	%	15.3	14.9	15.1
Stack Gas Carbon Dioxide Concentration	CO_2	%	11.4	11.9	12.2
Impinger Gain	W_w	g	243.8	243.8	250.8

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	ACS
City:	Bowmanville, ON	**Entered by:**	ACS
Source:	Main Stack Baseline	**Checked by:**	JDF
Reference Method:	Environment Canada 1/RM/2		

Emissions Calculations	**Symbol**	**Units**	**Test #1** SVOC	**Test #2** SVOC	**Test #3** SVOC	**AVERAGE**
Nozzle Area	A_n	ft²	0.00024	0.00024	0.00024	
Stack Area	A_s	ft²	254.47	254.47	254.47	
Average Stack Temperature	T_s	°R	727	717	716	720
Average DGM Temperature	T_m	°R	536	531	534	
Sample Volume at Reference Conditions	V_{mStd}	ft³	139.43	138.47	138.07	
	V_{mmstd}	**m³**	**3.95**	**3.92**	**3.91**	
Vol. of Water Vapour	V_{wStd}	ft³	11.7024	11.70192	12.0384	
Water Fraction	B_{ws}		7.7%	7.8%	8.0%	7.9%
Molecular Weight, dry	M_d	g/mole	30.54	30.60	30.66	30.60
Molecular Weight, wet	M_w	g/mole	29.57	29.62	29.64	29.61
Absolute Stack Pressure	P_s	" Hg	30.25	29.79	29.54	29.86
Stack Gas Velocity	U_s	ft/s	56.96	58.14	57.63	57.58
	U_{sm}	**m/s**	**17.36**	**17.72**	**17.57**	**17.55**
Actual Gas Flow Rate	Q_{act}	acf/min	869,692	887,677	879,943	879,104
Dry Gas Flow Rate (dry, ref)	Q_{ref}	dscf/min	598,946	610,575	599,482	603,001
	Q_{Rm}	m³/min	16956	17285	16971	17,071
	Qmref (Actual O_2)	**m³/s**	**282.60**	**288.09**	**282.86**	**284.5**
	Qmref (11% O_2)	**m³/sec**	**158.3**	**172.9**	**164.1**	**165.1**
Isokinetic Rate	I	%	102	99	101	100

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	ACS
City:	Bowmanville, ON	**Entered by:**	WSC
Source:	Main Stack Baseline	**Checked by:**	JDF
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	30-Sep-18
Run:	Test 1		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/s)
Traverse 1- East													
Pre-Test Leak Check =		<0.02 at 10" Hg											
1	0	0.86	1.00	179.88	300	242	253	53	70	66	-	99	61.14
	2.5	0.96	1.10	181.30	294	242	247	47	71	51	-5	94	64.34
	5	1.00	1.20	182.74	290	243	249	47	70	37	-7	103	65.50
2	7.5	1.00	1.20	184.34	287	240	250	47	70	37	-7	93	65.36
	10	0.90	1.20	185.80	284	240	250	45	71	37	-8	108	61.89
	12.5	0.90	1.20	187.40	284	240	250	45	71	37	-8	108	61.89
3	15	0.92	1.20	189.00	282	240	250	45	71	37	-8	101	62.49
	17.5	0.90	1.20	190.52	281	240	251	45	71	37	-8	103	61.76
	20	0.89	1.20	192.05	281	240	251	45	74	37	-8	109	61.42
4	22.5	0.93	1.20	193.67	279	241	251	45	74	37	-8	106	62.70
	25	0.90	1.20	195.28	278	241	251	45	74	37	-8	105	61.64
	27.5	0.89	1.20	196.86	277	241	250	45	74	37	-8	106	61.25
5	30	0.88	1.10	198.45	276	240	248	44	74	37	-8	104	60.86
	32.5	0.88	1.10	200.00	275	241	249	44	74	37	-8	101	60.82
	35	0.86	1.10	201.51	272	241	250	44	74	37	-8	101	60.00
6	37.5	0.86	1.10	203.00	273	240	250	44	75	37	-8	102	60.05
	40	0.84	1.10	204.50	272	240	250	44	75	37	-8	103	59.30
	42.5	0.84	1.10	206.00	271	241	251	44	75	37	-8	103	59.26
7	45	0.80	1.00	207.51	271	241	250	44	75	37	-8	104	57.83
	47.5	0.80	1.00	208.99	270	239	250	44	75	38	-7	104	57.79
	50	0.82	1.00	210.48	270	239	250	44	75	38	-7	102	58.51
8	52.5	0.76	0.95	211.96	270	240	251	44	75	38	-7	104	56.33
	55	0.76	0.95	213.41	270	244	251	44	75	38	-7	101	56.33
	57.5	0.76	0.95	214.82	269	240	249	45	76	38	-7	101	56.29
	60	-	-	216.23	-	-	-	-	-	-	-	-	-
Traverse 2 - North													
1	0	0.82	1.00	216.23	270	240	250	45	74	38	-	104	58.51
	2.5	0.77	0.96	217.73	265	238	240	45	74	38	-7	102	56.51
	5	0.79	1.00	219.16	268	242	250	46	77	38	-7	101	57.35
2	7.5	0.80	1.00	220.60	268	238	250	45	77	38	-7	101	57.72
	10	0.80	1.00	222.05	267	238	250	45	77	39	-7	101	57.68
	12.5	0.76	0.95	223.50	266	235	249	45	77	39	-7	100	56.18
3	15	0.79	1.00	224.90	267	241	251	46	78	39	-7	100	57.31
	17.5	0.79	1.00	226.33	266	238	250	46	78	40	-7	101	57.27
	20	0.80	1.00	227.77	267	240	250	47	78	40	-7	99	57.68
4	22.5	0.86	1.10	229.20	267	239	250	47	78	40	-7	97	59.80
	25	0.86	1.10	230.65	266	239	250	47	78	40	-7	103	59.76
	27.5	0.86	1.10	232.19	266	240	250	47	78	40	-7	95	59.76
5	30	0.86	1.10	233.61	265	241	250	47	78	40	-7	92	59.72
	32.5	0.86	1.10	234.99	266	241	250	47	81	40	-7	103	59.76
	35	0.86	1.10	236.54	265	239	249	47	81	41	-7	97	59.72
6	37.5	0.86	1.10	238.00	264	240	250	47	79	41	-7	97	59.68
	40	0.86	1.10	239.45	265	238	240	48	79	41	-7	98	59.72
	42.5	0.86	1.10	240.92	263	239	249	48	79	41	-7	98	59.63
7	45	0.88	1.10	242.38	265	241	251	48	79	41	-7	96	60.41
	47.5	0.88	1.10	243.83	264	240	250	48	79	41	-7	97	60.37
	50	0.85	1.10	245.30	264	240	250	48	79	41	-7	98	59.33
8	52.5	0.87	1.10	246.75	263	239	250	48	79	44	-7	102	59.98
	55	0.90	1.20	248.28	263	240	250	48	79	45	-7	95	61.01
	57.5	0.87	1.20	249.73	263	240	250	48	79	45	-7	102	59.98
	60			251.27									
Traverse 3 - West													
1	0	0.82	1.05	251.27	263	239	247	52	77	49	-	104	58.23
	2.5	0.80	1.00	252.78	263	240	251	51	77	50	-7	102	57.52
	5	0.80	1.00	254.25	262	240	251	51	77	50	-7	101	57.48
2	7.5	0.80	1.00	255.71	262	241	249	52	81	52	-7	100	57.48
	10	0.78	1.00	257.16	264	240	251	52	78	52	-7	104	56.83
	12.5	0.76	1.00	258.64	263	241	251	52	78	52	-7	101	56.06
3	15	0.72	0.92	260.06	262	240	249	52	78	52	-7	106	54.53
	17.5	0.74	0.95	261.51	263	240	249	53	77	54	-7	102	55.32
	20	0.74	0.95	262.92	264	239	254	53	77	54	-7	103	55.36
4	22.5	0.74	0.95	264.35	264	239	250	53	77	54	-7	106	55.36
	25	0.74	0.95	265.81	265	239	250	53	77	54	-7	101	55.39
	27.5	0.74	0.95	267.20	265	241	250	54	78	56	-7	103	55.39
5	30	0.72	0.97	268.62	264	240	250	54	78	58	-7	101	54.60
	32.5	0.70	0.88	270.00	264	241	246	54	78	58	-7	104	53.84
	35	0.72	0.88	271.40	266	239	252	54	78	58	-7	98	54.68
6	37.5	0.70	0.88	272.74	265	241	252	51	78	42	-7	105	53.88
	40	0.66	0.83	274.15	265	240	249	51	78	42	-7	103	52.31
	42.5	0.66	0.83	275.50	264	240	248	51	78	42	-7	102	52.28
7	45	0.66	0.83	276.83	264	240	252	49	78	40	-7	99	52.28
	47.5	0.62	0.78	278.12	264	240	251	49	78	40	-6	106	50.67
	50	0.62	0.78	279.47	264	240	250	49	78	40	-6	105	50.67
8	52.5	0.62	0.78	280.80	262	240	250	49	78	40	-6	102	50.60
	55	0.64	0.81	282.10	262	240	252	48	78	41	-6	102	51.41
	57.5	0.66	0.83	283.42	262	239	248	48	78	41	-6	103	52.21
	60			284.77									
Traverse 4- East													
1	0	0.66	0.83	284.77	261	240	251	51	76	43	-	102	52.17
	2.5	0.62	0.78	286.10	261	240	245	50	76	44	-7	101	50.56
	5	0.62	0.78	287.38	260	232	245	48	76	44	-7	105	50.53
2	7.5	0.64	0.81	288.71	260	247	247	48	77	45	-7	100	51.34
	10	0.64	0.81	290.00	261	240	252	48	77	45	-7	106	51.37
	12.5	0.64	0.81	291.36	262	240	239	48	77	45	-7	105	51.41
3	15	0.65	0.90	292.71	262	252	239	48	77	45	-7	105	51.81
	17.5	0.69	0.90	294.07	262	241	250	49	77	47	-7	102	53.38
	20	0.68	0.90	295.43	262	240	250	49	77	47	-7	105	52.99
4	22.5	0.72	0.91	296.82	262	240	249	50	77	48	-7	101	54.53
	25	0.72	0.91	298.20	262	240	251	50	77	48	-7	103	54.53
	27.5	0.72	0.91	299.61	261	239	250	50	77	50	-7	102	54.49
5	30	0.72	0.91	301.00	263	239	249	50	77	50	-7	102	54.57
	32.5	0.72	0.91	302.40	263	240	250	50	77	50	-7	101	54.57
	35	0.73	0.91	303.78	263	241	250	50	77	50	-7	100	54.94
6	37.5	0.73	0.92	305.16	263	239	241	51	77	52	-7	101	54.94
	40	0.75	0.95	306.55	263	240	250	51	77	52	-7	104	55.69
	42.5	0.75	0.95	308.00	262	240	249	52	77	53	-7	99	55.65
7	45	0.75	0.95	309.38	263	240	250	52	77	53	-7	100	55.69
	47.5	0.75	0.95	310.77	263	238	251	52	77	54	-7	104	55.69
	50	0.76	0.96	312.22	263	241	250	52	77	54	-7	98	56.06
8	52.5	0.76	0.96	313.60	264	240	248	52	77	54	-7	100	56.10
	55	0.75	0.95	315.00	263	230	239	52	77	54	-7	101	55.69
	57.5	0.75	0.95	316.41	262	241	242	51	77	55	-7	100	55.65
	60			317.81									
Post-Test Leak Check =		<0.02 at 12" Hg											
	Average	0.78	0.99	137.93	267.35	240.01	249.17	48.39	75.54	44.36	-7.09	101.63	56.96

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	ACS
City:	Bowmanville, ON	**Entered by:**	ACS
Source:	Main Stack Baseline	**Checked by:**	JDF
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	1-Oct-18
Run:	Test 2		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/s)
Traverse 1- East													
Pre-Test Leak Check =		<0.02 at 10" Hg											
1	0	0.87	1.10	363.87	255	240	249	45	52	41	-	104	60.05
	2.5	0.87	1.10	365.37	255	240	249	44	53	36	-5	97	60.05
	5	0.87	1.10	366.77	255	239	249	44	53	36	-5	97	60.05
2	7.5	0.88	1.10	368.17	254	240	241	42	55	36	-5	97	60.35
	10	0.87	1.10	369.59	255	239	250	42	55	36	-5	101	60.05
	12.5	0.87	1.10	371.06	255	238	246	41	56	36	-5	90	60.05
3	15	0.87	1.10	372.38	256	241	251	41	56	36	-5	105	60.09
	17.5	0.87	1.10	373.91	257	241	259	41	56	36	-5	105	60.13
	20	0.84	1.00	375.44	256	241	249	41	61	37	-5	103	59.05
4	22.5	0.90	1.10	376.93	257	239	250	41	62	37	-5	95	61.16
	25	0.90	1.10	378.36	257	241	251	41	62	37	-5	99	61.16
	27.5	0.90	1.10	379.84	257	239	248	41	63	38	-5	102	61.16
5	30	0.83	1.05	381.37	258	240	249	41	63	39	-5	96	58.78
	32.5	0.84	1.05	382.75	258	241	251	41	65	39	-5	100	59.13
	35	0.84	1.05	384.20	258	241	251	41	65	39	-5	98	59.13
6	37.5	0.84	1.05	385.62	257	240	250	41	65	39	-5	98	59.09
	40	0.84	1.05	387.04	258	240	250	41	65	39	-5	80	59.13
	42.5	0.82	1.05	388.21	259	240	250	41	66	38	-5	107	58.46
7	45	0.82	1.05	389.75	257	239	251	41	67	38	-5	111	58.38
	47.5	0.76	1.00	391.36	258	240	252	41	67	38	-5	101	56.24
	50	0.76	1.00	392.76	258	240	249	42	68	39	-5	100	56.24
8	52.5	0.76	1.00	394.15	258	239	249	42	68	39	-5	103	56.24
	55	0.76	1.00	395.58	259	240	250	42	68	39	-5	95	56.28
	57.5	0.76	1.00	396.90	258	240	250	42	68	39	-5	106	56.24
	60			398.37									
Traverse 2 - North													
1	0	0.78	1.00	398.37	260	240	250	44	66	40	-	103	57.06
	2.5	0.78	1.00	399.81	260	240	252	43	68	40	-5	102	57.06
	5	0.79	1.00	401.25	259	240	250	43	68	40	-5	108	57.38
2	7.5	0.79	1.00	402.78	259	239	248	42	69	40	-5	94	57.38
	10	0.80	1.00	404.12	259	241	250	42	69	40	-5	87	57.75
	12.5	0.80	1.00	405.37	258	240	250	42	69	40	-5	114	57.71
3	15	0.80	1.00	407.00	259	238	251	42	69	40	-5	101	57.75
	17.5	0.84	1.10	408.45	258	240	251	42	69	40	-5	99	59.13
	20	0.84	1.10	409.90	258	242	249	42	69	40	-5	97	59.13
4	22.5	0.84	1.10	411.33	258	240	250	42	69	40	-5	106	59.13
	25	0.86	1.10	412.88	258	240	249	42	71	41	-5	101	59.83
	27.5	0.88	1.10	414.38	259	239	250	42	71	41	-5	33	60.56
5	30	0.88	1.10	414.88	259	241	251	43	72	42	-5	100	60.56
	32.5	0.88	1.10	416.39	259	240	250	43	72	42	-5	161	60.56
	35	0.88	1.10	418.82	258	240	250	43	72	42	-5	95	60.52
6	37.5	0.88	1.10	420.25	258	239	250	45	72	42	-5	99	60.52
	40	0.88	1.10	421.75	259	240	250	45	72	42	-5	99	60.56
	42.5	0.89	1.10	423.24	257	240	250	45	72	42	-5	96	60.82
7	45	0.90	1.10	424.70	259	241	250	45	72	42	-5	95	61.25
	47.5	0.90	1.10	426.15	259	241	250	45	72	42	-5	98	61.25
	50	0.90	1.10	427.65	258	239	250	45	74	45	-6	97	61.21
8	52.5	0.90	1.10	429.13	258	241	250	45	74	45	-6	96	61.21
	55	0.90	1.10	430.60	259	241	251	45	74	45	-6	98	61.25
	57.5	0.90	1.10	432.10	258	239	251	45	74	45	-6	93	61.21
	60			433.53									
Traverse 3 - West													
1	0	0.85	1.10	433.53	258	242	248	53	71	40	-	97	59.48
	2.5	0.85	1.10	434.97	258	240	250	53	71	40	-6	98	59.48
	5	0.86	1.10	436.42	258	239	250	49	73	48	-6	96	59.83
2	7.5	0.82	1.00	437.85	258	240	251	49	73	48	-6	99	58.42
	10	0.83	1.00	439.30	257	241	251	49	73	48	-6	99	58.74
	12.5	0.84	1.00	440.75	258	240	250	51	73	52	-6	98	59.13
3	15	0.82	1.00	442.20	257	240	252	51	75	52	-6	98	58.38
	17.5	0.82	1.00	443.64	257	239	250	51	75	52	-6	100	58.38
	20	0.84	1.00	445.10	257	240	250	52	76	55	-6	97	59.09
4	22.5	0.82	1.00	446.55	257	242	250	52	76	55	-6	99	58.38
	25	0.82	1.00	448.00	256	239	250	53	77	57	-6	99	58.34
	27.5	0.82	1.00	449.46	256	240	250	53	77	57	-6	101	58.34
5	30	0.82	1.00	450.95	256	240	250	53	77	57	-6	98	58.34
	32.5	0.82	1.00	452.40	256	240	252	53	77	57	-6	105	58.34
	35	0.82	1.00	453.95	257	241	250	55	77	59	-6	98	58.38
6	37.5	0.76	1.00	455.40	256	239	251	56	77	60	-6	94	56.17
	40	0.76	1.00	456.74	256	239	251	56	77	60	-6	101	56.17
	42.5	0.76	1.00	458.17	258	239	250	56	77	60	-6	104	56.24
7	45	0.66	0.86	459.65	257	238	251	56	77	60	-6	102	52.38
	47.5	0.67	0.86	461.00	257	241	250	56	77	62	-6	99	52.77
	50	0.66	0.85	462.32	257	241	250	57	77	62	-6	104	52.38
8	52.5	0.75	0.97	463.70	257	240	250	57	77	62	-6	96	55.83
	55	0.75	0.97	465.05	257	240	250	57	77	60	-6	103	55.83
	57.5	0.75	0.97	466.50	256	240	250	56	77	47	-6	101	55.79
	60			467.92									
Traverse 4- South													
1	0	0.68	0.87	467.92	250	235	250	53	75	49	-	95	52.90
	2.5	0.68	0.87	469.20	257	240	250	53	75	46	-6	108	53.16
	5	0.68	0.87	470.64	257	240	250	53	75	46	-6	100	53.16
2	7.5	0.72	0.96	471.97	250	240	250	49	75	46	-6	101	54.44
	10	0.72	0.96	473.36	250	239	250	49	78	47	-6	98	54.44
	12.5	0.72	0.96	474.72	257	235	249	49	78	47	-6	107	54.71
3	15	0.72	0.96	476.20	257	235	249	49	78	47	-6	101	54.71
	17.5	0.72	0.96	477.60	257	232	250	49	78	47	-6	98	54.71
	20	0.72	0.96	478.96	257	242	250	49	78	47	-6	98	54.71
4	22.5	0.72	0.96	480.32	250	238	250	47	78	47	-6	99	54.44
	25	0.79	1.00	481.70	257	238	250	49	78	47	-6	100	57.30
	27.5	0.79	1.00	483.15	257	242	250	49	78	47	-6	100	57.30
5	30	0.81	1.00	484.60	257	240	249	49	78	47	-6	97	58.02
	32.5	0.81	1.00	486.02	257	238	250	49	78	47	-6	98	58.02
	35	0.82	1.00	487.45	258	240	250	49	78	47	-6	99	58.42
6	37.5	0.82	1.00	488.91	257	239	249	51	79	46	-6	98	58.38
	40	0.82	1.00	490.35	250	241	251	51	79	46	-6	96	58.10
	42.5	0.82	1.00	491.77	251	249	251	51	79	46	-6	97	58.14
7	45	0.84	1.00	493.21	252	249	251	51	79	46	-6	101	58.88
	47.5	0.84	1.00	494.72	253	245	251	51	79	46	-6	95	58.92
	50	0.84	1.00	496.15	257	249	251	51	79	46	-6	92	59.09
8	52.5	0.84	1.00	497.52	257	245	251	52	79	49	-6	96	59.09
	55	0.84	1.00	498.95	257	245	251	54	79	55	-6	96	59.09
	57.5	0.84	1.00	500.38	257	245	251	54	79	55	-6	95	59.09
	60			501.80									
Post-Test Leak Check =		<0.02 at 12" Hg											
	Average	0.81	1.02	137.93	256.84	240.21	250.08	47.26	71.17	45.35	-5.54	99.11	58.14

Semi-Volatile Organic Compounds Sampling

Facility:	St. Mary's	**Operator:**	ACS
City:	Bowmanville, ON	**Entered by:**	ACS
Source:	Main Stack Baseline	**Checked by:**	JDF
Reference Method:	Environment Canada 1/RM/2	**Test Date:**	2-Oct-18
Run:	Test 3		

Point	Time (min)	Velocity Pressure (" H_2O)	Orifice Pressure (" H_2O)	Meter Volume (ft^3)	Stack Temp (^oF)	Probe Temp (^oF)	Box Temp (^oF)	Imp Temp (^oF)	Meter Temp (^oF)	XAD Trap (^oF)	Vacuum Pressure (" Hg)	Percentage Isokinetic (%)	Stack Velocity (ft/sec)
Traverse 1- West													
Pre-test Leak Check =		<0.02 at 10" Hg											
1	0	0.88	0.90	502.25	254	238	248	45	57	40	-	85	60.58
	2.5	0.85	1.10	503.50	252	240	248	44	57	35	5	115	59.46
	5	0.87	1.12	505.16	253	242	251	44	57	36	5	102	60.20
2	7.5	0.92	1.20	506.66	253	240	249	43	58	35	5	100	61.90
	10	0.88	1.15	508.17	254	240	250	43	59	35	5	103	60.58
	12.5	0.86	1.15	509.70	252	241	251	43	60	35	5	101	59.81
3	15	0.83	1.07	511.18	253	241	251	43	61	36	5	103	58.80
	17.5	0.84	1.08	512.67	254	240	250	44	62	35	5	101	59.19
	20	0.85	1.12	514.13	253	239	250	43	62	35	5	102	59.50
4	22.5	0.84	1.10	515.62	255	239	250	43	64	36	5	102	59.23
	25	0.85	1.10	517.10	256	240	251	43	64	36	5	100	59.63
	27.5	0.84	1.10	518.56	255	238	249	44	65	36	5	100	59.23
5	30	0.83	1.10	520.02	256	239	250	43	65	36	5	105	58.92
	32.5	0.83	1.10	521.55	256	240	249	43	66	36	5	97	58.92
	35	0.83	1.10	522.96	257	242	250	43	67	37	5	100	58.96
6	37.5	0.82	1.05	524.42	256	239	249	43	67	37	5	101	58.56
	40	0.83	1.07	525.88	256	240	249	43	68	36	5	100	58.92
	42.5	0.82	1.05	527.34	256	240	250	43	69	36	5	101	58.56
7	45	0.83	1.07	528.80	256	240	250	42	69	37	5	101	58.92
	47.5	0.75	0.93	530.28	255	241	252	42	70	36	5	100	55.97
	50	0.73	0.93	531.67	255	239	249	42	70	34	5	101	55.22
8	52.5	0.74	0.99	533.06	255	239	249	42	71	36	5	104	55.59
	55	0.79	0.99	534.50	255	240	249	42	71	36	5	98	57.44
	57.5	0.77	0.97	535.91	254	240	251	42	72	36	5	101	56.67
	60			537.34									
Traverse 2- North													
1	0	0.85	1.12	537.24	254	241	250	48	69	41	-	107	59.54
	2.5	0.84	1.10	538.82	254	240	252	45	71	37	5	100	59.19
	5	0.84	1.10	540.29	254	240	255	44	71	38	5	99	59.19
2	7.5	0.8	1.10	541.76	255	240	248	44	71	38	6	105	57.80
	10	0.84	1.10	543.28	254	241	251	44	72	37	6	101	59.19
	12.5	0.83	1.05	544.77	256	241	251	44	71	38	6	100	58.92
3	15	0.8	1.00	546.24	255	239	250	44	73	38	6	99	57.80
	17.5	0.8	1.00	547.67	254	240	246	45	74	38	6	101	57.76
	20	0.78	0.99	549.13	257	240	249	45	74	38	6	101	57.16
4	22.5	0.78	0.99	550.57	254	239	251	46	75	38	6	100	57.04
	25	0.79	0.99	552.00	255	240	250	45	75	38	6	98	57.44
	27.5	0.77	0.99	553.42	255	240	250	45	75	38	6	101	56.71
5	30	0.78	1.00	554.86	255	239	250	45	76	38	6	100	57.08
	32.5	0.74	1.00	556.30	254	240	241	45	76	38	6	104	55.56
	35	0.78	1.00	557.75	255	240	248	45	76	38	6	101	57.08
6	37.5	0.78	0.99	559.20	254	240	247	45	76	38	6	106	57.04
	40	0.73	0.94	560.72	255	240	250	46	76	40	6	96	55.22
	42.5	0.73	0.94	562.05	256	240	250	46	77	41	6	102	55.26
7	45	0.65	0.82	563.47	256	239	249	48	78	41	6	102	52.14
	47.5	0.65	0.82	564.81	257	240	250	47	78	46	6	102	52.18
	50	0.67	0.82	566.15	256	240	249	47	78	46	6	99	52.94
8	52.5	0.65	0.80	567.47	257	241	250	48	79	48	6	99	52.18
	55	0.65	0.80	568.77	257	239	249	49	79	48	6	101	52.18
	57.5	0.65	0.80	570.10	254	240	249	49	79	48	6	98	52.07
	60			571.39									
Traverse 3- West													
1	0	0.81	1.04	571.40	256	240	248	53	76	54	-	101	58.21
	2.5	0.81	1.04	572.88	254	240	250	52	76	55	6	100	58.12
	5	0.85	1.10	574.35	256	238	250	52	76	54	6	99	59.63
2	7.5	0.85	1.10	575.84	254	240	248	52	77	55	6	99	59.54
	10	0.8	1.03	577.33	253	240	250	52	77	55	6	101	57.72
	12.5	0.83	1.05	578.80	254	240	249	53	77	58	6	99	58.84
3	15	0.85	1.05	580.27	255	240	249	53	77	56	6	98	59.58
	17.5	0.83	1.05	581.75	255	240	248	40	78	40	6	101	58.88
	20	0.83	1.05	583.25	254	240	251	40	78	38	6	101	58.84
4	22.5	0.83	1.05	584.75	254	240	250	48	79	38	6	99	58.84
	25	0.83	1.05	586.22	252	240	248	48	79	37	6	98	58.75
	27.5	0.83	1.05	587.69	253	240	248	47	79	37	6	98	58.80
5	30	0.78	1.00	589.15	255	242	250	47	79	37	6	102	57.08
	32.5	0.78	1.00	590.63	253	240	248	47	79	37	6	100	57.00
	35	0.78	1.00	592.08	250	240	248	47	79	37	6	99	56.88
6	37.5	0.7	0.90	593.52	253	240	245	47	79	37	6	87	54.00
	40	0.74	0.98	594.72	253	240	245	46	79	38	6	116	55.52
	42.5	0.74	0.98	596.35	253	241	250	46	79	37	6	101	55.52
7	45	0.74	0.96	597.78	257	241	250	46	79	37	6	102	55.67
	47.5	0.74	0.96	599.22	257	240	250	46	79	38	6	101	55.67
	50	0.74	0.96	600.64	256	240	250	46	80	38	6	101	55.63
8	52.5	0.74	0.96	602.07	257	240	250	46	79	38	6	101	55.67
	55	0.74	0.96	603.49	258	241	249	47	79	39	6	105	55.71
	57.5	0.74	0.96	604.96	258	240	248	48	79	40	6	98	55.71
	60			606.33									
Traverse 4 - South													
1	0	0.76	0.98	606.33	258	240	250	52	78	41	-	102	56.46
	2.5	0.76	0.98	607.78	258	241	249	49	78	41	6	103	56.46
	5	0.76	0.98	609.24	259	242	249	49	77	40	6	102	56.50
2	7.5	0.74	0.96	610.68	257	245	249	50	78	43	6	103	55.67
	10	0.74	0.96	612.13	258	243	251	49	79	43	6	101	55.71
	12.5	0.74	0.96	613.55	257	239	249	49	78	44	6	101	55.67
3	15	0.74	0.96	614.97	259	240	249	49	79	44	6	101	55.75
	17.5	0.76	0.98	616.39	259	239	250	49	79	45	6	101	56.50
	20	0.76	0.98	617.83	259	240	251	49	79	46	6	101	56.50
4	22.5	0.81	1.02	619.26	259	241	250	49	80	46	6	101	58.33
	25	0.81	1.02	620.74	259	243	251	50	80	51	6	100	58.33
	27.5	0.79	1.00	622.21	259	245	250	52	80	47	6	99	57.60
5	30	0.84	1.07	623.65	260	245	251	51	80	49	6	100	59.44
	32.5	0.84	1.07	625.14	260	248	251	52	81	51	6	99	59.44
	35	0.84	1.07	626.63	260	249	250	51	81	51	6	100	59.44
6	37.5	0.87	1.12	628.13	260	249	250	51	81	51	6	86	60.49
	40	0.87	1.12	629.44	260	245	251	52	82	50	6	112	60.49
	42.5	0.87	1.12	631.15	260	245	250	52	82	49	6	99	60.49
7	45	0.87	1.12	632.67	260	245	250	52	82	48	6	99	60.49
	47.5	0.85	1.04	634.18	261	245	251	53	82	49	6	99	59.83
	50	0.85	1.04	635.68	261	245	251	55	82	49	6	99	59.83
8	52.5	0.85	1.04	637.18	261	245	251	55	82	49	6	99	59.83
	55	0.83	1.05	638.68	261	245	250	56	82	49	6	99	59.13
	57.5	0.83	1.05	640.16	261	245	250	54	80	50	6	100	59.13
	60			641.65									
Post-test Leak Check =		<0.02 at 15" Hg											
	Average	0.80	1.02	139.49	256	241	250	47	74	42	6	101	58

APPENDIX E

Summary of CEM Data

Kiln Stack, Baseline

O_2 (%)	CO_2 (%)
15.1	11.8

Test ID: Date: 30-Sep-18

Time	O_2 (%)	CO_2 (%)
12:06 to 16:25	15.3	11.4

Test ID: Date: Oct 1 2018

Time	O_2 (%)	CO_2 (%)
8:57 to 12:16	14.9	11.9

Test ID: Date: 2-Oct-18

Time	O_2 (%)	CO_2 (%)
8:08 to 12:29	15.1	12.2

Test 1 **Kiln Stack**				
Date	30-Sep-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.01		0.00	
System Post *(Csf)*	0.01		0.02	
Average *(Co)*	0.01		0.01	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.00%	*PASS*	0.10%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	9.95		10.3	
System Post *(Csf)*	10.02		10.3	
Average *(Cm)*	10.0		10.3	
System Bias Initial *(SBi)*	-0.2%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.1%	*PASS*	0.0%	*PASS*
Drift Assessment *(D)*	0.33%	*PASS*	0.00%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	15.27	15.30	11.39	11.39
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
12:06:00	15.4277	15.46	11.2698	11.27
12:07:00	15.417	15.45	11.2923	11.29
12:08:00	15.4203	15.45	11.2932	11.29
12:09:00	15.442	15.47	11.2726	11.27
12:10:00	15.3635	15.39	11.3262	11.33
12:11:00	15.3573	15.39	11.3326	11.33
12:12:00	15.3257	15.35	11.3799	11.38
12:13:00	15.3254	15.35	11.3714	11.37
12:14:00	15.3056	15.33	11.3877	11.39
12:15:00	15.2434	15.27	11.4479	11.45
12:16:00	15.1971	15.23	11.4798	11.48
12:17:00	15.2897	15.32	11.4352	11.44
12:18:00	15.1848	15.21	11.5116	11.51
12:19:00	15.2258	15.25	11.4758	11.48
12:20:00	15.1738	15.20	11.5253	11.53
12:21:00	15.2086	15.24	11.5068	11.51
12:22:00	15.2041	15.23	11.5075	11.51
12:23:00	15.2059	15.23	11.508	11.51
12:24:00	15.1703	15.20	11.5113	11.51
12:25:00	15.1784	15.21	11.5068	11.51
12:26:00	15.1745	15.20	11.5064	11.51
12:27:00	15.2285	15.26	11.4776	11.48
12:28:00	15.1913	15.22	11.4915	11.49
12:29:00	15.2144	15.24	11.4651	11.47
12:30:00	15.1811	15.21	11.5039	11.51
12:31:00	15.2494	15.28	11.4503	11.45
12:32:00	15.2013	15.23	11.4502	11.45
12:33:00	15.227	15.26	11.4407	11.44
12:34:00	15.1283	15.16	11.5096	11.51
12:35:00	15.1469	15.17	11.5043	11.51
12:36:00	15.149	15.18	11.5076	11.51
12:37:00	15.0923	15.12	11.5335	11.53
12:38:00	15.187	15.22	11.4681	11.47
12:39:00	15.1019	15.13	11.517	11.52
12:40:00	15.2037	15.23	11.4478	11.45
12:41:00	15.2925	15.32	11.394	11.40
12:42:00	15.205	15.23	11.4608	11.46
12:43:00	15.2565	15.28	11.4358	11.44
12:44:00	15.1793	15.21	11.4924	11.49
12:45:00	15.2282	15.26	11.4564	11.46
12:46:00	15.2692	15.30	11.4182	11.42
12:47:00	15.2903	15.32	11.3895	11.39
12:48:00	15.3453	15.37	11.3309	11.33
12:49:00	15.405	15.43	11.2791	11.28
12:50:00	15.4224	15.45	11.2371	11.24

Test 1 **Kiln Stack**				
Date	30-Sep-18			
Analyzer	**O_2**		**CO_2**	
Low				
12:51:00	15.4566	15.49	11.2023	11.20
12:52:00	15.4884	15.52	11.1685	11.17
12:53:00	15.3824	15.41	11.2361	11.24
12:54:00	15.3919	15.42	11.2229	11.22
12:55:00	15.3215	15.35	11.287	11.29
12:56:00	15.341	15.37	11.2715	11.27
12:57:00	15.2591	15.29	11.337	11.34
12:58:00	15.2418	15.27	11.3489	11.35
12:59:00	15.2769	15.31	11.3201	11.32
13:00:00	15.3169	15.35	11.29	11.29
13:01:00	15.288	15.32	11.2894	11.29
13:02:00	15.3386	15.37	11.2643	11.27
13:03:00	15.2635	15.29	11.306	11.31
13:04:00	15.3043	15.33	11.2648	11.27
13:05:00	15.301	15.33	11.2681	11.27
13:06:00	15.3218	15.35	11.2428	11.24
13:07:00	15.2769	15.31	11.2858	11.29
13:08:00	15.2833	15.31	11.2956	11.30
13:09:00	15.2516	15.28	11.3158	11.32
13:10:00	15.2792	15.31	11.3117	11.31
13:11:00	15.2557	15.28	11.3427	11.34
13:12:00	15.2917	15.32	11.335	11.34
13:13:00	15.2388	15.27	11.3942	11.40
13:14:00	15.2154	15.24	11.4315	11.43
13:15:00	15.0945	15.12	11.5514	11.55
13:16:00	15.2168	15.24	11.4465	11.45
13:17:00	15.2214	15.25	11.4245	11.43
13:18:00	15.3271	15.36	11.3508	11.35
13:19:00	15.3251	15.35	11.3403	11.34
13:20:00	15.3458	15.37	11.332	11.33
13:21:00	15.2548	15.28	11.3956	11.40
13:22:00	15.2817	15.31	11.391	11.39
13:23:00	15.3376	15.37	11.3471	11.35
13:24:00	15.2875	15.32	11.3803	11.38
13:25:00	15.2385	15.27	11.405	11.41
13:26:00	15.3245	15.35	11.3436	11.34
13:27:00	15.3149	15.34	11.3377	11.34
13:28:00	15.3065	15.33	11.3347	11.34
13:29:00	15.2755	15.30	11.3622	11.36
13:30:00	15.207	15.24	11.4135	11.41
13:31:00	15.2553	15.28	11.3832	11.38
13:32:00	15.2296	15.26	11.3885	11.39
13:33:00	15.2302	15.26	11.3772	11.38
13:34:00	15.1995	15.23	11.4027	11.40
13:35:00	15.1704	15.20	11.4051	11.41
13:36:00	15.224	15.25	11.3738	11.37
13:37:00	15.2411	15.27	11.3377	11.34
13:38:00	15.2456	15.27	11.3189	11.32
13:39:00	15.2759	15.30	11.3045	11.31
13:40:00	15.1971	15.23	11.351	11.35
13:41:00	15.2061	15.23	11.331	11.33
13:42:00	15.1925	15.22	11.3309	11.33
13:43:00	15.2365	15.26	11.2869	11.29
13:44:00	15.2601	15.29	11.2734	11.27
13:45:00	15.2459	15.27	11.2645	11.27
13:46:00	15.2723	15.30	11.2289	11.23
13:47:00	15.281	15.31	11.2153	11.22
13:48:00	15.2269	15.26	11.2519	11.25
13:49:00	15.2864	15.31	11.2023	11.20
13:50:00	15.285	15.31	11.1931	11.19
13:51:00	15.364	15.39	11.1254	11.13
13:52:00	15.387	15.42	11.11	11.11
13:53:00	15.3453	15.37	11.1207	11.12
13:54:00	15.3548	15.38	11.0937	11.09
13:55:00	15.4011	15.43	11.0662	11.07
13:56:00	15.426	15.45	11.0266	11.03
13:57:00	15.4802	15.51	10.9849	10.99
13:58:00	15.4108	15.44	11.0244	11.03
13:59:00	15.3807	15.41	11.0316	11.03
14:00:00	15.3631	15.39	11.0487	11.05
14:01:00	15.2813	15.31	11.1128	11.11
14:02:00	15.2697	15.30	11.1069	11.11
14:03:00	15.2216	15.25	11.155	11.16
14:04:00	15.282	15.31	11.1017	11.10
14:05:00	15.3537	15.38	11.0499	11.05

Test 1 **Kiln Stack**				
Date	30-Sep-18			
Analyzer	**O_2**		**CO_2**	
Low				
14:06:00	15.3249	15.35	11.0629	11.06
14:07:00	15.3119	15.34	11.0752	11.08
14:08:00	15.3119	15.34	11.0863	11.09
14:09:00	15.2454	15.27	11.1418	11.14
14:10:00	15.2556	15.28	11.136	11.14
14:11:00	15.2735	15.30	11.1343	11.14
14:12:00	15.4022	15.43	11.0265	11.03
14:13:00	15.3106	15.34	11.1012	11.10
14:14:00	15.2901	15.32	11.1255	11.13
14:15:00	15.2607	15.29	11.1452	11.15
14:16:00	15.3199	15.35	11.1114	11.11
14:17:00	15.1955	15.22	11.1945	11.20
14:18:00	15.2492	15.28	11.156	11.16
14:19:00	15.2477	15.28	11.1843	11.19
14:20:00	15.2057	15.23	11.2407	11.24
14:21:00	15.1549	15.18	11.3182	11.32
14:22:00	15.1149	15.14	11.3694	11.37
14:23:00	15.1503	15.18	11.346	11.35
14:24:00	15.1377	15.17	11.3824	11.38
14:25:00	15.1104	15.14	11.4135	11.41
14:26:00	15.2082	15.24	11.3541	11.36
14:27:00	15.1644	15.19	11.3804	11.38
14:28:00	15.1511	15.18	11.4078	11.41
14:29:00	15.1604	15.19	11.4153	11.42
14:30:00	15.187	15.22	11.4037	11.40
14:31:00	15.2416	15.27	11.3514	11.35
14:32:00	15.2954	15.32	11.309	11.31
14:33:00	15.1897	15.22	11.3789	11.38
14:34:00	15.2565	15.28	11.3286	11.33
14:35:00	15.2462	15.27	11.3295	11.33
14:36:00	15.2786	15.31	11.3001	11.30
14:37:00	15.2583	15.29	11.3229	11.32
14:38:00	15.1656	15.19	11.3849	11.39
14:39:00	15.1811	15.21	11.37	11.37
14:40:00	15.2269	15.26	11.326	11.33
14:41:00	15.2094	15.24	11.3216	11.32
14:42:00	15.2289	15.26	11.3153	11.32
14:43:00	15.1168	15.14	11.3871	11.39
14:44:00	15.1429	15.17	11.3642	11.37
14:45:00	15.159	15.19	11.3618	11.36
14:46:00	15.161	15.19	11.3478	11.35
14:47:00	15.147	15.17	11.3414	11.34
14:48:00	15.1336	15.16	11.3649	11.37
14:49:00	15.1999	15.23	11.3012	11.30
14:50:00	15.2971	15.33	11.2325	11.23
14:51:00	15.3165	15.34	11.2095	11.21
14:52:00	15.3793	15.41	11.1649	11.17
14:53:00	15.3263	15.35	11.2189	11.22
14:54:00	15.3573	15.39	11.1967	11.20
14:55:00	15.3622	15.39	11.1812	11.18
14:56:00	15.3599	15.39	11.1946	11.20
14:57:00	15.3892	15.42	11.165	11.17
14:58:00	15.4392	15.47	11.1297	11.13
14:59:00	15.4336	15.46	11.114	11.11
15:00:00	15.4171	15.45	11.1266	11.13
15:01:00	15.461	15.49	11.1057	11.11
15:02:00	15.4452	15.47	11.1099	11.11
15:03:00	15.5341	15.56	11.0499	11.05
15:04:00	15.3913	15.42	11.169	11.17
15:05:00	15.3655	15.39	11.1762	11.18
15:06:00	15.4264	15.46	11.1369	11.14
15:07:00	15.4094	15.44	11.1362	11.14
15:08:00	15.5075	15.54	11.0432	11.04
15:09:00	15.5317	15.56	11.0335	11.03
15:10:00	15.3963	15.42	11.1197	11.12
15:11:00	15.4768	15.51	11.0551	11.06
15:12:00	15.4786	15.51	11.0631	11.06
15:13:00	15.5107	15.54	11.0265	11.03
15:14:00	15.5501	15.58	10.9971	11.00
15:15:00	15.5627	15.59	10.9983	11.00
15:16:00	15.5014	15.53	11.0385	11.04
15:17:00	15.4879	15.52	11.0635	11.06
15:18:00	15.4754	15.50	11.0689	11.07
15:19:00	15.5684	15.60	10.988	10.99
15:20:00	15.5357	15.56	10.9947	11.00

Test 1 **Kiln Stack**				
Date	30-Sep-18			
Analyzer	**O_2**		**CO_2**	
Low				
15:21:00	15.6389	15.67	10.9217	10.92
15:22:00	15.6548	15.68	10.9177	10.92
15:23:00	15.591	15.62	10.9665	10.97
15:24:00	15.5826	15.61	10.9569	10.96
15:25:00	15.5331	15.56	11.0045	11.01
15:26:00	15.5334	15.56	11.0119	11.01
15:27:00	15.566	15.59	10.9861	10.99
15:28:00	15.5264	15.56	11.0163	11.02
15:29:00	15.5186	15.55	11.031	11.03
15:30:00	15.562	15.59	11.0067	11.01
15:31:00	15.494	15.52	11.0682	11.07
15:32:00	15.5635	15.59	11.0355	11.04
15:33:00	15.546	15.57	11.0724	11.07
15:34:00	15.4642	15.49	11.1289	11.13
15:35:00	15.4424	15.47	11.1602	11.16
15:36:00	15.411	15.44	11.1826	11.18
15:37:00	15.4797	15.51	11.1392	11.14
15:38:00	15.4014	15.43	11.2139	11.21
15:39:00	15.2986	15.33	11.285	11.29
15:40:00	15.3823	15.41	11.2365	11.24
15:41:00	15.4524	15.48	11.1747	11.18
15:42:00	15.4616	15.49	11.1364	11.14
15:43:00	15.4451	15.47	11.1454	11.15
15:44:00	15.4973	15.53	11.1106	11.11
15:45:00	15.4737	15.50	11.1149	11.12
15:46:00	15.4804	15.51	11.1052	11.11
15:47:00	15.457	15.49	11.1199	11.12
15:48:00	15.4943	15.52	11.0878	11.09
15:49:00	15.4492	15.48	11.1181	11.12
15:50:00	15.4501	15.48	11.1051	11.11
15:51:00	15.4485	15.48	11.1062	11.11
15:52:00	15.4151	15.44	11.1258	11.13
15:53:00	15.4595	15.49	11.0765	11.08
15:54:00	15.483	15.51	11.0606	11.06
15:55:00	15.4856	15.51	11.0435	11.04
15:56:00	15.4686	15.50	11.0303	11.03
15:57:00	15.5039	15.53	10.9907	10.99
15:58:00	15.5367	15.57	10.9657	10.97
15:59:00	15.541	15.57	10.9436	10.94
16:00:00	15.5617	15.59	10.9319	10.93
16:01:00	15.53	15.56	10.9525	10.95
16:02:00	15.5049	15.53	10.966	10.97
16:03:00	15.4944	15.52	10.9719	10.97
16:04:00	15.4594	15.49	10.9936	10.99
16:05:00	15.4544	15.48	11.0012	11.00
16:06:00	15.4253	15.45	11.0255	11.03
16:07:00	15.3773	15.41	11.0576	11.06
16:08:00	15.4121	15.44	11.0499	11.05
16:09:00	15.3741	15.40	11.0733	11.07
16:10:00	15.3822	15.41	11.0533	11.05
16:11:00	15.4467	15.48	11.0194	11.02
16:12:00	15.4379	15.47	11.0154	11.02
16:13:00	15.4827	15.51	10.9881	10.99
16:14:00	15.3765	15.41	11.0497	11.05
16:15:00	15.4677	15.50	10.9955	11.00
16:16:00	15.4324	15.46	11.0271	11.03
16:17:00	15.4334	15.46	11.0193	11.02
16:18:00	15.4285	15.46	11.033	11.03
16:19:00	15.376	15.40	11.0736	11.07
16:20:00	15.41	15.44	11.0304	11.03
16:21:00	15.4821	15.51	10.9984	11.00
16:22:00	15.4296	15.46	11.0355	11.04
16:23:00	15.5475	15.58	10.9489	10.95
16:24:00	15.4524	15.48	11.0227	11.02
16:25:00	15.4545	15.48	11.0271	11.03

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.01		0.00	
System Post *(Csf)*	0.01		0.02	
Average *(Co)*	0.01		0.01	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.00%	*PASS*	0.10%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	9.9		10.31	
System Post *(Csf)*	10.1		10.33	
Average *(Cm)*	10.0		10.31	
System Bias Initial *(SBi)*	-0.5%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.5%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.95%	*PASS*	0.10%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	14.87	14.87	11.90	11.89
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
8:57:00	14.7827	14.79	12.1316	12.12
8:58:00	14.7707	14.78	12.14	12.13
8:59:00	14.7927	14.80	12.1182	12.11
9:00:00	14.7989	14.80	12.122	12.11
9:01:00	14.753	14.76	12.1317	12.12
9:02:00	14.8117	14.82	12.0872	12.08
9:03:00	14.8181	14.82	12.0834	12.07
9:04:00	14.7841	14.79	12.0885	12.08
9:05:00	14.7727	14.78	12.0772	12.07
9:06:00	14.7972	14.80	12.0552	12.05
9:07:00	14.7472	14.75	12.0991	12.09
9:08:00	14.7353	14.74	12.1119	12.10
9:09:00	14.7013	14.71	12.1281	12.12
9:10:00	14.7261	14.73	12.1025	12.09
9:11:00	14.7855	14.79	12.0596	12.05
9:12:00	14.7678	14.77	12.0726	12.06
9:13:00	14.8053	14.81	12.0645	12.05
9:14:00	14.7488	14.75	12.0907	12.08
9:15:00	14.7567	14.76	12.0861	12.08
9:16:00	14.8421	14.85	12.0264	12.02
9:17:00	14.7895	14.79	12.0494	12.04
9:18:00	14.7538	14.76	12.0674	12.06
9:19:00	14.7123	14.72	12.103	12.09
9:20:00	14.7393	14.74	12.0761	12.07
9:21:00	14.7269	14.73	12.0927	12.08
9:22:00	14.6997	14.70	12.0998	12.09
9:23:00	14.758	14.76	12.0326	12.02
9:24:00	14.7468	14.75	12.042	12.03
9:25:00	14.7683	14.77	12.0279	12.02
9:26:00	14.6923	14.70	12.0753	12.07
9:27:00	14.7443	14.75	12.0321	12.02
9:28:00	14.618	14.62	12.1171	12.11
9:29:00	14.6889	14.69	12.0682	12.06
9:30:00	14.6958	14.70	12.0702	12.06
9:31:00	14.6761	14.68	12.0984	12.09
9:32:00	14.7	14.70	12.0829	12.07
9:33:00	14.6798	14.68	12.0935	12.08
9:34:00	14.7416	14.75	12.0597	12.05
9:35:00	14.784	14.79	12.0227	12.01
9:36:00	14.7316	14.74	12.04	12.03
9:37:00	14.7694	14.77	12.0341	12.02
9:38:00	14.776	14.78	12.0095	12.00
9:39:00	14.756	14.76	12.011	12.00
9:40:00	14.7908	14.80	11.9886	11.98
9:41:00	14.7373	14.74	12.0166	12.01

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
9:42:00	14.8161	14.82	11.9531	11.94
9:43:00	14.816	14.82	11.9505	11.94
9:44:00	14.8837	14.89	11.8907	11.88
9:45:00	14.8819	14.89	11.878	11.87
9:46:00	14.8054	14.81	11.9261	11.92
9:47:00	14.7411	14.75	11.991	11.98
9:48:00	14.8022	14.81	11.9771	11.97
9:49:00	14.6888	14.69	12.0586	12.05
9:50:00	14.7194	14.72	12.0703	12.06
9:51:00	14.7501	14.75	12.0746	12.06
9:52:00	14.7536	14.76	12.0898	12.08
9:53:00	14.7217	14.73	12.1204	12.11
9:54:00	14.6869	14.69	12.1519	12.14
9:55:00	14.7389	14.74	12.1208	12.11
9:56:00	14.7535	14.76	12.1132	12.10
9:57:00	14.7238	14.73	12.123	12.11
9:58:00	14.6973	14.70	12.1493	12.14
9:59:00	14.7181	14.72	12.1319	12.12
10:00:00	14.7287	14.73	12.1219	12.11
10:01:00	14.7298	14.73	12.1063	12.10
10:02:00	14.6608	14.67	12.153	12.14
10:03:00	14.7741	14.78	12.0839	12.07
10:04:00	14.7247	14.73	12.1011	12.09
10:05:00	14.6734	14.68	12.1263	12.12
10:06:00	14.7578	14.76	12.0686	12.06
10:07:00	14.7564	14.76	12.0528	12.04
10:08:00	14.6614	14.67	12.1093	12.10
10:09:00	14.6933	14.70	12.079	12.07
10:10:00	14.6391	14.64	12.1068	12.10
10:11:00	14.6974	14.70	12.0561	12.05
10:12:00	14.7208	14.73	12.0382	12.03
10:13:00	14.7059	14.71	12.0419	12.03
10:14:00	14.7823	14.79	12.0025	11.99
10:15:00	14.7087	14.71	12.0493	12.04
10:16:00	14.6793	14.68	12.0629	12.05
10:17:00	14.6564	14.66	12.0746	12.06
10:18:00	14.6141	14.62	12.1059	12.10
10:19:00	14.6385	14.64	12.0989	12.09
10:20:00	14.5308	14.54	12.1522	12.14
10:21:00	14.6386	14.64	12.083	12.07
10:22:00	14.6869	14.69	12.0357	12.03
10:23:00	14.5601	14.56	12.1103	12.10
10:24:00	14.6016	14.61	12.1099	12.10
10:25:00	14.5081	14.51	12.1732	12.16
10:26:00	14.457	14.46	12.2165	12.21
10:27:00	14.4425	14.45	12.2236	12.21
10:28:00	14.5011	14.51	12.1659	12.16
10:29:00	14.6219	14.63	12.0671	12.06
10:30:00	14.6698	14.67	12.0232	12.01
10:31:00	14.834	14.84	11.8908	11.88
10:32:00	14.8303	14.84	11.8899	11.88
10:33:00	14.8685	14.87	11.8345	11.82
10:34:00	14.9217	14.93	11.7775	11.77
10:35:00	15.0561	15.06	11.6999	11.69
10:36:00	15.0751	15.08	11.656	11.65
10:37:00	15.1349	15.14	11.6095	11.60
10:38:00	15.1508	15.16	11.5872	11.58
10:39:00	15.1683	15.17	11.5587	11.55
10:40:00	15.2159	15.22	11.5138	11.50
10:41:00	15.2674	15.27	11.4774	11.47
10:42:00	15.2275	15.23	11.4827	11.47
10:43:00	15.166	15.17	11.5308	11.52
10:44:00	15.241	15.25	11.4688	11.46
10:45:00	15.1923	15.20	11.5051	11.50
10:46:00	15.24	15.25	11.463	11.45
10:47:00	15.2111	15.22	11.4739	11.46
10:48:00	15.2679	15.27	11.4395	11.43
10:49:00	15.2598	15.27	11.4382	11.43
10:50:00	15.2371	15.24	11.4497	11.44
10:51:00	15.2585	15.26	11.4493	11.44
10:52:00	15.2384	15.24	11.4624	11.45
10:53:00	15.2241	15.23	11.4882	11.48
10:54:00	15.1881	15.19	11.5234	11.51
10:55:00	15.1528	15.16	11.5534	11.54
10:56:00	15.2012	15.21	11.5319	11.52

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
10:57:00	15.1182	15.12	11.5862	11.58
10:58:00	15.1761	15.18	11.5456	11.54
10:59:00	15.1457	15.15	11.5777	11.57
11:00:00	15.0957	15.10	11.6096	11.60
11:01:00	15.186	15.19	11.5484	11.54
11:02:00	15.1399	15.15	11.5852	11.58
11:03:00	15.0822	15.09	11.6266	11.62
11:04:00	15.1131	15.12	11.6175	11.61
11:05:00	15.0603	15.07	11.6534	11.64
11:06:00	15.0334	15.04	11.6804	11.67
11:07:00	15.0136	15.02	11.6958	11.69
11:08:00	14.9432	14.95	11.7443	11.73
11:09:00	15.0176	15.02	11.683	11.67
11:10:00	15.1068	15.11	11.6327	11.62
11:11:00	15.0837	15.09	11.6317	11.62
11:12:00	15.0634	15.07	11.6694	11.66
11:13:00	15.1169	15.12	11.643	11.63
11:14:00	15.139	15.14	11.6354	11.63
11:15:00	15.1373	15.14	11.6426	11.63
11:16:00	15.062	15.07	11.7053	11.70
11:17:00	15.0738	15.08	11.695	11.69
11:18:00	15.0588	15.06	11.7025	11.69
11:19:00	15.0553	15.06	11.6991	11.69
11:20:00	15.062	15.07	11.7008	11.69
11:21:00	15.0101	15.02	11.7283	11.72
11:22:00	15.0523	15.06	11.6843	11.67
11:23:00	15.0303	15.04	11.7211	11.71
11:24:00	15.0407	15.05	11.7191	11.71
11:25:00	15.0574	15.06	11.7176	11.71
11:26:00	15.1487	15.15	11.6581	11.65
11:27:00	15.0601	15.07	11.7198	11.71
11:28:00	15.0577	15.06	11.7396	11.73
11:29:00	15.1385	15.14	11.6828	11.67
11:30:00	15.2086	15.21	11.634	11.62
11:31:00	15.2259	15.23	11.6138	11.60
11:32:00	15.135	15.14	11.6672	11.66
11:33:00	15.207	15.21	11.6083	11.60
11:34:00	15.1945	15.20	11.603	11.59
11:35:00	15.1936	15.20	11.5889	11.58
11:36:00	15.2774	15.28	11.5189	11.51
11:37:00	15.2743	15.28	11.5104	11.50
11:38:00	15.2266	15.23	11.5285	11.52
11:39:00	15.2668	15.27	11.4907	11.48
11:40:00	15.1684	15.17	11.5407	11.53
11:41:00	15.2129	15.22	11.5195	11.51
11:42:00	15.1604	15.17	11.5393	11.53
11:43:00	15.1705	15.18	11.5344	11.52
11:44:00	15.1536	15.16	11.5435	11.53
11:45:00	15.1848	15.19	11.5126	11.50
11:46:00	15.1043	15.11	11.5744	11.56
11:47:00	15.1209	15.13	11.5935	11.58
11:48:00	15.1067	15.11	11.6068	11.60
11:49:00	15.1618	15.17	11.5941	11.58
11:50:00	15.1622	15.17	11.5953	11.59
11:51:00	15.2293	15.23	11.5586	11.55
11:52:00	15.2068	15.21	11.5653	11.56
11:53:00	15.1976	15.20	11.5671	11.56
11:54:00	15.2179	15.22	11.5502	11.54
11:55:00	15.2277	15.23	11.5451	11.54
11:56:00	15.1698	15.17	11.5594	11.55
11:57:00	15.2712	15.28	11.4887	11.48
11:58:00	15.2541	15.26	11.4845	11.47
11:59:00	15.2348	15.24	11.4953	11.49
12:00:00	15.2605	15.27	11.4715	11.46
12:01:00	15.1974	15.20	11.5051	11.50
12:02:00	15.1916	15.20	11.5024	11.49
12:03:00	15.219	15.22	11.4925	11.48
12:04:00	15.2461	15.25	11.4456	11.44
12:05:00	15.3497	15.36	11.3773	11.37
12:06:00	15.3141	15.32	11.3971	11.39
12:07:00	15.2107	15.22	11.4645	11.45
12:08:00	15.2404	15.25	11.4407	11.43
12:09:00	15.2337	15.24	11.4311	11.42
12:10:00	15.3209	15.33	11.3707	11.36
12:11:00	15.307	15.31	11.3677	11.36

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
12:12:00	15.3092	15.31	11.353	11.34
12:13:00	15.3377	15.34	11.3422	11.33
12:14:00	15.315	15.32	11.3511	11.34
12:15:00	15.2438	15.25	11.4058	11.40
12:16:00	15.2252	15.23	11.4081	11.40

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.00		0.03	
System Post *(Csf)*	0.01		0.04	
Average *(Co)*	0.01		0.04	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.2%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.2%	*PASS*
Drift Assessment *(D)*	0.05%	*PASS*	0.05%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	10.2		10.29	
System Post *(Csf)*	10.1		10.28	
Average *(Cm)*	10.2		10.29	
System Bias Initial *(SBi)*	1.0%	*PASS*	-0.1%	*PASS*
System Bias Post *(SBf)*	0.5%	*PASS*	-0.1%	*PASS*
Drift Assessment *(D)*	-0.48%	*PASS*	-0.05%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	15.31	15.09	12.18	12.19
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
8:08:00	15.105	14.88	12.6533	12.67
8:09:00	15.0453	14.83	12.6825	12.70
8:10:00	15.0392	14.82	12.6842	12.70
8:11:00	15.002	14.78	12.6995	12.72
8:12:00	15.0336	14.81	12.6723	12.69
8:13:00	15.0637	14.84	12.6368	12.66
8:14:00	15.1117	14.89	12.6024	12.62
8:15:00	15.1276	14.91	12.5668	12.59
8:16:00	15.058	14.84	12.6114	12.63
8:17:00	15.0188	14.80	12.6329	12.65
8:18:00	15.0054	14.79	12.6587	12.68
8:19:00	14.9835	14.76	12.6921	12.71
8:20:00	14.9028	14.68	12.755	12.78
8:21:00	15.0079	14.79	12.6664	12.69
8:22:00	14.9025	14.68	12.7466	12.77
8:23:00	15.0153	14.80	12.6671	12.69
8:24:00	14.938	14.72	12.7172	12.74
8:25:00	14.9907	14.77	12.681	12.70
8:26:00	14.9763	14.76	12.6884	12.71
8:27:00	14.9148	14.70	12.7433	12.76
8:28:00	14.8512	14.63	12.7811	12.80
8:29:00	14.904	14.69	12.7401	12.76
8:30:00	14.8739	14.66	12.7607	12.78
8:31:00	14.891	14.67	12.7451	12.77
8:32:00	14.8718	14.65	12.7532	12.77
8:33:00	14.8165	14.60	12.7983	12.82
8:34:00	14.8675	14.65	12.7648	12.79
8:35:00	14.9533	14.73	12.7082	12.73
8:36:00	15.0851	14.86	12.6112	12.63
8:37:00	15.1412	14.92	12.5743	12.59
8:38:00	15.172	14.95	12.5518	12.57
8:39:00	15.1936	14.97	12.5369	12.56
8:40:00	15.1798	14.96	12.5463	12.57
8:41:00	15.132	14.91	12.5821	12.60
8:42:00	15.2471	15.02	12.4919	12.51
8:43:00	15.2612	15.04	12.4835	12.50
8:44:00	15.2336	15.01	12.4996	12.52
8:45:00	15.3756	15.15	12.3872	12.41
8:46:00	15.3219	15.10	12.4251	12.44
8:47:00	15.3679	15.14	12.3852	12.40
8:48:00	15.4186	15.19	12.3347	12.35
8:49:00	15.368	15.14	12.3714	12.39
8:50:00	15.4042	15.18	12.321	12.34
8:51:00	15.1084	14.89	12.1433	12.16
8:52:00	15.088	14.87	12.1361	12.15

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
8:53:00	15.087	14.87	12.1419	12.16
8:54:00	15.0815	14.86	12.1503	12.17
8:55:00	15.0804	14.86	12.1656	12.18
8:56:00	15.0803	14.86	12.1829	12.20
8:57:00	15.0802	14.86	12.1943	12.21
8:58:00	15.0758	14.86	12.2021	12.22
8:59:00	15.0728	14.85	12.2106	12.23
9:00:00	15.0732	14.85	12.2154	12.23
9:01:00	15.2168	14.99	12.314	12.33
9:02:00	17.8173	17.56	10.6875	10.70
9:03:00	17.5148	17.26	11.0348	11.05
9:04:00	15.3896	15.16	12.3873	12.41
9:05:00	15.3833	15.16	12.3818	12.40
9:06:00	10.1486	10.00	9.5316	9.54
9:07:00	5.8561	5.77	8.0385	8.04
9:08:00	5.8482	5.76	8.0293	8.03
9:09:00	5.8476	5.76	8.0246	8.02
9:10:00	8.15	8.03	9.2816	9.29
9:11:00	15.1317	14.91	12.5731	12.59
9:12:00	15.0389	14.82	12.6749	12.70
9:13:00	15.0308	14.81	12.6831	12.70
9:14:00	15.0854	14.86	12.6397	12.66
9:15:00	15.0936	14.87	12.6404	12.66
9:16:00	15.1661	14.94	12.5815	12.60
9:17:00	15.1489	14.93	12.5851	12.61
9:18:00	15.2406	15.02	12.5173	12.54
9:19:00	15.1802	14.96	12.5592	12.58
9:20:00	15.2081	14.99	12.5472	12.57
9:21:00	15.0689	14.85	12.6435	12.66
9:22:00	15.1043	14.88	12.6118	12.63
9:23:00	14.9847	14.77	12.7089	12.73
9:24:00	15.0702	14.85	12.6437	12.66
9:25:00	15.0844	14.86	12.6248	12.65
9:26:00	15.1322	14.91	12.5948	12.61
9:27:00	15.2796	15.06	12.4817	12.50
9:28:00	15.4368	15.21	12.3861	12.41
9:29:00	15.459	15.23	12.3811	12.40
9:30:00	15.4194	15.19	12.4035	12.42
9:31:00	15.3478	15.12	12.4687	12.49
9:32:00	15.4672	15.24	12.371	12.39
9:33:00	15.5261	15.30	12.3226	12.34
9:34:00	15.4631	15.24	12.3654	12.38
9:35:00	15.627	15.40	12.2225	12.24
9:36:00	15.5755	15.35	12.2614	12.28
9:37:00	15.6686	15.44	12.2012	12.22
9:38:00	15.7471	15.52	12.1297	12.15
9:39:00	15.8374	15.61	12.0629	12.08
9:40:00	15.8149	15.58	12.0294	12.05
9:41:00	16.0789	15.84	11.8097	11.83
9:42:00	16.3298	16.09	11.6594	11.68
9:43:00	16.4269	16.19	11.6005	11.62
9:44:00	16.4193	16.18	11.6109	11.63
9:45:00	16.4147	16.18	11.6181	11.63
9:46:00	16.3673	16.13	11.6461	11.66
9:47:00	16.3951	16.16	11.6334	11.65
9:48:00	16.3936	16.15	11.6339	11.65
9:49:00	16.4172	16.18	11.6157	11.63
9:50:00	16.3226	16.08	11.6846	11.70
9:51:00	16.3676	16.13	11.6517	11.67
9:52:00	16.3533	16.11	11.6625	11.68
9:53:00	16.3813	16.14	11.6315	11.65
9:54:00	16.3881	16.15	11.6267	11.64
9:55:00	16.2876	16.05	11.6921	11.71
9:56:00	16.3327	16.09	11.6647	11.68
9:57:00	16.2775	16.04	11.7021	11.72
9:58:00	16.2688	16.03	11.7101	11.73
9:59:00	16.3253	16.09	11.664	11.68
10:00:00	16.3481	16.11	11.6551	11.67
10:01:00	16.3304	16.09	11.666	11.68
10:02:00	16.3053	16.07	11.6823	11.70
10:03:00	16.279	16.04	11.704	11.72
10:04:00	16.2725	16.03	11.7074	11.72
10:05:00	16.311	16.07	11.6808	11.70
10:06:00	16.2764	16.04	11.705	11.72
10:07:00	16.2387	16.00	11.7284	11.74

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
10:08:00	16.1372	15.90	11.7996	11.82
10:09:00	16.2195	15.98	11.7391	11.76
10:10:00	16.1659	15.93	11.7878	11.80
10:11:00	15.9013	15.67	11.9661	11.98
10:12:00	16.0867	15.85	11.8403	11.86
10:13:00	15.9374	15.70	11.9579	11.98
10:14:00	15.896	15.66	11.9849	12.00
10:15:00	15.5132	15.29	12.2603	12.28
10:16:00	15.8671	15.64	12.0054	12.02
10:17:00	15.7959	15.57	12.0289	12.05
10:18:00	15.804	15.57	12.0209	12.04
10:19:00	15.2113	14.99	12.4382	12.46
10:20:00	15.4316	15.21	12.2556	12.27
10:21:00	15.5991	15.37	12.1417	12.16
10:22:00	15.7686	15.54	12.0182	12.04
10:23:00	15.8551	15.62	11.9583	11.98
10:24:00	15.6544	15.43	12.0983	12.12
10:25:00	15.3413	15.12	12.3281	12.35
10:26:00	15.4676	15.24	12.2366	12.26
10:27:00	15.6748	15.45	12.0922	12.11
10:28:00	15.4872	15.26	12.2522	12.27
10:29:00	15.5981	15.37	12.1771	12.20
10:30:00	15.4486	15.22	12.3035	12.32
10:31:00	15.5844	15.36	12.2128	12.23
10:32:00	15.616	15.39	12.1845	12.20
10:33:00	15.6369	15.41	12.1687	12.19
10:34:00	15.4453	15.22	12.3231	12.34
10:35:00	15.477	15.25	12.3104	12.33
10:36:00	15.4475	15.22	12.3316	12.35
10:37:00	15.4432	15.22	12.3482	12.37
10:38:00	15.5643	15.34	12.266	12.28
10:39:00	15.6014	15.37	12.2352	12.25
10:40:00	15.5595	15.33	12.2584	12.28
10:41:00	15.6333	15.40	12.2147	12.23
10:42:00	15.5308	15.30	12.2744	12.29
10:43:00	15.6654	15.44	12.1724	12.19
10:44:00	15.6456	15.42	12.1784	12.20
10:45:00	15.697	15.47	12.1526	12.17
10:46:00	15.6154	15.39	12.2049	12.22
10:47:00	15.5276	15.30	12.2616	12.28
10:48:00	15.4893	15.26	12.2718	12.29
10:49:00	15.6508	15.42	12.1478	12.17
10:50:00	15.5867	15.36	12.1836	12.20
10:51:00	15.5502	15.32	12.2077	12.23
10:52:00	15.4189	15.19	12.3068	12.33
10:53:00	15.3632	15.14	12.3316	12.35
10:54:00	15.443	15.22	12.2826	12.30
10:55:00	15.384	15.16	12.3246	12.34
10:56:00	15.4302	15.20	12.2907	12.31
10:57:00	15.4673	15.24	12.2675	12.29
10:58:00	15.3792	15.15	12.3269	12.35
10:59:00	15.6035	15.38	12.1462	12.16
11:00:00	15.4591	15.23	12.2585	12.28
11:01:00	15.4336	15.21	12.2637	12.28
11:02:00	15.4161	15.19	12.2705	12.29
11:03:00	15.376	15.15	12.3065	12.33
11:04:00	15.3853	15.16	12.2991	12.32
11:05:00	15.2342	15.01	12.401	12.42
11:06:00	15.1639	14.94	12.4636	12.48
11:07:00	15.1228	14.90	12.4798	12.50
11:08:00	15.1622	14.94	12.468	12.49
11:09:00	15.0882	14.87	12.5155	12.54
11:10:00	15.2198	15.00	12.4061	12.43
11:11:00	15.3551	15.13	12.3176	12.34
11:12:00	15.379	15.15	12.2986	12.32
11:13:00	15.2708	15.05	12.3776	12.40
11:14:00	15.4321	15.21	12.251	12.27
11:15:00	15.6297	15.40	12.1013	12.12
11:16:00	15.5537	15.33	12.1555	12.17
11:17:00	15.53	15.30	12.1734	12.19
11:18:00	15.3805	15.16	12.2729	12.29
11:19:00	15.5075	15.28	12.1887	12.21
11:20:00	15.6918	15.46	12.0409	12.06
11:21:00	15.6244	15.40	12.0872	12.11
11:22:00	15.4343	15.21	12.2416	12.26

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
11:23:00	15.2303	15.01	12.3603	12.38
11:24:00	15.4756	15.25	12.2008	12.22
11:25:00	15.6049	15.38	12.1094	12.13
11:26:00	15.4086	15.18	12.237	12.26
11:27:00	15.4848	15.26	12.1779	12.20
11:28:00	15.6108	15.38	12.0944	12.11
11:29:00	15.5446	15.32	12.1531	12.17
11:30:00	15.4764	15.25	12.1724	12.19
11:31:00	15.5572	15.33	12.1199	12.14
11:32:00	15.7048	15.48	12.0165	12.03
11:33:00	15.6852	15.46	12.0225	12.04
11:34:00	15.5182	15.29	12.1467	12.16
11:35:00	15.3756	15.15	12.252	12.27
11:36:00	15.4378	15.21	12.2098	12.23
11:37:00	15.6754	15.45	12.0245	12.04
11:38:00	15.6355	15.41	12.0688	12.09
11:39:00	15.2956	15.07	12.3277	12.35
11:40:00	15.4105	15.19	12.2405	12.26
11:41:00	15.4574	15.23	12.1984	12.22
11:42:00	15.6231	15.39	12.0878	12.11
11:43:00	15.6376	15.41	12.0755	12.09
11:44:00	15.7695	15.54	11.9699	11.99
11:45:00	15.5902	15.36	12.0824	12.10
11:46:00	15.6083	15.38	12.0674	12.09
11:47:00	15.7344	15.50	11.9695	11.99
11:48:00	15.6737	15.44	12.0142	12.03
11:49:00	15.583	15.36	12.0952	12.11
11:50:00	15.3057	15.08	12.2967	12.32
11:51:00	15.3385	15.11	12.2576	12.28
11:52:00	15.2729	15.05	12.3088	12.33
11:53:00	15.3547	15.13	12.2535	12.27
11:54:00	15.2111	14.99	12.3369	12.36
11:55:00	15.1127	14.89	12.4137	12.43
11:56:00	15.1834	14.96	12.3526	12.37
11:57:00	15.0087	14.79	12.499	12.52
11:58:00	15.0874	14.87	12.4225	12.44
11:59:00	14.9847	14.77	12.5167	12.54
12:00:00	14.8327	14.62	12.6026	12.62
12:01:00	14.8849	14.67	12.5958	12.62
12:02:00	14.9292	14.71	12.5374	12.56
12:03:00	14.9026	14.68	12.5597	12.58
12:04:00	15.1444	14.92	12.3909	12.41
12:05:00	15.1062	14.89	12.3979	12.42
12:06:00	15.3453	15.12	12.2309	12.25
12:07:00	15.1479	14.93	12.3615	12.38
12:08:00	15.1669	14.95	12.3521	12.37
12:09:00	15.1808	14.96	12.3421	12.36
12:10:00	15.2602	15.04	12.2865	12.31
12:11:00	15.3245	15.10	12.2331	12.25
12:12:00	15.4029	15.18	12.2004	12.22
12:13:00	15.3915	15.17	12.2022	12.22
12:14:00	15.3619	15.14	12.2131	12.23
12:15:00	15.5082	15.28	12.1018	12.12
12:16:00	15.3507	15.13	12.2316	12.25
12:17:00	15.3105	15.09	12.2555	12.27
12:18:00	15.4364	15.21	12.15	12.17
12:19:00	15.3375	15.11	12.2403	12.26
12:20:00	15.5124	15.29	12.0892	12.11
12:21:00	15.4834	15.26	12.1254	12.14
12:22:00	15.4533	15.23	12.1467	12.16
12:23:00	15.4255	15.20	12.1583	12.18
12:24:00	15.2523	15.03	12.2783	12.30
12:25:00	15.3693	15.14	12.1942	12.21
12:26:00	15.2032	14.98	12.3085	12.33
12:27:00	15.3556	15.13	12.2055	12.22
12:28:00	15.3721	15.15	12.1938	12.21
12:29:00	15.377	15.15	12.2127	12.23

Summary of CEM Data

Kiln Stack with LCF

O_2 (%)	CO_2 (%)
15.0	11.5

Test ID: Date: 5-Oct-18

Time	O_2 (%)	CO_2 (%)
8:44 to 13:55	14.8	11.0

Test ID: Date: Oct 9 2018

Time	O_2 (%)	CO_2 (%)
9:35 to 13:52	15.1	11.6

Test ID: Date: 9-Oct-18

Time	O_2 (%)	CO_2 (%)
14:36 to 18:57	15.1	11.8

Test 1 **Kiln Stack**				
Date	5-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.01		0.00	
System Post *(Csf)*	0.01		0.02	
Average *(Co)*	0.01		0.01	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.00%	*PASS*	0.10%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	10.03		10.3	
System Post *(Csf)*	10.02		10.3	
Average *(Cm)*	10.0		10.3	
System Bias Initial *(SBi)*	0.1%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.1%	*PASS*	0.0%	*PASS*
Drift Assessment *(D)*	-0.05%	*PASS*	0.00%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	14.81	14.78	11.03	11.03
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
9:35:00	14.828	14.80	11.0698	11.07
9:36:00	14.842	14.81	11.0923	11.09
9:37:00	14.8691	14.84	11.0932	11.09
9:38:00	14.8424	14.81	11.0726	11.07
9:39:00	14.747	14.71	11.1262	11.13
9:40:00	14.8123	14.78	11.1326	11.13
9:41:00	14.7585	14.73	11.1799	11.18
9:42:00	14.7118	14.68	11.1714	11.17
9:43:00	14.6968	14.66	11.1877	11.19
9:44:00	14.7024	14.67	11.2479	11.25
9:45:00	14.669	14.64	11.2798	11.28
9:46:00	14.7115	14.68	11.2352	11.24
9:47:00	14.6681	14.64	11.3116	11.31
9:48:00	14.6859	14.65	11.2758	11.28
9:49:00	14.7358	14.70	11.3253	11.33
9:50:00	14.7465	14.71	11.3068	11.31
9:51:00	14.7786	14.75	11.3075	11.31
9:52:00	14.7524	14.72	11.308	11.31
9:53:00	14.7877	14.76	11.3113	11.31
9:54:00	14.8319	14.80	11.3068	11.31
9:55:00	14.7379	14.71	11.3064	11.31
9:56:00	14.7429	14.71	11.2776	11.28
9:57:00	14.7183	14.69	11.2915	11.29
9:58:00	14.7304	14.70	11.2651	11.27
9:59:00	14.7751	14.74	11.3039	11.30
10:00:00	14.7983	14.77	11.2503	11.25
10:01:00	14.8383	14.81	11.2502	11.25
10:02:00	14.7856	14.75	11.2407	11.24
10:03:00	14.7166	14.68	11.3096	11.31
10:04:00	14.8164	14.78	11.3043	11.31
10:05:00	14.7636	14.73	11.3076	11.31
10:06:00	14.9647	14.93	11.3335	11.33
10:07:00	14.9901	14.96	11.2681	11.27
10:08:00	14.9475	14.92	11.317	11.32
10:09:00	15.0477	15.02	11.2478	11.25
10:10:00	14.9757	14.94	11.194	11.19
10:11:00	14.948	14.92	11.2608	11.26
10:12:00	15.0094	14.98	11.2358	11.24
10:13:00	15.0204	14.99	11.2924	11.29
10:14:00	14.9732	14.94	11.2564	11.26
10:15:00	14.9819	14.95	11.2182	11.22
10:16:00	14.9088	14.88	11.1895	11.19
10:17:00	14.9741	14.94	11.1309	11.13
10:18:00	14.9835	14.95	11.0791	11.08
10:19:00	15.0129	14.98	11.0371	11.04

Test 1 **Kiln Stack**				
Date	5-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
10:20:00	15.0099	14.98	11.0023	11.00
10:21:00	15.0346	15.00	10.9685	10.97
10:22:00	15.0209	14.99	11.0361	11.04
10:23:00	15.0433	15.01	11.0229	11.02
10:24:00	14.9799	14.95	11.087	11.09
10:25:00	14.9652	14.93	11.0715	11.07
10:26:00	14.9812	14.95	11.137	11.14
10:27:00	14.9733	14.94	11.1489	11.15
10:28:00	15.04	15.01	11.1201	11.12
10:29:00	15.0374	15.00	11.09	11.09
10:30:00	14.965	14.93	11.0894	11.09
10:31:00	14.9661	14.93	11.0643	11.07
10:32:00	14.9547	14.92	11.106	11.11
10:33:00	14.9147	14.88	11.0648	11.07
10:34:00	14.9469	14.91	11.0681	11.07
10:35:00	14.974	14.94	11.0428	11.04
10:36:00	15.0491	15.02	11.0858	11.09
10:37:00	14.99	14.96	11.0956	11.10
10:38:00	15.0445	15.01	11.1158	11.12
10:39:00	15.1027	15.07	11.1117	11.11
10:40:00	15.1056	15.07	11.1427	11.14
10:41:00	15.0963	15.06	11.135	11.14
10:42:00	15.1303	15.10	11.1942	11.20
10:43:00	15.1218	15.09	11.2315	11.23
10:44:00	15.1095	15.08	11.3514	11.35
10:45:00	15.0456	15.01	11.2465	11.25
10:46:00	15.0453	15.01	11.2245	11.23
10:47:00	15.0193	14.99	11.1508	11.15
10:48:00	14.9391	14.91	11.1403	11.14
10:49:00	14.9467	14.91	11.132	11.13
10:50:00	14.9612	14.93	11.1956	11.20
10:51:00	14.9178	14.89	11.191	11.19
10:52:00	14.8938	14.86	11.1471	11.15
10:53:00	14.8861	14.85	11.1803	11.18
10:54:00	14.9638	14.93	11.205	11.21
10:55:00	14.9157	14.88	11.1436	11.14
10:56:00	14.8836	14.85	11.1377	11.14
10:57:00	14.8839	14.85	11.1347	11.14
10:58:00	14.9097	14.88	11.1622	11.16
10:59:00	14.8824	14.85	11.2135	11.21
11:00:00	14.9088	14.88	11.1832	11.18
11:01:00	14.9268	14.89	11.1885	11.19
11:02:00	14.9791	14.95	11.1772	11.18
11:03:00	14.8339	14.80	11.2027	11.20
11:04:00	14.8253	14.79	11.2051	11.21
11:05:00	14.85	14.82	11.1738	11.17
11:06:00	14.8648	14.83	11.1377	11.14
11:07:00	14.8945	14.86	11.1189	11.12
11:08:00	14.865	14.83	11.1045	11.11
11:09:00	14.8545	14.82	11.151	11.15
11:10:00	14.9135	14.88	11.131	11.13
11:11:00	14.8463	14.81	11.1309	11.13
11:12:00	14.9017	14.87	11.0869	11.09
11:13:00	14.9005	14.87	11.0734	11.07
11:14:00	14.873	14.84	11.0645	11.07
11:15:00	14.9211	14.89	11.0289	11.03
11:16:00	15.026	14.99	11.0153	11.02
11:17:00	15.0046	14.97	11.0519	11.05
11:18:00	14.9864	14.95	11.0023	11.00
11:19:00	15.0963	15.06	10.9931	10.99
11:20:00	15.145	15.11	10.9254	10.93
11:21:00	15.0852	15.05	10.91	10.91
11:22:00	14.9058	14.87	10.9207	10.92
11:23:00	14.896	14.86	10.8937	10.89
11:24:00	14.7614	14.73	10.8662	10.87
11:25:00	14.7699	14.74	10.8266	10.83
11:26:00	14.7667	14.73	10.7849	10.79
11:27:00	14.8003	14.77	10.8244	10.82
11:28:00	14.7738	14.74	10.8316	10.83
11:29:00	14.8106	14.78	10.8487	10.85
11:30:00	14.7767	14.74	10.9128	10.91
11:31:00	14.7748	14.74	10.9069	10.91
11:32:00	14.7204	14.69	10.955	10.96
11:33:00	14.7422	14.71	10.9017	10.90
11:34:00	14.77	14.74	10.8499	10.85

Test 1 **Kiln Stack**				
Date	5-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
11:35:00	14.7289	14.70	10.8629	10.86
11:36:00	14.7054	14.67	10.8752	10.88
11:37:00	14.7132	14.68	10.8863	10.89
11:38:00	14.6628	14.63	10.9418	10.94
11:39:00	14.6905	14.66	10.936	10.94
11:40:00	14.7764	14.74	10.9343	10.93
11:41:00	15.0685	15.04	10.8265	10.83
11:42:00	15.1051	15.07	10.9012	10.90
11:43:00	15.0762	15.04	10.9255	10.93
11:44:00	15.1651	15.13	10.9452	10.95
11:45:00	15.1876	15.15	10.9114	10.91
11:46:00	15.1791	15.15	10.9945	11.00
11:47:00	15.1326	15.10	10.956	10.96
11:48:00	15.213	15.18	10.9843	10.98
11:49:00	15.2192	15.19	11.0407	11.04
11:50:00	15.1576	15.12	11.1182	11.12
11:51:00	15.0955	15.06	11.1694	11.17
11:52:00	15.1527	15.12	11.146	11.15
11:53:00	15.1031	15.07	11.1824	11.18
11:54:00	15.0533	15.02	11.2135	11.21
11:55:00	15.0432	15.01	11.1541	11.15
11:56:00	14.9958	14.96	11.1804	11.18
11:57:00	15.0894	15.06	11.2078	11.21
11:58:00	15.0886	15.06	11.2153	11.22
11:59:00	15.1338	15.10	11.2037	11.20
12:00:00	15.1404	15.11	11.1514	11.15
12:01:00	15.0865	15.05	11.109	11.11
12:02:00	15.0082	14.98	11.1789	11.18
12:03:00	15.0166	14.98	11.1286	11.13
12:04:00	14.9843	14.95	11.1295	11.13
12:05:00	14.9998	14.97	11.1001	11.10
12:06:00	15.0362	15.00	11.1229	11.12
12:07:00	14.9349	14.90	11.1849	11.19
12:08:00	14.9671	14.93	11.17	11.17
12:09:00	14.9431	14.91	11.126	11.13
12:10:00	14.8981	14.87	11.1216	11.12
12:11:00	14.8917	14.86	11.1153	11.12
12:12:00	14.9262	14.89	11.1871	11.19
12:13:00	14.9645	14.93	11.1642	11.17
12:14:00	14.9573	14.92	11.1618	11.16
12:15:00	14.9936	14.96	11.1478	11.15
12:16:00	14.9817	14.95	11.1414	11.14
12:17:00	14.971	14.94	11.1649	11.17
12:18:00	14.9743	14.94	11.1012	11.10
12:19:00	14.996	14.96	11.0325	11.03
12:20:00	14.7175	14.69	11.0095	11.01
12:21:00	14.7113	14.68	10.9649	10.97
12:22:00	14.6797	14.65	11.0189	11.02
12:23:00	14.6794	14.65	10.9967	11.00
12:24:00	14.6596	14.63	10.9812	10.98
12:25:00	14.5974	14.57	10.9946	11.00
12:26:00	14.5511	14.52	10.965	10.97
12:27:00	14.6437	14.61	10.9297	10.93
12:28:00	14.5388	14.51	10.914	10.91
12:29:00	14.5798	14.55	10.9266	10.93
12:30:00	14.5278	14.50	10.9057	10.91
12:31:00	14.5626	14.53	10.9099	10.91
12:32:00	14.5581	14.53	10.8499	10.85
12:33:00	14.5599	14.53	10.969	10.97
12:34:00	14.5243	14.49	10.9762	10.98
12:35:00	14.5324	14.50	10.9369	10.94
12:36:00	14.5285	14.50	10.9362	10.94
12:37:00	14.5825	14.55	10.8432	10.84
12:38:00	14.5453	14.51	10.8335	10.83
12:39:00	14.5684	14.54	10.9197	10.92
12:40:00	14.5351	14.50	10.8551	10.86
12:41:00	14.6034	14.57	10.8631	10.86
12:42:00	14.5553	14.52	10.8265	10.83
12:43:00	14.581	14.55	10.7971	10.80
12:44:00	14.4823	14.45	10.7983	10.80
12:45:00	14.5009	14.47	10.8385	10.84
12:46:00	14.503	14.47	10.8635	10.86
12:47:00	14.4463	14.41	10.8689	10.87
12:48:00	14.541	14.51	10.788	10.79
12:49:00	14.4559	14.42	10.7947	10.80

Test 1 **Kiln Stack**				
Date	5-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
12:50:00	14.5577	14.53	10.7217	10.72
12:51:00	14.6465	14.61	10.7177	10.72
12:52:00	14.559	14.53	10.7665	10.77
12:53:00	14.6105	14.58	10.7569	10.76
12:54:00	14.5333	14.50	10.8045	10.80
12:55:00	14.5822	14.55	10.8119	10.81
12:56:00	14.6232	14.59	10.7861	10.79
12:57:00	14.6443	14.61	10.8163	10.82
12:58:00	14.6993	14.67	10.831	10.83
12:59:00	14.759	14.73	10.8067	10.81
13:00:00	14.7764	14.74	10.8682	10.87
13:01:00	14.8106	14.78	10.8355	10.84
13:02:00	14.8424	14.81	10.8724	10.87
13:03:00	14.7364	14.70	10.9289	10.93
13:04:00	14.7459	14.71	10.9602	10.96
13:05:00	14.6755	14.64	10.9826	10.98
13:06:00	14.695	14.66	10.9392	10.94
13:07:00	14.6131	14.58	11.0139	11.01
13:08:00	14.5958	14.56	11.085	11.09
13:09:00	14.6309	14.60	11.0365	11.04
13:10:00	14.6709	14.64	10.9747	10.98
13:11:00	14.642	14.61	10.9364	10.94
13:12:00	14.6926	14.66	10.9454	10.95
13:13:00	14.6175	14.59	10.9106	10.91
13:14:00	14.6583	14.63	10.9149	10.92
13:15:00	14.655	14.62	10.9052	10.91
13:16:00	14.6758	14.64	10.9199	10.92
13:17:00	14.6309	14.60	10.8878	10.89
13:18:00	14.6373	14.61	10.9181	10.92
13:19:00	14.6056	14.57	10.9051	10.91
13:20:00	14.6332	14.60	10.9062	10.91
13:21:00	14.6097	14.58	10.9258	10.93
13:22:00	14.6457	14.61	10.8765	10.88
13:23:00	14.5928	14.56	10.8606	10.86
13:24:00	14.5694	14.54	10.8435	10.84
13:25:00	14.4485	14.42	10.8303	10.83
13:26:00	14.5708	14.54	10.7907	10.79
13:27:00	14.5754	14.54	10.7657	10.77
13:28:00	14.6811	14.65	10.7436	10.74
13:29:00	14.6791	14.65	10.7319	10.73
13:30:00	14.6998	14.67	10.7525	10.75
13:31:00	14.6088	14.58	10.766	10.77
13:32:00	14.6357	14.60	10.7719	10.77
13:33:00	14.6916	14.66	10.7936	10.79
13:34:00	14.6415	14.61	10.8012	10.80
13:35:00	14.5925	14.56	10.8255	10.83
13:36:00	14.6785	14.65	10.8576	10.86
13:37:00	14.6689	14.64	10.8499	10.85
13:38:00	14.6605	14.63	10.8733	10.87
13:39:00	14.6295	14.60	10.8533	10.85
13:40:00	14.561	14.53	10.8194	10.82
13:41:00	14.6093	14.58	10.8154	10.82
13:42:00	14.5836	14.55	10.7881	10.79
13:43:00	14.5842	14.55	10.8497	10.85
13:44:00	14.5535	14.52	10.7955	10.80
13:45:00	14.5244	14.49	10.8271	10.83
13:46:00	14.578	14.55	10.8193	10.82
13:47:00	14.626	14.59	10.833	10.83
13:48:00	14.6046	14.57	10.8736	10.87
13:49:00	14.5864	14.55	10.8304	10.83
13:50:00	14.6963	14.66	10.7984	10.80
13:51:00	14.745	14.71	10.8355	10.84
13:52:00	14.6852	14.65	10.7489	10.75
13:53:00	14.5058	14.47	10.8227	10.82
13:54:00	14.496	14.46	10.8271	10.83

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.01		0.00	
System Post *(Csf)*	0.01		0.02	
Average *(Co)*	0.01		0.01	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.00%	*PASS*	0.10%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	9.9		10.31	
System Post *(Csf)*	10.1		10.33	
Average *(Cm)*	10.0		10.31	
System Bias Initial *(SBi)*	-0.5%	*PASS*	0.0%	*PASS*
System Bias Post *(SBf)*	0.5%	*PASS*	0.1%	*PASS*
Drift Assessment *(D)*	0.95%	*PASS*	0.10%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	15.10	15.10	11.60	11.59
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
9:25:00	14.8327	14.84	11.8316	11.82
9:26:00	14.8207	14.83	11.84	11.83
9:27:00	14.8427	14.85	11.8182	11.81
9:28:00	14.8489	14.85	11.822	11.81
9:29:00	14.803	14.81	11.8317	11.82
9:30:00	14.8617	14.87	11.7872	11.78
9:31:00	14.8681	14.87	11.7834	11.77
9:32:00	14.8341	14.84	11.7885	11.78
9:33:00	14.8227	14.83	11.7772	11.77
9:34:00	14.8472	14.85	11.7552	11.75
9:35:00	14.7972	14.80	11.7991	11.79
9:36:00	14.7853	14.79	11.8119	11.80
9:37:00	14.7513	14.76	11.8281	11.82
9:38:00	14.7761	14.78	11.8025	11.79
9:39:00	14.8355	14.84	11.7596	11.75
9:40:00	14.8178	14.82	11.7726	11.76
9:41:00	14.8553	14.86	11.7645	11.75
9:42:00	14.7988	14.80	11.7907	11.78
9:43:00	14.8067	14.81	11.7861	11.78
9:44:00	14.8921	14.90	11.7264	11.72
9:45:00	14.8395	14.84	11.7494	11.74
9:46:00	14.8038	14.81	11.7674	11.76
9:47:00	14.7623	14.77	11.803	11.79
9:48:00	14.7893	14.79	11.7761	11.77
9:49:00	14.7769	14.78	11.7927	11.78
9:50:00	14.7497	14.75	11.7998	11.79
9:51:00	14.808	14.81	11.7326	11.72
9:52:00	14.7968	14.80	11.742	11.73
9:53:00	14.8183	14.82	11.7279	11.72
9:54:00	14.7423	14.75	11.7753	11.77
9:55:00	14.7943	14.80	11.7321	11.72
9:56:00	14.868	14.87	11.8171	11.81
9:57:00	14.9389	14.94	11.7682	11.76
9:58:00	14.9458	14.95	11.7702	11.76
9:59:00	14.9261	14.93	11.7984	11.79
10:00:00	14.95	14.95	11.7829	11.77
10:01:00	14.9298	14.93	11.7935	11.78
10:02:00	14.9916	15.00	11.7597	11.75
10:03:00	15.034	15.04	11.7227	11.71
10:04:00	14.9816	14.99	11.74	11.73
10:05:00	15.0194	15.02	11.7341	11.72
10:06:00	15.026	15.03	11.7095	11.70
10:07:00	15.006	15.01	11.711	11.70
10:08:00	15.0408	15.05	11.6886	11.68
10:09:00	14.9873	14.99	11.7166	11.71

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
10:10:00	15.0661	15.07	11.6531	11.64
10:11:00	15.066	15.07	11.6505	11.64
10:12:00	15.1337	15.14	11.5907	11.58
10:13:00	15.1319	15.14	11.578	11.57
10:14:00	15.0554	15.06	11.6261	11.62
10:15:00	14.9911	15.00	11.691	11.68
10:16:00	15.0522	15.06	11.6771	11.67
10:17:00	14.9388	14.94	11.7586	11.75
10:18:00	14.9694	14.97	11.7703	11.76
10:19:00	15.0001	15.01	11.7746	11.76
10:20:00	15.0036	15.01	11.7898	11.78
10:21:00	14.9717	14.98	11.8204	11.81
10:22:00	14.9369	14.94	11.8519	11.84
10:23:00	14.9889	14.99	11.8208	11.81
10:24:00	15.0035	15.01	11.8132	11.80
10:25:00	14.9738	14.98	11.823	11.81
10:26:00	14.9473	14.95	11.8493	11.84
10:27:00	14.9681	14.97	11.8319	11.82
10:28:00	14.9787	14.98	11.8219	11.81
10:29:00	14.9798	14.98	11.8063	11.80
10:30:00	14.9108	14.92	11.853	11.84
10:31:00	15.0241	15.03	11.7839	11.77
10:32:00	14.9747	14.98	11.8011	11.79
10:33:00	14.9234	14.93	11.8263	11.82
10:34:00	15.0078	15.01	11.7686	11.76
10:35:00	15.0064	15.01	11.7528	11.74
10:36:00	14.9114	14.92	11.8093	11.80
10:37:00	14.9433	14.95	11.779	11.77
10:38:00	14.8891	14.89	11.8068	11.80
10:39:00	14.9474	14.95	11.7561	11.75
10:40:00	14.9708	14.98	11.7382	11.73
10:41:00	14.9559	14.96	11.7419	11.73
10:42:00	15.0323	15.04	11.7025	11.69
10:43:00	14.9587	14.96	11.7493	11.74
10:44:00	14.9293	14.93	11.7629	11.75
10:45:00	14.9064	14.91	11.7746	11.76
10:46:00	14.8641	14.87	11.8059	11.80
10:47:00	14.8885	14.89	11.7989	11.79
10:48:00	14.7808	14.79	11.8522	11.84
10:49:00	14.8886	14.89	11.783	11.77
10:50:00	14.9369	14.94	11.7357	11.73
10:51:00	14.8101	14.81	11.8103	11.80
10:52:00	14.8516	14.86	11.8099	11.80
10:53:00	14.7581	14.76	11.8732	11.86
10:54:00	14.707	14.71	11.9165	11.91
10:55:00	14.6925	14.70	11.9236	11.91
10:56:00	14.7511	14.76	11.8659	11.86
10:57:00	14.8719	14.88	11.7671	11.76
10:58:00	14.9198	14.92	11.7232	11.71
10:59:00	15.084	15.09	11.5908	11.58
11:00:00	15.0803	15.09	11.5899	11.58
11:01:00	15.1185	15.12	11.5345	11.52
11:02:00	15.1717	15.18	11.4775	11.47
11:03:00	15.3061	15.31	11.3999	11.39
11:04:00	15.3251	15.33	11.356	11.35
11:05:00	15.4389	15.44	11.3095	11.30
11:06:00	15.4548	15.46	11.2872	11.28
11:07:00	15.4723	15.48	11.2587	11.25
11:08:00	15.5199	15.53	11.2138	11.20
11:09:00	15.5714	15.58	11.1774	11.17
11:10:00	15.5315	15.54	11.1827	11.17
11:11:00	15.47	15.48	11.2308	11.22
11:12:00	15.545	15.55	11.1688	11.16
11:13:00	15.4963	15.50	11.2051	11.20
11:14:00	15.544	15.55	11.163	11.15
11:15:00	15.5151	15.52	11.1739	11.16
11:16:00	15.5719	15.58	11.1395	11.13
11:17:00	15.5638	15.57	11.1382	11.13
11:18:00	15.5411	15.55	11.1497	11.14
11:19:00	15.5625	15.57	11.1493	11.14
11:20:00	15.5424	15.55	11.1624	11.15
11:21:00	15.5281	15.53	11.1882	11.18
11:22:00	15.4921	15.50	11.2234	11.21
11:23:00	15.4568	15.46	11.2534	11.24
11:24:00	15.5052	15.51	11.2319	11.22

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
11:25:00	15.4222	15.43	11.2862	11.28
11:26:00	15.4801	15.49	11.2456	11.24
11:27:00	15.4497	15.46	11.2777	11.27
11:28:00	15.3997	15.41	11.3096	11.30
11:29:00	15.49	15.50	11.2484	11.24
11:30:00	15.4439	15.45	11.2852	11.28
11:31:00	15.3862	15.39	11.3266	11.32
11:32:00	15.4171	15.42	11.3175	11.31
11:33:00	15.3643	15.37	11.3534	11.34
11:34:00	15.3374	15.34	11.3804	11.37
11:35:00	15.3176	15.32	11.3958	11.39
11:36:00	15.2472	15.25	11.4443	11.43
11:37:00	15.3216	15.33	11.383	11.37
11:38:00	15.4108	15.42	11.3327	11.32
11:39:00	15.3877	15.39	11.3317	11.32
11:40:00	15.3674	15.37	11.3694	11.36
11:41:00	15.4209	15.43	11.343	11.33
11:42:00	15.443	15.45	11.3354	11.33
11:43:00	15.4413	15.45	11.3426	11.33
11:44:00	15.366	15.37	11.4053	11.40
11:45:00	15.3778	15.38	11.395	11.39
11:46:00	15.3628	15.37	11.4025	11.39
11:47:00	15.3593	15.36	11.3991	11.39
11:48:00	15.366	15.37	11.4008	11.39
11:49:00	15.3141	15.32	11.4283	11.42
11:50:00	15.3563	15.36	11.3843	11.37
11:51:00	15.3343	15.34	11.4211	11.41
11:52:00	15.3447	15.35	11.4191	11.41
11:53:00	15.3614	15.37	11.4176	11.41
11:54:00	15.4527	15.46	11.3581	11.35
11:55:00	15.3641	15.37	11.4198	11.41
11:56:00	15.3617	15.37	11.4396	11.43
11:57:00	15.4425	15.45	11.3828	11.37
11:58:00	15.5126	15.52	11.334	11.32
11:59:00	15.5299	15.54	11.3138	11.30
12:00:00	15.439	15.44	11.3672	11.36
12:01:00	15.511	15.52	11.3083	11.30
12:02:00	15.4985	15.50	11.303	11.29
12:03:00	15.4976	15.50	11.2889	11.28
12:04:00	15.5814	15.59	11.2189	11.21
12:05:00	15.5783	15.58	11.2104	11.20
12:06:00	15.5306	15.54	11.2285	11.22
12:07:00	15.5708	15.58	11.1907	11.18
12:08:00	15.4724	15.48	11.2407	11.23
12:09:00	15.5169	15.52	11.2195	11.21
12:10:00	15.2644	15.27	11.2393	11.23
12:11:00	15.2745	15.28	11.2344	11.22
12:12:00	15.2576	15.26	11.2435	11.23
12:13:00	15.2888	15.29	11.2126	11.20
12:14:00	15.2083	15.21	11.2744	11.26
12:15:00	15.2249	15.23	11.2935	11.28
12:16:00	15.2107	15.22	11.3068	11.30
12:17:00	15.2658	15.27	11.2941	11.28
12:18:00	15.2662	15.27	11.2953	11.29
12:19:00	15.3333	15.34	11.2586	11.25
12:20:00	15.3108	15.32	11.2653	11.26
12:21:00	15.3016	15.31	11.2671	11.26
12:22:00	15.3219	15.33	11.2502	11.24
12:23:00	15.3317	15.34	11.2451	11.24
12:24:00	15.2738	15.28	11.2594	11.25
12:25:00	15.3752	15.38	11.1887	11.18
12:26:00	15.3581	15.36	11.1845	11.17
12:27:00	15.3388	15.34	11.1953	11.19
12:28:00	15.3645	15.37	11.1715	11.16
12:29:00	15.3014	15.31	11.2051	11.20
12:30:00	15.2956	15.30	11.2024	11.19
12:31:00	15.323	15.33	11.1925	11.18
12:32:00	15.3501	15.36	11.1456	11.14
12:33:00	15.4537	15.46	11.0773	11.07
12:34:00	15.4181	15.42	11.0971	11.09
12:35:00	15.3147	15.32	11.1645	11.15
12:36:00	15.3444	15.35	11.1407	11.13
12:37:00	15.3377	15.34	11.1311	11.12
12:38:00	15.4249	15.43	11.0707	11.06
12:39:00	15.411	15.42	11.0677	11.06

Test 2 **Kiln Stack**				
Date	1-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
12:40:00	15.4132	15.42	11.053	11.04
12:41:00	15.4417	15.45	11.0422	11.03
12:42:00	15.419	15.42	11.0511	11.04
12:43:00	15.201	15.21	11.1058	11.10
12:44:00	15.1998	15.21	11.1081	11.10
12:45:00	15.2255	15.23	11.1081	11.10
12:46:00	15.2352	15.24	11.1081	11.10
12:47:00	15.2796	15.28	11.1081	11.10
12:48:00	15.2924	15.30	11.1081	11.10
12:49:00	15.2191	15.22	11.1081	11.10
12:50:00	15.2413	15.25	11.1081	11.10
12:51:00	15.3339	15.34	11.1081	11.10
12:52:00	15.3345	15.34	11.1081	11.10
12:53:00	15.3457	15.35	11.1081	11.10
12:54:00	15.3539	15.36	11.1081	11.10
12:55:00	15.3649	15.37	11.1081	11.10
12:56:00	15.5161	15.52	11.1081	11.10
12:57:00	15.6079	15.61	11.1081	11.10
12:58:00	15.8599	15.87	11.1081	11.10
12:59:00	15.8838	15.89	11.1081	11.10
13:00:00	15.9188	15.92	11.1081	11.10
13:01:00	15.8838	15.89	11.1081	11.10
13:02:00	15.733	15.74	11.1081	11.10
13:03:00	15.7446	15.75	11.1081	11.10
13:04:00	15.8193	15.83	11.1081	11.10
13:05:00	15.8772	15.88	11.1081	11.10
13:06:00	15.8928	15.90	11.1081	11.10
13:07:00	15.8958	15.90	11.1081	11.10
13:08:00	15.8779	15.88	11.1081	11.10
13:09:00	15.8893	15.90	11.1081	11.10
13:10:00	15.859	15.86	11.1081	11.10
13:11:00	15.8996	15.91	11.1081	11.10
13:12:00	15.9419	15.95	11.1081	11.10
13:13:00	15.8993	15.91	11.1081	11.10
13:14:00	15.9767	15.98	11.1081	11.10
13:15:00	15.8996	15.91	11.1081	11.10
13:16:00	15.9313	15.94	11.1081	11.10
13:17:00	15.8487	15.85	11.1081	11.10
13:18:00	15.9179	15.92	11.1081	11.10
13:19:00	15.8749	15.88	11.1081	11.10
13:20:00	15.8074	15.81	11.1081	11.10
13:21:00	15.8101	15.82	11.1081	11.10
13:22:00	15.8203	15.83	11.1081	11.10
13:23:00	15.8157	15.82	11.1081	11.10
13:24:00	15.7689	15.77	11.1081	11.10
13:25:00	15.7561	15.76	11.1081	11.10
13:26:00	15.7757	15.78	11.1081	11.10
13:27:00	15.7263	15.73	11.1081	11.10
13:28:00	15.7008	15.71	11.1081	11.10
13:29:00	15.7028	15.71	11.1081	11.10
13:30:00	15.7239	15.73	11.1081	11.10
13:31:00	15.7225	15.73	11.1081	11.10
13:32:00	15.7177	15.72	11.1081	11.10
13:33:00	15.7749	15.78	11.1081	11.10
13:34:00	15.7186	15.72	11.1081	11.10
13:35:00	15.7076	15.71	11.1081	11.10
13:36:00	15.6724	15.68	11.1081	11.10
13:37:00	15.625	15.63	11.1081	11.10
13:38:00	15.623	15.63	11.1081	11.10
13:39:00	15.6634	15.67	11.1081	11.10
13:40:00	15.6316	15.64	11.1081	11.10
13:41:00	15.6762	15.68	11.1081	11.10
13:42:00	15.6844	15.69	11.1081	11.10
13:43:00	15.6783	15.68	11.1081	11.10
13:44:00	15.6474	15.65	11.1081	11.10
13:45:00	15.6719	15.68	11.1081	11.10
13:46:00	15.6166	15.62	11.1081	11.10
13:47:00	15.6013	15.61	11.1081	11.10
13:48:00	15.6211	15.63	11.1081	11.10
13:49:00	15.5663	15.57	11.1081	11.10
13:50:00	15.6133	15.62	11.1081	11.10
13:51:00	15.6485	15.65	11.1081	11.10
13:52:00	15.3792	15.38	11.1081	11.10

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
Zero Value *(Cv)*	0.0		0.0	
Direct *(C Dir)*	0		0	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	0.00		0.03	
System Post *(Csf)*	0.01		0.04	
Average *(Co)*	0.01		0.04	
System Bias Initial *(SBi)*	0.0%	*PASS*	0.2%	*PASS*
System Bias Post *(SBf)*	0.0%	*PASS*	0.2%	*PASS*
Drift Assessment *(D)*	0.05%	*PASS*	0.05%	*PASS*
Mid				
Mid Value *(Cv)*	10.0		10.30	
Direct *(C Dir)*	10.0		10.3	
Calibration Error *(ACE)*	0.00%	*PASS*	0.00%	*PASS*
System Initial *(Csi)*	10.2		10.29	
System Post *(Csf)*	10.1		10.28	
Average *(Cm)*	10.2		10.29	
System Bias Initial *(SBi)*	1.0%	*PASS*	-0.1%	*PASS*
System Bias Post *(SBf)*	0.5%	*PASS*	-0.1%	*PASS*
Drift Assessment *(D)*	-0.48%	*PASS*	-0.05%	*PASS*
High				
High Value *(CS/Cv)*	21.00		20.0	
Direct *(C Dir)*	20.85		20.1	
Calibration Error *(ACE)*	-0.71%	*PASS*	0.50%	*PASS*
System Initial *(Csi)*				
System Post *(Csf)*				
Average *(Cm)*	-		-	
System Bias Initial *(SBi)*	N/A	-	N/A	-
System Bias Post *(SBf)*	N/A	-	N/A	-
Drift Assessment *(D)*	N/A	-	N/A	-
Analyser Span (Range)	25		20	
Average	15.35	15.12	11.78	11.79
Time	**Recorded**	**Corrected**	**Recorded**	**Corrected**
14:36:00	15.005	14.79	12.2533	12.27
14:37:00	14.9453	14.73	12.2825	12.30
14:38:00	14.9392	14.72	12.2842	12.30
14:39:00	14.902	14.68	12.2995	12.32
14:40:00	14.9336	14.72	12.2723	12.29
14:41:00	14.9637	14.74	12.2368	12.26
14:42:00	15.0117	14.79	12.2024	12.22
14:43:00	15.0276	14.81	12.1668	12.19
14:44:00	14.958	14.74	12.2114	12.23
14:45:00	14.9188	14.70	12.2329	12.25
14:46:00	14.9054	14.69	12.2587	12.28
14:47:00	14.8835	14.67	12.2921	12.31
14:48:00	14.8028	14.59	12.355	12.37
14:49:00	14.9079	14.69	12.2664	12.29
14:50:00	14.8025	14.59	12.3466	12.37
14:51:00	14.9153	14.70	12.2671	12.29
14:52:00	14.838	14.62	12.3172	12.34
14:53:00	14.8907	14.67	12.281	12.30
14:54:00	14.8763	14.66	12.2884	12.31
14:55:00	14.8148	14.60	12.3433	12.36
14:56:00	14.7512	14.54	12.3811	12.40
14:57:00	14.804	14.59	12.3401	12.36
14:58:00	14.7739	14.56	12.3607	12.38
14:59:00	14.791	14.57	12.3451	12.36
15:00:00	14.7718	14.56	12.3532	12.37
15:01:00	14.7165	14.50	12.3983	12.42
15:02:00	14.7675	14.55	12.3648	12.38
15:03:00	14.8533	14.64	12.3082	12.33
15:04:00	14.9851	14.77	12.2112	12.23
15:05:00	15.0412	14.82	12.1743	12.19
15:06:00	15.072	14.85	12.1518	12.17
15:07:00	15.2936	15.07	12.1369	12.16
15:08:00	15.2798	15.06	12.1463	12.16
15:09:00	15.232	15.01	12.1821	12.20
15:10:00	15.3471	15.12	12.0919	12.11
15:11:00	15.3612	15.14	12.0835	12.10
15:12:00	15.3336	15.11	12.0996	12.12
15:13:00	15.4756	15.25	11.9872	12.00
15:14:00	15.4219	15.20	12.0251	12.04
15:15:00	15.4679	15.24	11.9852	12.00
15:16:00	15.5186	15.29	11.9347	11.95
15:17:00	15.468	15.24	11.9714	11.99
15:18:00	15.5042	15.28	11.921	11.94
15:19:00	15.2084	14.99	11.7433	11.76
15:20:00	15.188	14.97	11.7361	11.75

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
15:21:00	15.187	14.97	11.7419	11.76
15:22:00	15.1815	14.96	11.7503	11.77
15:23:00	15.1804	14.96	11.7656	11.78
15:24:00	15.1803	14.96	11.7829	11.80
15:25:00	15.1802	14.96	11.7943	11.81
15:26:00	15.1758	14.95	11.8021	11.82
15:27:00	15.1728	14.95	11.8106	11.83
15:28:00	15.1732	14.95	11.8154	11.83
15:29:00	15.3168	15.09	11.914	11.93
15:30:00	17.9173	17.66	10.2875	10.30
15:31:00	17.6148	17.36	10.6348	10.65
15:32:00	15.4896	15.26	11.9873	12.00
15:33:00	15.4833	15.26	11.9818	12.00
15:34:00	10.2486	10.10	9.1316	9.14
15:35:00	5.9561	5.87	7.6385	7.64
15:36:00	5.9482	5.86	7.6293	7.63
15:37:00	5.9476	5.86	7.6246	7.62
15:38:00	8.25	8.13	8.8816	8.89
15:39:00	15.2317	15.01	12.1731	12.19
15:40:00	15.1389	14.92	12.2749	12.29
15:41:00	15.1308	14.91	12.2831	12.30
15:42:00	15.1854	14.96	12.2397	12.26
15:43:00	15.1936	14.97	12.2404	12.26
15:44:00	15.2661	15.04	12.1815	12.20
15:45:00	15.2489	15.03	12.1851	12.20
15:46:00	15.3406	15.12	12.1173	12.14
15:47:00	15.2802	15.06	12.1592	12.18
15:48:00	15.3081	15.08	12.1472	12.17
15:49:00	15.1689	14.95	12.2435	12.26
15:50:00	15.2043	14.98	12.2118	12.23
15:51:00	15.0847	14.86	12.3089	12.33
15:52:00	15.1702	14.95	12.2437	12.26
15:53:00	15.1844	14.96	12.2248	12.24
15:54:00	15.2322	15.01	12.1948	12.21
15:55:00	15.3796	15.15	12.0817	12.10
15:56:00	15.5368	15.31	11.9861	12.00
15:57:00	15.559	15.33	11.9811	12.00
15:58:00	15.5194	15.29	12.0035	12.02
15:59:00	15.4478	15.22	12.0687	12.09
16:00:00	15.5672	15.34	11.971	11.99
16:01:00	15.6261	15.40	11.9226	11.94
16:02:00	15.5631	15.34	11.9654	11.98
16:03:00	15.727	15.50	11.8225	11.84
16:04:00	15.6755	15.45	11.8614	11.88
16:05:00	15.7686	15.54	11.8012	11.82
16:06:00	15.8471	15.62	11.7297	11.75
16:07:00	15.9374	15.70	11.6629	11.68
16:08:00	15.9149	15.68	11.6294	11.65
16:09:00	16.1789	15.94	11.4097	11.42
16:10:00	16.4298	16.19	11.2594	11.27
16:11:00	16.5269	16.29	11.2005	11.21
16:12:00	16.5193	16.28	11.2109	11.22
16:13:00	16.5147	16.27	11.2181	11.23
16:14:00	16.4673	16.23	11.2461	11.26
16:15:00	16.4951	16.25	11.2334	11.25
16:16:00	16.5476	16.31	11.2339	11.25
16:17:00	16.5712	16.33	11.2157	11.23
16:18:00	16.4766	16.24	11.2846	11.30
16:19:00	16.5216	16.28	11.2517	11.27
16:20:00	16.5073	16.27	11.2625	11.28
16:21:00	16.5353	16.29	11.2315	11.25
16:22:00	16.5421	16.30	11.2267	11.24
16:23:00	16.4416	16.20	11.2921	11.31
16:24:00	16.4867	16.25	11.2647	11.28
16:25:00	16.4315	16.19	11.3021	11.32
16:26:00	16.4228	16.18	11.3101	11.32
16:27:00	16.4793	16.24	11.264	11.28
16:28:00	16.5021	16.26	11.2551	11.27
16:29:00	16.4844	16.24	11.266	11.28
16:30:00	16.4593	16.22	11.2823	11.30
16:31:00	16.433	16.19	11.304	11.32
16:32:00	16.4265	16.19	11.3074	11.32
16:33:00	16.465	16.22	11.2808	11.30
16:34:00	16.4304	16.19	11.305	11.32
16:35:00	16.3927	16.15	11.3284	11.34

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
16:36:00	16.2912	16.05	11.3996	11.41
16:37:00	16.3735	16.13	11.3391	11.35
16:38:00	16.3199	16.08	11.3878	11.40
16:39:00	16.0553	15.82	11.5661	11.58
16:40:00	16.2407	16.00	11.4403	11.46
16:41:00	16.0914	15.86	11.5579	11.57
16:42:00	16.05	15.82	11.5849	11.60
16:43:00	15.6672	15.44	11.8603	11.88
16:44:00	16.0211	15.79	11.6054	11.62
16:45:00	15.9499	15.72	11.6289	11.64
16:46:00	15.958	15.72	11.6209	11.64
16:47:00	15.3653	15.14	12.0382	12.06
16:48:00	15.5856	15.36	11.8556	11.87
16:49:00	15.7531	15.52	11.7417	11.76
16:50:00	15.9226	15.69	11.6182	11.63
16:51:00	16.0091	15.78	11.5583	11.57
16:52:00	15.8084	15.58	11.6983	11.71
16:53:00	15.4953	15.27	11.9281	11.95
16:54:00	15.6216	15.39	11.8366	11.85
16:55:00	15.8288	15.60	11.6922	11.71
16:56:00	15.6412	15.41	11.8522	11.87
16:57:00	15.7521	15.52	11.7771	11.79
16:58:00	15.6026	15.37	11.9035	11.92
16:59:00	15.7384	15.51	11.8128	11.83
17:00:00	15.77	15.54	11.7845	11.80
17:01:00	15.7909	15.56	11.7687	11.79
17:02:00	15.5993	15.37	11.9231	11.94
17:03:00	15.631	15.40	11.9104	11.93
17:04:00	15.6015	15.37	11.9316	11.95
17:05:00	15.5972	15.37	11.9482	11.97
17:06:00	15.7183	15.49	11.866	11.88
17:07:00	15.7554	15.53	11.8352	11.85
17:08:00	15.7135	15.48	11.8584	11.88
17:09:00	15.7873	15.56	11.8147	11.83
17:10:00	15.6848	15.46	11.8744	11.89
17:11:00	15.8194	15.59	11.7724	11.79
17:12:00	15.7996	15.57	11.7784	11.79
17:13:00	15.851	15.62	11.7526	11.77
17:14:00	15.7694	15.54	11.8049	11.82
17:15:00	15.6816	15.45	11.8616	11.88
17:16:00	15.6433	15.41	11.8718	11.89
17:17:00	15.8048	15.57	11.7478	11.76
17:18:00	15.7407	15.51	11.7836	11.80
17:19:00	15.7042	15.47	11.8077	11.82
17:20:00	15.5729	15.35	11.9068	11.92
17:21:00	15.3172	15.09	11.9316	11.95
17:22:00	15.397	15.17	11.8826	11.90
17:23:00	15.338	15.11	11.9246	11.94
17:24:00	15.3842	15.16	11.8907	11.91
17:25:00	15.4213	15.20	11.8675	11.88
17:26:00	15.3332	15.11	11.9269	11.94
17:27:00	15.5575	15.33	11.7462	11.76
17:28:00	15.4131	15.19	11.8585	11.88
17:29:00	15.3876	15.16	11.8637	11.88
17:30:00	15.3701	15.15	11.8705	11.89
17:31:00	15.33	15.11	11.9065	11.92
17:32:00	15.3393	15.12	11.8991	11.92
17:33:00	15.1882	14.97	12.001	12.02
17:34:00	15.1179	14.90	12.0636	12.08
17:35:00	15.0768	14.86	12.0798	12.10
17:36:00	15.1162	14.90	12.068	12.09
17:37:00	15.0422	14.82	12.1155	12.13
17:38:00	15.1738	14.95	12.0061	12.02
17:39:00	15.3091	15.09	11.9176	11.93
17:40:00	15.333	15.11	11.8986	11.92
17:41:00	15.2248	15.00	11.9776	12.00
17:42:00	15.3861	15.16	11.851	11.87
17:43:00	15.5837	15.36	11.7013	11.72
17:44:00	15.5077	15.28	11.7555	11.77
17:45:00	15.484	15.26	11.7734	11.79
17:46:00	15.3345	15.11	11.8729	11.89
17:47:00	15.4615	15.24	11.7887	11.81
17:48:00	15.6458	15.42	11.6409	11.66
17:49:00	15.5784	15.35	11.6872	11.70
17:50:00	15.3883	15.16	11.8416	11.86

Test 3 **Kiln Stack**				
Date	2-Oct-18			
Analyzer	**O_2**		**CO_2**	
Low				
17:51:00	15.1843	14.96	11.9603	11.98
17:52:00	15.4296	15.20	11.8008	11.82
17:53:00	15.5589	15.33	11.7094	11.73
17:54:00	15.3626	15.14	11.837	11.85
17:55:00	15.4388	15.21	11.7779	11.79
17:56:00	15.5648	15.34	11.6944	11.71
17:57:00	15.4986	15.27	11.7531	11.77
17:58:00	15.4304	15.20	11.7724	11.79
17:59:00	15.5112	15.28	11.7199	11.74
18:00:00	15.6588	15.43	11.6165	11.63
18:01:00	15.6392	15.41	11.6225	11.64
18:02:00	15.4722	15.25	11.7467	11.76
18:03:00	15.3296	15.11	11.852	11.87
18:04:00	15.3918	15.17	11.8098	11.83
18:05:00	15.6294	15.40	11.6245	11.64
18:06:00	15.5895	15.36	11.6688	11.68
18:07:00	15.2496	15.03	11.9277	11.94
18:08:00	15.3645	15.14	11.8405	11.86
18:09:00	15.4114	15.19	11.7984	11.82
18:10:00	15.5771	15.35	11.6878	11.70
18:11:00	15.5916	15.36	11.6755	11.69
18:12:00	15.7235	15.49	11.5699	11.59
18:13:00	15.5442	15.32	11.6824	11.70
18:14:00	15.5623	15.33	11.6674	11.68
18:15:00	15.6884	15.46	11.5695	11.59
18:16:00	15.6277	15.40	11.6142	11.63
18:17:00	15.537	15.31	11.6952	11.71
18:18:00	15.2597	15.04	11.8967	11.91
18:19:00	15.2925	15.07	11.8576	11.87
18:20:00	15.2269	15.00	11.9088	11.93
18:21:00	15.3087	15.08	11.8535	11.87
18:22:00	15.1651	14.94	11.9369	11.95
18:23:00	15.0667	14.85	12.0137	12.03
18:24:00	15.1374	14.92	11.9526	11.97
18:25:00	14.9627	14.74	12.099	12.12
18:26:00	15.0414	14.82	12.0225	12.04
18:27:00	14.9387	14.72	12.1167	12.13
18:28:00	14.7867	14.57	12.2026	12.22
18:29:00	14.8389	14.62	12.1958	12.21
18:30:00	14.8832	14.67	12.1374	12.16
18:31:00	14.8566	14.64	12.1597	12.18
18:32:00	15.0984	14.88	11.9909	12.01
18:33:00	15.0602	14.84	11.9979	12.02
18:34:00	15.2993	15.08	11.8309	11.85
18:35:00	15.1019	14.88	11.9615	11.98
18:36:00	15.1209	14.90	11.9521	11.97
18:37:00	15.1348	14.91	11.9421	11.96
18:38:00	15.2142	14.99	11.8865	11.90
18:39:00	15.2785	15.06	11.8331	11.85
18:40:00	15.3569	15.13	11.8004	11.82
18:41:00	15.3455	15.12	11.8022	11.82
18:42:00	15.3159	15.09	11.8131	11.83
18:43:00	15.4622	15.24	11.7018	11.72
18:44:00	15.3047	15.08	11.8316	11.85
18:45:00	15.2645	15.04	11.8555	11.87
18:46:00	15.3904	15.17	11.75	11.77
18:47:00	15.2915	15.07	11.8403	11.86
18:48:00	15.2664	15.04	11.6892	11.71
18:49:00	15.2374	15.01	11.7254	11.74
18:50:00	15.2073	14.99	11.7467	11.76
18:51:00	15.1795	14.96	11.7583	11.77
18:52:00	15.0063	14.79	11.8783	11.90
18:53:00	15.1233	14.90	11.7942	11.81
18:54:00	14.9572	14.74	11.9085	11.93
18:55:00	15.1096	14.89	11.8055	11.82
18:56:00	15.6721	15.44	11.9938	12.01
18:57:00	15.677	15.45	12.0127	12.03

APPENDIX F

Sampling for Ammonia and Hydrogen Chloride

Main Stack Baseline

Test :	**Test No. 1**			**Test No. 2**			**Test No. 3**			**Average**	
Sample ID :	M26-T1			M26-T2			M26-T3				
Sample Volume (Rm^3) [1] :	0.137			0.133			0.127				
Stack Flow Rate (Rm^3/s) [1] :	277.59			285.05			281.17				
	Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Conc.	Emission Rate
	(µg)	**(mg/m^3)**	**(g/s)**	**(µg)**	**(mg/m^3)**	**(g/s)**	**(µg)**	**(mg/m^3)**	**(g/s)**	**(mg/m^3)**	**(g/s)**
Hydrochloric Acid	1200	8.78	2.44	500	3.76	1.07	380	3.00	0.84	5.18	1.45
Ammonia (NH_3)	3022	22.10	6.14	3117	23.50	6.69	2267	17.90	5.03	21.20	5.95

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of isokentic tests conducted that day

Lab results for Ammonium converted to ammonia used molecular wts (17/18)

Sampling for Ammonia and Hydrogen Chloride

Facility:	St. Mary's Bowmanville	**Operator:**	JDF
City:	Bowmanville, Ontario	**Entered by:**	WSC
Source:	Main Stack Baseline	**Checked by:**	KNE
Date:	sept 30 to Oct 2	**Pbar:**	29.62
		Y:	1.013

Time (min)	Orifice Pressure ("H_2O)	Meter Volume (L)	Meter Temp (^oF)	Vacuum (in Hg)	Probe Temp (^oF)	Condensor Temp (^oF)	Sampling Rate (L/min)
Sept 30							
Sample ID = Test #1							
13:10 - 14:10							
0	2.3	0.00	45	-2.0	IN-Stack	45	-
20	2.3	46.23	47	-2.0		45	2.3
40	2.3	87.21	51	-2.0		45	2.0
60	2.3	128.48	54	-2.0		45	2.1
Average	**2.3**		**49**	**-2.0**		**-**	**2.1**
Total Volume Actual (m^3)		0.128					
Total Volume Reference (Rm^3)		**0.137**					
Oct 1							
Sample ID =Test #2							
10:20 - 11:20							
0	2.3	0.00	54	-2.0	IN-Stack	50	-
20	2.3	43.03	54	-2.0		50	2.2
40	2.3	85.12	56	-2.0		52	2.1
60	2.3	126.26	56	-2.0		52	2.1
Average	**2.3**		**55**	**-2.0**		**-**	**2.1**
Total Volume Actual (m^3)		0.126					
Total Volume Reference (Rm^3)		**0.133**					
Oct 2							
Sample ID = Test #3							
10:30 - 11:30							
0	2.3	0.00	53	-3.0	IN-Stack	47	-
20	2.3	40.13	54	-3.0		49	2.0
40	2.3	80.05	56	-3.0		50	2.0
60	2.3	120.34	57	-3.0		52	2.0
Average	**2.3**		**55**	**-3.0**		**-**	**2.0**
Total Volume Actual (m^3)		0.120					
Total Volume Reference (Rm^3)		**0.127**					

Sampling for Ammonia and Hydrogen Chloride

Main Stack LCF

Test :		Test No. 1				Test No. 2			Test No. 3			Average	
Sample ID :		M26-T1				M26-T2			M26-T3				
Sample Volume (Rm^3) [1] :	T1	0.121			T2-3	0.124			0.121				
Stack Flow Rate (Rm^3/s) [1] :	Lab DL	280.95			Lab DL	260.76			253.39				
		Lab Data	Conc.	Emission Rate		Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Conc.	Emission Rate
	(µg)	**(µg)**	**(mg/m^3)**	**(g/s)**	**(µg)**	**(µg)**	**(mg/m^3)**	**(g/s)**	**(µg)**	**(mg/m^3)**	**(g/s)**	**(mg/m^3)**	**(g/s)**
Hydrochloric Acid	<30	500	4.13	1.16	30	490	3.95	1.00	490	4.06	1.03	4.05	1.07
Ammonia (NH_3)	<75	2078	17.20	4.82	38	2361	19.10	5.00	2928	24.30	6.15	20.20	5.31

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on average of isokentic tests conducted that day

Lab results for Ammonium converted to ammonia used molecular wts (17/18)

Sampling for Ammonia and Hydrogen Chloride

Facility:	St. Mary's Bowmanville	**Operator:**	JDF
City:	Bowmanville, Ontario	**Entered by:**	WSC
Source:	Main Stack LCF	**Checked by:**	KNE
Date:	Oct 5 to Oct 9	**Pbar:**	29.62
		Y:	1.013

Time (min)	Orifice Pressure ("H_2O)	Meter Volume (L)	Meter Temp (^oF)	Vacuum (in Hg)	Probe Temp (^oF)	Condensor Temp (^oF)	Sampling Rate (L/min)
Oct 5							
Sample ID = Test #1							
9:10 - 10:10							
0	2.3	0.00	78	-3.0	IN-Stack	68	-
20	2.3	40.62	78	-3.0		60	2.0
40	2.3	80.27	79	-3.0		60	2.0
60	2.3	120.46	81	-3.0		62	2.0
Average	**2.3**		**79**	**-3.0**		**-**	**2.0**
Total Volume Actual (m^3)		0.120					
Total Volume Reference (Rm^3)		**0.121**					
Volume Reference (Rm^3) @ 11% O_2		**0.109**					
Oct 9							
Sample ID =Test #2							
10:20 - 11:20							
0	2.3	0.00	79	-3.0	IN-Stack	75	-
20	2.3	41.07	79	-3.0		60	2.1
40	2.3	82.81	80	-3.0		58	2.1
60	2.3	123.43	81	-3.0		62	2.0
Average	**2.3**		**80**	**-3.0**		**-**	**2.1**
Total Volume Actual (m^3)		0.123					
Total Volume Reference (Rm^3)		**0.124**					
Volume Reference (Rm^3) @ 11% O_2		**0.112**					
Oct 9							
Sample ID = Test #3							
11:30 - 12:30							
0	2.3	0.00	79	-3.0	IN-Stack	75	-
20	2.3	40.02	80	-3.0		60	2.0
40	2.3	80.11	81	-3.0		60	2.0
60	2.3	120.32	81	-3.0		62	2.0
Average	**2.3**		**80**	**-3.0**		**-**	**2.0**
Total Volume Actual (m^3)		0.120					
Total Volume Reference (Rm^3)		**0.121**					

APPENDIX G

Volatile Organic Compound Sampling

Main Stack Baseline

Sample ID :	Units	Test #1 Pair 1 ID = 9			Test #2 Pair 2 ID = 8			Test #3 Pair 3 ID = 7			Average		
Sampling Date :	-	Sep 30, 18			Oct 1, 18			Oct 2, 18			-		
Sampling Times :	-	12:10PM-1:10PM			1:20PM - 2:20PM			2:30PM - 3:30PM			-		
Sample Volume[1] :	Rm^3	0.019			0.019			0.018			0.019		
Stack Flow Rate[1], [2]	Rm^3/s	277.6			285.1			281.2			281.3		
		Lab Data (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Lab Data** (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Lab Data** (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Conc** (µg)	**Conc. Corrected to 11% O_2 [3]** (µg/m3)	**Emission Rate** (mg/s)
Dichlorodifluoromethane (FREON 12)		< 0.020	1.1	0.295	0.020	1.1	0.301	< 0.020	1.1	0.309	< 1.07	< 1.8	< 0.302
Chloromethane		4.48	238.3	66.155	5.06	267.4	76.219	4.98	273.5	76.898	260	440.2	73.1
Vinyl Chloride		< 0.013	0.7	0.192	< 0.013	0.7	0.196	< 0.013	0.7	0.201	< 0.697	< 1.2	< 0.196
Bromomethane		0.378	20.1	5.582	0.43	22.7	6.477	< 0.015	0.8	0.232	< 14.6	< 24.7	< 4.10
Chloroethane		0.750	39.9	11.075	0.43	22.7	6.477	0.46	25.3	7.103	29.3	49.7	8.22
Trichlorofluoromethane (FREON 11)		< 0.010	0.5	0.148	< 0.010	0.5	0.151	< 0.010	0.5	0.154	< 0.537	< 0.9	< 0.151
Acetone (2-Propanone)		5.94	316.0	87.714	6.34	335.0	95.500	7.21	396.0	111.332	348.991	591.5	98.2
1,1-Dichloroethylene		< 0.011	0.6	0.162	< 0.011	0.6	0.166	< 0.011	0.6	0.170	< 0.590	< 1.0	< 0.166
Methylene Chloride(Dichloromethane)		< 0.019	1.0	0.281	< 0.019	1.0	0.286	< 0.019	1.0	0.293	< 1.02	< 1.7	< 0.287
1,1-Dichloroethane		< 0.012	0.6	0.177	< 0.012	0.6	0.181	< 0.012	0.7	0.185	< 0.644	< 1.1	< 0.181
trans-1,2-Dichloroethylene		< 0.010	0.5	0.148	< 0.010	0.5	0.151	< 0.010	0.5	0.154	< 0.537	< 0.9	< 0.151
cis-1,2-Dichloroethylene		< 0.010	0.5	0.148	< 0.010	0.5	0.151	< 0.010	0.5	0.154	< 0.537	< 0.9	< 0.151
Chloroform		< 0.011	0.6	0.162	< 0.011	0.6	0.166	< 0.011	0.6	0.170	< 0.590	< 1.0	< 0.166
1,2-Dichloroethane		< 0.0070	0.4	0.103	< 0.0070	0.4	0.105	< 0.0070	0.4	0.108	< 0.376	< 0.6	< 0.106
Methyl Ethyl Ketone (2-Butanone)		< 0.036	1.9	0.532	< 0.036	1.9	0.542	< 0.036	2.0	0.556	< 1.93	< 3.3	< 0.543
1,1,1-Trichloroethane		< 0.014	0.7	0.207	< 0.014	0.7	0.211	< 0.014	0.8	0.216	< 0.751	< 1.3	< 0.211
Carbon Tetrachloride		< 0.016	0.9	0.236	< 0.016	0.8	0.241	< 0.016	0.9	0.247	< 0.858	< 1.5	< 0.241
Benzene		6.78	360.7	100.118	19.4	1025.2	292.224	21.900	1202.7	338.165	863	1462.5	244
1,1,2-Trichloroethane		< 0.016	0.9	0.236	< 0.016	0.8	0.241	< 0.016	0.9	0.247	< 0.858	< 1.5	< 0.241
1,2-Dichloropropane		< 0.011	0.6	0.162	< 0.011	0.6	0.166	< 0.011	0.6	0.170	< 0.590	< 1.0	< 0.166
Trichloroethylene		< 0.011	0.6	0.162	< 0.011	0.6	0.166	< 0.011	0.6	0.170	< 0.590	< 1.0	< 0.166
Bromodichloromethane		< 0.011	0.6	0.162	< 0.011	0.6	0.166	< 0.011	0.6	0.170	< 0.590	< 1.0	< 0.166
Dibromochloromethane		< 0.0090	0.5	0.133	< 0.0090	0.5	0.136	< 0.0090	0.5	0.139	< 0.483	< 0.8	< 0.136
Toluene		2.88	153.2	42.528	12.2	644.7	183.769	12.6	692.0	194.561	497	841.7	140
Ethylene Dibromide		< 0.010	0.5	0.148	< 0.010	0.5	0.151	< 0.010	0.5	0.154	< 0.537	< 0.9	< 0.151
Tetrachloroethylene		< 0.018	1.0	0.266	< 0.018	1.0	0.271	< 0.018	1.0	0.278	< 0.966	< 1.6	< 0.272
Chlorobenzene		0.393	20.9	5.803	0.33	17.4	4.971	0.39	21.4	6.022	19.9	33.8	5.60
1,1,1,2-Tetrachloroethane		< 0.010	0.5	0.148	< 0.010	0.5	0.151	< 0.010	0.5	0.154	< 0.537	< 0.9	< 0.151
Ethylbenzene		1.42	75.5	20.969	2.36	124.7	35.549	2.62	143.9	40.456	115	194.4	32.3
m / p-Xylene		4.49	238.8	66.302	9.38	495.7	141.292	10.4	571.1	160.590	435	737.7	123
Styrene		1.48	78.7	21.855	2.42	127.9	36.453	2.87	157.6	44.317	121	205.8	34.2
o-Xylene		1.77	94.2	26.137	3.75	198.2	56.487	4.01	220.2	61.920	171	289.6	48.2
Bromoform		< 0.014	0.7	0.207	< 0.014	0.7	0.211	< 0.014	0.8	0.216	< 0.751	< 1.3	< 0.211
1,1,2,2-Tetrachloroethane		< 0.014	0.7	0.207	< 0.014	0.7	0.211	< 0.014	0.8	0.216	< 0.751	< 1.3	< 0.211
1,3-Butadiene		4.410	234.6	65.121	4.440	234.6	66.880	4.420	242.7	68.251	237	402.2	66.8
Trichlorotrifluoroethane		< 0.025	1.3	0.369	< 0.500	26.4	7.532	< 0.500	27.5	7.721	< 18.4	< 31.2	< 5.21
Mesitylene		12.790	680.4	188.866	12.750	673.8	192.054	12.750	700.2	196.877	685	1160.6	193
Cumene		11.990	637.8	177.052	< 0.500	26.4	7.532	< 0.500	27.5	7.721	< 231	< 390.8	< 64.1

Notes:

' < ' indicates that the laboratory results were less than the Reportable Detection Limit (RDL). This RDL was used to calculate the concentration and emission rate.

[1] Sample volume, volumetric flow rate, and concentration based on dry referenced conditions (101.3 kPa, 25 °C, and Actual Oxygen)

[2] Average of the measured volumetric flow rates from isokinetic testing that day

Volatile Organic Compound Sampling

Main Stack Baseline

Facility:	St. Marys	**Operator:**	JDF
City:	Bowmanville	**Entered by:**	TFL
Source:	Main Stack Baseline	**Checked by:**	KNE
Run:	Test #1	**Test Date:**	September 30, 2018
Method:	VOST	**PBar:**	29.9
		DGM Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condenser Temp** (°F)	**Sampling Rate** (L/min)
Pair 1 ID = 9							
12:10PM-1:10PM				Pre-test Leak Check: <0.01 at 15" | Good			
0	0.6	0.00	59	-2.5	257	57	0.3
20	0.6	6.12	59	-3.5	259	52	0.3
40	0.6	12.03	60	-3.5	257	48	0.3
60	0.6	17.92	60	-3.5	257	52	0.3
				Post-test Leak Check: <0.01 at 3.5" Good			
Average	0.6		60	-3.3	258		0.30
Total Volume Actual (m^3)		0.018					
Total Volume Reference (Rm^3)		**0.019**					

Volatile Organic Compound Sampling

Main Stack Baseline

Facility:	St. Marys	**Operator:**	JDF
City:	Bowmanville	**Entered by:**	TFL
Source:	Main Stack Baseline	**Checked by:**	KNE
Run:	Test #2	**Test Date:**	October 1, 2018
Method:	VOST	**PBar:**	29.9
		Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condensor Temp** (°F)	**Sampling Rate** (L/min)
Pair 2 ID = 8							
1:20PM - 2:20PM				Pre-test Leak Check:	<0.01 at 13"	Good	
0	0.6	0.00	62	-2.5	257	59	0.3
20	0.6	6.12	63	-3.0	259	55	0.3
40	0.6	11.92	64	-3.0	257	52	0.3
60	0.6	18.16	63	-3.0	257	52	0.3
				Post-test Leak Check:	<0.01 at 3" H	Good	
Average	0.6		63	-2.9	258		0.31
Total Volume Actual (m^3)		0.018					
Total Volume Reference (Rm^3)		**0.019**					

Volatile Organic Compound Sampling

Main Stack Baseline

Facility:	St. Marys	**Operator:**	JDF
City:	Bowmanville	**Entered by:**	TFL
Source:	Main Stack Baseline	**Checked by:**	KNE
Run:	Test #3	**Test Date:**	October 2, 2018
Method:	VOST	**PBar:**	29.9
		Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condensor Temp** (°F)	**Sampling Rate** (L/min)
Pair 3 ID = 7							
2:30PM - 3:30PM				Pre-test Leak Check: <0.01 at 15"	Good		
0	0.6	0.00	63	-2.0	259	59	0.3
20	0.6	6.23	63	-3.0	257	57	0.3
40	0.6	12.12	63	-3.0	258	52	0.3
60	0.6	17.47	63	-3.0	258	52	0.3
				Post-test Leak Check: <0.01 at 3" H	Good		
Average	0.6		63	-2.8	258		0.29
Total Volume Actual (m^3)		0.017					
Total Volume Reference (Rm^3)		**0.018**					

Volatile Organic Compound Sampling

Main Stack with LCF

	Units	Test #1			Test #2			Test #3			Average		
Sample ID :		Pair 1 ID = 1			Pair 2 ID = 4			Pair 3 ID = 3					
Sampling Date :	-	Oct 5, 18			Oct 9, 18			Oct 9, 18			-		
Sampling Times :	-	9:30AM-10:30AM			10:40AM - 11:40AM			11:50AM - 12:50AM			-		
Sample Volume[1] :	Rm^3	0.018			0.019			0.018			0.018		
Stack Flow Rate[1], [2]	Rm^3/s	281.0			260.8			253.4			265.0		
		Lab Data (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Lab Data** (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Lab Data** (µg)	**Conc** ($µg/m^3$)	**Emission Rate** (mg/s)	**Conc** (µg)	**Conc. Corrected to 11% O_2** [3] (µg/m3)	**Emission Rate** (mg/s)
Dichlorodifluoromethane (FREON 12)		< 0.020	1.1	0.305	< 0.020	1.1	0.281	< 0.020	1.1	0.278	< 1.09	< 0.5	< 0.288
Chloromethane		4.15	225.5	63.350	5.37	289.5	75.500	4.62	253.9	64.333	256	122.0	67.7
Vinyl Chloride		0.090	4.9	1.374	< 0.013	0.7	0.183	< 0.013	0.7	0.181	< 2.10	< 1.0	< 0.579
Bromomethane		0.296	16.1	4.518	0.65	35.0	9.139	< 0.015	0.8	0.209	< 17.3	< 8.2	< 4.62
Chloroethane		0.483	26.2	7.373	0.54	29.1	7.592	0.44	24.2	6.127	26.5	12.6	7.03
Trichlorofluoromethane (FREON 11)		< 0.010	0.5	0.153	< 0.010	0.5	0.141	< 0.010	0.5	0.139	< 0.544	< 0.3	< 0.144
Acetone (2-Propanone)		6.36	345.6	97.086	6.1	328.9	85.763	4.5	247.3	62.662	307.3	146.3	81.837
1,1-Dichloroethylene		< 0.011	0.6	0.168	< 0.011	0.6	0.155	< 0.011	0.6	0.153	< 0.598	< 0.3	< 0.159
Methylene Chloride(Dichloromethane)		< 0.019	1.0	0.290	< 0.019	1.0	0.267	< 0.019	1.0	0.265	< 1.034	< 0.5	< 0.274
1,1-Dichloroethane		< 0.012	0.7	0.183	< 0.012	0.6	0.169	< 0.012	0.7	0.167	< 0.653	< 0.3	< 0.173
trans-1,2-Dichloroethylene		< 0.010	0.5	0.153	< 0.010	0.5	0.141	< 0.010	0.5	0.139	< 0.544	< 0.3	< 0.144
cis-1,2-Dichloroethylene		< 0.010	0.5	0.153	< 0.010	0.5	0.141	< 0.010	0.5	0.139	< 0.544	< 0.3	< 0.144
Chloroform		< 0.011	0.6	0.168	< 0.011	0.6	0.155	< 0.011	0.6	0.153	< 0.598	< 0.3	< 0.159
1,2-Dichloroethane		< 0.0070	0.4	0.107	< 0.0070	0.4	0.098	< 0.0070	0.4	0.097	< 0.381	< 0.2	< 0.101
Methyl Ethyl Ketone (2-Butanone)		< 0.036	2.0	0.550	< 0.036	1.9	0.506	< 0.036	2.0	0.501	< 1.958	< 0.9	< 0.519
1,1,1-Trichloroethane		< 0.014	0.8	0.214	< 0.014	0.8	0.197	< 0.014	0.8	0.195	< 0.762	< 0.4	< 0.202
Carbon Tetrachloride		< 0.016	0.9	0.244	< 0.016	0.9	0.225	< 0.016	0.9	0.223	< 0.870	< 0.4	< 0.231
Benzene		7.36	399.9	112.352	26.5	1428.8	372.578	23.0	1264.0	320.274	1030.9	490.9	268.4
1,1,2-Trichloroethane		< 0.016	0.9	0.244	< 0.016	0.9	0.225	< 0.016	0.9	0.223	< 0.870	< 0.4	< 0.231
1,2-Dichloropropane		< 0.011	0.6	0.168	< 0.011	0.6	0.155	< 0.011	0.6	0.153	< 0.598	< 0.3	< 0.159
Trichloroethylene		< 0.011	0.6	0.168	< 0.011	0.6	0.155	< 0.011	0.6	0.153	< 0.598	< 0.3	< 0.159
Bromodichloromethane		< 0.011	0.6	0.168	< 0.011	0.6	0.155	< 0.011	0.6	0.153	< 0.598	< 0.3	< 0.159
Dibromochloromethane		< 0.0090	0.5	0.137	< 0.0090	0.5	0.127	< 0.0090	0.5	0.125	< 0.490	< 0.2	< 0.130
Toluene		3.17	172.2	48.391	16.1	868.1	226.359	13.5	741.9	187.987	594.07	282.9	154.2
Ethylene Dibromide		< 0.010	0.5	0.153	< 0.010	0.5	0.141	< 0.010	0.5	0.139	< 0.54	< 0.3	< 0.144
Tetrachloroethylene		< 0.018	1.0	0.275	< 0.018	1.0	0.253	< 0.018	1.0	0.251	< 0.979	< 0.5	< 0.259
Chlorobenzene		0.543	29.5	8.289	0.62	33.4	8.717	0.54	29.7	7.519	30.9	14.7	8.18
1,1,1,2-Tetrachloroethane		< 0.010	0.5	0.153	< 0.010	0.5	0.141	< 0.010	0.5	0.139	< 0.544	< 0.3	< 0.144
Ethylbenzene		1.63	88.6	24.882	3.50	188.7	49.208	2.91	159.9	40.522	146	69.4	38.2
m / p-Xylene		5.33	289.6	81.363	14.1	760.2	198.240	11.7	643.0	162.922	564	268.7	147.5
Styrene		1.86	101.1	28.393	4.46	240.5	62.706	3.56	195.6	49.573	179	85.3	46.9
o-Xylene		2.00	108.7	30.530	5.28	284.7	74.234	4.47	245.6	62.245	213.0	101.4	55.7
Bromoform		< 0.014	0.8	0.214	< 0.014	0.8	0.197	< 0.014	0.8	0.195	< 0.762	< 0.4	< 0.202
1,1,2,2-Tetrachloroethane		< 0.014	0.8	0.214	< 0.014	0.8	0.197	< 0.014	0.8	0.195	< 0.762	< 0.4	< 0.202
1,3-Butadiene		4.410	239.6	67.319	< 1.000	53.9	14.060	< 1.000	55.0	13.925	< 116.162	< 55.3	< 31.768
Trichlorotrifluoroethane		< 0.025	1.4	0.382	< 0.025	1.3	0.351	< 0.025	1.4	0.348	< 1.360	< 0.6	< 0.360
Mesitylene		12.780	694.4	195.089	12.750	687.4	179.259	12.750	700.7	177.543	694.2	330.6	184.0
Cumene		0.190	10.3	2.900	< 1.000	53.9	14.060	< 1.000	55.0	13.925	< 39.7	< 18.9	< 10.3

Notes:

' < ' indicates that the laboratory results were less than the Reortable Detection Limit (RDL). This RDL was used to calculate the concentration and emission rate.

[1] Sample volume, volumetric flow rate, and concentration based on dry referenced conditions (101.3 kPa, 25 °C, and Actual Oxygen)

[2] Average of the measured volumetric flow rates from isokinetic testing that day

Volatile Organic Compound Sampling

Main Stack with LCF

Facility:	St. Mary's	**Operator:**	JDF
City:	Bowmanville, Ontario	**Entered by:**	TFL
Source:	Main Stack	**Checked by:**	KNE
Run:	Test #1	**Test Date:**	October 5, 2018
Method:	VOST	**PBar:**	29.9
		DGM Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condenser Temp** (°F)	**Sampling Rate** (L/min)
Pair 1 ID = 1							
9:30AM-10:30AM				Pre-test Leak Check: <0.01 at 15" Hg		Good	
0	0.6	0.00	52	-2.0	257	45	0.3
20	0.6	5.92	55	-3.0	258	47	0.3
40	0.6	11.82	57	-3.0	258	49	0.3
60	0.6	17.42	59	-3.0	258	50	0.3
				Post-test Leak Check: <0.01 at 3" Hg		Good	
Average	0.6		56	-2.8	258		0.29
Total Volume Actual (m^3)		0.017					
Total Volume Reference (Rm^3)		**0.018**					

Volatile Organic Compound Sampling

Main Stack with LCF

Facility:	St. Mary's	**Operator:**	JDF
City:	Bowmanville, Ontario	**Entered by:**	TFL
Source:	Main Stack	**Checked by:**	KNE
Run:	Test #2	**Test Date:**	October 9, 2018
Method:	VOST	**PBar:**	29.9
		Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condensor Temp** (°F)	**Sampling Rate** (L/min)
Pair 2 ID = 4							
10:40AM - 11:40AM				Pre-test Leak Check:	<0.01 at 10" Hg	Good	
0	0.6	0.00	54	-2.5	260	46	0.3
20	0.6	6.54	54	-3.0	259	46	0.3
40	0.6	13.21	54	-3.0	257	46	0.2
60	0.6	17.49	54	-3.0	259	46	0.2
				Post-test Leak Check:	<0.01 at 3" Hg	Good	
Average	0.6		54	-2.9	258		0.27
Total Volume Actual (m^3)		0.017					
Total Volume Reference (Rm^3)		**0.019**					

Volatile Organic Compound Sampling

Main Stack with LCF

Facility:	St. Mary's	**Operator:**	JDF
City:	Bowmanville, Ontario	**Entered by:**	TFL
Source:	Main Stack	**Checked by:**	KNE
Run:	Test #3	**Test Date:**	October 9, 2018
Method:	VOST	**PBar:**	29.9
		Y:	1.013

Time (min)	**Orifice Press.** ("H_2O)	**Meter Volume** (L)	**Meter Temp** (^oF)	**Vacuum** (in Hg)	**Probe Temp** (^oF)	**Condensor Temp** (°F)	**Sampling Rate** (L/min)
Pair 3 ID = 3							
11:50AM - 12:50AM				Pre-test Leak Check:	<0.01 at 11" Hg	Good	
0	0.6	0.00	50	-2.5	259	47	0.3
20	0.6	5.81	49	-3.0	259	45	0.3
40	0.6	11.45	50	-3.0	259	45	0.3
60	0.6	17.02	50	-3.0	257	44	0.3
				Post-test Leak Check:	<0.01 at 3" Hg	Good	
Average	0.6		50	-2.9	259		0.28
Total Volume Actual (m^3)		0.017					
Total Volume Reference (Rm^3)		**0.018**					

APPENDIX H

Sampling for Acrolein

Baseline

Test : Sample ID : Sample Volume (Rm^3) [1] : Stack Flow Rate (Rm^3/s) [1] :	 T1 Lab DL	**Test No. 1** Carb 430 T1- Baseline 0.039 298.36			**Test No. 2** Carb 430 T2- Baseline 0.030 292.21			**Test No. 3** Carb 430 T3- Baseline 0.030 295.85			**Average**	
		Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Conc.	Emission Rate
	(µg)	**(µg)**	**($µg/m^3$)**	**(mg/s)**	**(µg)**	**($µg/m^3$)**	**(mg/s)**	**(µg)**	**($µg/m^3$)**	**(mg/s)**	**($µg/m^3$)**	**(mg/s)**
Acrolein	<2	<2	50.70	15.12	<2	66.20	19.30	<2	66.40	19.60	61.10	18.00

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on measurements taken the same day

Sampling for Acrolein Baseline

Facility:	St. Marys		**Operator:**	WSC	
City:	Bowmanville , ON		**Entered by:**	WSC	
Source:	Kiln		**Checked by:**	KNE	
Date:	Feb. 28, 2019		**PBar:**	29.4	
Run:	#1 - #3		**Y:**	1.008	

Time (min)	Orifice Press. ("H2O)	Meter Volume (L)	Meter Temp (^{o}F)	Vacuum (in Hg)	Sampling Rate (L/min)
Sample ID =	**Test 1 Baseline**				
9:04pm					
0	0.75	0.00	37	0	0.3
5	0.75	1.41	37	0	0.3
10	0.75	2.92	37	0	0.3
15	0.75	4.38	37	0	0.3
20	0.75	6.01	37	0	0.3
25	0.75	7.62	37	0	0.3
30	0.75	9.34	37	0	0.3
35	0.75	11.19	37	0	0.3
40	0.75	12.37	37	0	0.3
45	0.75	13.81	37	0	0.3
50	0.75	15.35	37	0	0.3
55	0.75	16.88	37	0	0.3
60	0.75	18.32	37	0	0.3
65	0.75	19.79	37	0	0.3
70	0.75	21.00	37	0	0.3
75	0.75	22.46	37	0	0.3
80	0.75	23.95	39	0	0.3
85	0.75	25.60	39	0	0.3
90	0.75	27.26	39	0	0.3
95	0.75	28.94	39	0	0.3
100	0.75	30.63	39	0	0.3
105	0.75	32.16	39	0	0.3
110	0.75	33.74	37	0	0.3
115	0.75	35.31	37	0	0.3
120	0.75	36.86	37	0	0.3
Average	**0.8**		**38**	**0**	**0.3**
Total Volume Actual (m3)		0.037			
Total Volume Reference (Rm3)		**0.039**			
Sample ID =	**Test 2 Baseline**				
11:09pm-5:05pm					
0	0.75	0.00	30	0	0.3
5	0.75	1.60	30	0	0.3
10	0.75	3.07	30	0	0.3
15	0.75	4.69	30	0	0.3
20	0.75	6.11	30	0	0.3
25	0.75	7.72	30	0	0.3
30	0.75	9.31	30	0	0.3
35	0.75	10.82	30	0	0.3
40	0.75	12.34	28	0	0.3
45	0.75	13.84	28	0	0.3
50	0.70	15.37	28	0	0.3
55	0.75	16.87	28	0	0.3
60	0.75	18.48	28	0	0.3
65	0.75	19.91	28	0	0.3
70	0.75	21.62	28	0	0.3
75	0.75	23.02	30	0	0.3
80	0.75	24.69	30	0	0.3
85	0.75	26.13	30	0	0.3
90	0.75	27.77	30	0	0.3
Average	**0.7**		**29**	**0**	**0.3**
Total Volume Actual (m3)		0.028			
Total Volume Reference (Rm3)		**0.030**			
Sample ID =	**Test 3 Baseline**				
5:10pm-6:10pm					
0	0.75	0.00	30	0	0.3
5	0.75	1.53	30	0	0.3
10	0.75	3.07	28	0	0.3
15	0.75	4.59	28	0	0.3
20	0.75	6.14	28	0	0.3
25	0.75	7.67	28	0	0.3
30	0.75	9.31	28	0	0.3
35	0.75	10.87	27	0	0.3
40	0.75	12.52	27	0	0.3
45	0.75	14.06	27	0	0.3
50	0.75	15.47	27	0	0.3
55	0.75	16.94	27	0	0.3
60	0.75	18.41	27	0	0.3
65	0.75	19.91	27	0	0.3
70	0.75	21.40	27	0	0.3
75	0.75	22.91	27	0	0.3
80	0.75	24.51	28	0	0.3
85	0.75	26.01	28	0	0.3
90	0.75	27.57	28	0	0.3
Average	**0.8**		**28**	**0**	**0.3**
Total Volume Actual (m3)		0.028			
Total Volume Reference (Rm3)		**0.030**			

Sampling for Acrolein

LCF

Test : Sample ID : Sample Volume (Rm^3) [1] : Stack Flow Rate (Rm^3/s) [1] :	 T1 Lab DL	**Test No. 1** Carb 430 T1- LCF 0.032 259.77			**Test No. 2** Carb 430 T2- LCF 0.041 245.56			**Test No. 3** Carb 430 T3- LCF 0.036 283.54			**Average**	
		Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Lab Data	Conc.	Emission Rate	Conc.	Emission Rate
	(µg)	**(µg)**	**(µg/m^3)**	**(mg/s)**	**(µg)**	**(µg/m^3)**	**(mg/s)**	**(µg)**	**(µg/m^3)**	**(mg/s)**	**(µg/m^3)**	**(mg/s)**
Acrolein	<2	<3	92.40	24.00	<2	49.10	12.10	<2	55.05	15.60	65.50	17.20

Notes:

[1] Sample volume and volumetric flow rate based on dry referenced conditions (101.3kPa, 25 ^{o} C)

[1] Flow rate based on measurements taken the same day

*'**<**' indicates that the laboratory results were less than the Method Detection Limit (MDL). This MDL was used to calculate the concentration and emission rate.*

Sampling for Acrolein LCF

Facility:	St. Marys		**Operator:**	WSC	
City:	Bowmanville , ON		**Entered by:**	WSC	
Source:	Kiln		**Checked by:**	KNE	
Date:	Feb. 27, 2019		**PBar:**	29.4	
Run:	#1 - #3		**Y:**	1.008	

Time (min)	Orifice Press. ("H2O)	Meter Volume (L)	Meter Temp (^{o}C)	Vacuum (in Hg)	Sampling Rate (L/min)
Sample ID =	**Test 1 LCF**				
9:04pm					
0	0.80	0.00	28	0	0.3
5	0.60	1.80	28	0	0.3
10	0.60	3.34	28	0	0.3
15	0.60	4.41	27	0	0.3
20	0.60	5.50	25	0	0.3
25	0.60	7.08	25	0	0.3
30	0.60	8.65	25	0	0.3
35	0.60	10.10	25	0	0.3
40	0.60	11.42	25	0	0.3
45	0.60	12.32	25	0	0.3
50	0.60	13.42	25	0	0.3
55	0.60	14.40	25	0	0.3
60	0.60	15.68	25	0	0.3
65	0.60	17.27	25	0	0.3
70	0.60	18.43	25	0	0.3
75	0.60	20.03	25	0	0.3
80	0.60	21.67	25	0	0.3
85	0.60	23.23	25	0	0.3
90	0.60	24.50	25	0	0.3
95	0.60	25.74	25	0	0.3
100	0.60	26.95	25	0	0.3
105	0.60	28.30	25	0	0.3
110	0.60	29.59	25	0	0.3
Average	**0.6**		**25**	**0**	**0.3**
Total Volume Actual (m3)		0.030			
Total Volume Reference (Rm3)		**0.032**			
Sample ID =	**Test 2 LCF**				
11:09pm-5:05pm					
0	0.75	0.00	25	0	0.3
5	0.60	1.92	25	0	0.3
10	0.65	3.96	25	0	0.3
15	0.65	6.23	25	0	0.3
20	0.65	7.74	25	0	0.3
25	0.60	9.47	25	0	0.3
30	0.60	11.23	25	0	0.3
35	0.75	13.12	25	0	0.3
40	0.75	14.94	25	0	0.3
45	0.70	16.35	23	0	0.3
50	0.70	17.88	23	0	0.3
55	0.70	19.28	23	0	0.3
60	0.70	20.83	23	0	0.3
65	0.70	22.39	23	0	0.3
70	0.70	24.02	23	0	0.3
75	0.70	25.53	23	0	0.3
80	0.70	27.01	23	0	0.3
85	0.70	28.49	23	0	0.3
90	0.70	30.20	23	0	0.3
95	0.70	32.17	23	0	0.3
100	0.70	33.82	23	0	0.3
105	0.70	35.37	23	0	0.3
110	0.70	37.00	23	0	0.3
Average	**0.7**		**24**	**0**	**0.3**
Total Volume Actual (m3)		0.037			
Total Volume Reference (Rm3)		**0.041**			
Sample ID =	**Test 3 LCF**				
5:10pm-6:10pm					
0	0.80	0.00	28	0	0.3
5	0.75	1.63	28	0	0.3
10	0.75	3.23	30	0	0.3
15	0.75	4.70	30	0	0.3
20	0.75	6.20	30	0	0.3
25	0.75	7.77	30	0	0.3
30	0.75	9.63	32	0	0.3
35	0.75	11.27	32	0	0.3
40	0.75	12.59	32	0	0.3
45	0.75	13.96	34	0	0.3
50	0.75	15.70	34	0	0.3
55	0.75	16.16	34	0	0.3
60	0.75	18.70	34	0	0.3
65	0.75	20.25	34	0	0.3
70	0.75	21.79	34	0	0.3
75	0.75	23.31	34	0	0.3
80	0.75	24.80	34	0	0.3
85	0.75	26.33	34	0	0.3
90	0.75	27.89	34	0	0.3
95	0.75	29.30	36	0	0.3
100	0.75	30.81	36	0	0.3
105	0.75	32.18	37	0	0.3
110	0.75	33.61	37	0	0.3
Average	**0.8**		**33**	**0**	**0.3**
Total Volume Actual (m3)		0.034			
Total Volume Reference (Rm3)		**0.036**			

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #1 LCF
Date:	February 27, 2019
Time:	9:20 AM
stack diameter (inches):	216
Stack Area, (ft^2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.91

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.46
Moisture, Bws (%):	5.6%
Static Pressure, Pg (" H_2O):	-0.7

Dry Molecular Weight		
O_2	5.9	%
CO_2	11.2	%
CO	0.0005	%
N_2	81.9	%
Ar	1.0	%
Md	**30.14**	

QA:TFL

Point	Position (in)	Traverse 1 (NE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (NW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.24	226	30.4	<5°	0.24	226	30.4	<5°
2	10.6	0.70	226	51.9	<5°	0.48	226	42.9	<5°
3	18.4	0.64	226	49.6	<5°	0.66	226	50.3	<5°
4	27	0.72	226	52.6	<5°	0.68	226	51.1	<5°
5	36.5	0.80	226	55.4	<5°	0.69	226	51.5	<5°
6	47.5	0.96	226	60.7	<5°	0.74	226	53.3	<5°
7	61.1	0.88	226	58.1	<5°	0.72	226	52.6	<5°
8	81	0.81	226	55.8	<5°	0.70	226	51.9	<5°
		Traverse 3 (SW)				**Traverse 4 (SE)**			
1	3.5	0.20	226	27.7	<5°	0.22	226	29.1	<5°
2	10.6	0.44	226	41.1	<5°	0.42	226	40.2	<5°
3	18.4	0.64	226	49.6	<5°	0.60	226	48.0	<5°
4	27	0.72	226	52.6	<5°	0.64	226	49.6	<5°
5	36.5	0.72	226	52.6	<5°	0.78	226	54.7	<5°
6	47.5	0.74	226	53.3	<5°	0.74	226	53.3	<5°
7	61.1	0.76	226	54.0	<5°	0.78	226	54.7	<5°
8	81	0.68	226	51.1	<5°	0.69	226	51.5	<5°
Average		**0.67**	**226**	**49.8**		**0.61**	**226**	**47.8**	

Average velocity	(ft/s)	48.8
	(m/s)	**14.87**
Flow Rate, Qs (actual)	(cfm)	745,059
	(m^3/min)	21,097.7
	(m^3/sec)	351.63
Flow Rate, Qs (ref,dry)	(cf/sec)	9,173
	(m^3/sec)	**259.77**

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #2
Date:	February 27, 2019
Time:	11:40 AM
stack diameter (inches):	216
Stack Area, (ft2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.91

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.50
Moisture, Bws (%):	5.8%
Static Pressure, Pg (" H2O):	-0.7

Dry Molecular Weight		
O_2	7.9	%
CO_2	11.1	%
CO	0.0005	%
N_2	80.0	%
Ar	1.0	%
Md	**30.21**	

QA:TFL

Point	Position (in)	Traverse 1 (SE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (SW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.08	232	17.6	<5°	0.32	232	35.2	<5°
2	10.6	0.44	232	41.3	<5°	0.50	232	44.0	<5°
3	18.4	0.68	232	51.3	<5°	0.60	232	48.2	<5°
4	27	0.84	232	57.0	<5°	0.66	232	50.5	<5°
5	36.5	0.80	232	55.6	<5°	0.68	232	51.3	<5°
6	47.5	0.76	232	54.2	<5°	0.70	232	52.0	<5°
7	61.1	0.76	232	54.2	<5°	0.64	232	49.8	<5°
8	81	0.74	232	53.5	<5°	0.72	232	52.8	<5°
		Traverse 3 (NW)				**Traverse 4 (NE)**			
1	3.5	0.17	232	25.6	<5°	0.14	232	23.3	<5°
2	10.6	0.38	232	38.3	<5°	0.44	232	41.3	<5°
3	18.4	0.56	232	46.5	<5°	0.60	232	48.2	<5°
4	27	0.60	232	48.2	<5°	0.58	232	47.4	<5°
5	36.5	0.64	232	49.8	<5°	0.62	232	49.0	<5°
6	47.5	0.66	232	50.5	<5°	0.68	232	51.3	<5°
7	61.1	0.64	232	49.8	<5°	0.66	232	50.5	<5°
8	81	0.68	232	51.3	<5°	0.70	232	52.0	<5°
Average		**0.59**	**232**	**46.6**		**0.58**	**232**	**46.7**	

Average velocity	(ft/s)	46.6
	(m/s)	**14.21**
Flow Rate, Qs (actual)	(cfm)	711,678
	(m^3/min)	20,152.5
	(m^3/sec)	335.87
Flow Rate, Qs (ref,dry)	(cf/sec)	8,671
	(m^3/sec)	**245.56**

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #3
Date:	February 27, 2019
Time:	10:00 AM
stack diameter (inches):	216
Stack Area, (ft^2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.90

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.63
Moisture, Bws (%):	5.0%
Static Pressure, Pg (" H_2O):	-0.88

Dry Molecular Weight		
O_2	8.4	%
CO_2	11.2	%
CO	0.0005	%
N_2	79.5	%
Ar	0.9	%
Md	**30.24**	

QA:TFL

Point	Position (in)	Traverse 1 (NW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (NE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.10	229	19.6	<5°	0.42	229	40.1	<5°
2	10.6	0.46	229	42.0	<5°	0.74	229	53.3	<5°
3	18.4	0.72	229	52.6	<5°	0.78	229	54.7	<5°
4	27	0.69	229	51.5	<5°	0.89	229	58.4	<5°
5	36.5	0.70	229	51.8	<5°	1.10	229	65.0	<5°
6	47.5	0.77	229	54.4	<5°	0.97	229	61.0	<5°
7	61.1	0.80	229	55.4	<5°	0.98	229	61.3	<5°
8	81	0.79	229	55.1	<5°	0.91	229	59.1	<5°
		Traverse 3 (SE)				**Traverse 4 (SW)**			
1	3.5	0.40	229	39.2	<5°	0.30	229	33.9	<5°
2	10.6	0.63	229	49.2	<5°	0.60	229	48.0	<5°
3	18.4	0.82	229	56.1	<5°	0.86	229	57.5	<5°
4	27	0.86	229	57.5	<5°	0.93	229	59.7	<5°
5	36.5	0.90	229	58.8	<5°	0.89	229	58.4	<5°
6	47.5	0.83	229	56.4	<5°	0.82	229	56.1	<5°
7	61.1	0.88	229	58.1	<5°	0.89	229	58.4	<5°
8	81	0.91	229	59.1	<5°	0.94	229	60.1	<5°
Average		**0.70**	**229**	**51.0**		**0.81**	**229**	**55.3**	

Average velocity	(ft/s)	53.2
	(m/s)	**16.21**
Flow Rate, Qs (actual)	(cfm)	811,987
	(m^3/min)	22,992.9
	(m^3/sec)	383.22
Flow Rate, Qs (ref,dry)	(cf/sec)	10,012
	(m^3/sec)	**283.54**

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #1 Baseline
Date:	February 28, 2019
Time:	11:45 AM
stack diameter (inches):	216
Stack Area, (ft^2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.90

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.87
Moisture, Bws (%):	4.9%
Static Pressure, Pg (" H_2O):	-0.88

Dry Molecular Weight		
O_2	16.6	%
CO_2	10.7	%
CO	0.0005	%
N_2	71.8	%
Ar	0.9	%
Md	**30.48**	

Point	Position (in)	Traverse 1 (NE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (NW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.28	232	32.7	<5°	0.44	232	41.0	<5°
2	10.6	0.68	232	51.0	<5°	0.68	232	51.0	<5°
3	18.4	0.92	232	59.3	<5°	0.84	232	56.7	<5°
4	27	0.96	232	60.6	<5°	0.92	232	59.3	<5°
5	36.5	0.98	232	61.2	<5°	0.93	232	59.6	<5°
6	47.5	1.04	232	63.1	<5°	0.80	232	55.3	<5°
7	61.1	1.02	232	62.5	<5°	0.88	232	58.0	<5°
8	81	0.95	232	60.3	<5°	0.94	232	60.0	<5°
		Traverse 3 (SW)				**Traverse 4 (SE)**			
1	3.5	0.54	232	45.4	<5°	0.45	232	41.5	<5°
2	10.6	0.73	232	52.8	<5°	0.72	232	52.5	<5°
3	18.4	0.88	232	58.0	<5°	0.88	232	58.0	<5°
4	27	0.80	232	55.3	<5°	0.98	232	61.2	<5°
5	36.5	0.86	232	57.3	<5°	0.95	232	60.3	<5°
6	47.5	0.94	232	60.0	<5°	0.88	232	58.0	<5°
7	61.1	0.92	232	59.3	<5°	0.94	232	60.0	<5°
8	81	1.06	232	63.7	<5°	1.00	232	61.8	<5°
Average		**0.85**	**232**	**56.4**		**0.83**	**232**	**55.9**	

QA: TFL

Average velocity	(ft/s)	56.1
	(m/s)	**17.11**
Flow Rate, Qs (actual)	(cfm)	857,242
	(m^3/min)	24,274.4
	(m^3/sec)	404.57
Flow Rate, Qs (ref,dry)	(cf/sec)	10,535
	(m^3/sec)	**298.36**

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #2
Date:	February 28, 2019
Time:	3:30 PM
stack diameter (inches):	216
Stack Area, (ft^2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.90

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.69
Moisture, Bws (%):	4.7%
Static Pressure, Pg (" H_2O):	-0.78

Dry Molecular Weight		
O_2	14.9	%
CO_2	9.8	%
CO	0.0005	%
N_2	74.4	%
Ar	0.9	%
Md	**30.27**	

QA: TFL

Point	Position (in)	Traverse 1 (SE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (SW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.20	228	27.7	<5°	0.52	228	44.6	<5°
2	10.6	0.58	228	47.1	<5°	0.34	228	36.1	<5°
3	18.4	0.68	228	51.0	<5°	0.52	228	44.6	<5°
4	27	0.92	228	59.3	<5°	0.96	228	60.6	<5°
5	36.5	1.02	228	62.5	<5°	0.90	228	58.7	<5°
6	47.5	0.96	228	60.6	<5°	0.92	228	59.3	<5°
7	61.1	0.98	228	61.2	<5°	0.96	228	60.6	<5°
8	81	0.92	228	59.3	<5°	0.92	228	59.3	<5°
		Traverse 3 (NW)				**Traverse 4 (NE)**			
1	3.5	0.41	228	39.6	<5°	0.42	228	40.1	<5°
2	10.6	0.67	228	50.6	<5°	0.62	228	48.7	<5°
3	18.4	0.89	228	58.3	<5°	0.86	228	57.3	<5°
4	27	0.95	228	60.3	<5°	0.88	228	58.0	<5°
5	36.5	0.94	228	59.9	<5°	0.94	228	59.9	<5°
6	47.5	0.88	228	58.0	<5°	1.02	228	62.4	<5°
7	61.1	0.92	228	59.3	<5°	0.98	228	61.2	<5°
8	81	0.94	228	59.9	<5°	0.92	228	59.3	<5°
Average		**0.80**	**228**	**54.7**		**0.79**	**228**	**54.4**	

Average velocity	(m^3/min)	54.5
	(m^3/sec)	**16.62**
Flow Rate, Qs (actual)	(cfm)	832,764
	(m^3/sec)	23,581.3
	(m^3/sec)	393.02
Flow Rate, Qs (ref,dry)	(cf/sec)	10,318
	(m^3/sec)	**292.21**

Stack Gas Velocity

Client:	St. Mary's Bowmanville
Project #:	1901750
Locations:	Kiln Stack - Test #3
Date:	February 28, 2019
Time:	4:50 PM
stack diameter (inches):	216
Stack Area, (ft^2):	254.5
Barometric Press, Pb (" Hg):	29.96
Stack Pressure, Ps (" Hg):	29.91

Pitot Coefficient, Cp:	0.823
Molar Weight Stack Gas:	29.74
Moisture, Bws (%):	4.9%
Static Pressure, Pg (" H_2O):	-0.72

Dry Molecular Weight		
O_2	15.3	%
CO_2	10.2	%
CO	0.0005	%
N_2	73.6	%
Ar	0.9	%
Md	**30.35**	

QA: TFL

Point	Position (in)	Traverse 1 (NW) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle	Traverse 2 (NE) delta P (" H_2O)	Temp (Ts) (^oF)	Velocity (ft/s)	Cyclonic Angle
1	3.5	0.21	231	28.4	<5°	0.52	231	44.6	<5°
2	10.6	0.54	231	45.5	<5°	0.78	231	54.7	<5°
3	18.4	0.96	231	60.7	<5°	0.95	231	60.3	<5°
4	27	0.92	231	59.4	<5°	0.86	231	57.4	<5°
5	36.5	1.04	231	63.1	<5°	0.94	231	60.0	<5°
6	47.5	0.98	231	61.3	<5°	0.88	231	58.1	<5°
7	61.1	1.02	231	62.5	<5°	0.96	231	60.7	<5°
8	81	0.96	231	60.7	<5°	0.98	231	61.3	<5°
		Traverse 3 (SE)				**Traverse 4 (SW)**			
1	3.5	0.36	231	37.1	<5°	0.42	231	40.1	<5°
2	10.6	0.58	231	47.1	<5°	0.58	231	47.1	<5°
3	18.4	0.86	231	57.4	<5°	0.63	231	49.1	<5°
4	27	0.84	231	56.7	<5°	0.92	231	59.4	<5°
5	36.5	1.02	231	62.5	<5°	1.04	231	63.1	<5°
6	47.5	1.00	231	61.9	<5°	0.96	231	60.7	<5°
7	61.1	0.93	231	59.7	<5°	0.88	231	58.1	<5°
8	81	0.94	231	60.0	<5°	0.92	231	59.4	<5°
Average		**0.82**	**231**	**55.3**		**0.83**	**231**	**55.9**	

Average velocity	(ft/s)	55.6
	(m/s)	**16.94**
Flow Rate, Qs (actual)	(cfm)	848,469
	(m^3/min)	24,026
	(m^3/sec)	400.43
Flow Rate, Qs (ref,dry)	(cf/sec)	10,446
	(m^3/sec)	**295.85**

APPENDIX I

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 26188

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/10/24
Report #: R5454999
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8Q5571
Received: 2018/10/09, 08:30

Sample Matrix: Stack Sampling Train
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Mercury 3C in HCl Rinse	3	2018/10/23	2018/10/24	BRL SOP-00104	EPA M29/M0060 m
Mercury 2B in HNO3/H2O2 Imp.	3	2018/10/22	2018/10/24	BRL SOP-00104	EPA M29/M0060 m
Mercury 3A in HNO3 Rinse	3	2018/10/22	2018/10/23	BRL SOP-00104	EPA M29/M0060 m
Mercury 3B in KMnO4/H2SO4 Imp.	3	2018/10/15	2018/10/23	BRL SOP-00104	EPA M29/M0060 m
Mercury 1B in Filter + Rinse (M29)	3	2018/10/16	2018/10/23	BRL SOP-00104	EPA 29 m
Hydrogen Halides -Midget H2SO4 Imp	3	2018/10/15	2018/10/15	BRL SOP-00108	EPA 26 m
Metals in Combined Train (6020B m)	3	2018/10/16	2018/10/18	BRL SOP-00103/ BRL SOP-00102	EPA M29/CARB 436 m
Ammonium in Midget H2SO4 Imp(CTM-027mod)	3	2018/10/12	2018/10/12	BRL SOP-00107	EPA CTM-027 m
>10um Particulates in Rinse	3	2018/10/11	2018/10/19	BRL SOP-00109	EPA M201A
2.5-10um Particulates in Rinse	3	2018/10/11	2018/10/19	BRL SOP-00109	EPA M201A
2.5 um Particulates on Filter	3	N/A	2018/10/11	BRL SOP-00109	EPA M201A
<2.5um Particulates in Rinse	3	2018/10/11	2018/10/19	BRL SOP-00109	EPA M201A
Particulates/Acetone Rinse (M5/315/M201)	3	2018/10/10	2018/10/15	BRL SOP-00109	EPA 5/315 m
Particulates/Filter (M5/315/NJATM1/M201)	3	N/A	2018/10/11	BRL SOP-00109	EPA 5/315/NJATM1 m
Final Volume of Acetone Probe Rinse	3	N/A	2018/10/15	BRL SOP-00109	
Final Volume of Acetone Probe Rinse	3	N/A	2018/10/19	BRL SOP-00109	
Volume of Sulfuric Acid Impinger	3	N/A	2018/10/12		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

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Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 26188

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/10/24
Report #: R5454999
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8Q5571
Received: 2018/10/09, 08:30
agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HYV713	HYV714	HYV715			
Sampling Date		2018/09/30	2018/10/01	2018/10/02			
COC Number		26188	26188	26188			
	UNITS	**M5/29-T1**	**M5/29-T2**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
Acetone Rinse Particulate Weight in Acetone Rinse	mg	25.2	10.1	5.6	0.5	0.1	5774932
Front Half Particulate Weight on Filter	mg	1.00	14.9	26.5	0.30	0.060	5778504
Acetone Rinse Volume	ml	63	64	45	1	1	5774936

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		HYV719	HYV720	HYV721			
Sampling Date		2018/09/30	2018/10/01	2018/10/02			
COC Number							
	UNITS	**M201A-T1**	**M201A-T2**	**M201A-T3**	**RDL**	**MDL**	**QC Batch**
> 10 Particulate Weight in Acetone Rinse	mg	3.7	4.0	2.3	0.5	0.1	5777397
< 2.5 Particulate Weight in Acetone Rinse	mg	ND	ND	ND	0.5	0.5	5777393
2.5 - 10 Particulate Weight in Acetone Rinse	mg	1.4	1.4	1.1	0.5	0.5	5777396
< 2.5 Particulate Weight on Filter	mg	ND	ND	0.70	0.30	0.30	5778523
Acetone Rinse Volume (10)	ml	47	44	41	1	N/A	5777398
Acetone Rinse Volume (2.5 - 10)	ml	24	57	44	1	N/A	5777398
Acetone Rinse Volume (2.5)	ml	19	12	31	1	N/A	5777398

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

Maxxam ID		HYV992			HYW001			
Sampling Date		2018/09/30			2018/10/01			
COC Number								
	UNITS	**M26(M)/CTM027(M)- T1**	**RDL**	**MDL**	**M26(M)/CTM027(M)- T2**	**RDL**	**MDL**	**QC Batch**
Sulfuric Acid Volume	ml	49	1	1	49	1	1	5780357
Ammonium (NH4)	ug	3200	75	15	3300	38	7.6	5780351
Hydrochloric Acid	ug	1200	30	6.0	500	30	6.0	5783395

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HYW002			
Sampling Date		2018/10/02			
COC Number					
	UNITS	**M26(M)/CTM027(M)- T3**	**RDL**	**MDL**	**QC Batch**
Sulfuric Acid Volume	ml	49	1	1	5780357
Ammonium (NH4)	ug	2400	38	7.6	5780351
Hydrochloric Acid	ug	380	30	6.0	5783395

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

MERCURY BY COLD VAPOUR AA (STACK SAMPLING TRAIN)

Maxxam ID		HYV713			HYV714			HYV715			
Sampling Date		2018/09/30			2018/10/01			2018/10/02			
COC Number		26188			26188			26188			
	UNITS	**M5/29-T1**	**RDL**	**MDL**	**M5/29-T2**	**RDL**	**MDL**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
1B Mercury (Hg)	ug	0.042	0.015	0.006	0.050	0.015	0.006	0.033	0.015	0.006	5785191
2B Mercury (Hg)	ug	0.86	0.18	0.0072	1.24	0.21	0.0084	1.48	0.21	0.0084	5796437
3A Mercury (Hg)	ug	0.0068	0.0034	0.00041	0.0162	0.0019	0.00023	0.0110	0.0023	0.00028	5796452
3B Mercury (Hg)	ug	0.06	0.02	0.004	2.11	0.02	0.004	2.17	0.02	0.004	5796457
3C Mercury (Hg)	ug	3.02	0.02	0.004	3.16	0.023	0.0046	2.38	0.023	0.0046	5798720

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Maxxam ID		HYV713			HYV714	HYV715			
Sampling Date		2018/09/30			2018/10/01	2018/10/02			
COC Number		26188			26188	26188			
	UNITS	**M5/29-T1**	**RDL**	**MDL**	**M5/29-T2**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
Combined Train Aluminum (Al)	ug	875	60	3.0	803	830	150	7.5	5785203
Combined Train Antimony (Sb)	ug	ND	3.0	0.080	ND	ND	7.5	0.20	5785203
Combined Train Arsenic (As)	ug	1.76	0.80	0.080	ND	ND	2.0	0.20	5785203
Combined Train Barium (Ba)	ug	27.3	1.2	0.80	26.3	19.8	3.0	2.0	5785203
Combined Train Beryllium (Be)	ug	ND	0.18	0.040	ND	ND	0.45	0.10	5785203
Combined Train Boron (B)	ug	69	30	2.0	ND	ND	75	5.0	5785203
Combined Train Cadmium (Cd)	ug	0.35	0.18	0.040	0.47	0.48	0.45	0.10	5785203
Combined Train Calcium (Ca)	ug	9870	300	18	8520	10600	750	45	5785203
Combined Train Chromium (Cr)	ug	6.9	3.0	0.10	ND	ND	7.5	0.25	5785203
Combined Train Cobalt (Co)	ug	7.24	0.18	0.020	0.71	ND	0.45	0.050	5785203
Combined Train Copper (Cu)	ug	4.9	1.5	0.20	4.6	4.0	3.8	0.51	5785203
Combined Train Iron (Fe)	ug	645	60	10	519	720	150	25	5785203
Combined Train Lead (Pb)	ug	16.3	0.60	0.040	17.4	15.4	1.5	0.10	5785203
Combined Train Magnesium (Mg)	ug	429	30	1.0	391	424	75	2.5	5785203
Combined Train Manganese (Mn)	ug	27.6	1.2	0.10	24.8	18.4	3.0	0.25	5785203
Combined Train Molybdenum (Mo)	ug	12.4	1.0	0.10	12.2	12.3	2.5	0.25	5785203
Combined Train Nickel (Ni)	ug	8.8	1.0	0.20	6.9	5.7	2.5	0.50	5785203
Combined Train Phosphorus (P)	ug	92	90	10	ND	ND	230	26	5785203
Combined Train Potassium (K)	ug	1520	120	6.0	1460	1450	300	15	5785203
Combined Train Selenium (Se)	ug	ND	2.0	0.50	ND	ND	5.0	1.3	5785203
Combined Train Silver (Ag)	ug	13.3	0.24	0.040	1.02	ND	0.60	0.10	5785203
Combined Train Strontium (Sr)	ug	20.2	0.90	0.060	17.3	20.0	2.3	0.15	5785203
Combined Train Thallium (Tl)	ug	0.50	0.24	0.10	ND	ND	0.60	0.25	5785203
Combined Train Tin (Sn)	ug	114	1.2	0.10	125	108	3.0	0.25	5785203
Combined Train Titanium (Ti)	ug	52.1	3.0	0.30	48.7	51.4	7.5	0.75	5785203
Combined Train Vanadium (V)	ug	1.20	0.60	0.080	ND	ND	1.5	0.20	5785203
Combined Train Zinc (Zn)	ug	53	20	2.0	31	ND	25	2.5	5785203

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: HYV713 **Collected:** 2018/09/30
Sample ID: M5/29-T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5798720	2018/10/23	2018/10/24	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5796437	2018/10/22	2018/10/24	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5796452	2018/10/22	2018/10/23	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5796457	2018/10/15	2018/10/23	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5785191	2018/10/16	2018/10/23	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5785203	2018/10/16	2018/10/18	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5774932	2018/10/10	2018/10/15	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5778504	N/A	2018/10/11	Brenda Moore
Final Volume of Acetone Probe Rinse		5774936	N/A	2018/10/15	Farag Farag

Maxxam ID: HYV713 Dup **Collected:** 2018/09/30
Sample ID: M5/29-T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3A in HNO3 Rinse	CV/AA	5796452	2018/10/23	2018/10/23	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5796457	2018/10/22	2018/10/23	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5785203	2018/10/17	2018/10/18	Nan Raykha

Maxxam ID: HYV714 **Collected:** 2018/10/01
Sample ID: M5/29-T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5798720	2018/10/23	2018/10/24	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5796437	2018/10/22	2018/10/24	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5796452	2018/10/22	2018/10/23	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5796457	2018/10/15	2018/10/23	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5785191	2018/10/16	2018/10/23	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5785203	2018/10/16	2018/10/18	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5774932	2018/10/10	2018/10/15	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5778504	N/A	2018/10/11	Brenda Moore
Final Volume of Acetone Probe Rinse		5774936	N/A	2018/10/15	Farag Farag

Maxxam ID: HYV714 Dup **Collected:** 2018/10/01
Sample ID: M5/29-T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5796437	2018/10/22	2018/10/24	Meghaben Patel

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: HYV715
Sample ID: M5/29-T3
Matrix: Stack Sampling Train

Collected: 2018/10/02
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5798720	2018/10/23	2018/10/24	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5796437	2018/10/22	2018/10/24	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5796452	2018/10/22	2018/10/23	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5796457	2018/10/15	2018/10/23	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5785191	2018/10/16	2018/10/23	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5785203	2018/10/16	2018/10/18	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5774932	2018/10/10	2018/10/15	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5778504	N/A	2018/10/11	Brenda Moore
Final Volume of Acetone Probe Rinse		5774936	N/A	2018/10/15	Farag Farag

Maxxam ID: HYV715 Dup
Sample ID: M5/29-T3
Matrix: Stack Sampling Train

Collected: 2018/10/02
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5798720	2018/10/23	2018/10/24	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5785191	2018/10/18	2018/10/23	Meghaben Patel

Maxxam ID: HYV719
Sample ID: M201A-T1
Matrix: Stack Sampling Train

Collected: 2018/09/30
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	5777397	2018/10/11	2018/10/19	Farag Farag
2.5-10um Particulates in Rinse	BAL	5777396	2018/10/11	2018/10/19	Farag Farag
2.5 um Particulates on Filter	BAL	5778523	N/A	2018/10/11	Brenda Moore
<2.5um Particulates in Rinse	BAL	5777393	2018/10/11	2018/10/19	Farag Farag
Final Volume of Acetone Probe Rinse		5777398	N/A	2018/10/19	Farag Farag

Maxxam ID: HYV720
Sample ID: M201A-T2
Matrix: Stack Sampling Train

Collected: 2018/10/01
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	5777397	2018/10/11	2018/10/19	Farag Farag
2.5-10um Particulates in Rinse	BAL	5777396	2018/10/11	2018/10/19	Farag Farag
2.5 um Particulates on Filter	BAL	5778523	N/A	2018/10/11	Brenda Moore
<2.5um Particulates in Rinse	BAL	5777393	2018/10/11	2018/10/19	Farag Farag
Final Volume of Acetone Probe Rinse		5777398	N/A	2018/10/19	Farag Farag

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: HYV721 **Collected:** 2018/10/02
Sample ID: M201A-T3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	5777397	2018/10/11	2018/10/19	Farag Farag
2.5-10um Particulates in Rinse	BAL	5777396	2018/10/11	2018/10/19	Farag Farag
2.5 um Particulates on Filter	BAL	5778523	N/A	2018/10/11	Brenda Moore
<2.5um Particulates in Rinse	BAL	5777393	2018/10/11	2018/10/19	Farag Farag
Final Volume of Acetone Probe Rinse		5777398	N/A	2018/10/19	Farag Farag

Maxxam ID: HYV992 **Collected:** 2018/09/30
Sample ID: M26(M)/CTM027(M)- T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5783395	2018/10/15	2018/10/15	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5780351	2018/10/12	2018/10/12	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5780357	N/A	2018/10/12	Walt Wang

Maxxam ID: HYV992 Dup **Collected:** 2018/09/30
Sample ID: M26(M)/CTM027(M)- T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5783395	2018/10/15	2018/10/15	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5780351	2018/10/12	2018/10/12	Rupinder Sihota

Maxxam ID: HYW001 **Collected:** 2018/10/01
Sample ID: M26(M)/CTM027(M)- T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5783395	2018/10/15	2018/10/15	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5780351	2018/10/12	2018/10/12	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5780357	N/A	2018/10/12	Walt Wang

Maxxam ID: HYW002 **Collected:** 2018/10/02
Sample ID: M26(M)/CTM027(M)- T3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5783395	2018/10/15	2018/10/15	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5780351	2018/10/12	2018/10/12	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5780357	N/A	2018/10/12	Walt Wang

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

GENERAL COMMENTS

ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Metals in Combined Train (6020B m): Extra dilution was required for samples HYV714 and HYV715 due to the matrix.
Post digestion duplicate and spike were done on sample HYV713.
Trace level Ba (1.4 ug) was observed in the Processed Blank.

Results relate only to the items tested.

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5774932	FF	Method Blank	Acetone Rinse Particulate Weight in Acetone Rinse	2018/10/15	ND, RDL=0.5		mg	
5777393	FF	Method Blank	< 2.5 Particulate Weight in Acetone Rinse	2018/10/19	ND, RDL=0.5		mg	
5777396	FF	Method Blank	2.5 - 10 Particulate Weight in Acetone Rinse	2018/10/19	ND, RDL=0.5		mg	
5777397	FF	Method Blank	> 10 Particulate Weight in Acetone Rinse	2018/10/19	ND, RDL=0.5		mg	
5780351	RSU	Matrix Spike(HYV992)	Ammonium (NH4)	2018/10/12		96	%	75 - 125
5780351	RSU	Spiked Blank	Ammonium (NH4)	2018/10/12		100	%	90 - 110
5780351	RSU	Method Blank	Ammonium (NH4)	2018/10/12	ND, RDL=3.8		ug	
5780351	RSU	RPD - Sample/Sample Dup	Ammonium (NH4)	2018/10/12	0.65		%	20
5783395	A_S	Matrix Spike(HYV992)	Hydrochloric Acid	2018/10/15		89	%	80 - 120
5783395	A_S	Spiked Blank	Hydrochloric Acid	2018/10/15		100	%	90 - 110
5783395	A_S	Method Blank	Hydrochloric Acid	2018/10/15	ND, RDL=30		ug	
5783395	A_S	RPD - Sample/Sample Dup	Hydrochloric Acid	2018/10/15	0.59		%	20
5785191	MPD	Reagent Blank	1B Mercury (Hg)	2018/10/23	ND, RDL=0.015		ug	
5785191	MPD	Matrix Spike(HYV715)	1B Mercury (Hg)	2018/10/23		103	%	85 - 115
5785191	MPD	MS/MSD RPD	1B Mercury (Hg)	2018/10/23	0.88		%	20
5785191	MPD	Spiked Blank	1B Mercury (Hg)	2018/10/23		99	%	90 - 110
5785191	MPD	RPD	1B Mercury (Hg)	2018/10/23	4.3		%	20
5785191	MPD	Method Blank	1B Mercury (Hg)	2018/10/23	ND, RDL=0.015		ug	
5785191	MPD	RPD - Sample/Sample Dup	1B Mercury (Hg)	2018/10/23	0.92		%	20
5785203	N_R	Matrix Spike(HYV713)	Combined Train Aluminum (Al)	2018/10/18		91	%	75 - 125
			Combined Train Antimony (Sb)	2018/10/18		103	%	75 - 125
			Combined Train Arsenic (As)	2018/10/18		96	%	75 - 125
			Combined Train Barium (Ba)	2018/10/18		98	%	75 - 125
			Combined Train Beryllium (Be)	2018/10/18		99	%	75 - 125
			Combined Train Boron (B)	2018/10/18		94	%	75 - 125
			Combined Train Cadmium (Cd)	2018/10/18		100	%	75 - 125
			Combined Train Calcium (Ca)	2018/10/18		94	%	75 - 125
			Combined Train Chromium (Cr)	2018/10/18		96	%	75 - 125
			Combined Train Cobalt (Co)	2018/10/18		98	%	75 - 125
			Combined Train Copper (Cu)	2018/10/18		99	%	75 - 125
			Combined Train Iron (Fe)	2018/10/18		98	%	75 - 125
			Combined Train Lead (Pb)	2018/10/18		101	%	75 - 125
			Combined Train Magnesium (Mg)	2018/10/18		100	%	75 - 125
			Combined Train Manganese (Mn)	2018/10/18		97	%	75 - 125
			Combined Train Molybdenum (Mo)	2018/10/18		103	%	75 - 125
			Combined Train Nickel (Ni)	2018/10/18		99	%	75 - 125
			Combined Train Phosphorus (P)	2018/10/18		98	%	75 - 125
			Combined Train Potassium (K)	2018/10/18		97	%	75 - 125
			Combined Train Selenium (Se)	2018/10/18		95	%	75 - 125
			Combined Train Silver (Ag)	2018/10/18		101	%	75 - 125
			Combined Train Strontium (Sr)	2018/10/18		98	%	75 - 125
			Combined Train Thallium (Tl)	2018/10/18		101	%	75 - 125
			Combined Train Tin (Sn)	2018/10/18		100	%	75 - 125
			Combined Train Titanium (Ti)	2018/10/18		98	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Vanadium (V)	2018/10/18		98	%	75 - 125
			Combined Train Zinc (Zn)	2018/10/18		96	%	75 - 125
5785203	N_R	MS/MSD RPD	Combined Train Aluminum (Al)	2018/10/18	6.6		%	20
			Combined Train Antimony (Sb)	2018/10/18	0.63		%	20
			Combined Train Arsenic (As)	2018/10/18	0.021		%	20
			Combined Train Barium (Ba)	2018/10/18	0.051		%	20
			Combined Train Beryllium (Be)	2018/10/18	0.79		%	20
			Combined Train Boron (B)	2018/10/18	1.7		%	20
			Combined Train Cadmium (Cd)	2018/10/18	2.0		%	20
			Combined Train Calcium (Ca)	2018/10/18	0		%	20
			Combined Train Chromium (Cr)	2018/10/18	1.4		%	20
			Combined Train Cobalt (Co)	2018/10/18	1.2		%	20
			Combined Train Copper (Cu)	2018/10/18	0.96		%	20
			Combined Train Iron (Fe)	2018/10/18	2.1		%	20
			Combined Train Lead (Pb)	2018/10/18	0.82		%	20
			Combined Train Magnesium (Mg)	2018/10/18	0.77		%	20
			Combined Train Manganese (Mn)	2018/10/18	2.5		%	20
			Combined Train Molybdenum (Mo)	2018/10/18	0.84		%	20
			Combined Train Nickel (Ni)	2018/10/18	1.3		%	20
			Combined Train Phosphorus (P)	2018/10/18	0.14		%	20
			Combined Train Potassium (K)	2018/10/18	0		%	20
			Combined Train Selenium (Se)	2018/10/18	2.1		%	20
			Combined Train Silver (Ag)	2018/10/18	0.90		%	20
			Combined Train Strontium (Sr)	2018/10/18	1.5		%	20
			Combined Train Thallium (Tl)	2018/10/18	0.37		%	20
			Combined Train Tin (Sn)	2018/10/18	4.2		%	20
			Combined Train Titanium (Ti)	2018/10/18	3.1		%	20
			Combined Train Vanadium (V)	2018/10/18	0.65		%	20
			Combined Train Zinc (Zn)	2018/10/18	0.94		%	20
5785203	N_R	Spiked Blank	Combined Train Aluminum (Al)	2018/10/18		107	%	85 - 115
			Combined Train Antimony (Sb)	2018/10/18		105	%	85 - 115
			Combined Train Arsenic (As)	2018/10/18		100	%	85 - 115
			Combined Train Barium (Ba)	2018/10/18		100	%	85 - 115
			Combined Train Beryllium (Be)	2018/10/18		102	%	85 - 115
			Combined Train Boron (B)	2018/10/18		111	%	85 - 115
			Combined Train Cadmium (Cd)	2018/10/18		104	%	85 - 115
			Combined Train Calcium (Ca)	2018/10/18		100	%	85 - 115
			Combined Train Chromium (Cr)	2018/10/18		101	%	85 - 115
			Combined Train Cobalt (Co)	2018/10/18		101	%	85 - 115
			Combined Train Copper (Cu)	2018/10/18		105	%	85 - 115
			Combined Train Iron (Fe)	2018/10/18		105	%	85 - 115
			Combined Train Lead (Pb)	2018/10/18		102	%	85 - 115
			Combined Train Magnesium (Mg)	2018/10/18		103	%	85 - 115
			Combined Train Manganese (Mn)	2018/10/18		101	%	85 - 115
			Combined Train Molybdenum (Mo)	2018/10/18		108	%	85 - 115
			Combined Train Nickel (Ni)	2018/10/18		101	%	85 - 115
			Combined Train Phosphorus (P)	2018/10/18		113	%	85 - 115
			Combined Train Potassium (K)	2018/10/18		103	%	85 - 115
			Combined Train Selenium (Se)	2018/10/18		101	%	85 - 115
			Combined Train Silver (Ag)	2018/10/18		105	%	85 - 115
			Combined Train Strontium (Sr)	2018/10/18		102	%	85 - 115
			Combined Train Thallium (Tl)	2018/10/18		103	%	85 - 115

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Tin (Sn)	2018/10/18		106	%	85 - 115
			Combined Train Titanium (Ti)	2018/10/18		103	%	85 - 115
			Combined Train Vanadium (V)	2018/10/18		102	%	85 - 115
			Combined Train Zinc (Zn)	2018/10/18		100	%	85 - 115
5785203	N_R	RPD	Combined Train Aluminum (Al)	2018/10/18	0.29		%	20
			Combined Train Antimony (Sb)	2018/10/18	0.60		%	20
			Combined Train Arsenic (As)	2018/10/18	0.090		%	20
			Combined Train Barium (Ba)	2018/10/18	1.4		%	20
			Combined Train Beryllium (Be)	2018/10/18	0.51		%	20
			Combined Train Boron (B)	2018/10/18	5.5		%	20
			Combined Train Cadmium (Cd)	2018/10/18	0.94		%	20
			Combined Train Calcium (Ca)	2018/10/18	0		%	20
			Combined Train Chromium (Cr)	2018/10/18	0.14		%	20
			Combined Train Cobalt (Co)	2018/10/18	1.1		%	20
			Combined Train Copper (Cu)	2018/10/18	1.3		%	20
			Combined Train Iron (Fe)	2018/10/18	0.77		%	20
			Combined Train Lead (Pb)	2018/10/18	1.8		%	20
			Combined Train Magnesium (Mg)	2018/10/18	1.0		%	20
			Combined Train Manganese (Mn)	2018/10/18	0.46		%	20
			Combined Train Molybdenum (Mo)	2018/10/18	1.7		%	20
			Combined Train Nickel (Ni)	2018/10/18	0.38		%	20
			Combined Train Phosphorus (P)	2018/10/18	0.74		%	20
			Combined Train Potassium (K)	2018/10/18	0		%	20
			Combined Train Selenium (Se)	2018/10/18	1.8		%	20
			Combined Train Silver (Ag)	2018/10/18	0.71		%	20
			Combined Train Strontium (Sr)	2018/10/18	1.1		%	20
			Combined Train Thallium (Tl)	2018/10/18	2.9		%	20
			Combined Train Tin (Sn)	2018/10/18	1.1		%	20
			Combined Train Titanium (Ti)	2018/10/18	0.35		%	20
			Combined Train Vanadium (V)	2018/10/18	0.80		%	20
			Combined Train Zinc (Zn)	2018/10/18	0.86		%	20
5785203	N_R	Method Blank	Combined Train Aluminum (Al)	2018/10/18	ND, RDL=60		ug	
			Combined Train Antimony (Sb)	2018/10/18	ND, RDL=3.0		ug	
			Combined Train Arsenic (As)	2018/10/18	ND, RDL=0.80		ug	
			Combined Train Barium (Ba)	2018/10/18	1.4, RDL=1.2		ug	
			Combined Train Beryllium (Be)	2018/10/18	ND, RDL=0.18		ug	
			Combined Train Boron (B)	2018/10/18	ND, RDL=30		ug	
			Combined Train Cadmium (Cd)	2018/10/18	ND, RDL=0.18		ug	
			Combined Train Calcium (Ca)	2018/10/18	ND, RDL=300		ug	
			Combined Train Chromium (Cr)	2018/10/18	ND, RDL=3.0		ug	
			Combined Train Cobalt (Co)	2018/10/18	ND, RDL=0.18		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Copper (Cu)	2018/10/18	ND, RDL=1.5		ug	
			Combined Train Iron (Fe)	2018/10/18	ND, RDL=60		ug	
			Combined Train Lead (Pb)	2018/10/18	ND, RDL=0.60		ug	
			Combined Train Magnesium (Mg)	2018/10/18	ND, RDL=30		ug	
			Combined Train Manganese (Mn)	2018/10/18	ND, RDL=1.2		ug	
			Combined Train Molybdenum (Mo)	2018/10/18	ND, RDL=1.0		ug	
			Combined Train Nickel (Ni)	2018/10/18	ND, RDL=1.0		ug	
			Combined Train Phosphorus (P)	2018/10/18	ND, RDL=90		ug	
			Combined Train Potassium (K)	2018/10/18	ND, RDL=120		ug	
			Combined Train Selenium (Se)	2018/10/18	ND, RDL=2.0		ug	
			Combined Train Silver (Ag)	2018/10/18	ND, RDL=0.24		ug	
			Combined Train Strontium (Sr)	2018/10/18	ND, RDL=0.90		ug	
			Combined Train Thallium (Tl)	2018/10/18	ND, RDL=0.24		ug	
			Combined Train Tin (Sn)	2018/10/18	ND, RDL=1.2		ug	
			Combined Train Titanium (Ti)	2018/10/18	ND, RDL=3.0		ug	
			Combined Train Vanadium (V)	2018/10/18	ND, RDL=0.60		ug	
			Combined Train Zinc (Zn)	2018/10/18	ND, RDL=10		ug	
5785203	N_R	RPD - Sample/Sample Dup	Combined Train Aluminum (Al)	2018/10/18	1.2		%	20
			Combined Train Antimony (Sb)	2018/10/18	NC		%	20
			Combined Train Arsenic (As)	2018/10/18	0.068		%	20
			Combined Train Barium (Ba)	2018/10/18	1.7		%	20
			Combined Train Beryllium (Be)	2018/10/18	NC		%	20
			Combined Train Boron (B)	2018/10/18	0.70		%	20
			Combined Train Cadmium (Cd)	2018/10/18	0.61		%	20
			Combined Train Calcium (Ca)	2018/10/18	1.1		%	20
			Combined Train Chromium (Cr)	2018/10/18	3.1		%	20
			Combined Train Cobalt (Co)	2018/10/18	1.1		%	20
			Combined Train Copper (Cu)	2018/10/18	1.2		%	20
			Combined Train Iron (Fe)	2018/10/18	0.62		%	20
			Combined Train Lead (Pb)	2018/10/18	0.53		%	20
			Combined Train Magnesium (Mg)	2018/10/18	1.3		%	20
			Combined Train Manganese (Mn)	2018/10/18	1.7		%	20
			Combined Train Molybdenum (Mo)	2018/10/18	1.2		%	20
			Combined Train Nickel (Ni)	2018/10/18	3.1		%	20
			Combined Train Phosphorus (P)	2018/10/18	1.5		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Potassium (K)	2018/10/18	1.8		%	20
			Combined Train Selenium (Se)	2018/10/18	NC		%	20
			Combined Train Silver (Ag)	2018/10/18	0.53		%	20
			Combined Train Strontium (Sr)	2018/10/18	0.47		%	20
			Combined Train Thallium (Tl)	2018/10/18	4.2		%	20
			Combined Train Tin (Sn)	2018/10/18	1.3		%	20
			Combined Train Titanium (Ti)	2018/10/18	0.0092		%	20
			Combined Train Vanadium (V)	2018/10/18	7.6		%	20
			Combined Train Zinc (Zn)	2018/10/18	1.2		%	20
5796437	MPD	Matrix Spike(HYV714)	2B Mercury (Hg)	2018/10/24		99	%	85 - 115
5796437	MPD	MS/MSD RPD	2B Mercury (Hg)	2018/10/24	1.1		%	20
5796437	MPD	Spiked Blank	2B Mercury (Hg)	2018/10/24		102	%	90 - 110
5796437	MPD	RPD	2B Mercury (Hg)	2018/10/24	1.4		%	20
5796437	MPD	Method Blank	2B Mercury (Hg)	2018/10/24	ND, RDL=0.015		ug	
5796437	MPD	RPD - Sample/Sample Dup	2B Mercury (Hg)	2018/10/24	0.34		%	20
5796452	MPD	Matrix Spike(HYV713)	3A Mercury (Hg)	2018/10/23		90	%	85 - 115
5796452	MPD	Spiked Blank	3A Mercury (Hg)	2018/10/23		99	%	90 - 110
5796452	MPD	RPD	3A Mercury (Hg)	2018/10/23	0.60		%	20
5796452	MPD	Method Blank	3A Mercury (Hg)	2018/10/23	ND, RDL=0.005		ug	
5796452	MPD	RPD - Sample/Sample Dup	3A Mercury (Hg)	2018/10/23	16		%	20
5796457	MPD	Reagent Blank	3B Mercury (Hg)	2018/10/23	ND, RDL=0.013		ug	
5796457	MPD	Matrix Spike(HYV713)	3B Mercury (Hg)	2018/10/23		100	%	85 - 115
5796457	MPD	MS/MSD RPD	3B Mercury (Hg)	2018/10/23	3.1		%	20
5796457	MPD	Spiked Blank	3B Mercury (Hg)	2018/10/23		100	%	90 - 110
5796457	MPD	RPD	3B Mercury (Hg)	2018/10/23	1.2		%	20
5796457	MPD	Method Blank	3B Mercury (Hg)	2018/10/23	ND, RDL=0.013		ug	
5796457	MPD	RPD - Sample/Sample Dup	3B Mercury (Hg)	2018/10/23	0.70		%	20
5798720	MPD	Reagent Blank	3C Mercury (Hg)	2018/10/24	ND, RDL=0.013		ug	
5798720	MPD	Matrix Spike(HYV715)	3C Mercury (Hg)	2018/10/24		87	%	85 - 115
5798720	MPD	MS/MSD RPD	3C Mercury (Hg)	2018/10/24	11 (1)		%	20
5798720	MPD	Spiked Blank	3C Mercury (Hg)	2018/10/24		99	%	90 - 110
5798720	MPD	RPD	3C Mercury (Hg)	2018/10/24	1.5		%	20
5798720	MPD	Method Blank	3C Mercury (Hg)	2018/10/24	ND, RDL=0.013		ug	
5798720	MPD	RPD - Sample/Sample Dup	3C Mercury (Hg)	2018/10/24	0.021		%	20

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

Reagent Blank: A blank matrix containing all reagents used in the analytical procedure. Used to determine any analytical contamination.

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

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

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

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

(1) One of the matrix spikes, is within acceptable limits, hence the data is reported.

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Maxxam Job #: B8Q5571
Report Date: 2018/10/24

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Frank Mo, B.Sc., Inorganic Lab. Manager

John Bowman, Analyst I

Walt Wang, Supervisor, Inorganics

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Chain of Custody Form - Source

B825571 (MS/M29/M26(M)/CTM027/M201A)
B825238 (VOST)

Maxxam

6740 Campobello Rd.
Mississauga, Ontario L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5775

CAM FCD-01303 /2 Page ____ of ____

CLIENT INFORMATION SECTION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: kirk.easto@rwdi.com
Address: Guelph, ON
Phone: 519-823-1311 Fax: 519-823-1316
Sampled by: Kirk Easto

ANALYSIS REQUESTED

MAXXAM use only	Field Sample ID	# Bottles	Collection Date	Collection Time	Initial Impinger Charge Volumes (mL)*	SVOC ENV/CAN 1/RM/2	US EPA M29	US EPA M26 HCl/NH3	Method 30 VOC's	US EPA M201A						
	T1-Baseline -SVOC (6 pieces)	5	Sept 30			x										
	T2-Baseline -SVOC (6 pieces)	6	Oct 1			x										
	T3-Baseline -SVOC (6 pieces)	6	Oct 2			x										
	T1-Baseline - M29 (7 pieces)	7	Sept 30				x									
	T2-Baseline - M29 (7 pieces)	7	Oct 1				x									
	T3-Baseline - M29 (7 pieces)	7	Oct 2				x									
	T1/T2/T3-Baseline -M26 (3 bottle)	3	09/30-10/032		2 * 15 ml			x								
	T1/T2/T3-Baseline -VOST (3 pairs)	3	09/30-10/032						x							
	T1-Baseline - PM10 (4pieces)	4	Sept 30							x						
	T2-Baseline - PM10 (4pieces)	4	Oct 1							x						
	T3-Baseline - PM10 (4pieces)	4	Oct 2							x						

TAT Requirement

STD 10 Business day ☑
Rush 5 Business day ☐
Rush 2 Business day ☐
Rush 1 Business day ☐
Other (specify) ☐

PROJECT INFORMATION

Project # 1804600
Name: St. Marys
PO # 1804600
Maxxam Quote #:
Maxxam Contact: Clayton Johnson

REPORTING REQUIREMENTS

SSAS Audit samples ☐
Summary Report only ☐
Summary Report & ☐
Raw Data Package **
** additional cost may apply

PROJECT SPECIFIC COMMENTS

See attached list for parameter lists

* Initial impinger charge volumes are required before the following analysis can be started: Method 26, CTM-027 & Method 8

Client Signature: [signature]
Affiliation:
Date/Time: Oct 6 2018

Received by: MIDDLE NTAMWEMEZI
Affiliation: [signature]
Date/Time: 2018/10/06 10:30

Method 23 / TO9A
2005 WHO ☐
1989 NATO TEF ☐
1998 WHO ☐
TEF x DL ☐
TEF x 0 DL ☐
TEF x 0.5 DL ☐

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8.5/8.9/9.0
20.6/20.4/20.3

SCHEDULE "B2"

TEST CONTAMINANTS

Source Testing Program

B8Q5571 (MS/M29/M26(M)/CTM027/M29M)
B8Q5238 (VOST)

Nitrogen Oxides
Sulphur Dioxide
Carbon Monoxide
Carbon Dioxide
Total Suspended Particulate Matter
PM 10
PM 2.5
Hydrogen Chloride
Ammonia
Calcium Oxide
Ferric Oxide

Metals		Volatile Organic Matter
Cd	Cadmium	acetone
Be	Beryllium	benzene
Pb	Lead	bromodichloromethane
Mo	Molybdenum	bromoform
Cr	Chromium	bromomethane
Ni	Nickel	butanone, 2 -
V	Vanadium	carbon tetrachloride
Al	Aluminum	chlorobenzene
Ti	Titanium	chloroethane
Mg	Magnesium	chloroform
B	Boron	chloromethane
Ba	Barium	cumene (isopropyl benzene)
P	Phosphorus	dibromochloromethane
K	Potassium	dichloroethane, 1,1 -
Hg	Mercury	dichloroethane, 1,2 -
As	Arsenic	dichloroethene, trans - 1,2 -
Zn	Zinc	dichloroethene, 1,1 – (vinyl chloride)
Sb	Antimony	dichloroethylene, cis - 1,2 -
Mn	Manganese	dichloropropane, 1,2 -
Co	Cobalt	ethylbenzene
Se	Selenium	ethylene dibromide (1,2-dibromoethane)
Cu	Copper	methylene chloride
Ag	Silver	styrene
Sn	Tin	tetrachloroethane, 1,1,1,2 -
Sr	Strontium	tetrachloroethane, 1,1,2,2 -
Tl	Thalium	tetrachloroethene
		toluene
		trichloroethane, 1,1,1 -
		trichloroethane, 1,1,2 -
		trichloroethene (trichloroethylene, 1,1,2 -)
		xylenes

FUELE NTAMMEMEZI 2018/10/06
Fidèle Ntamwemezi 10:30

8.5/8.9/9.0
20.6/20.4/20.3
~~23/23/22~~ Fid 2018/10/06

B8Q5571

RWDI	B8O3742	Pall			18072358	0.45390
	HUA110-01	90mm Quartz			18072359	0.45930
		p/n 7203			18072360	0.45990
		lot# 20531			18072361	0.45810
					18072362	0.45565
					18072363	0.45625
					18072364	0.45800
					18072365	0.45790
					18072366	0.46280
					18072367	0.46005
					18072368	0.46365
					18072369	0.46005
					18072370	0.45730
					18072371	0.45940
					18072372	0.45655

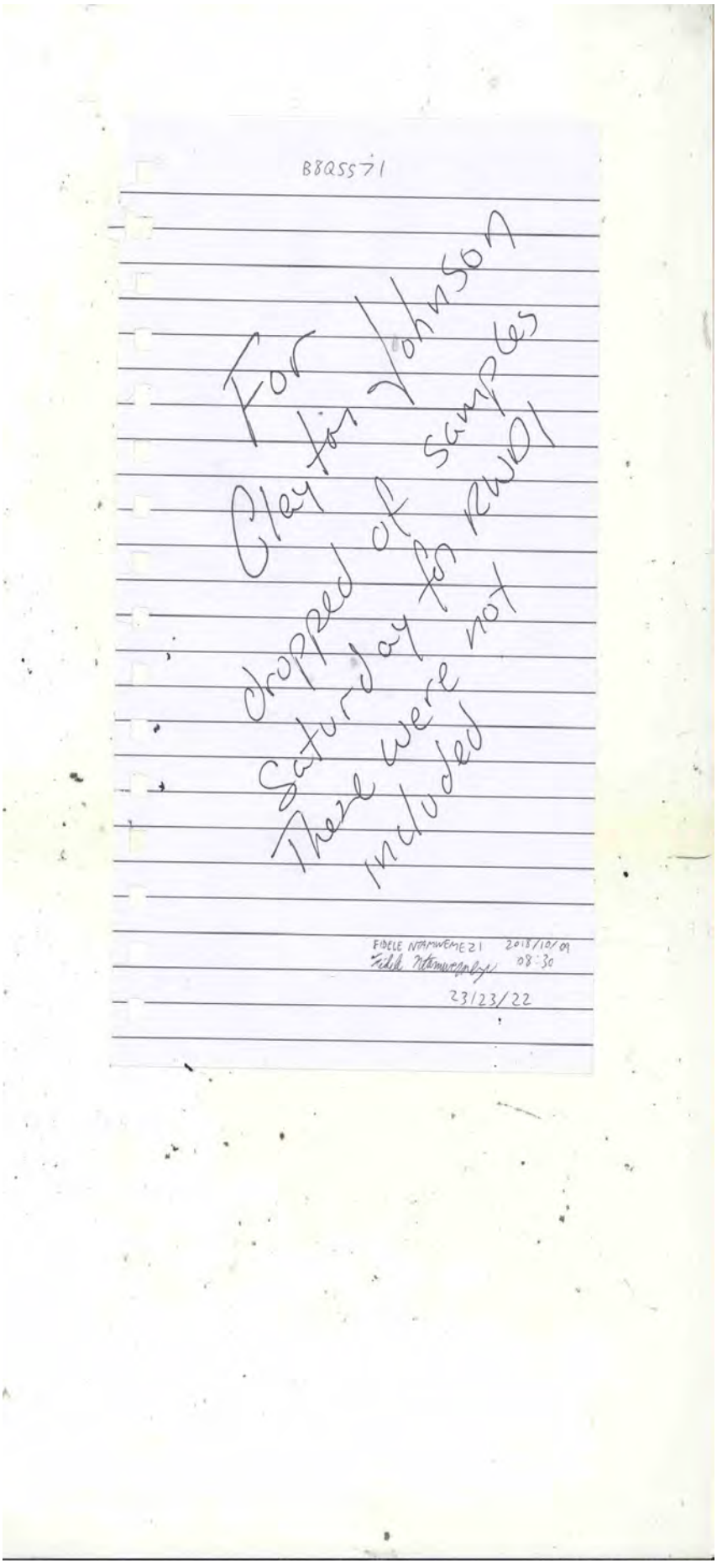
RWDI	B8O3742	Pall			18081617	0.45850
	HUA110-01	90mm Quartx			18081618	0.45860
		p/n 7203			18081619	0.46085
		lot# 20531			18081620	0.45840
					18081621	0.45955

R.I. Patel, Rain Patel 2018/10/09 08:30

23/23/22

~~20 20.1/20.4/20.3~~

FWL 2018/10/09


B8Q5571

For Clayton Johnson
dropped of samples
Saturday for RWDI
There were not
included

FIDELE NTAMWEMEZI 2018/10/09
08:30

23/23/22

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1702401
Your Project #: 1702401
Site Location: ST. MARYS
Your C.O.C. #: 26188

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/11/01
Report #: R5466882
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8R0031
Received: 2018/10/11, 15:27

Sample Matrix: Stack Sampling Train
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Mercury 3C in HCl Rinse	3	2018/10/30	2018/11/01	BRL SOP-00104	EPA M29/M0060 m
Mercury 2B in HNO3/H2O2 Imp.	3	2018/10/27	2018/10/30	BRL SOP-00104	EPA M29/M0060 m
Mercury 3A in HNO3 Rinse	3	2018/10/27	2018/10/30	BRL SOP-00104	EPA M29/M0060 m
Mercury 3B in KMnO4/H2SO4 Imp.	3	2018/10/29	2018/10/31	BRL SOP-00104	EPA M29/M0060 m
Mercury 1B in Filter + Rinse (M29)	3	2018/10/23	2018/10/30	BRL SOP-00104	EPA 29 m
Hydrogen Halides -Midget H2SO4 Imp	3	2018/10/22	2018/10/22	BRL SOP-00108	EPA 26 m
Metals in Combined Train (6020B m)	3	2018/10/23	2018/10/25	BRL SOP-00103/ BRL SOP-00102	EPA M29/CARB 436 m
Ammonium in Midget H2SO4 Imp(CTM-027mod)	3	2018/10/18	2018/10/18	BRL SOP-00107	EPA CTM-027 m
Particulates/Acetone Rinse (M5/315/M201)	3	2018/10/16	2018/10/18	BRL SOP-00109	EPA 5/315 m
Particulates/Filter (M5/315/NJATM1/M201)	3	N/A	2018/10/17	BRL SOP-00109	EPA 5/315/NJATM1 m
Final Volume of Acetone Probe Rinse	3	N/A	2018/10/18	BRL SOP-00109	
Volume of Sulfuric Acid Impinger	3	N/A	2018/10/18		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

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

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Your P.O. #: 1702401
Your Project #: 1702401
Site Location: ST. MARYS
Your C.O.C. #: 26188

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/11/01
Report #: R5466882
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8R0031
Received: 2018/10/11, 15:27

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HZU868	HZU869	HZU871			
Sampling Date		2018/10/05	2018/10/09	2018/10/09			
COC Number		26188	26188	26188			
	UNITS	**M5/29-T1**	**M5/29-T2**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
Acetone Rinse Particulate Weight in Acetone Rinse	mg	6.5	2.8	2.8	0.5	0.1	5785554
Front Half Particulate Weight on Filter	mg	11.7	12.5	14.7	0.30	0.060	5785342
Acetone Rinse Volume	ml	98	77	51	1	1	5785555

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		HZU875	HZU876			
Sampling Date		2018/10/05	2018/10/05			
COC Number						
	UNITS	**M26(M)/CTM027(M)- T1**	**M26(M)/CTM027(M)- T2**	**RDL**	**MDL**	**QC Batch**
Sulfuric Acid Volume	ml	49	50	1	1	5789747
Ammonium (NH4)	ug	2200	2500	38	7.6	5789745
Hydrochloric Acid	ug	500	490	30	6.0	5796430

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		HZU877			
Sampling Date		2018/10/05			
COC Number					
	UNITS	**M26(M)/CTM027(M)- T3**	**RDL**	**MDL**	**QC Batch**
Sulfuric Acid Volume	ml	50	1	1	5789747
Ammonium (NH4)	ug	3100	38	7.6	5789745
Hydrochloric Acid	ug	490	30	6.0	5796430

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

MERCURY BY COLD VAPOUR AA (STACK SAMPLING TRAIN)

Maxxam ID		HZU868			HZU869			HZU871			
Sampling Date		2018/10/05			2018/10/09			2018/10/09			
COC Number		26188			26188			26188			
	UNITS	**M5/29-T1**	**RDL**	**MDL**	**M5/29-T2**	**RDL**	**MDL**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
1B Mercury (Hg)	ug	ND	0.015	0.006	0.034	0.015	0.006	0.100	0.015	0.006	5798624
2B Mercury (Hg)	ug	3.43	0.19	0.0076	1.78	0.25	0.01	1.16	0.25	0.01	5806983
3A Mercury (Hg)	ug	0.0280	0.0015	0.00018	0.0272	0.0046	0.00055	0.0250	0.0032	0.00038	5806978
3B Mercury (Hg)	ug	2.41	0.025	0.005	0.45	0.02	0.004	0.22	0.02	0.004	5809990
3C Mercury (Hg)	ug	2.16	0.023	0.0046	2.01	0.02	0.004	2.02	0.023	0.0046	5811004

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Maxxam ID		HZU868	HZU869	HZU871			
Sampling Date		2018/10/05	2018/10/09	2018/10/09			
COC Number		26188	26188	26188			
	UNITS	**M5/29-T1**	**M5/29-T2**	**M5/29-T3**	**RDL**	**MDL**	**QC Batch**
Combined Train Aluminum (Al)	ug	453	405	454	150	7.5	5798617
Combined Train Antimony (Sb)	ug	ND	ND	ND	7.5	0.20	5798617
Combined Train Arsenic (As)	ug	ND	ND	ND	2.0	0.20	5798617
Combined Train Barium (Ba)	ug	17.0	18.0	20.0	3.0	2.0	5798617
Combined Train Beryllium (Be)	ug	ND	ND	ND	0.45	0.10	5798617
Combined Train Boron (B)	ug	ND	ND	ND	75	5.0	5798617
Combined Train Cadmium (Cd)	ug	ND	ND	0.49	0.45	0.10	5798617
Combined Train Calcium (Ca)	ug	4850	3840	4050	750	45	5798617
Combined Train Chromium (Cr)	ug	ND	ND	ND	7.5	0.25	5798617
Combined Train Cobalt (Co)	ug	ND	ND	0.60	0.45	0.050	5798617
Combined Train Copper (Cu)	ug	ND	ND	5.2	3.8	0.51	5798617
Combined Train Iron (Fe)	ug	437	299	343	150	25	5798617
Combined Train Lead (Pb)	ug	11.8	9.4	13.6	1.5	0.10	5798617
Combined Train Magnesium (Mg)	ug	183	167	194	75	2.5	5798617
Combined Train Manganese (Mn)	ug	9.9	8.9	14.8	3.0	0.25	5798617
Combined Train Molybdenum (Mo)	ug	11.9	12.5	12.0	2.5	0.25	5798617
Combined Train Nickel (Ni)	ug	4.6	4.7	24.1	2.5	0.50	5798617
Combined Train Phosphorus (P)	ug	ND	ND	ND	230	26	5798617
Combined Train Potassium (K)	ug	1030	830	996	300	15	5798617
Combined Train Selenium (Se)	ug	ND	ND	ND	5.0	1.3	5798617
Combined Train Silver (Ag)	ug	ND	ND	ND	0.60	0.10	5798617
Combined Train Strontium (Sr)	ug	10.2	8.5	9.0	2.3	0.15	5798617
Combined Train Thallium (Tl)	ug	ND	ND	ND	0.60	0.25	5798617
Combined Train Tin (Sn)	ug	79.2	99.1	112	3.0	0.25	5798617
Combined Train Titanium (Ti)	ug	34.3	31.6	28.2	7.5	0.75	5798617
Combined Train Vanadium (V)	ug	ND	ND	ND	1.5	0.20	5798617
Combined Train Zinc (Zn)	ug	ND	ND	33	25	2.5	5798617

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

TEST SUMMARY

Maxxam ID: HZU868 **Collected:** 2018/10/05
Sample ID: M5/29-T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5811004	2018/10/30	2018/11/01	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5806983	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5806978	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5809990	2018/10/29	2018/10/31	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5798624	2018/10/23	2018/10/30	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5798617	2018/10/23	2018/10/25	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5785554	2018/10/16	2018/10/18	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5785342	N/A	2018/10/17	Brenda Moore
Final Volume of Acetone Probe Rinse		5785555	N/A	2018/10/18	Farag Farag

Maxxam ID: HZU868 Dup **Collected:** 2018/10/05
Sample ID: M5/29-T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020B m)	ICP1/MS	5798617	2018/10/25	2018/10/25	Nan Raykha

Maxxam ID: HZU869 **Collected:** 2018/10/09
Sample ID: M5/29-T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5811004	2018/10/30	2018/11/01	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5806983	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5806978	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5809990	2018/10/29	2018/10/31	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5798624	2018/10/23	2018/10/30	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5798617	2018/10/23	2018/10/25	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5785554	2018/10/16	2018/10/18	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5785342	N/A	2018/10/17	Brenda Moore
Final Volume of Acetone Probe Rinse		5785555	N/A	2018/10/18	Farag Farag

Maxxam ID: HZU869 Dup **Collected:** 2018/10/09
Sample ID: M5/29-T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3A in HNO3 Rinse	CV/AA	5806978	2018/10/27	2018/10/30	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5798624	2018/10/24	2018/10/30	Meghaben Patel

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

TEST SUMMARY

Maxxam ID: HZU871 **Collected:** 2018/10/09
Sample ID: M5/29-T3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 3C in HCl Rinse	CV/AA	5811004	2018/10/30	2018/11/01	Meghaben Patel
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5806983	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3A in HNO3 Rinse	CV/AA	5806978	2018/10/27	2018/10/30	Meghaben Patel
Mercury 3B in KMnO4/H2SO4 Imp.	CV/AA	5809990	2018/10/29	2018/10/31	Meghaben Patel
Mercury 1B in Filter + Rinse (M29)	CV/AA	5798624	2018/10/23	2018/10/30	Meghaben Patel
Metals in Combined Train (6020B m)	ICP1/MS	5798617	2018/10/23	2018/10/25	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	5785554	2018/10/16	2018/10/18	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	5785342	N/A	2018/10/17	Brenda Moore
Final Volume of Acetone Probe Rinse		5785555	N/A	2018/10/18	Farag Farag

Maxxam ID: HZU871 Dup **Collected:** 2018/10/09
Sample ID: M5/29-T3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury 2B in HNO3/H2O2 Imp.	CV/AA	5806983	2018/10/27	2018/10/30	Meghaben Patel

Maxxam ID: HZU875 **Collected:** 2018/10/05
Sample ID: M26(M)/CTM027(M)- T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5796430	2018/10/22	2018/10/22	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5789745	2018/10/18	2018/10/18	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5789747	N/A	2018/10/18	Walt Wang

Maxxam ID: HZU875 Dup **Collected:** 2018/10/05
Sample ID: M26(M)/CTM027(M)- T1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5796430	2018/10/22	2018/10/22	Ann-Marie Stern

Maxxam ID: HZU876 **Collected:** 2018/10/05
Sample ID: M26(M)/CTM027(M)- T2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5796430	2018/10/22	2018/10/22	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5789745	2018/10/18	2018/10/18	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5789747	N/A	2018/10/18	Walt Wang

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

TEST SUMMARY

Maxxam ID: HZU877
Sample ID: M26(M)/CTM027(M)- T3
Matrix: Stack Sampling Train

Collected: 2018/10/05
Shipped:
Received: 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides -Midget H2SO4 Imp	IC/SPEC	5796430	2018/10/22	2018/10/22	Ann-Marie Stern
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5789745	2018/10/18	2018/10/18	Rupinder Sihota
Volume of Sulfuric Acid Impinger		5789747	N/A	2018/10/18	Walt Wang

Maxxam ID: HZU877 Dup
Sample ID: M26(M)/CTM027(M)- T3
Matrix: Stack Sampling Train

Collected: 2018/10/05
Shipped:
Received: 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Ammonium in Midget H2SO4 Imp(CTM-027mod)	IC/SPEC	5789745	2018/10/18	2018/10/18	Rupinder Sihota

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GENERAL COMMENTS

ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Metals in Combined Train (6020B m): Extra dilution was required for all samples except sample IAK787, due to the matrix.
Post digestion duplicate and spike were done on sample HZU868.
Trace level Ba was observed in the Processed Blank.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5785554	FF	Method Blank	Acetone Rinse Particulate Weight in Acetone Rinse	2018/10/18	ND, RDL=0.5		mg	
5789745	RSU	Matrix Spike(HZU877)	Ammonium (NH4)	2018/10/18		92	%	75 - 125
5789745	RSU	Spiked Blank	Ammonium (NH4)	2018/10/18		102	%	90 - 110
5789745	RSU	Method Blank	Ammonium (NH4)	2018/10/18	ND, RDL=3.8		ug	
5789745	RSU	RPD - Sample/Sample Dup	Ammonium (NH4)	2018/10/18	0.46		%	20
5796430	A_S	Matrix Spike(HZU875)	Hydrochloric Acid	2018/10/22		93	%	80 - 120
5796430	A_S	Spiked Blank	Hydrochloric Acid	2018/10/22		101	%	90 - 110
5796430	A_S	Method Blank	Hydrochloric Acid	2018/10/22	ND, RDL=30		ug	
5796430	A_S	RPD - Sample/Sample Dup	Hydrochloric Acid	2018/10/22	1.8		%	20
5798617	N_R	Matrix Spike(HZU868)	Combined Train Aluminum (Al)	2018/10/25		93	%	75 - 125
			Combined Train Antimony (Sb)	2018/10/25		104	%	75 - 125
			Combined Train Arsenic (As)	2018/10/25		107	%	75 - 125
			Combined Train Barium (Ba)	2018/10/25		93	%	75 - 125
			Combined Train Beryllium (Be)	2018/10/25		97	%	75 - 125
			Combined Train Boron (B)	2018/10/25		92	%	75 - 125
			Combined Train Cadmium (Cd)	2018/10/25		102	%	75 - 125
			Combined Train Calcium (Ca)	2018/10/25		94	%	75 - 125
			Combined Train Chromium (Cr)	2018/10/25		98	%	75 - 125
			Combined Train Cobalt (Co)	2018/10/25		102	%	75 - 125
			Combined Train Copper (Cu)	2018/10/25		96	%	75 - 125
			Combined Train Iron (Fe)	2018/10/25		103	%	75 - 125
			Combined Train Lead (Pb)	2018/10/25		104	%	75 - 125
			Combined Train Magnesium (Mg)	2018/10/25		102	%	75 - 125
			Combined Train Manganese (Mn)	2018/10/25		98	%	75 - 125
			Combined Train Molybdenum (Mo)	2018/10/25		101	%	75 - 125
			Combined Train Nickel (Ni)	2018/10/25		101	%	75 - 125
			Combined Train Phosphorus (P)	2018/10/25		97	%	75 - 125
			Combined Train Potassium (K)	2018/10/25		96	%	75 - 125
			Combined Train Selenium (Se)	2018/10/25		107	%	75 - 125
			Combined Train Silver (Ag)	2018/10/25		104	%	75 - 125
			Combined Train Strontium (Sr)	2018/10/25		100	%	75 - 125
			Combined Train Thallium (Tl)	2018/10/25		103	%	75 - 125
			Combined Train Tin (Sn)	2018/10/25		103	%	75 - 125
			Combined Train Titanium (Ti)	2018/10/25		93	%	75 - 125
			Combined Train Vanadium (V)	2018/10/25		98	%	75 - 125
			Combined Train Zinc (Zn)	2018/10/25		100	%	75 - 125
5798617	N_R	MS/MSD RPD	Combined Train Aluminum (Al)	2018/10/25	0		%	20
			Combined Train Antimony (Sb)	2018/10/25	0.41		%	20
			Combined Train Arsenic (As)	2018/10/25	2.3		%	20
			Combined Train Barium (Ba)	2018/10/25	0.70		%	20
			Combined Train Beryllium (Be)	2018/10/25	0.052		%	20
			Combined Train Boron (B)	2018/10/25	1.4		%	20
			Combined Train Cadmium (Cd)	2018/10/25	0		%	20
			Combined Train Calcium (Ca)	2018/10/25	0		%	20
			Combined Train Chromium (Cr)	2018/10/25	1.3		%	20
			Combined Train Cobalt (Co)	2018/10/25	1.6		%	20
			Combined Train Copper (Cu)	2018/10/25	0.96		%	20
			Combined Train Iron (Fe)	2018/10/25	0		%	20
			Combined Train Lead (Pb)	2018/10/25	1.7		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Magnesium (Mg)	2018/10/25	3.3		%	20
			Combined Train Manganese (Mn)	2018/10/25	1.1		%	20
			Combined Train Molybdenum (Mo)	2018/10/25	0.14		%	20
			Combined Train Nickel (Ni)	2018/10/25	1.0		%	20
			Combined Train Phosphorus (P)	2018/10/25	0		%	20
			Combined Train Potassium (K)	2018/10/25	0		%	20
			Combined Train Selenium (Se)	2018/10/25	0.34		%	20
			Combined Train Silver (Ag)	2018/10/25	1.4		%	20
			Combined Train Strontium (Sr)	2018/10/25	2.0		%	20
			Combined Train Thallium (Tl)	2018/10/25	0.41		%	20
			Combined Train Tin (Sn)	2018/10/25	2.3		%	20
			Combined Train Titanium (Ti)	2018/10/25	1.9		%	20
			Combined Train Vanadium (V)	2018/10/25	1.6		%	20
			Combined Train Zinc (Zn)	2018/10/25	0.71		%	20
5798617	N_R	Spiked Blank	Combined Train Aluminum (Al)	2018/10/25		108	%	85 - 115
			Combined Train Antimony (Sb)	2018/10/25		105	%	85 - 115
			Combined Train Arsenic (As)	2018/10/25		103	%	85 - 115
			Combined Train Barium (Ba)	2018/10/25		105	%	85 - 115
			Combined Train Beryllium (Be)	2018/10/25		106	%	85 - 115
			Combined Train Boron (B)	2018/10/25		119 (1)	%	85 - 115
			Combined Train Cadmium (Cd)	2018/10/25		107	%	85 - 115
			Combined Train Calcium (Ca)	2018/10/25		104	%	85 - 115
			Combined Train Chromium (Cr)	2018/10/25		105	%	85 - 115
			Combined Train Cobalt (Co)	2018/10/25		104	%	85 - 115
			Combined Train Copper (Cu)	2018/10/25		108	%	85 - 115
			Combined Train Iron (Fe)	2018/10/25		109	%	85 - 115
			Combined Train Lead (Pb)	2018/10/25		105	%	85 - 115
			Combined Train Magnesium (Mg)	2018/10/25		109	%	85 - 115
			Combined Train Manganese (Mn)	2018/10/25		105	%	85 - 115
			Combined Train Molybdenum (Mo)	2018/10/25		106	%	85 - 115
			Combined Train Nickel (Ni)	2018/10/25		104	%	85 - 115
			Combined Train Phosphorus (P)	2018/10/25		113	%	85 - 115
			Combined Train Potassium (K)	2018/10/25		107	%	85 - 115
			Combined Train Selenium (Se)	2018/10/25		108	%	85 - 115
			Combined Train Silver (Ag)	2018/10/25		106	%	85 - 115
			Combined Train Strontium (Sr)	2018/10/25		104	%	85 - 115
			Combined Train Thallium (Tl)	2018/10/25		107	%	85 - 115
			Combined Train Tin (Sn)	2018/10/25		105	%	85 - 115
			Combined Train Titanium (Ti)	2018/10/25		105	%	85 - 115
			Combined Train Vanadium (V)	2018/10/25		104	%	85 - 115
			Combined Train Zinc (Zn)	2018/10/25		101	%	85 - 115
5798617	N_R	RPD	Combined Train Aluminum (Al)	2018/10/25	3.0		%	20
			Combined Train Antimony (Sb)	2018/10/25	3.0		%	20
			Combined Train Arsenic (As)	2018/10/25	3.1		%	20
			Combined Train Barium (Ba)	2018/10/25	3.6		%	20
			Combined Train Beryllium (Be)	2018/10/25	3.2		%	20
			Combined Train Boron (B)	2018/10/25	2.9		%	20
			Combined Train Cadmium (Cd)	2018/10/25	3.8		%	20
			Combined Train Calcium (Ca)	2018/10/25	0		%	20
			Combined Train Chromium (Cr)	2018/10/25	3.3		%	20
			Combined Train Cobalt (Co)	2018/10/25	2.4		%	20
			Combined Train Copper (Cu)	2018/10/25	4.6		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Iron (Fe)	2018/10/25	2.7		%	20
			Combined Train Lead (Pb)	2018/10/25	2.6		%	20
			Combined Train Magnesium (Mg)	2018/10/25	4.6		%	20
			Combined Train Manganese (Mn)	2018/10/25	2.9		%	20
			Combined Train Molybdenum (Mo)	2018/10/25	1.8		%	20
			Combined Train Nickel (Ni)	2018/10/25	3.8		%	20
			Combined Train Phosphorus (P)	2018/10/25	2.4		%	20
			Combined Train Potassium (K)	2018/10/25	0		%	20
			Combined Train Selenium (Se)	2018/10/25	5.3		%	20
			Combined Train Silver (Ag)	2018/10/25	1.4		%	20
			Combined Train Strontium (Sr)	2018/10/25	2.7		%	20
			Combined Train Thallium (Tl)	2018/10/25	3.6		%	20
			Combined Train Tin (Sn)	2018/10/25	3.6		%	20
			Combined Train Titanium (Ti)	2018/10/25	1.2		%	20
			Combined Train Vanadium (V)	2018/10/25	2.5		%	20
			Combined Train Zinc (Zn)	2018/10/25	2.9		%	20
5798617	N_R	Method Blank	Combined Train Aluminum (Al)	2018/10/25	ND, RDL=60		ug	
			Combined Train Antimony (Sb)	2018/10/25	ND, RDL=3.0		ug	
			Combined Train Arsenic (As)	2018/10/25	ND, RDL=0.80		ug	
			Combined Train Barium (Ba)	2018/10/25	2.9, RDL=1.2		ug	
			Combined Train Beryllium (Be)	2018/10/25	ND, RDL=0.18		ug	
			Combined Train Boron (B)	2018/10/25	ND, RDL=30		ug	
			Combined Train Cadmium (Cd)	2018/10/25	ND, RDL=0.18		ug	
			Combined Train Calcium (Ca)	2018/10/25	ND, RDL=300		ug	
			Combined Train Chromium (Cr)	2018/10/25	ND, RDL=3.0		ug	
			Combined Train Cobalt (Co)	2018/10/25	ND, RDL=0.18		ug	
			Combined Train Copper (Cu)	2018/10/25	ND, RDL=1.5		ug	
			Combined Train Iron (Fe)	2018/10/25	ND, RDL=60		ug	
			Combined Train Lead (Pb)	2018/10/25	ND, RDL=0.60		ug	
			Combined Train Magnesium (Mg)	2018/10/25	ND, RDL=30		ug	
			Combined Train Manganese (Mn)	2018/10/25	ND, RDL=1.2		ug	
			Combined Train Molybdenum (Mo)	2018/10/25	ND, RDL=1.0		ug	
			Combined Train Nickel (Ni)	2018/10/25	ND, RDL=1.0		ug	
			Combined Train Phosphorus (P)	2018/10/25	ND, RDL=90		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Potassium (K)	2018/10/25	ND, RDL=120		ug	
			Combined Train Selenium (Se)	2018/10/25	ND, RDL=2.0		ug	
			Combined Train Silver (Ag)	2018/10/25	ND, RDL=0.24		ug	
			Combined Train Strontium (Sr)	2018/10/25	ND, RDL=0.90		ug	
			Combined Train Thallium (Tl)	2018/10/25	ND, RDL=0.24		ug	
			Combined Train Tin (Sn)	2018/10/25	ND, RDL=1.2		ug	
			Combined Train Titanium (Ti)	2018/10/25	ND, RDL=3.0		ug	
			Combined Train Vanadium (V)	2018/10/25	ND, RDL=0.60		ug	
			Combined Train Zinc (Zn)	2018/10/25	ND, RDL=10		ug	
5798617	N_R	RPD - Sample/Sample Dup	Combined Train Aluminum (Al)	2018/10/25	0.12		%	20
			Combined Train Antimony (Sb)	2018/10/25	NC		%	20
			Combined Train Arsenic (As)	2018/10/25	NC		%	20
			Combined Train Barium (Ba)	2018/10/25	0.30		%	20
			Combined Train Beryllium (Be)	2018/10/25	NC		%	20
			Combined Train Boron (B)	2018/10/25	NC		%	20
			Combined Train Cadmium (Cd)	2018/10/25	NC		%	20
			Combined Train Calcium (Ca)	2018/10/25	0.074		%	20
			Combined Train Chromium (Cr)	2018/10/25	NC		%	20
			Combined Train Cobalt (Co)	2018/10/25	NC		%	20
			Combined Train Copper (Cu)	2018/10/25	NC		%	20
			Combined Train Iron (Fe)	2018/10/25	2.3		%	20
			Combined Train Lead (Pb)	2018/10/25	0.94		%	20
			Combined Train Magnesium (Mg)	2018/10/25	6.1		%	20
			Combined Train Manganese (Mn)	2018/10/25	0.0060		%	20
			Combined Train Molybdenum (Mo)	2018/10/25	0.0041		%	20
			Combined Train Nickel (Ni)	2018/10/25	2.0		%	20
			Combined Train Phosphorus (P)	2018/10/25	NC		%	20
			Combined Train Potassium (K)	2018/10/25	1.6		%	20
			Combined Train Selenium (Se)	2018/10/25	NC		%	20
			Combined Train Silver (Ag)	2018/10/25	NC		%	20
			Combined Train Strontium (Sr)	2018/10/25	2.0		%	20
			Combined Train Thallium (Tl)	2018/10/25	NC		%	20
			Combined Train Tin (Sn)	2018/10/25	0.25		%	20
			Combined Train Titanium (Ti)	2018/10/25	1.1		%	20
			Combined Train Vanadium (V)	2018/10/25	NC		%	20
			Combined Train Zinc (Zn)	2018/10/25	NC		%	20
5798624	MPD	Reagent Blank	1B Mercury (Hg)	2018/10/30	ND, RDL=0.015		ug	
5798624	MPD	Matrix Spike(HZU869)	1B Mercury (Hg)	2018/10/30		103	%	85 - 115
5798624	MPD	MS/MSD RPD	1B Mercury (Hg)	2018/10/30	2.1		%	20
5798624	MPD	Spiked Blank	1B Mercury (Hg)	2018/10/30		103	%	90 - 110
5798624	MPD	RPD	1B Mercury (Hg)	2018/10/30	2.8		%	20

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Maxxam Job #: B8R0031
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5798624	MPD	Method Blank	1B Mercury (Hg)	2018/10/30	ND, RDL=0.015		ug	
5798624	MPD	RPD - Sample/Sample Dup	1B Mercury (Hg)	2018/10/30	18		%	20
5806978	MPD	Matrix Spike(HZU869)	3A Mercury (Hg)	2018/10/30		92	%	85 - 115
5806978	MPD	MS/MSD RPD	3A Mercury (Hg)	2018/10/30	1.8		%	20
5806978	MPD	Spiked Blank	3A Mercury (Hg)	2018/10/30		99	%	90 - 110
5806978	MPD	RPD	3A Mercury (Hg)	2018/10/30	3.4		%	20
5806978	MPD	Method Blank	3A Mercury (Hg)	2018/10/30	ND, RDL=0.005		ug	
5806978	MPD	RPD - Sample/Sample Dup	3A Mercury (Hg)	2018/10/30	17		%	20
5806983	MPD	Matrix Spike(HZU871)	2B Mercury (Hg)	2018/10/30		103	%	85 - 115
5806983	MPD	MS/MSD RPD	2B Mercury (Hg)	2018/10/30	2.2		%	20
5806983	MPD	Spiked Blank	2B Mercury (Hg)	2018/10/30		103	%	90 - 110
5806983	MPD	RPD	2B Mercury (Hg)	2018/10/30	1.3		%	20
5806983	MPD	Method Blank	2B Mercury (Hg)	2018/10/30	ND, RDL=0.015		ug	
5806983	MPD	RPD - Sample/Sample Dup	2B Mercury (Hg)	2018/10/30	2.5		%	20
5809990	MPD	Reagent Blank	3B Mercury (Hg)	2018/10/31	ND, RDL=0.013		ug	
5809990	MPD	Matrix Spike	3B Mercury (Hg)	2018/10/31		100	%	85 - 115
5809990	MPD	MS/MSD RPD	3B Mercury (Hg)	2018/10/31	0.90		%	20
5809990	MPD	Spiked Blank	3B Mercury (Hg)	2018/10/31		101	%	90 - 110
5809990	MPD	RPD	3B Mercury (Hg)	2018/10/31	1.6		%	20
5809990	MPD	Method Blank	3B Mercury (Hg)	2018/10/31	ND, RDL=0.02		ug	
5809990	MPD	RPD - Sample/Sample Dup	3B Mercury (Hg)	2018/10/31	0.24		%	20
5811004	MPD	Reagent Blank	3C Mercury (Hg)	2018/11/01	ND, RDL=0.013		ug	
5811004	MPD	Matrix Spike	3C Mercury (Hg)	2018/11/01		96	%	85 - 115
5811004	MPD	MS/MSD RPD	3C Mercury (Hg)	2018/11/01	1.5		%	20
5811004	MPD	Spiked Blank	3C Mercury (Hg)	2018/11/01		104	%	90 - 110
5811004	MPD	RPD	3C Mercury (Hg)	2018/11/01	2.9		%	20
5811004	MPD	Method Blank	3C Mercury (Hg)	2018/11/01	ND, RDL=0.013		ug	
5811004	MPD	RPD - Sample/Sample Dup	3C Mercury (Hg)	2018/11/01	1.6		%	20

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

Reagent Blank: A blank matrix containing all reagents used in the analytical procedure. Used to determine any analytical contamination.

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

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

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

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

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

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Maxxam Job #: B8R0031
Report Date: 2018/11/01

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Frank Mo, B.Sc., Inorganic Lab. Manager

John Bowman, Analyst I

Walt Wang, Supervisor, Inorganics

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B8R0031

Chain of Custody Form - AIR

11568

Maxxam

6740 Campobello Rd
Mississauga Ontario .L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

CLIENT INFORMATION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: Kirk.Easto@RWDI.com
Address:

SECTION

Phone: Fax:
Sampled by: JDF/KNE/MP

ANALYSIS REQUESTED

Field Sample ID	Total Volume Sampled	Flow Rate	Collection Date	Sample Collection Time	OSTC Method ON 5 (TPM)	USEPA Method 29 (Metals)	Environment Canada RM2 (Dioxins & Furans + PAH's)	USEPA Method 26 (HCl + Ammonia)	USEPA SW846 8030 VOST
LCF-SVOC-T1 (Wood Waste) (5 PCS)			10/5/18	AM			✓		
LCF-SVOC-T2 (Wood Waste) (5 PCS)			10/9/18	AM			✓		
LCF-SVOC-T3 (Wood Waste) (5 PCS)			10/9/18	PM			✓		
LCF-M29-T1 (7 PCS)			10/5/18	AM	✓	✓			
LCF-M29-T2 (7 PCS)			10/9/18	AM	✓	✓			
LCF-M29-T3 (7 PCS)			10/9/18	PM	✓	✓			
LCF-VOST-T1 (2 PCS)			10/9/18	AM					✓
LCF-VOST-T2 (2 PCS)			10/9/18	PM					✓
LCF-VOST-T3 (2 PCS)			10/9/18	PM					✓
LCF-M26-T1 (1 PCS)			10/5/18	AM				✓	
LCF-M26-T2 (1 PCS)			10/5/18	PM				✓	
LCF-M26-T3 (1 PCS)			10/5/18	PM				✓	

TAT Requirement

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

PROJECT INFORMATION

Project #: 1702401
Name: St. Marys
PO #: 1702401
Maxxam Quote #:
Maxxam Contact:

REPORTING REQUIREMENTS

Summary Report only ☐
EDD ☐
Regulation

Notes

PROJECT SPECIFIC COMMENTS

* SEE KIRK EASTO FOR PARAMETER LIST *

Client Signature: [signature]
Affiliation:
Date/Time: 10/11/18 15:30

Received by: Pardeep Kpurewal / [signature]
Affiliation: Maxxam
Date/Time: 2018/10/11 15:27

CUC-1031 (04/13) - Air

17.3/16.6/12.8

Maxxam
A Bureau Veritas Group Company

Your Project #: 1804600
Site#: MEDIA PREP
Site Location: ST. MARY'S BOWMANVILLE

Attention: kirk easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/10/18
Report #: R5446065
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8O3742
Received: 2018/09/18, 17:00

Sample Matrix: Air Sampling Media
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chlorobenzenes in MM5 Trains (EPA M0010)	1	2018/09/24	2018/09/24	BRL SOP-00202	In house (M0010)
Chlorophenols in MM5 Trains (EPA M0010)	1	2018/09/24	2018/09/26	BRL SOP-00204	In house (M0010)
Dioxins/Furans in Air (Method 23)	1	2018/09/24	2018/09/26	BRL SOP-00404	EPA M23/23A m
PAH's in MM5 SamplingTrains (CARB429mod)	1	2018/09/24	2018/09/24	BRL SOP-00201	CARB429(ARBM1,M2)mod
PCBs in a Sampling Train (1668Amod)	1	2018/09/24	2018/09/27	BRL SOP-00408	EPA 1668A m
VOST EPA5041A, 8260C for 0030, 0031	1	N/A	2018/09/27	BRL SOP-00302	EPA5041A, 8260C

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your Project #: 1804600
Site#: MEDIA PREP
Site Location: ST. MARY'S BOWMANVILLE

Attention: kirk easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2018/10/18
Report #: R5446065
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8O3742
Received: 2018/09/18, 17:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

RESULTS OF ANALYSES OF AIR SAMPLING MEDIA

Maxxam ID		HUA161							
Sampling Date		2018/09/18 17:11				TOXIC EQUIVALENCY		# of	
	UNITS	TRAIN PROOF 1-8	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	<0.14	0.14	0.60	N/A	0.00010	0.000014		5748626
344'5-TetraCB-(81)	ng	<0.14	0.14	0.60	N/A	0.00030	0.000042		5748626
233'44'-PentaCB-(105)	ng	0.087	0.043	0.60	N/A	0.000030	0.0000026		5748626
2344'5-PentaCB-(114)	ng	<0.043	0.043	0.60	N/A	0.000030	0.0000013		5748626
23'44'5-PentaCB-(118)	ng	0.16	0.043	0.60	N/A	0.000030	0.0000048		5748626
23'44'5'-PentaCB-(123)	ng	<0.048	0.048	0.60	N/A	0.000030	0.0000014		5748626
33'44'5-PentaCB-(126)	ng	<0.042	0.042	0.60	N/A	0.10	0.0042		5748626
HexaCB-(156)+(157)	ng	<0.096	0.096	1.2	N/A	0.000030	0.0000029		5748626
23'44'55'-HexaCB-(167)	ng	<0.091	0.091	0.60	N/A	0.000030	0.0000027		5748626
33'44'55'-HexaCB-(169)	ng	<0.098	0.098	0.60	N/A	0.030	0.0029		5748626
233'44'55'-HeptaCB-(189)	ng	<0.12	0.12	0.60	N/A	0.000030	0.0000036		5748626
TOTAL TOXIC EQUIVALENCY	ng						0.0072		
Surrogate Recovery (%)									
C13-233'44'55'-HeptaCB-(189)	%	104							5748626
C13-233'44'5-HexaCB-(156)	%	94							5748626
C13-233'44'5'-HexaCB-(157)	%	94							5748626
C13-233'44'-PentaCB-(105)	%	103							5748626
C13-23'44'55'-HexaCB-(167)	%	93							5748626
C13-2344'5-PentaCB-(114)	%	102							5748626
C13-23'44'5-PentaCB-(118)	%	99							5748626
C13-2'344'5-PentaCB-(123)	%	98							5748626
C13-33'44'55'-HexaCB-(169)	%	80							5748626
C13-33'44'5-PentaCB-(126)	%	97							5748626
C13-33'44'-TetraCB-(77)	%	92							5748626
C13-344'5-TetraCB-(81)	%	90							5748626

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

N/A = Not Applicable

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

SEMI-VOLATILE ORGANICS BY GC-MS (AIR SAMPLING MEDIA)

Maxxam ID		HUA161			
Sampling Date		2018/09/18 17:11			
	UNITS	**TRAIN PROOF 1-8**	**RDL**	**MDL**	**QC Batch**
1-Methylnaphthalene	ug	<0.30	0.30	0.30	5747447
1-Methylphenanthrene	ug	<0.30	0.30	0.30	5747447
2-Chloronaphthalene	ug	<0.30	0.30	0.30	5747447
2-Methylanthracene	ug	<0.30	0.30	0.30	5747447
2-Methylnaphthalene	ug	<0.30	0.30	0.060	5747447
3-Methylcholanthrene	ug	<0.30	0.30	0.30	5747447
7,12-Dimethylbenzo(a)anthracene	ug	<1.2	1.2	0.30	5747447
9,10-Dimethylanthracene	ug	<0.30	0.30	0.30	5747447
Acenaphthene	ug	<0.30	0.30	0.060	5747447
Acenaphthylene	ug	<0.30	0.30	0.060	5747447
Anthracene	ug	<0.30	0.30	0.060	5747447
Benzo(a)anthracene	ug	<0.30	0.30	0.060	5747447
Benzo(a)fluorene	ug	<0.30	0.30	0.30	5747447
Benzo(a)pyrene	ug	<0.30	0.30	0.060	5747447
Benzo(b)Anthracene	ug	<0.30	0.30	0.060	5747447
Benzo(b)fluoranthene	ug	<0.30	0.30	0.060	5747447
Benzo(b)fluorene	ug	<0.30	0.30	0.30	5747447
Benzo(e)pyrene	ug	<0.30	0.30	0.30	5747447
Benzo(g,h,i)perylene	ug	<0.30	0.30	0.060	5747447
Benzo(k)fluoranthene	ug	<0.30	0.30	0.060	5747447
Biphenyl	ug	<0.30	0.30	0.30	5747447
Chrysene	ug	<0.30	0.30	0.060	5747447
Coronene	ug	<0.30	0.30	0.30	5747447
Dibenz(a,h)anthracene	ug	<0.30	0.30	0.060	5747447
Dibenzo(a,c)anthracene	ug	<0.30	0.30	0.060	5747447
Dibenzo(a,e)pyrene	ug	<0.30	0.30	0.30	5747447
Fluoranthene	ug	<0.30	0.30	0.060	5747447
Fluorene	ug	<0.30	0.30	0.060	5747447
Indeno(1,2,3-cd)pyrene	ug	<0.30	0.30	0.060	5747447
m-Terphenyl	ug	<0.30	0.30	0.30	5747447
Naphthalene	ug	<0.30	0.30	0.30	5747447
o-Terphenyl	ug	<0.30	0.30	0.30	5747447
Perylene	ug	<0.30	0.30	0.30	5747447
Phenanthrene	ug	<0.30	0.30	0.060	5747447
Picene	ug	<0.30	0.30	0.060	5747447

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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SEMI-VOLATILE ORGANICS BY GC-MS (AIR SAMPLING MEDIA)

Maxxam ID		HUA161			
Sampling Date		2018/09/18 17:11			
	UNITS	**TRAIN PROOF 1-8**	**RDL**	**MDL**	**QC Batch**
p-Terphenyl	ug	<0.30	0.30	0.30	5747447
Pyrene	ug	<0.30	0.30	0.060	5747447
Quinoline	ug	<0.30	0.30	0.30	5747447
Tetralin	ug	<0.30	0.30	0.30	5747447
Triphenylene	ug	<0.30	0.30	0.060	5747447
1,2,3,4-Tetrachlorobenzene	ug	<0.30	0.30	0.060	5747460
1,2,3,5+1,2,4,5-Tetrachlorobenzene	ug	<0.30	0.30	0.060	5747460
1,2,3-Trichlorobenzene	ug	<0.30	0.30	0.060	5747460
1,2,4-Trichlorobenzene	ug	<0.30	0.30	0.060	5747460
1,2-Dichlorobenzene	ug	<0.30	0.30	0.060	5747460
1,3,5-Trichlorobenzene	ug	<0.30	0.30	0.060	5747460
1,3-Dichlorobenzene	ug	<0.30	0.30	0.060	5747460
1,4-Dichlorobenzene	ug	<0.30	0.30	0.060	5747460
Hexachlorobenzene	ug	<0.30	0.30	0.060	5747460
Pentachlorobenzene	ug	<0.30	0.30	0.060	5747460
2,3,4,5-Tetrachlorophenol	ug	<0.30	0.30	0.24	5747742
2,3,4,6-Tetrachlorophenol	ug	<0.30	0.30	0.24	5747742
2,3,4-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
2,3,5,6-Tetrachlorophenol	ug	<0.30	0.30	0.24	5747742
2,3,5-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
2,3,6-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
2,3-Dichlorophenol	ug	<0.30	0.30	0.24	5747742
2,4 + 2,5-Dichlorophenol	ug	<0.30	0.30	0.24	5747742
2,4,5-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
2,4,6-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
2,6-Dichlorophenol	ug	<0.30	0.30	0.24	5747742
2-Chlorophenol	ug	<0.30	0.30	0.24	5747742
3,4,5-Trichlorophenol	ug	<0.30	0.30	0.24	5747742
3,4-Dichlorophenol	ug	<0.30	0.30	0.24	5747742
3,5-Dichlorophenol	ug	<0.30	0.30	0.24	5747742
3-Chlorophenol	ug	<0.30	0.30	0.24	5747742
4-Chlorophenol	ug	<0.30	0.30	0.24	5747742
Pentachlorophenol	ug	<0.30	0.30	0.24	5747742
Surrogate Recovery (%)					
13C6-Hexachlorobenzene	%	102			5747460

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

SEMI-VOLATILE ORGANICS BY GC-MS (AIR SAMPLING MEDIA)

Maxxam ID		HUA161			
Sampling Date		2018/09/18 17:11			
	UNITS	**TRAIN PROOF 1-8**	**RDL**	**MDL**	**QC Batch**
2H3-1,2,4-Trichlorobenzene	%	103			5747460
2H4-1,3-Dichlorobenzene	%	98			5747460
D3-2,4-Dichlorophenol	%	88			5747742
D6-Pentachlorophenol	%	98			5747742
D10-2-Methylnaphthalene	%	70			5747447
D10-Fluoranthene	%	70			5747447
D10-Phenanthrene	%	70			5747447
D12-Benzo(a)anthracene	%	82			5747447
D12-Benzo(a)pyrene	%	82			5747447
D12-Benzo(b)fluoranthene	%	88			5747447
D12-Benzo(ghi)perylene	%	84			5747447
D12-Benzo(k)fluoranthene	%	76			5747447
D12-Chrysene	%	80			5747447
D12-Indeno(1,2,3-cd)pyrene	%	82			5747447
D12-Perylene	%	76			5747447
D14-Dibenzo(a,h)anthracene	%	80			5747447
D8-Acenaphthylene	%	68			5747447
D8-Naphthalene	%	68			5747447

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

VOLATILE ORGANICS BY GC/MS (AIR SAMPLING MEDIA)

Maxxam ID		HUA336			
Sampling Date		2018/09/18 17:11			
	UNITS	**VOST PROOF 1-9**	**RDL**	**MDL**	**QC Batch**
Dichlorodifluoromethane (FREON 12)	ug	<0.020	0.020	0.020	5754531
Chloromethane	ug	<0.015	0.015	0.015	5754531
Vinyl Chloride	ug	<0.013	0.013	0.013	5754531
Bromomethane	ug	<0.015	0.015	0.015	5754531
Chloroethane	ug	<0.0090	0.0090	0.0090	5754531
Trichlorofluoromethane (FREON 11)	ug	<0.010	0.010	0.010	5754531
Acetone (2-Propanone)	ug	<0.045	0.045	0.025	5754531
1,1-Dichloroethylene	ug	<0.011	0.011	0.011	5754531
Iodomethane	ug	<0.015	0.015	0.015	5754531
Carbon Disulfide	ug	<0.026	0.026	0.026	5754531
Methylene Chloride(Dichloromethane)	ug	<0.019	0.019	0.020	5754531
1,1-Dichloroethane	ug	<0.012	0.012	0.012	5754531
trans-1,2-Dichloroethylene	ug	<0.010	0.010	0.010	5754531
cis-1,2-Dichloroethylene	ug	<0.010	0.010	0.010	5754531
Chloroform	ug	<0.011	0.011	0.011	5754531
1,2-Dichloroethane	ug	<0.0070	0.0070	0.0070	5754531
Methyl Ethyl Ketone (2-Butanone)	ug	<0.036	0.036	0.036	5754531
1,1,1-Trichloroethane	ug	<0.014	0.014	0.014	5754531
Carbon Tetrachloride	ug	<0.016	0.016	0.016	5754531
Benzene	ug	<0.0090	0.0090	0.0090	5754531
1,1,2-Trichloroethane	ug	<0.016	0.016	0.016	5754531
1,2-Dichloropropane	ug	<0.011	0.011	0.011	5754531
Trichloroethylene	ug	<0.011	0.011	0.011	5754531
Dibromomethane	ug	<0.010	0.010	0.010	5754531
Bromodichloromethane	ug	<0.011	0.011	0.011	5754531
cis-1,3-Dichloropropene	ug	<0.010	0.010	0.010	5754531
trans-1,3-Dichloropropene	ug	<0.0070	0.0070	0.0070	5754531
Dibromochloromethane	ug	<0.0090	0.0090	0.0090	5754531
Methyl Isobutyl Ketone	ug	<0.019	0.019	0.019	5754531
Methyl Butyl Ketone (2-Hexanone)	ug	<0.031	0.031	0.031	5754531
Toluene	ug	<0.014	0.014	0.014	5754531
Ethylene Dibromide	ug	<0.010	0.010	0.010	5754531
Tetrachloroethylene	ug	<0.018	0.018	0.018	5754531
Chlorobenzene	ug	<0.011	0.011	0.011	5754531
1,1,1,2-Tetrachloroethane	ug	<0.010	0.010	0.010	5754531

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

VOLATILE ORGANICS BY GC/MS (AIR SAMPLING MEDIA)

Maxxam ID		HUA336			
Sampling Date		2018/09/18 17:11			
	UNITS	**VOST PROOF 1-9**	**RDL**	**MDL**	**QC Batch**
Ethylbenzene	ug	<0.014	0.014	0.014	5754531
m / p-Xylene	ug	<0.015	0.015	0.015	5754531
Styrene	ug	<0.012	0.012	0.012	5754531
o-Xylene	ug	<0.015	0.015	0.015	5754531
Bromoform	ug	<0.014	0.014	0.014	5754531
1,1,2,2-Tetrachloroethane	ug	<0.014	0.014	0.014	5754531
1,2,3-Trichloropropane	ug	<0.015	0.015	0.015	5754531
1,3-Dichlorobenzene	ug	<0.020	0.020	0.020	5754531
1,4-Dichlorobenzene	ug	<0.020	0.020	0.020	5754531
1,2-Dichlorobenzene	ug	<0.020	0.020	0.020	5754531
Surrogate Recovery (%)					
Bromofluorobenzene	%	101			5754531
D10-Ethylbenzene (FS)	%	90			5754531
D4-1,2-Dichloroethane	%	106			5754531
D8-Toluene	%	100			5754531

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

DIOXINS AND FURANS BY HRMS (AIR SAMPLING MEDIA)

Maxxam ID		HUA161							
Sampling Date		2018/09/18 17:11				TOXIC EQUIVALENCY		# of	
	UNITS	TRAIN PROOF 1-8	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	<1.1	1.1	10	2.0	1.00	1.10		5748168
1,2,3,7,8-Penta CDD *	pg	<1.1	1.1	10	2.0	1.00	1.10		5748168
1,2,3,4,7,8-Hexa CDD *	pg	<1.0	1.0	10	2.0	0.100	0.100		5748168
1,2,3,6,7,8-Hexa CDD *	pg	<1.0	1.0	10	2.0	0.100	0.100		5748168
1,2,3,7,8,9-Hexa CDD *	pg	<0.96	0.96	10	2.0	0.100	0.0960		5748168
1,2,3,4,6,7,8-Hepta CDD *	pg	<1.1	1.1	10	3.0	0.0100	0.0110		5748168
1,2,3,4,6,7,8,9-Octa CDD *	pg	<1.1	1.1	100	3.0	0.000300	0.000330		5748168
Total Tetra CDD *	pg	<1.1	1.1	10	N/A			0	5748168
Total Penta CDD *	pg	<1.1	1.1	10	N/A			0	5748168
Total Hexa CDD *	pg	<1.0	1.0	10	N/A			0	5748168
Total Hepta CDD *	pg	<1.1	1.1	10	N/A			0	5748168
2,3,7,8-Tetra CDF **	pg	<0.99	0.99	10	2.0	0.100	0.0990		5748168
1,2,3,7,8-Penta CDF **	pg	<1.0	1.0	10	2.0	0.0300	0.0300		5748168
2,3,4,7,8-Penta CDF **	pg	<1.0	1.0	10	2.0	0.300	0.300		5748168
1,2,3,4,7,8-Hexa CDF **	pg	<0.97	0.97	10	2.0	0.100	0.0970		5748168
1,2,3,6,7,8-Hexa CDF **	pg	<0.99	0.99	10	2.0	0.100	0.0990		5748168
2,3,4,6,7,8-Hexa CDF **	pg	<1.0	1.0	10	2.0	0.100	0.100		5748168
1,2,3,7,8,9-Hexa CDF **	pg	<1.2	1.2	10	2.0	0.100	0.120		5748168
1,2,3,4,6,7,8-Hepta CDF **	pg	<0.88	0.88	10	3.0	0.0100	0.00880		5748168
1,2,3,4,7,8,9-Hepta CDF **	pg	<1.2	1.2	10	2.0	0.0100	0.0120		5748168
1,2,3,4,6,7,8,9-Octa CDF **	pg	<0.99	0.99	100	5.0	0.000300	0.000297		5748168
Total Tetra CDF **	pg	<0.99	0.99	10	N/A			0	5748168
Total Penta CDF **	pg	<1.0	1.0	10	N/A			0	5748168
Total Hexa CDF **	pg	<1.0	1.0	10	N/A			0	5748168
Total Hepta CDF **	pg	<1.0	1.0	10	N/A			0	5748168
TOTAL TOXIC EQUIVALENCY	pg						3.37		

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

N/A = Not Applicable

** CDF = Chloro Dibenzo-p-Furan

Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

DIOXINS AND FURANS BY HRMS (AIR SAMPLING MEDIA)

Maxxam ID		HUA161							
Sampling Date		2018/09/18 17:11				TOXIC EQUIVALENCY		# of	
	UNITS	TRAIN PROOF 1-8	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	106							5748168
C13-1234678 HeptaCDF **	%	100							5748168
C13-123678 HexaCDD *	%	77							5748168
C13-123678 HexaCDF **	%	94							5748168
C13-12378 PentaCDD *	%	101							5748168
C13-12378 PentaCDF **	%	102							5748168
C13-2378 TetraCDD *	%	109							5748168
C13-2378 TetraCDF **	%	91							5748168
C13-Octachlorodibenzo-p-Dioxin	%	122							5748168

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

** CDF = Chloro Dibenzo-p-Furan

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

TEST SUMMARY

Maxxam ID: HUA161
Sample ID: TRAIN PROOF 1-8
Matrix: Air Sampling Media

Collected: 2018/09/18
Shipped:
Received: 2018/09/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5747460	2018/09/24	2018/09/24	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5747742	2018/09/24	2018/09/26	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5748168	2018/09/24	2018/09/26	Angel Guerrero
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5747447	2018/09/24	2018/09/24	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5748626	2018/09/24	2018/09/27	Cathy Xu

Maxxam ID: HUA161 Dup
Sample ID: TRAIN PROOF 1-8
Matrix: Air Sampling Media

Collected: 2018/09/18
Shipped:
Received: 2018/09/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dioxins/Furans in Air (Method 23)	HRMS/MS	5748168	2018/09/24	2018/09/26	Angel Guerrero
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5748626	2018/10/03	2018/09/27	Cathy Xu

Maxxam ID: HUA336
Sample ID: VOST PROOF 1-9
Matrix: Air Sampling Media

Collected: 2018/09/18
Shipped:
Received: 2018/09/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5754531	N/A	2018/09/27	Yujie Yan

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5748168	AGU	RPD - Sample/Sample Dup	2,3,7,8-Tetra CDD	2018/09/26	NC		%	20
			1,2,3,7,8-Penta CDD	2018/09/26	NC		%	20
			1,2,3,4,7,8-Hexa CDD	2018/09/26	NC		%	20
			1,2,3,6,7,8-Hexa CDD	2018/09/26	NC		%	20
			1,2,3,7,8,9-Hexa CDD	2018/09/26	NC		%	20
			1,2,3,4,6,7,8-Hepta CDD	2018/09/26	NC		%	20
			1,2,3,4,6,7,8,9-Octa CDD	2018/09/26	NC		%	20
			Total Tetra CDD	2018/09/26	NC		%	20
			Total Penta CDD	2018/09/26	NC		%	20
			Total Hexa CDD	2018/09/26	NC		%	20
			Total Hepta CDD	2018/09/26	NC		%	20
			2,3,7,8-Tetra CDF	2018/09/26	NC		%	20
			1,2,3,7,8-Penta CDF	2018/09/26	NC		%	20
			2,3,4,7,8-Penta CDF	2018/09/26	NC		%	20
			1,2,3,4,7,8-Hexa CDF	2018/09/26	NC		%	20
			1,2,3,6,7,8-Hexa CDF	2018/09/26	NC		%	20
			2,3,4,6,7,8-Hexa CDF	2018/09/26	NC		%	20
			1,2,3,7,8,9-Hexa CDF	2018/09/26	NC		%	20
			1,2,3,4,6,7,8-Hepta CDF	2018/09/26	NC		%	20
			1,2,3,4,7,8,9-Hepta CDF	2018/09/26	NC		%	20
			1,2,3,4,6,7,8,9-Octa CDF	2018/09/26	NC		%	20
			Total Tetra CDF	2018/09/26	NC		%	20
			Total Penta CDF	2018/09/26	NC		%	20
			Total Hexa CDF	2018/09/26	NC		%	20
			Total Hepta CDF	2018/09/26	NC		%	20
5748626	CXU	RPD - Sample/Sample Dup	33'44'-TetraCB-(77)	2018/09/27	NC		%	30
			344'5-TetraCB-(81)	2018/09/27	NC		%	30
			233'44'-PentaCB-(105)	2018/09/27	NC		%	30
			2344'5-PentaCB-(114)	2018/09/27	NC		%	30
			23'44'5-PentaCB-(118)	2018/09/27	NC		%	30
			23'44'5'-PentaCB-(123)	2018/09/27	NC		%	30
			33'44'5-PentaCB-(126)	2018/09/27	NC		%	30
			HexaCB-(156)+(157)	2018/09/27	NC		%	30
			23'44'55'-HexaCB-(167)	2018/09/27	NC		%	30
			33'44'55'-HexaCB-(169)	2018/09/27	NC		%	30
			233'44'55'-HeptaCB-(189)	2018/09/27	NC		%	30

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

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Maxxam Job #: B8O3742
Report Date: 2018/10/18

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARY'S BOWMANVILLE

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Branko Vrzic, A.SC.T., Senior Analyst, HRMS Services

Melanie Mabini, VOC Analyst

Rodney Major, Manager Organic Processing Lab

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Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 32140

Attention: Kirk Easto

RWDI West Inc
600 Southgate Drive
Guelph, ON
Canada N1G 4P6

Report Date: 2019/03/07
Report #: R5620417
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8Q9027
Received: 2018/10/09, 08:30

Sample Matrix: Stack Sampling Train
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chlorobenzenes in MM5 Trains (EPA M0010)	3	2018/10/19	2018/10/29	BRL SOP-00202	In house (M0010)
Chlorophenols in MM5 Trains (EPA M0010)	3	2018/10/19	2018/11/07	BRL SOP-00204	In house (M0010)
Dioxins/Furans in Air (Method 23)	3	2018/10/19	2018/11/04	BRL SOP-00404	EPA M23/23A m
PAH's in MM5 SamplingTrains (CARB429mod)	2	2018/10/19	2018/10/31	BRL SOP-00201	CARB429(ARBM1,M2)mod
PAH's in MM5 SamplingTrains (CARB429mod)	1	2018/10/19	2018/11/01	BRL SOP-00201	CARB429(ARBM1,M2)mod
PCBs in a Sampling Train (1668Amod)	3	2018/10/19	2018/11/06	BRL SOP-00408	EPA 1668A m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 32140

Attention: Kirk Easto

RWDI West Inc
600 Southgate Drive
Guelph, ON
Canada N1G 4P6

Report Date: 2019/03/07
Report #: R5620417
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8Q9027
Received: 2018/10/09, 08:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HZP289						
Sampling Date		2018/09/30						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.057	0.60	0.00010	0.0000057		5793011
344'5-TetraCB-(81)	ng	ND	0.056	0.60	0.00030	0.000017		5793011
233'44'-PentaCB-(105)	ng	0.22	0.026	0.60	0.000030	0.0000066		5793011
2344'5-PentaCB-(114)	ng	ND	0.026	0.60	0.000030	0.00000078		5793011
23'44'5-PentaCB-(118)	ng	0.46	0.026	0.60	0.000030	0.000014		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.029	0.60	0.000030	0.00000087		5793011
33'44'5-PentaCB-(126)	ng	ND	0.025	0.60	0.10	0.0025		5793011
HexaCB-(156)+(157)	ng	0.091	0.048	1.2	0.000030	0.0000027		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.046	0.60	0.000030	0.0000014		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.049	0.60	0.030	0.0015		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.046	0.60	0.000030	0.0000014		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.0041		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	103						5793011
C13-233'44'5-HexaCB-(156)	%	76						5793011
C13-233'44'5'-HexaCB-(157)	%	76						5793011
C13-233'44'-PentaCB-(105)	%	82						5793011
C13-23'44'55'-HexaCB-(167)	%	78						5793011
C13-2344'5-PentaCB-(114)	%	79						5793011
C13-23'44'5-PentaCB-(118)	%	83						5793011
C13-2'344'5-PentaCB-(123)	%	80						5793011
C13-33'44'55'-HexaCB-(169)	%	53						5793011
C13-33'44'5-PentaCB-(126)	%	81						5793011
C13-33'44'-TetraCB-(77)	%	90						5793011
C13-344'5-TetraCB-(81)	%	91						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HZP290						
Sampling Date		2018/10/01						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.073	0.60	0.00010	0.0000073		5793011
344'5-TetraCB-(81)	ng	ND	0.072	0.60	0.00030	0.000022		5793011
233'44'-PentaCB-(105)	ng	0.18	0.056	0.60	0.000030	0.0000054		5793011
2344'5-PentaCB-(114)	ng	ND	0.056	0.60	0.000030	0.0000017		5793011
23'44'5-PentaCB-(118)	ng	0.39	0.055	0.60	0.000030	0.000012		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.062	0.60	0.000030	0.0000019		5793011
33'44'5-PentaCB-(126)	ng	ND	0.053	0.60	0.10	0.0053		5793011
HexaCB-(156)+(157)	ng	ND	0.067	1.2	0.000030	0.0000020		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.063	0.60	0.000030	0.0000019		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.068	0.60	0.030	0.0020		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.046	0.60	0.000030	0.0000014		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.0074		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	103						5793011
C13-233'44'5-HexaCB-(156)	%	73						5793011
C13-233'44'5'-HexaCB-(157)	%	73						5793011
C13-233'44'-PentaCB-(105)	%	79						5793011
C13-23'44'55'-HexaCB-(167)	%	75						5793011
C13-2344'5-PentaCB-(114)	%	73						5793011
C13-23'44'5-PentaCB-(118)	%	78						5793011
C13-2'344'5-PentaCB-(123)	%	75						5793011
C13-33'44'55'-HexaCB-(169)	%	53						5793011
C13-33'44'5-PentaCB-(126)	%	72						5793011
C13-33'44'-TetraCB-(77)	%	84						5793011
C13-344'5-TetraCB-(81)	%	84						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		HZP291						
Sampling Date		2018/10/02						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.073	0.60	0.00010	0.0000073		5793011
344'5-TetraCB-(81)	ng	ND	0.072	0.60	0.00030	0.000022		5793011
233'44'-PentaCB-(105)	ng	0.069	0.033	0.60	0.000030	0.0000021		5793011
2344'5-PentaCB-(114)	ng	ND	0.034	0.60	0.000030	0.0000010		5793011
23'44'5-PentaCB-(118)	ng	0.18	0.033	0.60	0.000030	0.0000054		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.037	0.60	0.000030	0.0000011		5793011
33'44'5-PentaCB-(126)	ng	ND	0.031	0.60	0.10	0.0031		5793011
HexaCB-(156)+(157)	ng	ND	0.063	1.2	0.000030	0.0000019		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.060	0.60	0.000030	0.0000018		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.064	0.60	0.030	0.0019		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.12	0.60	0.000030	0.0000036		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.0050		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	105						5793011
C13-233'44'5-HexaCB-(156)	%	74						5793011
C13-233'44'5'-HexaCB-(157)	%	74						5793011
C13-233'44'-PentaCB-(105)	%	81						5793011
C13-23'44'55'-HexaCB-(167)	%	76						5793011
C13-2344'5-PentaCB-(114)	%	78						5793011
C13-23'44'5-PentaCB-(118)	%	83						5793011
C13-2'344'5-PentaCB-(123)	%	79						5793011
C13-33'44'55'-HexaCB-(169)	%	53						5793011
C13-33'44'5-PentaCB-(126)	%	74						5793011
C13-33'44'-TetraCB-(77)	%	92						5793011
C13-344'5-TetraCB-(81)	%	94						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		HZP289	HZP290	HZP291		
Sampling Date		2018/09/30	2018/10/01	2018/10/02		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
1-Methylnaphthalene	ug	322	313	304	6.0	5792973
1-Methylphenanthrene	ug	0.96	1.02	0.66	0.30	5792973
2-Chloronaphthalene	ug	4.08	7.32	4.86	0.30	5792973
2-Methylanthracene	ug	ND	ND	ND	0.30	5792973
2-Methylnaphthalene	ug	448	446	418	6.0	5792973
3-Methylcholanthrene	ug	ND	ND	ND	0.30	5792973
7,12-Dimethylbenzo(a)anthracene	ug	ND	ND	ND	1.2	5792973
9,10-Dimethylanthracene	ug	ND	ND	ND	0.30	5792973
9-Methylphenanthrene	ug	1.98	2.22	1.86	0.30	5792973
Acenaphthene	ug	4.44	8.70	5.46	0.30	5792973
Acenaphthylene	ug	6.30	9.84	7.08	0.30	5792973
Anthracene	ug	0.66	0.60	0.48	0.30	5792973
Benzo(a)anthracene	ug	ND	ND	ND	0.30	5792973
Benzo(a)fluorene	ug	ND	ND	ND	0.30	5792973
Benzo(a)pyrene	ug	ND	ND	ND	0.30	5792973
Benzo(b)fluoranthene	ug	ND	ND	ND	0.30	5792973
Benzo(b)fluorene	ug	ND	ND	ND	0.30	5792973
Benzo(e)pyrene	ug	ND	ND	ND	0.30	5792973
Benzo(g,h,i)perylene	ug	ND	ND	ND	0.30	5792973
Benzo(k)fluoranthene	ug	ND	ND	ND	0.30	5792973
Biphenyl	ug	138	139	137	6.0	5792973
Chrysene	ug	ND	ND	ND	0.30	5792973
Coronene	ug	ND	ND	ND	0.30	5792973
Dibenzo(a,c)anthracene	ug	ND	ND	ND	0.30	5792973
Fluoranthene	ug	ND	ND	ND	0.30	5792973
Fluorene	ug	2.46	3.96	2.46	0.30	5792973
Indeno(1,2,3-cd)pyrene	ug	ND	ND	ND	0.30	5792973
m-Terphenyl	ug	ND	ND	ND	0.30	5792973
Naphthalene	ug	788	739	716	6.0	5792973
o-Terphenyl	ug	0.36	0.36	0.30	0.30	5792973
Perylene	ug	ND	ND	ND	0.30	5792973
Phenanthrene	ug	12.0	14.8	11.2	0.30	5792973
Picene	ug	ND	ND	ND	0.30	5792973
p-Terphenyl	ug	ND	ND	ND	0.30	5792973
Pyrene	ug	ND	ND	ND	0.30	5792973

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		HZP289	HZP290	HZP291		
Sampling Date		2018/09/30	2018/10/01	2018/10/02		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
Tetralin	ug	206	191	188	6.0	5792973
Triphenylene	ug	ND	ND	ND	0.30	5792973
1,2,3,4-Tetrachlorobenzene	ug	ND	ND	ND	0.30	5792998
1,2,3,5+1,2,4,5-Tetrachlorobenzene	ug	ND	ND	ND	0.30	5792998
1,2,3-Trichlorobenzene	ug	0.71	3.69	0.96	0.30	5792998
1,2,4-Trichlorobenzene	ug	1.45	1.57	1.70	0.30	5792998
1,2-Dichlorobenzene	ug	9.30	5.32	6.07	0.30	5792998
1,3,5-Trichlorobenzene	ug	0.39	ND	ND	0.30	5792998
1,3-Dichlorobenzene	ug	2.11	2.35	1.91	0.30	5792998
1,4-Dichlorobenzene	ug	1.39	1.69	1.84	0.30	5792998
Hexachlorobenzene	ug	ND	ND	ND	0.30	5792998
Pentachlorobenzene	ug	ND	ND	ND	0.30	5792998
2,3,4,5-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,4,6-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,4-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,5,6-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,6-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
2,4 + 2,5-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
2,4,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,4,6-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,6-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
2-Chlorophenol	ug	7.83	7.67	6.05	0.30	5793003
3,4,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
3,4-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
3,5-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
3-Chlorophenol	ug	1.51	1.13	0.74	0.30	5793003
4-Chlorophenol	ug	1.86	1.54	1.45	0.30	5793003
Pentachlorophenol	ug	ND	ND	ND	0.30	5793003
Surrogate Recovery (%)						
13C6-Hexachlorobenzene	%	124	97	99		5792998
2H3-1,2,3-Trichlorobenzene (FS)	%	95	100	94		5792998
2H3-1,2,4-Trichlorobenzene	%	89	98	91		5792998
2H4-1,3-Dichlorobenzene	%	114	114	127		5792998

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		HZP289	HZP290	HZP291		
Sampling Date		2018/09/30	2018/10/01	2018/10/02		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
2H4-1,4-Dichlorobenzene (FS)	%	91	104	133 (1)		5792998
2,6-Dibromo-4-fluorophenol (FS)	%	98	95	94		5793003
D3-2,4-Dichlorophenol	%	101	99	96		5793003
D6-Pentachlorophenol	%	137 (1)	137 (1)	139 (1)		5793003
D10-2-Methylnaphthalene	%	144	228 (2)	168 (2)		5792973
D10-Anthracene	%	72	92	82		5792973
D10-Fluoranthene	%	94	114	96		5792973
D10-Fluorene (FS)	%	76	102	76		5792973
D10-Phenanthrene	%	88	112	88		5792973
D12-Benzo(a)anthracene	%	116	116	108		5792973
D12-Benzo(a)pyrene	%	110	104	100		5792973
D12-Benzo(b)fluoranthene	%	118	112	106		5792973
D12-Benzo(ghi)perylene	%	116	112	104		5792973
D12-Benzo(k)fluoranthene	%	110	110	100		5792973
D12-Chrysene	%	110	112	100		5792973
D12-Indeno(1,2,3-cd)pyrene	%	116	110	102		5792973
D12-Perylene	%	110	104	100		5792973
D14-Dibenzo(a,h)anthracene	%	118	112	104		5792973
D14-Terphenyl (FS)	%	90	110	100		5792973
D8-Acenaphthylene	%	92	116	98		5792973
D8-Naphthalene	%	128	194 (2)	122		5792973

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) Surrogate recovery was above the upper control limit due to matrix interference. This may represent a high bias in some results.

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP289						
Sampling Date		2018/09/30						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	13	60	1.00	13.0		5819589
1,2,3,7,8-Penta CDD *	pg	ND	7.1	60	1.00	7.10		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.4	60	0.100	0.640		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	6.0	60	0.100	0.600		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	ND	6.1	60	0.0100	0.0610		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	26.1	6.7	600	0.000300	0.00783		5819589
Total Tetra CDD *	pg	ND (1)	74	60			0	5819589
Total Penta CDD *	pg	ND (1)	64	60			0	5819589
Total Hexa CDD *	pg	ND (1)	180	60			0	5819589
Total Hepta CDD *	pg	ND	6.1	60			0	5819589
2,3,7,8-Tetra CDF **	pg	ND	9.0	60	0.100	0.900		5819589
1,2,3,7,8-Penta CDF **	pg	ND	6.5	60	0.0300	0.195		5819589
2,3,4,7,8-Penta CDF **	pg	ND	6.5	60	0.300	1.95		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	6.0	60	0.100	0.600		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	5.9	60	0.100	0.590		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	7.5	60	0.100	0.750		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	ND	6.2	60	0.0100	0.0620		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	8.0	60	0.0100	0.0800		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	10.2	6.9	600	0.000300	0.00306		5819589
Total Tetra CDF **	pg	ND	9.0	60			0	5819589
Total Penta CDF **	pg	ND	6.5	60			0	5819589
Total Hexa CDF **	pg	ND	6.4	60			0	5819589
Total Hepta CDF **	pg	ND	7.0	60			0	5819589
TOTAL TOXIC EQUIVALENCY	pg					27.8		

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
ND = Not detected
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP289						
Sampling Date		2018/09/30						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	86						5819589
C13-1234678 HeptaCDF **	%	69						5819589
C13-123478 HexaCDD *	%	113						5819589
C13-123478 HexaCDF **	%	105						5819589
C13-1234789 HeptaCDF **	%	119						5819589
C13-123678 HexaCDD *	%	88						5819589
C13-123678 HexaCDF **	%	76						5819589
C13-12378 PentaCDD *	%	103						5819589
C13-12378 PentaCDF **	%	85						5819589
C13-123789 HexaCDF **	%	72						5819589
C13-23478 PentaCDF **	%	120						5819589
C13-2378 TetraCDD *	%	121						5819589
C13-2378 TetraCDF **	%	78						5819589
C13-Octachlorodibenzo-p-Dioxin	%	99						5819589
Cl37-2378 TetraCDD *	%	81						5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

** CDF = Chloro Dibenzo-p-Furan

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP290						
Sampling Date		2018/10/01						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	17	60	1.00	17.0		5819589
1,2,3,7,8-Penta CDD *	pg	ND	9.7	60	1.00	9.70		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.3	60	0.100	0.630		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	5.9	60	0.100	0.590		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	ND	9.2	60	0.0100	0.0920		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	14.2 (1)	6.3	600	0.000300	0.00426		5819589
Total Tetra CDD *	pg	ND (2)	78	60			0	5819589
Total Penta CDD *	pg	ND (2)	70	60			0	5819589
Total Hexa CDD *	pg	ND (2)	160	60			0	5819589
Total Hepta CDD *	pg	ND	9.2	60			0	5819589
2,3,7,8-Tetra CDF **	pg	ND	8.7	60	0.100	0.870		5819589
1,2,3,7,8-Penta CDF **	pg	ND	7.6	60	0.0300	0.228		5819589
2,3,4,7,8-Penta CDF **	pg	ND	7.6	60	0.300	2.28		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	6.4	60	0.100	0.640		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	6.3	60	0.100	0.630		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	7.0	60	0.100	0.700		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	7.9	60	0.100	0.790		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	ND	5.7	60	0.0100	0.0570		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	7.4	60	0.0100	0.0740		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	ND	6.8	600	0.000300	0.00204		5819589
Total Tetra CDF **	pg	ND (2)	18	60			0	5819589
Total Penta CDF **	pg	ND	7.6	60			0	5819589
Total Hexa CDF **	pg	ND	6.8	60			0	5819589
Total Hepta CDF **	pg	ND	6.5	60			0	5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

ND = Not detected

** CDF = Chloro Dibenzo-p-Furan

(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical

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

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP290						
Sampling Date		2018/10/01						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
TOTAL TOXIC EQUIVALENCY	pg					34.9		
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	89						5819589
C13-1234678 HeptaCDF **	%	72						5819589
C13-123478 HexaCDD *	%	105						5819589
C13-123478 HexaCDF **	%	95						5819589
C13-1234789 HeptaCDF **	%	115						5819589
C13-123678 HexaCDD *	%	91						5819589
C13-123678 HexaCDF **	%	81						5819589
C13-12378 PentaCDD *	%	84						5819589
C13-12378 PentaCDF **	%	71						5819589
C13-123789 HexaCDF **	%	72						5819589
C13-23478 PentaCDF **	%	119						5819589
C13-2378 TetraCDD *	%	99						5819589
C13-2378 TetraCDF **	%	67						5819589
C13-Octachlorodibenzo-p-Dioxin	%	97						5819589
Cl37-2378 TetraCDD *	%	91						5819589

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

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP291						
Sampling Date		2018/10/02						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	18	60	1.00	18.0		5819589
1,2,3,7,8-Penta CDD *	pg	ND	9.3	60	1.00	9.30		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	7.0	60	0.100	0.700		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.9	60	0.100	0.690		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	6.4	60	0.100	0.640		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	11.3	6.8	60	0.0100	0.113		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	22.0	6.7	600	0.000300	0.00660		5819589
Total Tetra CDD *	pg	ND (1)	80	60			0	5819589
Total Penta CDD *	pg	ND (1)	68	60			0	5819589
Total Hexa CDD *	pg	ND (1)	150	60			0	5819589
Total Hepta CDD *	pg	11.3	6.8	60			1	5819589
2,3,7,8-Tetra CDF **	pg	ND (2)	13	60	0.100	1.30		5819589
1,2,3,7,8-Penta CDF **	pg	ND	6.8	60	0.0300	0.204		5819589
2,3,4,7,8-Penta CDF **	pg	ND	6.9	60	0.300	2.07		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	6.3	60	0.100	0.630		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	6.2	60	0.100	0.620		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	6.8	60	0.100	0.680		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	7.8	60	0.100	0.780		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	6.9	5.6	60	0.0100	0.0690		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	7.3	60	0.0100	0.0730		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	ND	6.5	600	0.000300	0.00195		5819589
Total Tetra CDF **	pg	13.1	9.6	60			1	5819589
Total Penta CDF **	pg	ND (1)	12	60			0	5819589
Total Hexa CDF **	pg	ND	6.7	60			0	5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

ND = Not detected

** CDF = Chloro Dibenzo-p-Furan

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

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

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		HZP291						
Sampling Date		2018/10/02						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Total Hepta CDF **	pg	6.9	6.4	60			1	5819589
TOTAL TOXIC EQUIVALENCY	pg					35.9		
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	87						5819589
C13-1234678 HeptaCDF **	%	74						5819589
C13-123478 HexaCDD *	%	102						5819589
C13-123478 HexaCDF **	%	99						5819589
C13-1234789 HeptaCDF **	%	116						5819589
C13-123678 HexaCDD *	%	96						5819589
C13-123678 HexaCDF **	%	80						5819589
C13-12378 PentaCDD *	%	91						5819589
C13-12378 PentaCDF **	%	72						5819589
C13-123789 HexaCDF **	%	70						5819589
C13-23478 PentaCDF **	%	118						5819589
C13-2378 TetraCDD *	%	101						5819589
C13-2378 TetraCDF **	%	74						5819589
C13-Octachlorodibenzo-p-Dioxin	%	99						5819589
Cl37-2378 TetraCDD *	%	89						5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

** CDF = Chloro Dibenzo-p-Furan

* CDD = Chloro Dibenzo-p-Dioxin

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: HZP289
Sample ID: SVOC T1
Matrix: Stack Sampling Train

Collected: 2018/09/30
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/04	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/10/31	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

Maxxam ID: HZP290
Sample ID: SVOC T2
Matrix: Stack Sampling Train

Collected: 2018/10/01
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/04	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/10/31	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

Maxxam ID: HZP291
Sample ID: SVOC T3
Matrix: Stack Sampling Train

Collected: 2018/10/02
Shipped:
Received: 2018/10/09

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/04	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/11/01	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

GENERAL COMMENTS

Impinger extracted past hold time.

Dibenzo(a,c) anthracene, Triphenylene and Picene : These parameters are not accredited for the submitted matrix. Triphenylene co-elutes with Chrysene and Dibenzo(a,c)anthracene co-elutes with Dibenz(a,h)anthracene. The data reported is the total of the 2 compounds if both are present.

Benzo(b)fluoranthene and Benzo(j)fluoranthene co-elute. The data reported is the total of the 2 compounds if both are present.

D6-Pentachlorophenol surrogate recovery was above the upper control limit. This may represent a high bias in some results.

Sample HZP289 [SVOC T1] : PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Sample HZP290 [SVOC T2] : PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Sample HZP291 [SVOC T3] : PAH Analysis: One of the field spikes recovery is above our criteria. This may be due to sample matrix interference.

PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Results relate only to the items tested.

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Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5792973	FJI	Spiked Blank	D10-2-Methylnaphthalene	2018/10/31		90	%	50 - 150
			D10-Fluoranthene	2018/10/31		92	%	50 - 150
			D10-Phenanthrene	2018/10/31		94	%	50 - 150
			D12-Benzo(a)anthracene	2018/10/31		106	%	50 - 150
			D12-Benzo(a)pyrene	2018/10/31		76	%	50 - 150
			D12-Benzo(b)fluoranthene	2018/10/31		112	%	50 - 150
			D12-Benzo(ghi)perylene	2018/10/31		114	%	50 - 150
			D12-Benzo(k)fluoranthene	2018/10/31		106	%	50 - 150
			D12-Chrysene	2018/10/31		106	%	50 - 150
			D12-Indeno(1,2,3-cd)pyrene	2018/10/31		114	%	50 - 150
			D12-Perylene	2018/10/31		56	%	50 - 150
			D14-Dibenzo(a,h)anthracene	2018/10/31		114	%	50 - 150
			D8-Acenaphthylene	2018/10/31		86	%	50 - 150
			D8-Naphthalene	2018/10/31		88	%	50 - 150
			Acenaphthene	2018/10/31		90	%	60 - 130
			Acenaphthylene	2018/10/31		90	%	60 - 130
			Anthracene	2018/10/31		73	%	60 - 130
			Benzo(a)anthracene	2018/10/31		108	%	60 - 130
			Benzo(a)pyrene	2018/10/31		83	%	60 - 130
			Benzo(b)fluoranthene	2018/10/31		115	%	60 - 130
			Benzo(g,h,i)perylene	2018/10/31		115	%	60 - 130
			Benzo(k)fluoranthene	2018/10/31		110	%	60 - 130
			Biphenyl	2018/10/31		93	%	60 - 130
			Chrysene	2018/10/31		115	%	60 - 130
			Fluoranthene	2018/10/31		95	%	60 - 130
			Fluorene	2018/10/31		98	%	60 - 130
			Indeno(1,2,3-cd)pyrene	2018/10/31		123	%	60 - 130
			Naphthalene	2018/10/31		100	%	60 - 130
			Phenanthrene	2018/10/31		95	%	60 - 130
			Pyrene	2018/10/31		90	%	60 - 130
5792973	FJI	RPD	Acenaphthene	2018/10/31	0		%	50
			Acenaphthylene	2018/10/31	5.7		%	50
			Anthracene	2018/10/31	3.5		%	50
			Benzo(a)anthracene	2018/10/31	7.2		%	50
			Benzo(a)pyrene	2018/10/31	3.0		%	50
			Benzo(b)fluoranthene	2018/10/31	24		%	50
			Benzo(g,h,i)perylene	2018/10/31	9.1		%	50
			Benzo(k)fluoranthene	2018/10/31	19		%	50
			Biphenyl	2018/10/31	2.7		%	50
			Chrysene	2018/10/31	6.7		%	50
			Fluoranthene	2018/10/31	5.4		%	50
			Fluorene	2018/10/31	5.3		%	50
			Indeno(1,2,3-cd)pyrene	2018/10/31	11		%	50
			Naphthalene	2018/10/31	2.5		%	50
			Phenanthrene	2018/10/31	2.7		%	50
			Pyrene	2018/10/31	5.7		%	50
5792973	FJI	Method Blank	D10-2-Methylnaphthalene	2018/10/31		86	%	50 - 150
			D10-Fluoranthene	2018/10/31		86	%	50 - 150
			D10-Phenanthrene	2018/10/31		88	%	50 - 150
			D12-Benzo(a)anthracene	2018/10/31		98	%	50 - 150
			D12-Benzo(a)pyrene	2018/10/31		80	%	50 - 150
			D12-Benzo(b)fluoranthene	2018/10/31		106	%	50 - 150
			D12-Benzo(ghi)perylene	2018/10/31		108	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			D12-Benzo(k)fluoranthene	2018/10/31		102	%	50 - 150
			D12-Chrysene	2018/10/31		102	%	50 - 150
			D12-Indeno(1,2,3-cd)pyrene	2018/10/31		106	%	50 - 150
			D12-Perylene	2018/10/31		84	%	50 - 150
			D14-Dibenzo(a,h)anthracene	2018/10/31		106	%	50 - 150
			D8-Acenaphthylene	2018/10/31		78	%	50 - 150
			D8-Naphthalene	2018/10/31		84	%	50 - 150
			1-Methylnaphthalene	2018/10/31	ND, RDL=0.30		ug	
			1-Methylphenanthrene	2018/10/31	ND, RDL=0.30		ug	
			2-Chloronaphthalene	2018/10/31	ND, RDL=0.30		ug	
			2-Methylanthracene	2018/10/31	ND, RDL=0.30		ug	
			2-Methylnaphthalene	2018/10/31	ND, RDL=0.30		ug	
			3-Methylcholanthrene	2018/10/31	ND, RDL=0.30		ug	
			7,12-Dimethylbenzo(a)anthracene	2018/10/31	ND, RDL=1.2		ug	
			9,10-Dimethylanthracene	2018/10/31	ND, RDL=0.30		ug	
			9-Methylphenanthrene	2018/10/31	ND, RDL=0.30		ug	
			Acenaphthene	2018/10/31	ND, RDL=0.30		ug	
			Acenaphthylene	2018/10/31	ND, RDL=0.30		ug	
			Anthracene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)anthracene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)fluorene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)pyrene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(b)fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(b)fluorene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(e)pyrene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(g,h,i)perylene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(k)fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Biphenyl	2018/10/31	ND, RDL=0.30		ug	
			Chrysene	2018/10/31	ND, RDL=0.30		ug	
			Coronene	2018/10/31	ND, RDL=0.30		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Dibenzo(a,c)anthracene	2018/10/31	ND, RDL=0.30		ug	
			Fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Fluorene	2018/10/31	ND, RDL=0.30		ug	
			Indeno(1,2,3-cd)pyrene	2018/10/31	ND, RDL=0.30		ug	
			m-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Naphthalene	2018/10/31	ND, RDL=0.30		ug	
			o-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Perylene	2018/10/31	ND, RDL=0.30		ug	
			Phenanthrene	2018/10/31	ND, RDL=0.30		ug	
			Picene	2018/10/31	ND, RDL=0.30		ug	
			p-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Pyrene	2018/10/31	ND, RDL=0.30		ug	
			Tetralin	2018/10/31	ND, RDL=0.30		ug	
			Triphenylene	2018/10/31	ND, RDL=0.30		ug	
5792998	FJI	Spiked Blank	1,2,3,4-Tetrachlorobenzene	2018/10/29		81	%	40 - 130
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29		41	%	40 - 130
			1,2,3-Trichlorobenzene	2018/10/29		80	%	40 - 130
			1,2,4-Trichlorobenzene	2018/10/29		84	%	40 - 130
			1,2-Dichlorobenzene	2018/10/29		64	%	40 - 130
			1,3,5-Trichlorobenzene	2018/10/29		85	%	40 - 130
			1,3-Dichlorobenzene	2018/10/29		54	%	40 - 130
			1,4-Dichlorobenzene	2018/10/29		74	%	40 - 130
			13C6-Hexachlorobenzene	2018/10/29		79	%	30 - 130
			2H3-1,2,4-Trichlorobenzene	2018/10/29		79	%	30 - 130
			2H4-1,3-Dichlorobenzene	2018/10/29		62	%	30 - 130
			Hexachlorobenzene	2018/10/29		82	%	40 - 130
			Pentachlorobenzene	2018/10/29		87	%	40 - 130
5792998	FJI	RPD	1,2,3,4-Tetrachlorobenzene	2018/10/29	12		%	50
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29	16		%	50
			1,2,3-Trichlorobenzene	2018/10/29	18		%	50
			1,2,4-Trichlorobenzene	2018/10/29	21		%	50
			1,2-Dichlorobenzene	2018/10/29	31		%	50
			1,3,5-Trichlorobenzene	2018/10/29	18		%	50
			1,3-Dichlorobenzene	2018/10/29	26		%	50
			1,4-Dichlorobenzene	2018/10/29	35		%	50
			Hexachlorobenzene	2018/10/29	8.6		%	50
			Pentachlorobenzene	2018/10/29	8.5		%	50
5792998	FJI	Method Blank	1,2,3,4-Tetrachlorobenzene	2018/10/29	ND, RDL=0.30		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2,3-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2,4-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,3,5-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,3-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,4-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			13C6-Hexachlorobenzene	2018/10/29		82	%	30 - 130
			2H3-1,2,4-Trichlorobenzene	2018/10/29		87	%	30 - 130
			2H4-1,3-Dichlorobenzene	2018/10/29		70	%	30 - 130
			Hexachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			Pentachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
5793003	FJI	Spiked Blank	2,3,4,5-Tetrachlorophenol	2018/11/06		96	%	22 - 134
			2,3,4-Trichlorophenol	2018/11/06		107	%	22 - 134
			2,3,5-Trichlorophenol	2018/11/06		101	%	22 - 134
			2,4 + 2,5-Dichlorophenol	2018/11/06		89	%	22 - 134
			2,4,6-Trichlorophenol	2018/11/06		104	%	22 - 134
			2,6-Dichlorophenol	2018/11/06		97	%	22 - 134
			2-Chlorophenol	2018/11/06		99	%	22 - 134
			3,4,5-Trichlorophenol	2018/11/06		105	%	22 - 134
			3,4-Dichlorophenol	2018/11/06		107	%	22 - 134
			3,5-Dichlorophenol	2018/11/06		97	%	22 - 134
			4-Chlorophenol	2018/11/06		127	%	22 - 134
			D3-2,4-Dichlorophenol	2018/11/06		107	%	20 - 130
			D6-Pentachlorophenol	2018/11/06		144 (1)	%	20 - 130
			Pentachlorophenol	2018/11/06		109	%	22 - 134
			2,3,4,6-Tetrachlorophenol	2018/11/06		105	%	22 - 134
			2,3,5,6-Tetrachlorophenol	2018/11/06		109	%	22 - 134
			2,3,6-Trichlorophenol	2018/11/06		105	%	22 - 134
			2,3-Dichlorophenol	2018/11/06		102	%	22 - 134
			2,4,5-Trichlorophenol	2018/11/06		106	%	22 - 134
			3-Chlorophenol	2018/11/06		96	%	22 - 134
5793003	FJI	RPD	2,3,4,5-Tetrachlorophenol	2018/11/06	16		%	50
			2,3,4-Trichlorophenol	2018/11/06	2.6		%	50
			2,3,5-Trichlorophenol	2018/11/06	6.4		%	50
			2,4 + 2,5-Dichlorophenol	2018/11/06	2.2		%	50
			2,4,6-Trichlorophenol	2018/11/06	1.7		%	50
			2,6-Dichlorophenol	2018/11/06	3.8		%	50
			2-Chlorophenol	2018/11/06	7.3		%	50
			3,4,5-Trichlorophenol	2018/11/06	6.4		%	50
			3,4-Dichlorophenol	2018/11/06	2.7		%	50
			3,5-Dichlorophenol	2018/11/06	3.1		%	50
			4-Chlorophenol	2018/11/06	0.78		%	50
			Pentachlorophenol	2018/11/06	19		%	50

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			2,3,4,6-Tetrachlorophenol	2018/11/06	8.5		%	50
			2,3,5,6-Tetrachlorophenol	2018/11/06	11		%	50
			2,3,6-Trichlorophenol	2018/11/06	1.4		%	50
			2,3-Dichlorophenol	2018/11/06	2.3		%	50
			2,4,5-Trichlorophenol	2018/11/06	5.3		%	50
			3-Chlorophenol	2018/11/06	3.6		%	50
5793003	FJI	Method Blank	2,3,4,5-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,4-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4 + 2,5-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4,6-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,6-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,4,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,4-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,5-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			4-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
			D3-2,4-Dichlorophenol	2018/11/06		105	%	20 - 130
			D6-Pentachlorophenol	2018/11/06		162 (1)	%	20 - 130
			Pentachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,4,6-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,5,6-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,6-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
5793011	CXU	Spiked Blank	C13-233'44'55'-HeptaCB-(189)	2018/11/06		102	%	30 - 140
			C13-233'44'5-HexaCB-(156)	2018/11/06		95	%	30 - 140
			C13-233'44'5'-HexaCB-(157)	2018/11/06		95	%	30 - 140
			C13-233'44'-PentaCB-(105)	2018/11/06		104	%	30 - 140
			C13-23'44'55'-HexaCB-(167)	2018/11/06		94	%	30 - 140
			C13-2344'5-PentaCB-(114)	2018/11/06		98	%	30 - 140
			C13-23'44'5-PentaCB-(118)	2018/11/06		105	%	30 - 140
			C13-2'344'5-PentaCB-(123)	2018/11/06		102	%	30 - 140
			C13-33'44'55'-HexaCB-(169)	2018/11/06		78	%	30 - 140
			C13-33'44'5-PentaCB-(126)	2018/11/06		100	%	30 - 140

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			C13-33'44'-TetraCB-(77)	2018/11/06		91	%	30 - 140
			C13-344'5-TetraCB-(81)	2018/11/06		92	%	30 - 140
			33'44'-TetraCB-(77)	2018/11/06		100	%	50 - 150
			344'5-TetraCB-(81)	2018/11/06		99	%	50 - 150
			233'44'-PentaCB-(105)	2018/11/06		98	%	50 - 150
			2344'5-PentaCB-(114)	2018/11/06		99	%	50 - 150
			23'44'5-PentaCB-(118)	2018/11/06		99	%	50 - 150
			23'44'5'-PentaCB-(123)	2018/11/06		103	%	50 - 150
			33'44'5-PentaCB-(126)	2018/11/06		98	%	50 - 150
			HexaCB-(156)+(157)	2018/11/06		98	%	N/A
			23'44'55'-HexaCB-(167)	2018/11/06		99	%	50 - 150
			33'44'55'-HexaCB-(169)	2018/11/06		104	%	50 - 150
			233'44'55'-HeptaCB-(189)	2018/11/06		102	%	50 - 150
5793011	CXU	RPD	33'44'-TetraCB-(77)	2018/11/06	3.9		%	30
			344'5-TetraCB-(81)	2018/11/06	3.0		%	30
			233'44'-PentaCB-(105)	2018/11/06	6.9		%	30
			2344'5-PentaCB-(114)	2018/11/06	4.9		%	30
			23'44'5-PentaCB-(118)	2018/11/06	4.0		%	30
			23'44'5'-PentaCB-(123)	2018/11/06	1.9		%	30
			33'44'5-PentaCB-(126)	2018/11/06	7.8		%	30
			HexaCB-(156)+(157)	2018/11/06	5.0		%	30
			23'44'55'-HexaCB-(167)	2018/11/06	5.9		%	30
			33'44'55'-HexaCB-(169)	2018/11/06	0.97		%	30
			233'44'55'-HeptaCB-(189)	2018/11/06	4.0		%	30
5793011	CXU	Method Blank	C13-233'44'55'-HeptaCB-(189)	2018/11/06		122	%	30 - 140
			C13-233'44'5-HexaCB-(156)	2018/11/06		108	%	30 - 140
			C13-233'44'5'-HexaCB-(157)	2018/11/06		108	%	30 - 140
			C13-233'44'-PentaCB-(105)	2018/11/06		128	%	30 - 140
			C13-23'44'55'-HexaCB-(167)	2018/11/06		108	%	30 - 140
			C13-2344'5-PentaCB-(114)	2018/11/06		118	%	30 - 140
			C13-23'44'5-PentaCB-(118)	2018/11/06		127	%	30 - 140
			C13-2'344'5-PentaCB-(123)	2018/11/06		125	%	30 - 140
			C13-33'44'55'-HexaCB-(169)	2018/11/06		84	%	30 - 140
			C13-33'44'5-PentaCB-(126)	2018/11/06		121	%	30 - 140
			C13-33'44'-TetraCB-(77)	2018/11/06		105	%	30 - 140
			C13-344'5-TetraCB-(81)	2018/11/06		104	%	30 - 140
			33'44'-TetraCB-(77)	2018/11/06	ND, RDL=0.60		ng	
			344'5-TetraCB-(81)	2018/11/06	ND, RDL=0.60		ng	
			233'44'-PentaCB-(105)	2018/11/06	ND, RDL=0.60		ng	
			2344'5-PentaCB-(114)	2018/11/06	ND, RDL=0.60		ng	
			23'44'5-PentaCB-(118)	2018/11/06	ND, RDL=0.60 (2)		ng	
			23'44'5'-PentaCB-(123)	2018/11/06	ND, RDL=0.60		ng	
			33'44'5-PentaCB-(126)	2018/11/06	ND, RDL=0.60		ng	
			HexaCB-(156)+(157)	2018/11/06	ND, RDL=1.2		ng	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			23'44'55'-HexaCB-(167)	2018/11/06	ND, RDL=0.60		ng	
			33'44'55'-HexaCB-(169)	2018/11/06	ND, RDL=0.60		ng	
			233'44'55'-HeptaCB-(189)	2018/11/06	ND, RDL=0.60		ng	
5819589	OBC	Spiked Blank	C13-1234678 HeptaCDD	2018/11/04		100	%	25 - 130
			C13-1234678 HeptaCDF	2018/11/04		75	%	25 - 130
			C13-123678 HexaCDD	2018/11/04		81	%	40 - 130
			C13-123678 HexaCDF	2018/11/04		70	%	40 - 130
			C13-12378 PentaCDD	2018/11/04		77	%	40 - 130
			C13-12378 PentaCDF	2018/11/04		74	%	40 - 130
			C13-123789 HexaCDF	2018/11/04		72	%	40 - 130
			C13-2378 TetraCDD	2018/11/04		100	%	40 - 130
			C13-2378 TetraCDF	2018/11/04		79	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2018/11/04		108	%	25 - 130
			2,3,7,8-Tetra CDD	2018/11/04		93	%	80 - 140
			1,2,3,7,8-Penta CDD	2018/11/04		126	%	80 - 140
			1,2,3,4,7,8-Hexa CDD	2018/11/04		110	%	80 - 140
			1,2,3,6,7,8-Hexa CDD	2018/11/04		117	%	80 - 140
			1,2,3,7,8,9-Hexa CDD	2018/11/04		127	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04		91	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04		109	%	80 - 140
			2,3,7,8-Tetra CDF	2018/11/04		109	%	80 - 140
			1,2,3,7,8-Penta CDF	2018/11/04		119	%	80 - 140
			2,3,4,7,8-Penta CDF	2018/11/04		116	%	80 - 140
			1,2,3,4,7,8-Hexa CDF	2018/11/04		106	%	80 - 140
			1,2,3,6,7,8-Hexa CDF	2018/11/04		120	%	80 - 140
			2,3,4,6,7,8-Hexa CDF	2018/11/04		124	%	80 - 140
			1,2,3,7,8,9-Hexa CDF	2018/11/04		134	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04		112	%	80 - 140
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04		128	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04		97	%	80 - 140
5819589	OBC	RPD	2,3,7,8-Tetra CDD	2018/11/04	2.2		%	20
			1,2,3,7,8-Penta CDD	2018/11/04	1.6		%	20
			1,2,3,4,7,8-Hexa CDD	2018/11/04	0.91		%	20
			1,2,3,6,7,8-Hexa CDD	2018/11/04	9.0		%	20
			1,2,3,7,8,9-Hexa CDD	2018/11/04	2.4		%	20
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04	27 (1)		%	20
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04	0		%	20
			2,3,7,8-Tetra CDF	2018/11/04	3.7		%	20
			1,2,3,7,8-Penta CDF	2018/11/04	4.9		%	20
			2,3,4,7,8-Penta CDF	2018/11/04	12		%	20
			1,2,3,4,7,8-Hexa CDF	2018/11/04	0		%	20
			1,2,3,6,7,8-Hexa CDF	2018/11/04	7.2		%	20
			2,3,4,6,7,8-Hexa CDF	2018/11/04	2.4		%	20
			1,2,3,7,8,9-Hexa CDF	2018/11/04	6.2 (3)		%	20
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04	0		%	20
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04	5.6		%	20
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04	0		%	20
5819589	OBC	Method Blank	C13-1234678 HeptaCDD	2018/11/04		78	%	25 - 130
			C13-1234678 HeptaCDF	2018/11/04		66	%	25 - 130
			C13-123678 HexaCDD	2018/11/04		80	%	40 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			C13-123678 HexaCDF	2018/11/04		68	%	40 - 130
			C13-12378 PentaCDD	2018/11/04		78	%	40 - 130
			C13-12378 PentaCDF	2018/11/04		71	%	40 - 130
			C13-123789 HexaCDF	2018/11/04		71	%	40 - 130
			C13-2378 TetraCDD	2018/11/04		104	%	40 - 130
			C13-2378 TetraCDF	2018/11/04		75	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2018/11/04		99	%	25 - 130
			2,3,7,8-Tetra CDD	2018/11/04	ND, EDL=19		pg	
			1,2,3,7,8-Penta CDD	2018/11/04	ND, EDL=12		pg	
			1,2,3,4,7,8-Hexa CDD	2018/11/04	ND, EDL=7.2		pg	
			1,2,3,6,7,8-Hexa CDD	2018/11/04	ND, EDL=7.0		pg	
			1,2,3,7,8,9-Hexa CDD	2018/11/04	ND, EDL=6.6		pg	
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04	10.5, EDL=6.4		pg	
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04	35.0, EDL=7.1		pg	
			Total Tetra CDD	2018/11/04	ND, EDL=69 (2)		pg	
			Total Penta CDD	2018/11/04	ND, EDL=53 (2)		pg	
			Total Hexa CDD	2018/11/04	ND, EDL=150 (2)		pg	
			Total Hepta CDD	2018/11/04	10.5, EDL=6.4		pg	
			2,3,7,8-Tetra CDF	2018/11/04	ND, EDL=11		pg	
			1,2,3,7,8-Penta CDF	2018/11/04	ND, EDL=8.4		pg	
			2,3,4,7,8-Penta CDF	2018/11/04	ND, EDL=8.5		pg	
			1,2,3,4,7,8-Hexa CDF	2018/11/04	ND, EDL=7.8		pg	
			1,2,3,6,7,8-Hexa CDF	2018/11/04	ND, EDL=7.7		pg	
			2,3,4,6,7,8-Hexa CDF	2018/11/04	ND, EDL=8.5		pg	
			1,2,3,7,8,9-Hexa CDF	2018/11/04	11.5, EDL=9.7		pg	
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04	7.8, EDL=6.3		pg	
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04	12.7, EDL=8.3		pg	
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04	27.0, EDL=6.1		pg	
			Total Tetra CDF	2018/11/04	ND, EDL=11		pg	
			Total Penta CDF	2018/11/04	ND, EDL=8.4		pg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Total Hexa CDF	2018/11/04	11.5, EDL=8.4		pg	
			Total Hepta CDF	2018/11/04	20.5, EDL=7.2		pg	

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

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

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

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

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

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

(3) Recovery exceeds method criteria

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8Q9027
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cathy Xu, Scientific Specialist, Ultra Trace Analysis, HRMS

Owen Cosby, BSc.C.Chem, Supervisor, HRMS Services

Rodney Major, Manager Organic Processing Lab

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Chain of Custody Form - Source

B8Q9027 (SVOC) B8Q5571 (MS/M29/M26(M)/CTM027/M201A) B8Q5238 (VOST)

Maxxam

6740 Campobello Rd.
Mississauga, Ontario L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5775

CAM FCD-01303 /2 Page ___ of ___

CLIENT INFORMATION SECTION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: kirk.easto@rwdi.com
Address: Guelph, ON
Phone: 519-823-1311 Fax: 519-823-1316
Sampled by: Kirk Easto

ANALYSIS REQUESTED

MAXXAM use only	Field Sample ID	# Bottles	Collection Date	Collection Time	Initial Impinger Charge Volumes (mL)*	SVOC ENV/CAN 1/RM/2	US EPA M29	US EPA M26 HCl/NH3	Method 30 VOC's	US EPA M201A
	T1-Baseline -SVOC (6 pieces)	6	Sept 30			x				
	T2-Baseline -SVOC (6 pieces)	6	Oct 1			x				
	T3-Baseline -SVOC (6 pieces)	6	Oct 2			x				
	T1-Baseline - M29 (7 pieces)	7	Sept 30				x			
	T2-Baseline - M29 (7 pieces)	7	Oct 1				x			
	T3-Baseline - M29 (7 pieces)	7	Oct 2				x			
	T1/T2/T3-Baseline -M26 (3 bottle)	3	09/30-10/032		2 * 15 ml			x		
	T1/T2/T3-Baseline -VOST (3 pairs)	3	09/30-10/032						X	
	T1-Baseline - PM10 (4pieces)	4	Sept 30							x
	T2-Baseline - PM10 (4pieces)	4	Oct 1							x
	T3-Baseline - PM10 (4pieces)	4	Oct 2							x

TAT Requirement

- STD 10 Business day ☑
- Rush 5 Business day ☐
- Rush 2 Business day ☐
- Rush 1 Business day ☐
- Other (specify):

PROJECT INFORMATION

Project #: 1804600
Name: St. Marys
PO #: 1804600
Maxxam Quote #:
Maxxam Contact: Clayton Johnson

REPORTING REQUIREMENTS

- SSAS Audit samples ☐
- Summary Report only ☐
- Summary Report & Raw Data Package ** ☐

** additional cost may apply

PROJECT SPECIFIC COMMENTS

See attached list for parameter lists

* Initial Impinger charge volumes are required before the following analysis can be started: Method 26, CTM-027 & Method 8

Client Signature: [signature]
Affilitation: Oct 6 2018
Date/Time:

Received by: * FIDELE NTAMWEMEZI
Affilitation: [signature]
Date/Time: 2018/10/06 10:30

Method 23 / TO9A

- 2005 WHO ☐
- 1989 NATO TEF ☐
- 1998 WHO ☐

TEF x DL ☐
TEF x 0 DL ☐
TEF x 0.5 DL ☐

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8.5/8.9/9.0
20.6/20.4/20.3

8809027 (SVOC)

Dioxins, Furans and Dioxin-like PCBs ✓

2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]
2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]
2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]
1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]
1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]
1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]
1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]
2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]
1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]
1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]

3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)] ✓
3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]
3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]
3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]
2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]
2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]
2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]
2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]
2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]
2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]
2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]
2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]

Polycyclic Organic Matter: ✓
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene
Benzo(e)pyrene
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene

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2018/10/06
10:30

B8Q9027 (SVOC)

Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
Triphenylene

Chlorinated Organics /

total dichlorobenzenes
total trichlorobenzenes (1,3,5-; 1,2,3-; 1,2,4-)
total tetrachlorobenzenes (1,2,4,5-; 1,2,3,5-)
pentachlorobenzene
hexachlorobenzene
total dichlorophenols (2,3-; 2,4-; and 2,6-)
total trichlorophenols (2,3,4-; 2,4,5-; 2,4,6-; 3,4,5-)
total tetrachlorophenols (2,3,4,6-;2,3,5,6)
total pentachlorophenols

FIRLE NTAMWEMEZI
2018/12/06
16:30

8.5/8.9/9.0
20.6/20.4/20.3

B8Q9027 (SVOC)
B8Q5571 (MS/M29/M26(M)/CTM027/M201A)

RWDI	B8O3742	Pall			18072358	0.45390
	HUA110-01	90mm Quartz			18072359	0.45930
		p/n 7203			18072360	0.45990
		lot# 20531			18072361	0.45810
					18072362	0.45565
					18072363	0.45625
					18072364	0.45800
					18072365	0.45790
					18072366	0.46280
					18072367	0.46005
					18072368	0.46365
					18072369	0.46005
					18072370	0.45730
					18072371	0.45940
					18072372	0.45655

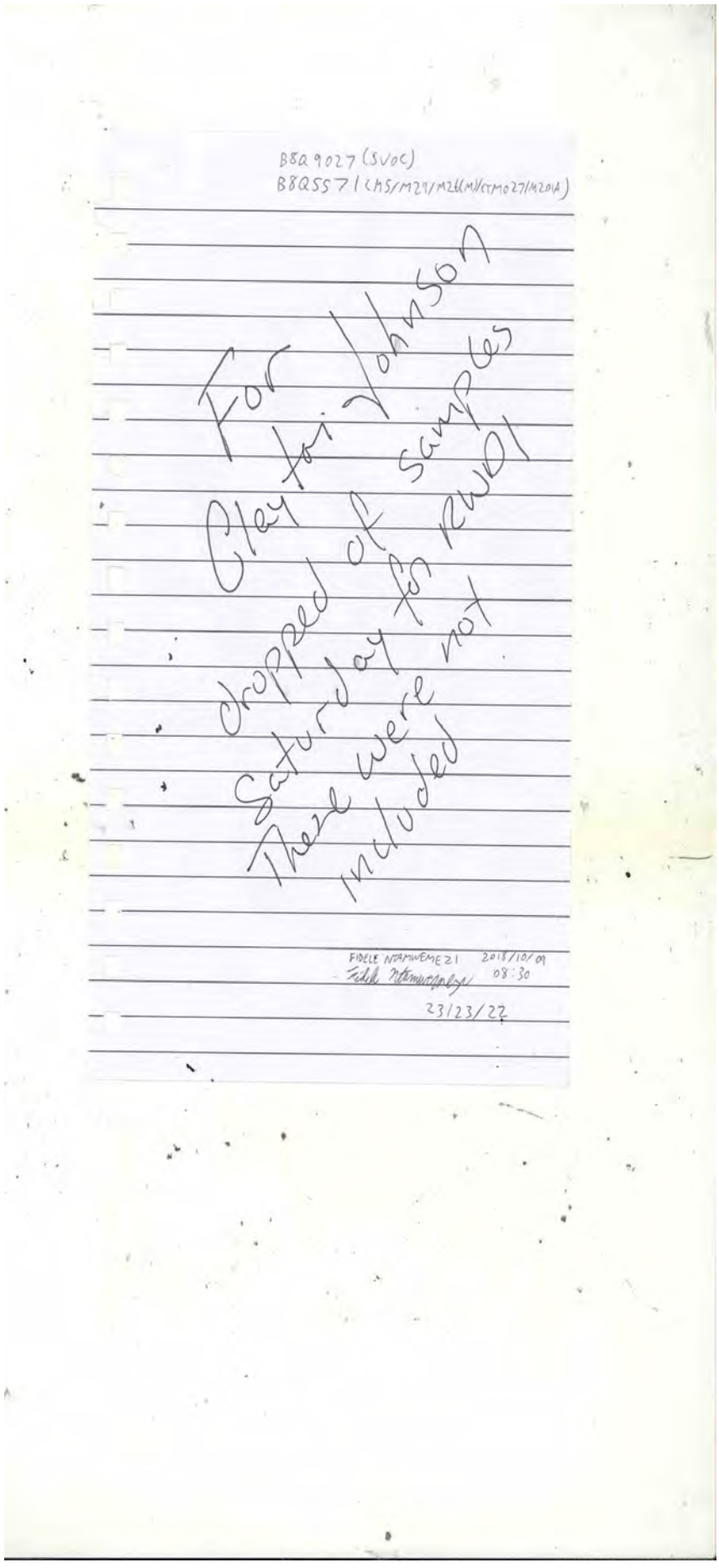
RWDI	B8O3742	Pall			18081617	0.45850
	HUA110-01	90mm Quartx			18081618	0.45860
		p/n 7203			18081619	0.46085
		lot# 20531			18081620	0.45840
					18081621	0.45955

R.K. Patel Rain Patel 2018/10/09 08:30

23/23/22

~~20 20.1/20.4/20.3~~

FWL 2018/10/09



B8Q9027 (SVOC)
B8Q5571 (CMS/M29/M26(M)/CTM027/M201A)

For Clay for Johnson
dropped of samples
Saturday for RWD1
These were not
included

FIDELE NTAMWEME21 2018/10/09
Fidele Ntamwemeze 08:30
23/23/22

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1702401
Your Project #: 1702401
Site Location: ST. MARYS
Your C.O.C. #: 32140

Attention: Kirk Easto

RWDI West Inc
600 Southgate Drive
Guelph, ON
Canada N1G 4P6

Report Date: 2019/03/07
Report #: R5620418
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8R1217
Received: 2018/10/15, 09:19

Sample Matrix: Stack Sampling Train
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Chlorobenzenes in MM5 Trains (EPA M0010)	3	2018/10/19	2018/10/29	BRL SOP-00202	In house (M0010)
Chlorophenols in MM5 Trains (EPA M0010)	3	2018/10/19	2018/11/07	BRL SOP-00204	In house (M0010)
Dioxins/Furans in Air (Method 23)	3	2018/10/19	2018/11/05	BRL SOP-00404	EPA M23/23A m
PAH's in MM5 SamplingTrains (CARB429mod)	3	2018/10/19	2018/11/01	BRL SOP-00201	CARB429(ARBM1,M2)mod
PCBs in a Sampling Train (1668Amod)	3	2018/10/19	2018/11/06	BRL SOP-00408	EPA 1668A m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 1702401
Your Project #: 1702401
Site Location: ST. MARYS
Your C.O.C. #: 32140

Attention: Kirk Easto

RWDI West Inc
600 Southgate Drive
Guelph, ON
Canada N1G 4P6

Report Date: 2019/03/07
Report #: R5620418
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8R1217
Received: 2018/10/15, 09:19

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		IAC222						
Sampling Date		2018/10/05						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.13	0.60	0.00010	0.000013		5793011
344'5-TetraCB-(81)	ng	ND	0.13	0.60	0.00030	0.000039		5793011
233'44'-PentaCB-(105)	ng	0.16	0.050	0.60	0.000030	0.0000048		5793011
2344'5-PentaCB-(114)	ng	ND	0.050	0.60	0.000030	0.0000015		5793011
23'44'5-PentaCB-(118)	ng	0.47	0.049	0.60	0.000030	0.000014		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.055	0.60	0.000030	0.0000017		5793011
33'44'5-PentaCB-(126)	ng	ND	0.047	0.60	0.10	0.0047		5793011
HexaCB-(156)+(157)	ng	ND	0.10	1.2	0.000030	0.0000030		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.099	0.60	0.000030	0.0000030		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.11	0.60	0.030	0.0033		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.15	0.60	0.000030	0.0000045		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.0081		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	104						5793011
C13-233'44'5-HexaCB-(156)	%	71						5793011
C13-233'44'5'-HexaCB-(157)	%	71						5793011
C13-233'44'-PentaCB-(105)	%	72						5793011
C13-23'44'55'-HexaCB-(167)	%	74						5793011
C13-2344'5-PentaCB-(114)	%	72						5793011
C13-23'44'5-PentaCB-(118)	%	76						5793011
C13-2'344'5-PentaCB-(123)	%	73						5793011
C13-33'44'55'-HexaCB-(169)	%	50						5793011
C13-33'44'5-PentaCB-(126)	%	69						5793011
C13-33'44'-TetraCB-(77)	%	91						5793011
C13-344'5-TetraCB-(81)	%	90						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		IAC223						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.12	0.60	0.00010	0.000012		5793011
344'5-TetraCB-(81)	ng	ND	0.12	0.60	0.00030	0.000036		5793011
233'44'-PentaCB-(105)	ng	0.22	0.092	0.60	0.000030	0.0000066		5793011
2344'5-PentaCB-(114)	ng	ND	0.092	0.60	0.000030	0.0000028		5793011
23'44'5-PentaCB-(118)	ng	0.72	0.090	0.60	0.000030	0.000022		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.10	0.60	0.000030	0.0000030		5793011
33'44'5-PentaCB-(126)	ng	ND	0.086	0.60	0.10	0.0086		5793011
HexaCB-(156)+(157)	ng	ND	0.081	1.2	0.000030	0.0000024		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.077	0.60	0.000030	0.0000023		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.083	0.60	0.030	0.0025		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.088	0.60	0.000030	0.0000026		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.011		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	101						5793011
C13-233'44'5-HexaCB-(156)	%	70						5793011
C13-233'44'5'-HexaCB-(157)	%	70						5793011
C13-233'44'-PentaCB-(105)	%	76						5793011
C13-23'44'55'-HexaCB-(167)	%	73						5793011
C13-2344'5-PentaCB-(114)	%	73						5793011
C13-23'44'5-PentaCB-(118)	%	78						5793011
C13-2'344'5-PentaCB-(123)	%	75						5793011
C13-33'44'55'-HexaCB-(169)	%	54						5793011
C13-33'44'5-PentaCB-(126)	%	74						5793011
C13-33'44'-TetraCB-(77)	%	132						5793011
C13-344'5-TetraCB-(81)	%	121						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		IAC224						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
33'44'-TetraCB-(77)	ng	ND	0.096	0.60	0.00010	0.0000096		5793011
344'5-TetraCB-(81)	ng	ND	0.095	0.60	0.00030	0.000029		5793011
233'44'-PentaCB-(105)	ng	0.18	0.068	0.60	0.000030	0.0000054		5793011
2344'5-PentaCB-(114)	ng	ND	0.068	0.60	0.000030	0.0000020		5793011
23'44'5-PentaCB-(118)	ng	0.57	0.067	0.60	0.000030	0.000017		5793011
23'44'5'-PentaCB-(123)	ng	ND	0.076	0.60	0.000030	0.0000023		5793011
33'44'5-PentaCB-(126)	ng	ND	0.064	0.60	0.10	0.0064		5793011
HexaCB-(156)+(157)	ng	ND	0.074	1.2	0.000030	0.0000022		5793011
23'44'55'-HexaCB-(167)	ng	ND	0.070	0.60	0.000030	0.0000021		5793011
33'44'55'-HexaCB-(169)	ng	ND	0.075	0.60	0.030	0.0023		5793011
233'44'55'-HeptaCB-(189)	ng	ND	0.12	0.60	0.000030	0.0000036		5793011
TOTAL TOXIC EQUIVALENCY	ng					0.0088		
Surrogate Recovery (%)								
C13-233'44'55'-HeptaCB-(189)	%	105						5793011
C13-233'44'5-HexaCB-(156)	%	78						5793011
C13-233'44'5'-HexaCB-(157)	%	78						5793011
C13-233'44'-PentaCB-(105)	%	79						5793011
C13-23'44'55'-HexaCB-(167)	%	81						5793011
C13-2344'5-PentaCB-(114)	%	79						5793011
C13-23'44'5-PentaCB-(118)	%	81						5793011
C13-2'344'5-PentaCB-(123)	%	78						5793011
C13-33'44'55'-HexaCB-(169)	%	54						5793011
C13-33'44'5-PentaCB-(126)	%	81						5793011
C13-33'44'-TetraCB-(77)	%	116						5793011
C13-344'5-TetraCB-(81)	%	110						5793011

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

ND = Not detected

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		IAC222	IAC223	IAC224		
Sampling Date		2018/10/05	2018/10/09	2018/10/09		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
1-Methylnaphthalene	ug	392	371	359	6.0	5792973
1-Methylphenanthrene	ug	2.94	5.76	3.96	0.30	5792973
2-Chloronaphthalene	ug	8.22	8.16	6.84	0.30	5792973
2-Methylanthracene	ug	ND	ND	ND	0.30	5792973
2-Methylnaphthalene	ug	592	527	508	6.0	5792973
3-Methylcholanthrene	ug	ND	ND	ND	0.30	5792973
7,12-Dimethylbenzo(a)anthracene	ug	ND	ND	ND	1.2	5792973
9,10-Dimethylanthracene	ug	ND	ND	ND	0.30	5792973
9-Methylphenanthrene	ug	7.08	13.7	9.78	0.30	5792973
Acenaphthene	ug	12.1	8.76	8.76	0.30	5792973
Acenaphthylene	ug	15.1	16.4	12.7	0.30	5792973
Anthracene	ug	1.44	0.42	1.86	0.30	5792973
Benzo(a)anthracene	ug	ND	ND	ND	0.30	5792973
Benzo(a)fluorene	ug	ND	ND	ND	0.30	5792973
Benzo(a)pyrene	ug	ND	ND	ND	0.30	5792973
Benzo(b)fluoranthene	ug	ND	ND	ND	0.30	5792973
Benzo(b)fluorene	ug	ND	ND	ND	0.30	5792973
Benzo(e)pyrene	ug	ND	ND	ND	0.30	5792973
Benzo(g,h,i)perylene	ug	ND	ND	ND	0.30	5792973
Benzo(k)fluoranthene	ug	ND	ND	ND	0.30	5792973
Biphenyl	ug	196	137	121	6.0	5792973
Chrysene	ug	ND	ND	ND	0.30	5792973
Coronene	ug	ND	ND	ND	0.30	5792973
Dibenzo(a,c)anthracene	ug	ND	ND	ND	0.30	5792973
Fluoranthene	ug	0.48	0.72	0.54	0.30	5792973
Fluorene	ug	6.00	9.24	8.04	0.30	5792973
Indeno(1,2,3-cd)pyrene	ug	ND	ND	ND	0.30	5792973
m-Terphenyl	ug	ND	ND	ND	0.30	5792973
Naphthalene	ug	980	712	715	6.0	5792973
o-Terphenyl	ug	0.90	0.66	0.54	0.30	5792973
Perylene	ug	ND	ND	ND	0.30	5792973
Phenanthrene	ug	41.1	57.5	42.4	0.30	5792973
Picene	ug	ND	ND	ND	0.30	5792973
p-Terphenyl	ug	ND	ND	ND	0.30	5792973
Pyrene	ug	ND	0.36	ND	0.30	5792973

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam Job #: B8R1217
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SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		IAC222	IAC223	IAC224		
Sampling Date		2018/10/05	2018/10/09	2018/10/09		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
Tetralin	ug	178	169	172	6.0	5792973
Triphenylene	ug	ND	ND	ND	0.30	5792973
1,2,3,4-Tetrachlorobenzene	ug	ND	ND	ND	0.30	5792998
1,2,3,5+1,2,4,5-Tetrachlorobenzene	ug	ND	ND	ND	0.30	5792998
1,2,3-Trichlorobenzene	ug	1.30	3.74	1.27	0.30	5792998
1,2,4-Trichlorobenzene	ug	2.01	2.27	2.16	0.30	5792998
1,2-Dichlorobenzene	ug	6.57	6.18	6.05	0.30	5792998
1,3,5-Trichlorobenzene	ug	ND	ND	ND	0.30	5792998
1,3-Dichlorobenzene	ug	3.25	2.95	2.73	0.30	5792998
1,4-Dichlorobenzene	ug	2.89	2.30	2.68	0.30	5792998
Hexachlorobenzene	ug	ND	ND	ND	0.30	5792998
Pentachlorobenzene	ug	ND	ND	ND	0.30	5792998
2,3,4,5-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,4,6-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,4-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,5,6-Tetrachlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3,6-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,3-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
2,4 + 2,5-Dichlorophenol	ug	0.31	0.63	0.62	0.30	5793003
2,4,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,4,6-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
2,6-Dichlorophenol	ug	ND	ND	0.32	0.30	5793003
2-Chlorophenol	ug	11.9	18.8	20.6	0.30	5793003
3,4,5-Trichlorophenol	ug	ND	ND	ND	0.30	5793003
3,4-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
3,5-Dichlorophenol	ug	ND	ND	ND	0.30	5793003
3-Chlorophenol	ug	2.25	4.45	4.32	0.30	5793003
4-Chlorophenol	ug	2.22	4.43	4.00	0.30	5793003
Pentachlorophenol	ug	ND	ND	ND	0.30	5793003
Surrogate Recovery (%)						
13C6-Hexachlorobenzene	%	89	94	93		5792998
2H3-1,2,3-Trichlorobenzene (FS)	%	84	93	89		5792998
2H3-1,2,4-Trichlorobenzene	%	86	90	85		5792998
2H4-1,3-Dichlorobenzene	%	130	126	125		5792998

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		IAC222	IAC223	IAC224		
Sampling Date		2018/10/05	2018/10/09	2018/10/09		
COC Number		32140	32140	32140		
	UNITS	**SVOC T1**	**SVOC T2**	**SVOC T3**	**RDL**	**QC Batch**
2H4-1,4-Dichlorobenzene (FS)	%	128	124	134 (1)		5792998
2,6-Dibromo-4-fluorophenol (FS)	%	87	92	94		5793003
D3-2,4-Dichlorophenol	%	93	96	100		5793003
D6-Pentachlorophenol	%	132 (1)	140 (1)	142 (1)		5793003
D10-2-Methylnaphthalene	%	180 (2)	192 (2)	176 (2)		5792973
D10-Anthracene	%	68	74	64		5792973
D10-Fluoranthene	%	104	106	88		5792973
D10-Fluorene (FS)	%	86	78	78		5792973
D10-Phenanthrene	%	104	98	86		5792973
D12-Benzo(a)anthracene	%	112	118	114		5792973
D12-Benzo(a)pyrene	%	102	112	94		5792973
D12-Benzo(b)fluoranthene	%	112	114	108		5792973
D12-Benzo(ghi)perylene	%	112	116	106		5792973
D12-Benzo(k)fluoranthene	%	104	108	104		5792973
D12-Chrysene	%	104	108	108		5792973
D12-Indeno(1,2,3-cd)pyrene	%	112	116	104		5792973
D12-Perylene	%	104	106	96		5792973
D14-Dibenzo(a,h)anthracene	%	114	118	106		5792973
D14-Terphenyl (FS)	%	112	110	90		5792973
D8-Acenaphthylene	%	116	94	94		5792973
D8-Naphthalene	%	130	114	148		5792973

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) Surrogate recovery was above the upper control limit due to matrix interference. This may represent a high bias in some results.

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DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC222						
Sampling Date		2018/10/05						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	6.9	60	1.00	6.90		5819589
1,2,3,7,8-Penta CDD *	pg	ND	7.4	60	1.00	7.40		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	6.6	60	0.100	0.660		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	6.1	60	0.100	0.610		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	ND	7.0	60	0.0100	0.0700		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	9.5	6.3	600	0.000300	0.00285		5819589
Total Tetra CDD *	pg	ND (1)	26	60			0	5819589
Total Penta CDD *	pg	ND (1)	24	60			0	5819589
Total Hexa CDD *	pg	ND (1)	59	60			0	5819589
Total Hepta CDD *	pg	ND	7.0	60			0	5819589
2,3,7,8-Tetra CDF **	pg	ND	8.7	60	0.100	0.870		5819589
1,2,3,7,8-Penta CDF **	pg	ND	6.4	60	0.0300	0.192		5819589
2,3,4,7,8-Penta CDF **	pg	ND	6.5	60	0.300	1.95		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	6.3	60	0.100	0.630		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	7.0	60	0.100	0.700		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	8.0	60	0.100	0.800		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	ND	5.5	60	0.0100	0.0550		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	7.2	60	0.0100	0.0720		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	ND	7.7	600	0.000300	0.00231		5819589
Total Tetra CDF **	pg	ND (2)	15	60			0	5819589
Total Penta CDF **	pg	ND	6.4	60			0	5819589
Total Hexa CDF **	pg	ND	6.9	60			0	5819589
Total Hepta CDF **	pg	ND	6.3	60			0	5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

ND = Not detected

** CDF = Chloro Dibenzo-p-Furan

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

(2) RT>2 seconds - PCDD/DF analysis-Peak maxima of monitored ions exceeds 2 seconds

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC222						
Sampling Date		2018/10/05						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T1	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
TOTAL TOXIC EQUIVALENCY	pg					22.2		
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	98						5819589
C13-1234678 HeptaCDF **	%	75						5819589
C13-123478 HexaCDD *	%	102						5819589
C13-123478 HexaCDF **	%	101						5819589
C13-1234789 HeptaCDF **	%	116						5819589
C13-123678 HexaCDD *	%	94						5819589
C13-123678 HexaCDF **	%	77						5819589
C13-12378 PentaCDD *	%	86						5819589
C13-12378 PentaCDF **	%	67						5819589
C13-123789 HexaCDF **	%	66						5819589
C13-23478 PentaCDF **	%	116						5819589
C13-2378 TetraCDD *	%	107						5819589
C13-2378 TetraCDF **	%	84						5819589
C13-Octachlorodibenzo-p-Dioxin	%	103						5819589
Cl37-2378 TetraCDD *	%	93						5819589

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

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DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC223						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	7.2	60	1.00	7.20		5819589
1,2,3,7,8-Penta CDD *	pg	ND	9.2	60	1.00	9.20		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	6.9	60	0.100	0.690		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.8	60	0.100	0.680		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	6.4	60	0.100	0.640		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	ND	6.9	60	0.0100	0.0690		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	8.8	6.8	600	0.000300	0.00264		5819589
Total Tetra CDD *	pg	ND	27	60			0	5819589
Total Penta CDD *	pg	ND (1)	24	60			0	5819589
Total Hexa CDD *	pg	ND (1)	55	60			0	5819589
Total Hepta CDD *	pg	ND	6.9	60			0	5819589
2,3,7,8-Tetra CDF **	pg	7.3 (2)	7.0	60	0.100	0.730		5819589
1,2,3,7,8-Penta CDF **	pg	ND	6.3	60	0.0300	0.189		5819589
2,3,4,7,8-Penta CDF **	pg	ND	6.4	60	0.300	1.92		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	6.7	60	0.100	0.670		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	6.6	60	0.100	0.660		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	7.3	60	0.100	0.730		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	8.3	60	0.100	0.830		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	ND	5.9	60	0.0100	0.0590		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	7.7	60	0.0100	0.0770		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	ND	7.2	600	0.000300	0.00216		5819589
Total Tetra CDF **	pg	25.2	7.0	60			2	5819589
Total Penta CDF **	pg	ND	6.3	60			0	5819589
Total Hexa CDF **	pg	ND	7.1	60			0	5819589
Total Hepta CDF **	pg	ND	6.7	60			0	5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

ND = Not detected

** CDF = Chloro Dibenzo-p-Furan

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

(2) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical

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Maxxam Job #: B8R1217
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RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC223						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T2	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
TOTAL TOXIC EQUIVALENCY	pg					24.3		
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	89						5819589
C13-1234678 HeptaCDF **	%	78						5819589
C13-123478 HexaCDD *	%	101						5819589
C13-123478 HexaCDF **	%	96						5819589
C13-1234789 HeptaCDF **	%	116						5819589
C13-123678 HexaCDD *	%	98						5819589
C13-123678 HexaCDF **	%	87						5819589
C13-12378 PentaCDD *	%	85						5819589
C13-12378 PentaCDF **	%	70						5819589
C13-123789 HexaCDF **	%	78						5819589
C13-23478 PentaCDF **	%	121						5819589
C13-2378 TetraCDD *	%	109						5819589
C13-2378 TetraCDF **	%	78						5819589
C13-Octachlorodibenzo-p-Dioxin	%	107						5819589
Cl37-2378 TetraCDD *	%	95						5819589

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

Maxxam Job #: B8R1217
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DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC224						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	ND	8.6	60	1.00	8.60		5819589
1,2,3,7,8-Penta CDD *	pg	ND	7.7	60	1.00	7.70		5819589
1,2,3,4,7,8-Hexa CDD *	pg	ND	6.6	60	0.100	0.660		5819589
1,2,3,6,7,8-Hexa CDD *	pg	ND	6.5	60	0.100	0.650		5819589
1,2,3,7,8,9-Hexa CDD *	pg	ND	6.1	60	0.100	0.610		5819589
1,2,3,4,6,7,8-Hepta CDD *	pg	ND	6.6	60	0.0100	0.0660		5819589
1,2,3,4,6,7,8,9-Octa CDD *	pg	11.2	7.0	600	0.000300	0.00336		5819589
Total Tetra CDD *	pg	ND (1)	21	60			0	5819589
Total Penta CDD *	pg	ND (1)	26	60			0	5819589
Total Hexa CDD *	pg	ND (1)	61	60			0	5819589
Total Hepta CDD *	pg	ND	6.6	60			0	5819589
2,3,7,8-Tetra CDF **	pg	13.4 (2)	6.8	60	0.100	1.34		5819589
1,2,3,7,8-Penta CDF **	pg	ND	6.5	60	0.0300	0.195		5819589
2,3,4,7,8-Penta CDF **	pg	ND	6.6	60	0.300	1.98		5819589
1,2,3,4,7,8-Hexa CDF **	pg	ND	5.9	60	0.100	0.590		5819589
1,2,3,6,7,8-Hexa CDF **	pg	ND	5.8	60	0.100	0.580		5819589
2,3,4,6,7,8-Hexa CDF **	pg	ND	6.4	60	0.100	0.640		5819589
1,2,3,7,8,9-Hexa CDF **	pg	ND	7.3	60	0.100	0.730		5819589
1,2,3,4,6,7,8-Hepta CDF **	pg	ND	5.6	60	0.0100	0.0560		5819589
1,2,3,4,7,8,9-Hepta CDF **	pg	ND	7.3	60	0.0100	0.0730		5819589
1,2,3,4,6,7,8,9-Octa CDF **	pg	ND	6.5	600	0.000300	0.00195		5819589
Total Tetra CDF **	pg	33.8	6.8	60			2	5819589
Total Penta CDF **	pg	ND	6.6	60			0	5819589
Total Hexa CDF **	pg	ND	6.3	60			0	5819589
Total Hepta CDF **	pg	ND	6.3	60			0	5819589

EDL = Estimated Detection Limit

RDL = Reportable Detection Limit

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

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

QC Batch = Quality Control Batch

* CDD = Chloro Dibenzo-p-Dioxin

ND = Not detected

** CDF = Chloro Dibenzo-p-Furan

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

(2) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		IAC224						
Sampling Date		2018/10/09						
COC Number		32140			TOXIC EQUIVALENCY		# of	
	UNITS	SVOC T3	EDL	RDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
TOTAL TOXIC EQUIVALENCY	pg					24.5		
Surrogate Recovery (%)								
C13-1234678 HeptaCDD *	%	93						5819589
C13-1234678 HeptaCDF **	%	75						5819589
C13-123478 HexaCDD *	%	107						5819589
C13-123478 HexaCDF **	%	105						5819589
C13-1234789 HeptaCDF **	%	118						5819589
C13-123678 HexaCDD *	%	95						5819589
C13-123678 HexaCDF **	%	78						5819589
C13-12378 PentaCDD *	%	80						5819589
C13-12378 PentaCDF **	%	67						5819589
C13-123789 HexaCDF **	%	78						5819589
C13-23478 PentaCDF **	%	116						5819589
C13-2378 TetraCDD *	%	105						5819589
C13-2378 TetraCDF **	%	75						5819589
C13-Octachlorodibenzo-p-Dioxin	%	108						5819589
Cl37-2378 TetraCDD *	%	92						5819589

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

Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

TEST SUMMARY

Maxxam ID: IAC222
Sample ID: SVOC T1
Matrix: Stack Sampling Train

Collected: 2018/10/05
Shipped:
Received: 2018/10/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/05	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/11/01	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

Maxxam ID: IAC223
Sample ID: SVOC T2
Matrix: Stack Sampling Train

Collected: 2018/10/09
Shipped:
Received: 2018/10/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/05	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/11/01	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

Maxxam ID: IAC224
Sample ID: SVOC T3
Matrix: Stack Sampling Train

Collected: 2018/10/09
Shipped:
Received: 2018/10/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chlorobenzenes in MM5 Trains (EPA M0010)	GC/MS	5792998	2018/10/19	2018/10/29	Fan (Carrie) Jiang
Chlorophenols in MM5 Trains (EPA M0010)	GC/MS	5793003	2018/10/19	2018/11/07	Fan (Carrie) Jiang
Dioxins/Furans in Air (Method 23)	HRMS/MS	5819589	2018/10/19	2018/11/05	Owen Cosby
PAH's in MM5 SamplingTrains (CARB429mod)	GC/MS	5792973	2018/10/19	2018/11/01	Fan (Carrie) Jiang
PCBs in a Sampling Train (1668Amod)	HRMS/MS	5793011	2018/10/19	2018/11/06	Cathy Xu

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

GENERAL COMMENTS

Impinger extracted past hold time.

Sample IAC222 [SVOC T1] : PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Sample IAC223 [SVOC T2] : PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Sample IAC224 [SVOC T3] : PAH Analysis: One of the field spikes recovery is above our criteria. This may be due to sample matrix interference.

PAH Analysis: Due to high concentrations of some of the target analytes, sample required dilution. Detection limits for those compounds were adjusted accordingly.

Results relate only to the items tested.

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5792973	FJI	Spiked Blank	D10-2-Methylnaphthalene	2018/10/31		90	%	50 - 150
			D10-Fluoranthene	2018/10/31		92	%	50 - 150
			D10-Phenanthrene	2018/10/31		94	%	50 - 150
			D12-Benzo(a)anthracene	2018/10/31		106	%	50 - 150
			D12-Benzo(a)pyrene	2018/10/31		76	%	50 - 150
			D12-Benzo(b)fluoranthene	2018/10/31		112	%	50 - 150
			D12-Benzo(ghi)perylene	2018/10/31		114	%	50 - 150
			D12-Benzo(k)fluoranthene	2018/10/31		106	%	50 - 150
			D12-Chrysene	2018/10/31		106	%	50 - 150
			D12-Indeno(1,2,3-cd)pyrene	2018/10/31		114	%	50 - 150
			D12-Perylene	2018/10/31		56	%	50 - 150
			D14-Dibenzo(a,h)anthracene	2018/10/31		114	%	50 - 150
			D8-Acenaphthylene	2018/10/31		86	%	50 - 150
			D8-Naphthalene	2018/10/31		88	%	50 - 150
			Acenaphthene	2018/10/31		90	%	60 - 130
			Acenaphthylene	2018/10/31		90	%	60 - 130
			Anthracene	2018/10/31		73	%	60 - 130
			Benzo(a)anthracene	2018/10/31		108	%	60 - 130
			Benzo(a)pyrene	2018/10/31		83	%	60 - 130
			Benzo(b)fluoranthene	2018/10/31		115	%	60 - 130
			Benzo(g,h,i)perylene	2018/10/31		115	%	60 - 130
			Benzo(k)fluoranthene	2018/10/31		110	%	60 - 130
			Biphenyl	2018/10/31		93	%	60 - 130
			Chrysene	2018/10/31		115	%	60 - 130
			Fluoranthene	2018/10/31		95	%	60 - 130
			Fluorene	2018/10/31		98	%	60 - 130
			Indeno(1,2,3-cd)pyrene	2018/10/31		123	%	60 - 130
			Naphthalene	2018/10/31		100	%	60 - 130
			Phenanthrene	2018/10/31		95	%	60 - 130
			Pyrene	2018/10/31		90	%	60 - 130
5792973	FJI	RPD	Acenaphthene	2018/10/31	0		%	50
			Acenaphthylene	2018/10/31	5.7		%	50
			Anthracene	2018/10/31	3.5		%	50
			Benzo(a)anthracene	2018/10/31	7.2		%	50
			Benzo(a)pyrene	2018/10/31	3.0		%	50
			Benzo(b)fluoranthene	2018/10/31	24		%	50
			Benzo(g,h,i)perylene	2018/10/31	9.1		%	50
			Benzo(k)fluoranthene	2018/10/31	19		%	50
			Biphenyl	2018/10/31	2.7		%	50
			Chrysene	2018/10/31	6.7		%	50
			Fluoranthene	2018/10/31	5.4		%	50
			Fluorene	2018/10/31	5.3		%	50
			Indeno(1,2,3-cd)pyrene	2018/10/31	11		%	50
			Naphthalene	2018/10/31	2.5		%	50
			Phenanthrene	2018/10/31	2.7		%	50
			Pyrene	2018/10/31	5.7		%	50
5792973	FJI	Method Blank	D10-2-Methylnaphthalene	2018/10/31		86	%	50 - 150
			D10-Fluoranthene	2018/10/31		86	%	50 - 150
			D10-Phenanthrene	2018/10/31		88	%	50 - 150
			D12-Benzo(a)anthracene	2018/10/31		98	%	50 - 150
			D12-Benzo(a)pyrene	2018/10/31		80	%	50 - 150
			D12-Benzo(b)fluoranthene	2018/10/31		106	%	50 - 150
			D12-Benzo(ghi)perylene	2018/10/31		108	%	50 - 150

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			D12-Benzo(k)fluoranthene	2018/10/31		102	%	50 - 150
			D12-Chrysene	2018/10/31		102	%	50 - 150
			D12-Indeno(1,2,3-cd)pyrene	2018/10/31		106	%	50 - 150
			D12-Perylene	2018/10/31		84	%	50 - 150
			D14-Dibenzo(a,h)anthracene	2018/10/31		106	%	50 - 150
			D8-Acenaphthylene	2018/10/31		78	%	50 - 150
			D8-Naphthalene	2018/10/31		84	%	50 - 150
			1-Methylnaphthalene	2018/10/31	ND, RDL=0.30		ug	
			1-Methylphenanthrene	2018/10/31	ND, RDL=0.30		ug	
			2-Chloronaphthalene	2018/10/31	ND, RDL=0.30		ug	
			2-Methylanthracene	2018/10/31	ND, RDL=0.30		ug	
			2-Methylnaphthalene	2018/10/31	ND, RDL=0.30		ug	
			3-Methylcholanthrene	2018/10/31	ND, RDL=0.30		ug	
			7,12-Dimethylbenzo(a)anthracene	2018/10/31	ND, RDL=1.2		ug	
			9,10-Dimethylanthracene	2018/10/31	ND, RDL=0.30		ug	
			9-Methylphenanthrene	2018/10/31	ND, RDL=0.30		ug	
			Acenaphthene	2018/10/31	ND, RDL=0.30		ug	
			Acenaphthylene	2018/10/31	ND, RDL=0.30		ug	
			Anthracene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)anthracene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)fluorene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(a)pyrene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(b)fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(b)fluorene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(e)pyrene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(g,h,i)perylene	2018/10/31	ND, RDL=0.30		ug	
			Benzo(k)fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Biphenyl	2018/10/31	ND, RDL=0.30		ug	
			Chrysene	2018/10/31	ND, RDL=0.30		ug	
			Coronene	2018/10/31	ND, RDL=0.30		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Dibenzo(a,c)anthracene	2018/10/31	ND, RDL=0.30		ug	
			Fluoranthene	2018/10/31	ND, RDL=0.30		ug	
			Fluorene	2018/10/31	ND, RDL=0.30		ug	
			Indeno(1,2,3-cd)pyrene	2018/10/31	ND, RDL=0.30		ug	
			m-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Naphthalene	2018/10/31	ND, RDL=0.30		ug	
			o-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Perylene	2018/10/31	ND, RDL=0.30		ug	
			Phenanthrene	2018/10/31	ND, RDL=0.30		ug	
			Picene	2018/10/31	ND, RDL=0.30		ug	
			p-Terphenyl	2018/10/31	ND, RDL=0.30		ug	
			Pyrene	2018/10/31	ND, RDL=0.30		ug	
			Tetralin	2018/10/31	ND, RDL=0.30		ug	
			Triphenylene	2018/10/31	ND, RDL=0.30		ug	
5792998	FJI	Spiked Blank	1,2,3,4-Tetrachlorobenzene	2018/10/29		81	%	40 - 130
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29		41	%	40 - 130
			1,2,3-Trichlorobenzene	2018/10/29		80	%	40 - 130
			1,2,4-Trichlorobenzene	2018/10/29		84	%	40 - 130
			1,2-Dichlorobenzene	2018/10/29		64	%	40 - 130
			1,3,5-Trichlorobenzene	2018/10/29		85	%	40 - 130
			1,3-Dichlorobenzene	2018/10/29		54	%	40 - 130
			1,4-Dichlorobenzene	2018/10/29		74	%	40 - 130
			13C6-Hexachlorobenzene	2018/10/29		79	%	30 - 130
			2H3-1,2,4-Trichlorobenzene	2018/10/29		79	%	30 - 130
			2H4-1,3-Dichlorobenzene	2018/10/29		62	%	30 - 130
			Hexachlorobenzene	2018/10/29		82	%	40 - 130
			Pentachlorobenzene	2018/10/29		87	%	40 - 130
5792998	FJI	RPD	1,2,3,4-Tetrachlorobenzene	2018/10/29	12		%	50
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29	16		%	50
			1,2,3-Trichlorobenzene	2018/10/29	18		%	50
			1,2,4-Trichlorobenzene	2018/10/29	21		%	50
			1,2-Dichlorobenzene	2018/10/29	31		%	50
			1,3,5-Trichlorobenzene	2018/10/29	18		%	50
			1,3-Dichlorobenzene	2018/10/29	26		%	50
			1,4-Dichlorobenzene	2018/10/29	35		%	50
			Hexachlorobenzene	2018/10/29	8.6		%	50
			Pentachlorobenzene	2018/10/29	8.5		%	50
5792998	FJI	Method Blank	1,2,3,4-Tetrachlorobenzene	2018/10/29	ND, RDL=0.30		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			1,2,3,5+1,2,4,5-Tetrachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2,3-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2,4-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,2-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,3,5-Trichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,3-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			1,4-Dichlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			13C6-Hexachlorobenzene	2018/10/29		82	%	30 - 130
			2H3-1,2,4-Trichlorobenzene	2018/10/29		87	%	30 - 130
			2H4-1,3-Dichlorobenzene	2018/10/29		70	%	30 - 130
			Hexachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
			Pentachlorobenzene	2018/10/29	ND, RDL=0.30		ug	
5793003	FJI	Spiked Blank	2,3,4,5-Tetrachlorophenol	2018/11/06		96	%	22 - 134
			2,3,4-Trichlorophenol	2018/11/06		107	%	22 - 134
			2,3,5-Trichlorophenol	2018/11/06		101	%	22 - 134
			2,4 + 2,5-Dichlorophenol	2018/11/06		89	%	22 - 134
			2,4,6-Trichlorophenol	2018/11/06		104	%	22 - 134
			2,6-Dichlorophenol	2018/11/06		97	%	22 - 134
			2-Chlorophenol	2018/11/06		99	%	22 - 134
			3,4,5-Trichlorophenol	2018/11/06		105	%	22 - 134
			3,4-Dichlorophenol	2018/11/06		107	%	22 - 134
			3,5-Dichlorophenol	2018/11/06		97	%	22 - 134
			4-Chlorophenol	2018/11/06		127	%	22 - 134
			D3-2,4-Dichlorophenol	2018/11/06		107	%	20 - 130
			D6-Pentachlorophenol	2018/11/06		144 (1)	%	20 - 130
			Pentachlorophenol	2018/11/06		109	%	22 - 134
			2,3,4,6-Tetrachlorophenol	2018/11/06		105	%	22 - 134
			2,3,5,6-Tetrachlorophenol	2018/11/06		109	%	22 - 134
			2,3,6-Trichlorophenol	2018/11/06		105	%	22 - 134
			2,3-Dichlorophenol	2018/11/06		102	%	22 - 134
			2,4,5-Trichlorophenol	2018/11/06		106	%	22 - 134
			3-Chlorophenol	2018/11/06		96	%	22 - 134
5793003	FJI	RPD	2,3,4,5-Tetrachlorophenol	2018/11/06	16		%	50
			2,3,4-Trichlorophenol	2018/11/06	2.6		%	50
			2,3,5-Trichlorophenol	2018/11/06	6.4		%	50
			2,4 + 2,5-Dichlorophenol	2018/11/06	2.2		%	50
			2,4,6-Trichlorophenol	2018/11/06	1.7		%	50
			2,6-Dichlorophenol	2018/11/06	3.8		%	50
			2-Chlorophenol	2018/11/06	7.3		%	50
			3,4,5-Trichlorophenol	2018/11/06	6.4		%	50
			3,4-Dichlorophenol	2018/11/06	2.7		%	50
			3,5-Dichlorophenol	2018/11/06	3.1		%	50
			4-Chlorophenol	2018/11/06	0.78		%	50
			Pentachlorophenol	2018/11/06	19		%	50

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			2,3,4,6-Tetrachlorophenol	2018/11/06	8.5		%	50
			2,3,5,6-Tetrachlorophenol	2018/11/06	11		%	50
			2,3,6-Trichlorophenol	2018/11/06	1.4		%	50
			2,3-Dichlorophenol	2018/11/06	2.3		%	50
			2,4,5-Trichlorophenol	2018/11/06	5.3		%	50
			3-Chlorophenol	2018/11/06	3.6		%	50
5793003	FJI	Method Blank	2,3,4,5-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,4-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4 + 2,5-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4,6-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,6-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,4,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,4-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3,5-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			4-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
			D3-2,4-Dichlorophenol	2018/11/06		105	%	20 - 130
			D6-Pentachlorophenol	2018/11/06		162 (1)	%	20 - 130
			Pentachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,4,6-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,5,6-Tetrachlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3,6-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,3-Dichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			2,4,5-Trichlorophenol	2018/11/06	ND, RDL=0.30		ug	
			3-Chlorophenol	2018/11/06	ND, RDL=0.30		ug	
5793011	CXU	Spiked Blank	C13-233'44'55'-HeptaCB-(189)	2018/11/06		102	%	30 - 140
			C13-233'44'5-HexaCB-(156)	2018/11/06		95	%	30 - 140
			C13-233'44'5'-HexaCB-(157)	2018/11/06		95	%	30 - 140
			C13-233'44'-PentaCB-(105)	2018/11/06		104	%	30 - 140
			C13-23'44'55'-HexaCB-(167)	2018/11/06		94	%	30 - 140
			C13-2344'5-PentaCB-(114)	2018/11/06		98	%	30 - 140
			C13-23'44'5-PentaCB-(118)	2018/11/06		105	%	30 - 140
			C13-2'344'5-PentaCB-(123)	2018/11/06		102	%	30 - 140
			C13-33'44'55'-HexaCB-(169)	2018/11/06		78	%	30 - 140
			C13-33'44'5-PentaCB-(126)	2018/11/06		100	%	30 - 140

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			C13-33'44'-TetraCB-(77)	2018/11/06		91	%	30 - 140
			C13-344'5-TetraCB-(81)	2018/11/06		92	%	30 - 140
			33'44'-TetraCB-(77)	2018/11/06		100	%	50 - 150
			344'5-TetraCB-(81)	2018/11/06		99	%	50 - 150
			233'44'-PentaCB-(105)	2018/11/06		98	%	50 - 150
			2344'5-PentaCB-(114)	2018/11/06		99	%	50 - 150
			23'44'5-PentaCB-(118)	2018/11/06		99	%	50 - 150
			23'44'5'-PentaCB-(123)	2018/11/06		103	%	50 - 150
			33'44'5-PentaCB-(126)	2018/11/06		98	%	50 - 150
			HexaCB-(156)+(157)	2018/11/06		98	%	N/A
			23'44'55'-HexaCB-(167)	2018/11/06		99	%	50 - 150
			33'44'55'-HexaCB-(169)	2018/11/06		104	%	50 - 150
			233'44'55'-HeptaCB-(189)	2018/11/06		102	%	50 - 150
5793011	CXU	RPD	33'44'-TetraCB-(77)	2018/11/06	3.9		%	30
			344'5-TetraCB-(81)	2018/11/06	3.0		%	30
			233'44'-PentaCB-(105)	2018/11/06	6.9		%	30
			2344'5-PentaCB-(114)	2018/11/06	4.9		%	30
			23'44'5-PentaCB-(118)	2018/11/06	4.0		%	30
			23'44'5'-PentaCB-(123)	2018/11/06	1.9		%	30
			33'44'5-PentaCB-(126)	2018/11/06	7.8		%	30
			HexaCB-(156)+(157)	2018/11/06	5.0		%	30
			23'44'55'-HexaCB-(167)	2018/11/06	5.9		%	30
			33'44'55'-HexaCB-(169)	2018/11/06	0.97		%	30
			233'44'55'-HeptaCB-(189)	2018/11/06	4.0		%	30
5793011	CXU	Method Blank	C13-233'44'55'-HeptaCB-(189)	2018/11/06		122	%	30 - 140
			C13-233'44'5-HexaCB-(156)	2018/11/06		108	%	30 - 140
			C13-233'44'5'-HexaCB-(157)	2018/11/06		108	%	30 - 140
			C13-233'44'-PentaCB-(105)	2018/11/06		128	%	30 - 140
			C13-23'44'55'-HexaCB-(167)	2018/11/06		108	%	30 - 140
			C13-2344'5-PentaCB-(114)	2018/11/06		118	%	30 - 140
			C13-23'44'5-PentaCB-(118)	2018/11/06		127	%	30 - 140
			C13-2'344'5-PentaCB-(123)	2018/11/06		125	%	30 - 140
			C13-33'44'55'-HexaCB-(169)	2018/11/06		84	%	30 - 140
			C13-33'44'5-PentaCB-(126)	2018/11/06		121	%	30 - 140
			C13-33'44'-TetraCB-(77)	2018/11/06		105	%	30 - 140
			C13-344'5-TetraCB-(81)	2018/11/06		104	%	30 - 140
			33'44'-TetraCB-(77)	2018/11/06	ND, RDL=0.60		ng	
			344'5-TetraCB-(81)	2018/11/06	ND, RDL=0.60		ng	
			233'44'-PentaCB-(105)	2018/11/06	ND, RDL=0.60		ng	
			2344'5-PentaCB-(114)	2018/11/06	ND, RDL=0.60		ng	
			23'44'5-PentaCB-(118)	2018/11/06	ND, RDL=0.60 (2)		ng	
			23'44'5'-PentaCB-(123)	2018/11/06	ND, RDL=0.60		ng	
			33'44'5-PentaCB-(126)	2018/11/06	ND, RDL=0.60		ng	
			HexaCB-(156)+(157)	2018/11/06	ND, RDL=1.2		ng	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			23'44'55'-HexaCB-(167)	2018/11/06	ND, RDL=0.60		ng	
			33'44'55'-HexaCB-(169)	2018/11/06	ND, RDL=0.60		ng	
			233'44'55'-HeptaCB-(189)	2018/11/06	ND, RDL=0.60		ng	
5819589	OBC	Spiked Blank	C13-1234678 HeptaCDD	2018/11/04		100	%	25 - 130
			C13-1234678 HeptaCDF	2018/11/04		75	%	25 - 130
			C13-123678 HexaCDD	2018/11/04		81	%	40 - 130
			C13-123678 HexaCDF	2018/11/04		70	%	40 - 130
			C13-12378 PentaCDD	2018/11/04		77	%	40 - 130
			C13-12378 PentaCDF	2018/11/04		74	%	40 - 130
			C13-123789 HexaCDF	2018/11/04		72	%	40 - 130
			C13-2378 TetraCDD	2018/11/04		100	%	40 - 130
			C13-2378 TetraCDF	2018/11/04		79	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2018/11/04		108	%	25 - 130
			2,3,7,8-Tetra CDD	2018/11/04		93	%	80 - 140
			1,2,3,7,8-Penta CDD	2018/11/04		126	%	80 - 140
			1,2,3,4,7,8-Hexa CDD	2018/11/04		110	%	80 - 140
			1,2,3,6,7,8-Hexa CDD	2018/11/04		117	%	80 - 140
			1,2,3,7,8,9-Hexa CDD	2018/11/04		127	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04		91	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04		109	%	80 - 140
			2,3,7,8-Tetra CDF	2018/11/04		109	%	80 - 140
			1,2,3,7,8-Penta CDF	2018/11/04		119	%	80 - 140
			2,3,4,7,8-Penta CDF	2018/11/04		116	%	80 - 140
			1,2,3,4,7,8-Hexa CDF	2018/11/04		106	%	80 - 140
			1,2,3,6,7,8-Hexa CDF	2018/11/04		120	%	80 - 140
			2,3,4,6,7,8-Hexa CDF	2018/11/04		124	%	80 - 140
			1,2,3,7,8,9-Hexa CDF	2018/11/04		134	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04		112	%	80 - 140
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04		128	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04		97	%	80 - 140
5819589	OBC	RPD	2,3,7,8-Tetra CDD	2018/11/04	2.2		%	20
			1,2,3,7,8-Penta CDD	2018/11/04	1.6		%	20
			1,2,3,4,7,8-Hexa CDD	2018/11/04	0.91		%	20
			1,2,3,6,7,8-Hexa CDD	2018/11/04	9.0		%	20
			1,2,3,7,8,9-Hexa CDD	2018/11/04	2.4		%	20
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04	27 (1)		%	20
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04	0		%	20
			2,3,7,8-Tetra CDF	2018/11/04	3.7		%	20
			1,2,3,7,8-Penta CDF	2018/11/04	4.9		%	20
			2,3,4,7,8-Penta CDF	2018/11/04	12		%	20
			1,2,3,4,7,8-Hexa CDF	2018/11/04	0		%	20
			1,2,3,6,7,8-Hexa CDF	2018/11/04	7.2		%	20
			2,3,4,6,7,8-Hexa CDF	2018/11/04	2.4		%	20
			1,2,3,7,8,9-Hexa CDF	2018/11/04	6.2 (3)		%	20
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04	0		%	20
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04	5.6		%	20
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04	0		%	20
5819589	OBC	Method Blank	C13-1234678 HeptaCDD	2018/11/04		78	%	25 - 130
			C13-1234678 HeptaCDF	2018/11/04		66	%	25 - 130
			C13-123678 HexaCDD	2018/11/04		80	%	40 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			C13-123678 HexaCDF	2018/11/04		68	%	40 - 130
			C13-12378 PentaCDD	2018/11/04		78	%	40 - 130
			C13-12378 PentaCDF	2018/11/04		71	%	40 - 130
			C13-123789 HexaCDF	2018/11/04		71	%	40 - 130
			C13-2378 TetraCDD	2018/11/04		104	%	40 - 130
			C13-2378 TetraCDF	2018/11/04		75	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2018/11/04		99	%	25 - 130
			2,3,7,8-Tetra CDD	2018/11/04	ND, EDL=19		pg	
			1,2,3,7,8-Penta CDD	2018/11/04	ND, EDL=12		pg	
			1,2,3,4,7,8-Hexa CDD	2018/11/04	ND, EDL=7.2		pg	
			1,2,3,6,7,8-Hexa CDD	2018/11/04	ND, EDL=7.0		pg	
			1,2,3,7,8,9-Hexa CDD	2018/11/04	ND, EDL=6.6		pg	
			1,2,3,4,6,7,8-Hepta CDD	2018/11/04	10.5, EDL=6.4		pg	
			1,2,3,4,6,7,8,9-Octa CDD	2018/11/04	35.0, EDL=7.1		pg	
			Total Tetra CDD	2018/11/04	ND, EDL=69 (2)		pg	
			Total Penta CDD	2018/11/04	ND, EDL=53 (2)		pg	
			Total Hexa CDD	2018/11/04	ND, EDL=150 (2)		pg	
			Total Hepta CDD	2018/11/04	10.5, EDL=6.4		pg	
			2,3,7,8-Tetra CDF	2018/11/04	ND, EDL=11		pg	
			1,2,3,7,8-Penta CDF	2018/11/04	ND, EDL=8.4		pg	
			2,3,4,7,8-Penta CDF	2018/11/04	ND, EDL=8.5		pg	
			1,2,3,4,7,8-Hexa CDF	2018/11/04	ND, EDL=7.8		pg	
			1,2,3,6,7,8-Hexa CDF	2018/11/04	ND, EDL=7.7		pg	
			2,3,4,6,7,8-Hexa CDF	2018/11/04	ND, EDL=8.5		pg	
			1,2,3,7,8,9-Hexa CDF	2018/11/04	11.5, EDL=9.7		pg	
			1,2,3,4,6,7,8-Hepta CDF	2018/11/04	7.8, EDL=6.3		pg	
			1,2,3,4,7,8,9-Hepta CDF	2018/11/04	12.7, EDL=8.3		pg	
			1,2,3,4,6,7,8,9-Octa CDF	2018/11/04	27.0, EDL=6.1		pg	
			Total Tetra CDF	2018/11/04	ND, EDL=11		pg	
			Total Penta CDF	2018/11/04	ND, EDL=8.4		pg	

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Total Hexa CDF	2018/11/04	11.5, EDL=8.4		pg	
			Total Hepta CDF	2018/11/04	20.5, EDL=7.2		pg	

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

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

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

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

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

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

(3) Recovery exceeds method criteria

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Maxxam Job #: B8R1217
Report Date: 2019/03/07

RWDI West Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cathy Xu, Scientific Specialist, Ultra Trace Analysis, HRMS

Owen Cosby, BSc.C.Chem, Supervisor, HRMS Services

Rodney Major, Manager Organic Processing Lab

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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(VOST) B8R0081 / B8R0079 / B8R1217 (SVOC)

Chain of Custody Form - AIR

11568

Maxxam
6740 Campobello Rd
Mississauga Ontario ,L5N 2L8
www.maxxamanalytics.com
Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

Page 1 of 1

CLIENT INFORMATION

Company Name: RWDI
Project Manager: Kirk EA570
e-mail: Kirk.EA570@RWDI.com
Address:

SECTION

Phone: Fax:
Sampled by: JOF/KNE/MP

ANALYSIS REQUESTED

Field Sample ID	Total Volume Sampled	Flow Rate	Collection Date	Sample Collection Time	OSTC Method 0N.5 (7PM)	USEPA Method 29 (Metals)	Environment Canada RM2 (Dioxins/Furans, PAH's)	USEPA Method 26 (HCl + Ammonia)	USEPA SW-846 1030 VOST								
LCF-SVOC-T1 (WOODWASTE) (5 PCS)			10/5/18	AM			✓										
LCF-SVOC-T2 (WOODWASTE) (5 PCS)			10/9/18	AM			✓										
LCF-SVOC-T3 (WOODWASTE) (5 PCS)			10/9/18	PM			✓										
LCF-M29-T1 (7 PCS)			10/5/18	AM	✓	✓											
LCF-M29-T2 (7 PCS)			10/9/18	AM	✓	✓											
LCF-M29-T3 (7 PCS)			10/9/18	PM	✓	✓											
LCF-VOST-T1 (2 PCS)			10/4/18	AM					✓								
LCF-VOST-T2 (2 PCS)			10/9/18	PM					✓								
LCF-VOST-T3 (2 PCS)			10/9/18	PM					✓								
LCF-M26-T1 (1 PCS)			10/5/18	AM				✓									
LCF-M26-T2 (1 PCS)			10/5/18	PM				✓									
LCF-M26-T3 (1 PCS)			10/5/18	PM				✓							✓		

TAT Requirement

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

PROJECT INFORMATION

Project #: 1702401
Name: ST. MARYS
PO #: 1702401
Maxxam Quote #:
Maxxam Contact:

REPORTING REQUIREMENTS

Summary Report only ☐
EDD ☐
Regulation

Notes

PROJECT SPECIFIC COMMENTS

* SEE KIRK @ EA570 FOR PARAMETER LIST*

Client Signature:
Affiliation:
Date/Time: 10/11/18 15:30

Received by: Pabelyn Kimwood / Pabelyn
Affiliation: Maxxam
Date/Time: 2018/10/11 15:27

CDC-1031 (04/13) - 8a

173/16.6/128

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 32138

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2019/03/06
Report #: R5617993
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8Q5238
Received: 2018/10/06, 10:30

Sample Matrix: Stack Sampling Train
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
VOST EPA5041A, 8260C for 0030, 0031	3	N/A	2018/10/11	BRL SOP-00302	EPA5041A, 8260C

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

Maxxam ID		HYT930		HYT931		HYT932		
Sampling Date		2018/09/30		2018/10/01		2018/10/02		
COC Number		32138		32138		32138		
	UNITS	**M0030- T1-#9A/B**	**RDL**	**M0030- T2-#8A/B**	**RDL**	**M0030- T3-#7A/B**	**RDL**	**QC Batch**
Dichlorodifluoromethane (FREON 12)	ug	ND	0.020	ND	0.40	ND	0.40	5777722
Chloromethane	ug	4.48	0.015	5.06	0.30	4.98	0.30	5777722
Vinyl Chloride	ug	ND	0.013	ND	0.26	ND	0.26	5777722
Bromomethane	ug	0.378	0.015	0.43	0.30	ND	0.30	5777722
Chloroethane	ug	0.750	0.0090	0.43	0.18	0.46	0.18	5777722
Trichlorofluoromethane (FREON 11)	ug	ND	0.010	ND	0.20	ND	0.20	5777722
Acetone (2-Propanone)	ug	5.94	0.045	6.34	0.90	7.21	0.90	5777722
1,1-Dichloroethylene	ug	ND	0.011	ND	0.22	ND	0.22	5777722
Methylene Chloride(Dichloromethane)	ug	ND	0.019	ND	0.38	ND	0.38	5777722
1,1-Dichloroethane	ug	ND	0.012	ND	0.24	ND	0.24	5777722
trans-1,2-Dichloroethylene	ug	ND	0.010	ND	0.20	ND	0.20	5777722
cis-1,2-Dichloroethylene	ug	ND	0.010	ND	0.20	ND	0.20	5777722
Chloroform	ug	ND	0.011	ND	0.22	ND	0.22	5777722
1,2-Dichloroethane	ug	ND	0.0070	ND	0.14	ND	0.14	5777722
Methyl Ethyl Ketone (2-Butanone)	ug	ND	0.036	ND	0.72	ND	0.72	5777722
1,1,1-Trichloroethane	ug	ND	0.014	ND	0.28	ND	0.28	5777722
Carbon Tetrachloride	ug	ND	0.016	ND	0.32	ND	0.32	5777722
Benzene	ug	6.78	0.0090	19.4	0.18	21.9 (1)	0.36	5777722
1,1,2-Trichloroethane	ug	ND	0.016	ND	0.32	ND	0.32	5777722
1,2-Dichloropropane	ug	ND	0.011	ND	0.22	ND	0.22	5777722
Trichloroethylene	ug	ND	0.011	ND	0.22	ND	0.22	5777722
Bromodichloromethane	ug	ND	0.011	ND	0.22	ND	0.22	5777722
Dibromochloromethane	ug	ND	0.0090	ND	0.18	ND	0.18	5777722
Toluene	ug	2.88	0.014	12.2	0.28	12.6	0.28	5777722
Ethylene Dibromide	ug	ND	0.010	ND	0.20	ND	0.20	5777722
Tetrachloroethylene	ug	ND	0.018	ND	0.36	ND	0.36	5777722
Chlorobenzene	ug	0.393	0.011	0.33	0.22	0.39	0.22	5777722
1,1,1,2-Tetrachloroethane	ug	ND	0.010	ND	0.20	ND	0.20	5777722
Ethylbenzene	ug	1.42	0.014	2.36	0.28	2.62	0.28	5777722
m / p-Xylene	ug	4.49	0.015	9.38	0.30	10.4	0.30	5777722
Styrene	ug	1.48	0.012	2.42	0.24	2.87	0.24	5777722
o-Xylene	ug	1.77	0.015	3.75	0.30	4.01	0.30	5777722
Bromoform	ug	ND	0.014	ND	0.28	ND	0.28	5777722

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) was analyzed at a 40X dilution. The DLs were adjusted accordingly.

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

Maxxam ID		HYT930		HYT931		HYT932		
Sampling Date		2018/09/30		2018/10/01		2018/10/02		
COC Number		32138		32138		32138		
	UNITS	**M0030- T1-#9A/B**	**RDL**	**M0030- T2-#8A/B**	**RDL**	**M0030- T3-#7A/B**	**RDL**	**QC Batch**
1,1,2,2-Tetrachloroethane	ug	ND	0.014	ND	0.28	ND	0.28	5777722
Surrogate Recovery (%)								
Bromofluorobenzene	%	81		66		73		5777722
D10-Ethylbenzene (FS)	%	145		115		148		5777722
D4-1,2-Dichloroethane	%	282 (1)		91		100		5777722
D8-Toluene	%	106		71		78		5777722

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: HYT930 **Collected:** 2018/09/30
Sample ID: M0030- T1- #9A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5777722	N/A	2018/10/11	Yujie Yan

Maxxam ID: HYT931 **Collected:** 2018/10/01
Sample ID: M0030- T2- #8A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5777722	N/A	2018/10/11	Yujie Yan

Maxxam ID: HYT932 **Collected:** 2018/10/02
Sample ID: M0030- T3- #7A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5777722	N/A	2018/10/11	Yujie Yan

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

GENERAL COMMENTS

In the continuing calibration standard 1,1,2,2-Tetrachloroethane exceed the acceptance limit of 20%.

Sample HYT930 [M0030- T1- #9A/B] : D4-1,2-Dichloroethane surrogate recovery exceed acceptance range of 133% due to hydrocarbon interference. Chloromethane, Acetone, Benzene, Toluene, Ethylbenzene, m/p-Xylene, Styrene and o-Xylene exceed calibration range in this sample, results for these analytes are estimates only.

Sample HYT931 [M0030- T2- #8A/B] : Sample was analyzed at a 20X dilution. The DLs were adjusted accordingly.

Sample HYT932 [M0030- T3- #7A/B] : Sample was analyzed at a 20X dilution. The DLs were adjusted accordingly.

Results relate only to the items tested.

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5777722	YYA	Spiked Blank	Bromofluorobenzene	2018/10/11		100	%	43 - 131
			D10-Ethylbenzene (FS)	2018/10/11		95	%	47 - 157
			D4-1,2-Dichloroethane	2018/10/11		100	%	64 - 133
			D8-Toluene	2018/10/11		97	%	68 - 121
			Dichlorodifluoromethane (FREON 12)	2018/10/11		116	%	50 - 150
			Chloromethane	2018/10/11		115	%	50 - 150
			Vinyl Chloride	2018/10/11		104	%	50 - 150
			Bromomethane	2018/10/11		119	%	50 - 150
			Chloroethane	2018/10/11		103	%	50 - 150
			Trichlorofluoromethane (FREON 11)	2018/10/11		103	%	50 - 150
			Acetone (2-Propanone)	2018/10/11		134	%	50 - 150
			1,1-Dichloroethylene	2018/10/11		106	%	50 - 150
			Methylene Chloride(Dichloromethane)	2018/10/11		104	%	50 - 150
			1,1-Dichloroethane	2018/10/11		106	%	50 - 150
			trans-1,2-Dichloroethylene	2018/10/11		104	%	50 - 150
			cis-1,2-Dichloroethylene	2018/10/11		105	%	50 - 150
			Chloroform	2018/10/11		103	%	50 - 150
			1,2-Dichloroethane	2018/10/11		102	%	50 - 150
			Methyl Ethyl Ketone (2-Butanone)	2018/10/11		126	%	50 - 150
			1,1,1-Trichloroethane	2018/10/11		102	%	50 - 150
			Carbon Tetrachloride	2018/10/11		104	%	50 - 150
			Benzene	2018/10/11		102	%	50 - 150
			1,1,2-Trichloroethane	2018/10/11		100	%	50 - 150
			1,2-Dichloropropane	2018/10/11		102	%	50 - 150
			Trichloroethylene	2018/10/11		96	%	50 - 150
			Bromodichloromethane	2018/10/11		104	%	50 - 150
			Dibromochloromethane	2018/10/11		102	%	50 - 150
			Toluene	2018/10/11		100	%	50 - 150
			Ethylene Dibromide	2018/10/11		98	%	50 - 150
			Tetrachloroethylene	2018/10/11		100	%	50 - 150
			Chlorobenzene	2018/10/11		99	%	50 - 150
			1,1,1,2-Tetrachloroethane	2018/10/11		102	%	50 - 150
			Ethylbenzene	2018/10/11		100	%	50 - 150
			m / p-Xylene	2018/10/11		100	%	50 - 150
			Styrene	2018/10/11		101	%	50 - 150
			o-Xylene	2018/10/11		101	%	50 - 150
			Bromoform	2018/10/11		102	%	50 - 150
			1,1,2,2-Tetrachloroethane	2018/10/11		114	%	50 - 150
5777722	YYA	Method Blank	Bromofluorobenzene	2018/10/11		102	%	43 - 131
			D10-Ethylbenzene (FS)	2018/10/11		115	%	47 - 157
			D4-1,2-Dichloroethane	2018/10/11		107	%	64 - 133
			D8-Toluene	2018/10/11		101	%	68 - 121
			Dichlorodifluoromethane (FREON 12)	2018/10/11	ND, RDL=0.020		ug	
			Chloromethane	2018/10/11	ND, RDL=0.015		ug	
			Vinyl Chloride	2018/10/11	ND, RDL=0.013		ug	
			Bromomethane	2018/10/11	ND, RDL=0.015		ug	
			Chloroethane	2018/10/11	ND, RDL=0.0090		ug	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Trichlorofluoromethane (FREON 11)	2018/10/11	ND, RDL=0.010		ug	
			Acetone (2-Propanone)	2018/10/11	ND, RDL=0.045		ug	
			1,1-Dichloroethylene	2018/10/11	ND, RDL=0.011		ug	
			Methylene Chloride(Dichloromethane)	2018/10/11	ND, RDL=0.019		ug	
			1,1-Dichloroethane	2018/10/11	ND, RDL=0.012		ug	
			trans-1,2-Dichloroethylene	2018/10/11	ND, RDL=0.010		ug	
			cis-1,2-Dichloroethylene	2018/10/11	ND, RDL=0.010		ug	
			Chloroform	2018/10/11	ND, RDL=0.011		ug	
			1,2-Dichloroethane	2018/10/11	ND, RDL=0.0070		ug	
			Methyl Ethyl Ketone (2-Butanone)	2018/10/11	ND, RDL=0.036		ug	
			1,1,1-Trichloroethane	2018/10/11	ND, RDL=0.014		ug	
			Carbon Tetrachloride	2018/10/11	ND, RDL=0.016		ug	
			Benzene	2018/10/11	ND, RDL=0.0090		ug	
			1,1,2-Trichloroethane	2018/10/11	ND, RDL=0.016		ug	
			1,2-Dichloropropane	2018/10/11	ND, RDL=0.011		ug	
			Trichloroethylene	2018/10/11	ND, RDL=0.011		ug	
			Bromodichloromethane	2018/10/11	ND, RDL=0.011		ug	
			Dibromochloromethane	2018/10/11	ND, RDL=0.0090		ug	
			Toluene	2018/10/11	ND, RDL=0.014		ug	
			Ethylene Dibromide	2018/10/11	ND, RDL=0.010		ug	
			Tetrachloroethylene	2018/10/11	ND, RDL=0.018		ug	
			Chlorobenzene	2018/10/11	ND, RDL=0.011		ug	
			1,1,1,2-Tetrachloroethane	2018/10/11	ND, RDL=0.010		ug	
			Ethylbenzene	2018/10/11	ND, RDL=0.014		ug	
			m / p-Xylene	2018/10/11	ND, RDL=0.015		ug	
			Styrene	2018/10/11	ND, RDL=0.012		ug	
			o-Xylene	2018/10/11	ND, RDL=0.015		ug	

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Bromoform	2018/10/11	ND, RDL=0.014		ug	
			1,1,2,2-Tetrachloroethane	2018/10/11	ND, RDL=0.014		ug	

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

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

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

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Maxxam Job #: B8Q5238
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Maureen Smith

Maureen Smith, Supervisor, Volatiles

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Chain of Custody Form - Source

B8Q5238

Maxxam

6740 Campobello Rd.
Mississauga, Ontario L5N 2L8
www.maxxamanalytics.com

Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5775

CAM FCD-01303 /2 Page ____ of ____

CLIENT INFORMATION SECTION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: kirk.easto@rwdi.com
Address: Guelph, ON
Phone: 519-823-1311 Fax: 519-823-1316
Sampled by: Kirk Easto

ANALYSIS REQUESTED

MAXXAM use only	Field Sample ID	# Bottles	Collection Date	Collection Time	Initial Impinger Charge Volumes (mL)*	SVOC ENV/CAN 1/RM/2	US EPA M29	US EPA M26 HCl/NH3	Method 30 VOC's	US EPA M201A						
	T1-Baseline -SVOC (6 pieces)	6	Sept 30			x										
	T2-Baseline -SVOC (6 pieces)	6	Oct 1			x										
	T3-Baseline -SVOC (6 pieces)	6	Oct 2			x										
	T1-Baseline - M29 (7 pieces)	7	Sept 30				x									
	T2-Baseline - M29 (7 pieces)	7	Oct 1				x									
	T3-Baseline - M29 (7 pieces)	7	Oct 2				x									
	T1/T2/T3-Baseline -M26 (3 bottle)	3	09/30-10/032		2 * 15 ml			x								
	T1/T2/T3-Baseline -VOST (3 pairs)	3	09/30-10/032						x							
	T1-Baseline - PM10 (4pieces)	4	Sept 30							x						
	T2-Baseline - PM10 (4pieces)	4	Oct 1							x						
	T3-Baseline - PM10 (4pieces)	4	Oct 2							x						

TAT Requirement

STD: 10 Business day ☑
Rush 5 Business day ☐
Rush 2 Business day ☐
Rush 1 Business day ☐
Other (specify): ☐

PROJECT INFORMATION

Project #: 1804600
Name: St. Marys
PO #: 1804600
Maxxam Quote #:
Maxxam Contact: Clayton Johnson

REPORTING REQUIREMENTS

SSAS Audit samples ☐
Summary Report only ☐
Summary Report & Raw Data Package ** ☐
** additional cost may apply

PROJECT SPECIFIC COMMENTS

See attached list for parameter lists

* Initial Impinger charge volumes are required before the following analysis can be started: Method 26, CTM-027 & Method 8

Client Signature: [signature]
Affiliation:
Date/Time: Oct 6 2018

Received by: [signature]
Affiliation:
Date/Time: 2018/10/06 10:30

Method 23 / TO9A

2005 WHO ☐
1989 NATO TEF ☐
1998 WHO ☐

TEF x DL ☐
TEF x 0 DL ☐
TEF x 0.5 DL ☐

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8.5/8.9/9.0

SCHEDULE "B2"

TEST CONTAMINANTS

Source Testing Program

Nitrogen Oxides
Sulphur Dioxide
Carbon Monoxide
Carbon Dioxide
Total Suspended Particulate Matter
PM 10
PM 2.5
Hydrogen Chloride
Ammonia
Calcium Oxide
Ferric Oxide

B8Q5238

Metals		Volatile Organic Matter
Cd	Cadmium	acetone
Be	Beryllium	benzene
Pb	Lead	bromodichloromethane
Mo	Molybdenum	bromoform
Cr	Chromium	bromomethane
Ni	Nickel	butanone, 2 -
V	Vanadium	carbon tetrachloride
Al	Aluminum	chlorobenzene
Ti	Titanium	chloroethane
Mg	Magnesium	chloroform
B	Boron	chloromethane
Ba	Barium	cumene (isopropyl benzene)
P	Phosphorus	dibromochloromethane
K	Potassium	dichloroethane, 1,1 -
Hg	Mercury	dichloroethane, 1,2 -
As	Arsenic	dichloroethene, trans - 1,2 -
Zn	Zinc	dichloroethene, 1,1 – (vinyl chloride)
Sb	Antimony	dichloroethylene, cis - 1,2 -
Mn	Manganese	dichloropropane, 1,2 -
Co	Cobalt	ethylbenzene
Se	Selenium	ethylene dibromide (1,2-dibromoethane)
Cu	Copper	methylene chloride
Ag	Silver	styrene
Sn	Tin	tetrachloroethane, 1,1,1,2 -
Sr	Strontium	tetrachloroethane, 1,1,2,2 -
Tl	Thalium	tetrachloroethene
		toluene
		trichloroethane, 1,1,1 –
		trichloroethane, 1,1,2 -
		trichloroethene (trichloroethylene, 1,1,2 -)
		xylenes

FIDELE NTAMWEMEZI 2018/10/06
10:30

8.5/8.9/9.0

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: Method Blank

Field ID#: Method Blank

Number of TICs found:_____0_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.		1,3-Butadiene < 0.025 ug			
2.		Trichlorotrifluoroethane < 0.025 ug			
3.		Cumene < 0.025 ug			
4.		1,3,5-Trimethylbenzene < 0.025 ug			

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#:	HYT930
Field ID#:	M0030-T1-#9A/B

Number of TICs found:_____3_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.	106-99-0	1,3-Butadiene	4.41	1.03	
2.		Trichlorotrifluoroethane < 0.025			
3.	98-82-8	Cumene	11.99	0.19	
4.	108-67-8	1,3,5-Trimethylbenzene	12.79	1.7	

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: HYT931

Field ID#: M0030-T2-#8A/B

Number of TICs found:_____2_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.	106-99-0	1,3-Butadiene	4.44	0.79	
2.		Trichlorotrifluoroethane < 0.5			
3.		Cumene < 0.5 ug			
4.	108-67-8	1,3,5-Trimethylbenzene	12.75	2.9	

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: HYT932

Field ID#: M0030-T3-#7A/B

Number of TICs found:_____2_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.	106-99-0	1,3-Butadiene	4.42	0.96	
2.		Trichlorotrifluoroethane < 0.5			
3.		Cumene < 0.5 ug			
4.	108-67-8	1,3,5-Trimethylbenzene	12.75	3.3	

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1702401
Your Project #: 1702401
Site Location: ST. MARYS
Your C.O.C. #: 32138

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2019/03/06
Report #: R5617991
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8R0079
Received: 2018/10/11, 15:27

Sample Matrix: Stack Sampling Train
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
VOST EPA5041A, 8260C for 0030, 0031	3	N/A	2018/10/16	BRL SOP-00302	EPA5041A, 8260C

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

Maxxam ID		HZV219			HZV220	HZV221		
Sampling Date		2018/10/09			2018/10/09	2018/10/09		
COC Number		32138			32138	32138		
	UNITS	**M0030- T1-#1A/B**	**RDL**	**QC Batch**	**M0030- T2-#4A/B**	**M0030- T3-#3A/B**	**RDL**	**QC Batch**
Dichlorodifluoromethane (FREON 12)	ug	ND	0.020	5786207	ND	ND	0.80	5786207
Chloromethane	ug	4.15	0.015	5786207	5.37	4.62	0.60	5786207
Vinyl Chloride	ug	0.090	0.013	5786207	ND	ND	0.52	5786207
Bromomethane	ug	0.296	0.015	5786207	0.65	ND	0.60	5786207
Chloroethane	ug	0.483	0.0090	5786207	0.54	0.44	0.36	5786207
Trichlorofluoromethane (FREON 11)	ug	ND	0.010	5786207	ND	ND	0.40	5786207
Acetone (2-Propanone)	ug	6.36	0.045	5786207	6.1	4.5	1.8	5786207
1,1-Dichloroethylene	ug	ND	0.011	5786207	ND	ND	0.44	5786207
Methylene Chloride(Dichloromethane)	ug	ND	0.019	5786207	ND	ND	0.76	5786207
1,1-Dichloroethane	ug	ND	0.012	5786207	ND	ND	0.48	5786207
trans-1,2-Dichloroethylene	ug	ND	0.010	5786207	ND	ND	0.40	5786207
cis-1,2-Dichloroethylene	ug	ND	0.010	5786207	ND	ND	0.40	5786207
Chloroform	ug	ND	0.011	5786207	ND	ND	0.44	5786207
1,2-Dichloroethane	ug	ND	0.0070	5786207	ND	ND	0.28	5786207
Methyl Ethyl Ketone (2-Butanone)	ug	ND	0.036	5786207	ND	ND	1.4	5786207
1,1,1-Trichloroethane	ug	ND	0.014	5786207	ND	ND	0.56	5786207
Carbon Tetrachloride	ug	ND	0.016	5786207	ND	ND	0.64	5786207
Benzene	ug	7.36	0.0090	5786207	26.5	23.0	0.36	5786207
1,1,2-Trichloroethane	ug	ND	0.016	5786207	ND	ND	0.64	5786207
1,2-Dichloropropane	ug	ND	0.011	5786207	ND	ND	0.44	5786207
Trichloroethylene	ug	ND	0.011	5786207	ND	ND	0.44	5786207
Bromodichloromethane	ug	ND	0.011	5786207	ND	ND	0.44	5786207
Dibromochloromethane	ug	ND	0.0090	5786207	ND	ND	0.36	5786207
Toluene	ug	3.17	0.014	5786207	16.1	13.5	0.56	5786207
Ethylene Dibromide	ug	ND	0.010	5786207	ND	ND	0.40	5786207
Tetrachloroethylene	ug	ND	0.018	5786207	ND	ND	0.72	5786207
Chlorobenzene	ug	0.543	0.011	5786207	0.62	0.54	0.44	5786207
1,1,1,2-Tetrachloroethane	ug	ND	0.010	5786207	ND	ND	0.40	5786207
Ethylbenzene	ug	1.63	0.014	5786207	3.50	2.91	0.56	5786207
m / p-Xylene	ug	5.33	0.015	5786207	14.1	11.7	0.60	5786207
Styrene	ug	1.86	0.012	5786207	4.46	3.56	0.48	5786207
o-Xylene	ug	2.00	0.015	5786207	5.28	4.47	0.60	5786207
Bromoform	ug	ND	0.014	5786207	ND	ND	0.56	5786207
1,1,2,2-Tetrachloroethane	ug	ND	0.014	5786207	ND	ND	0.56	5786207

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

VOLATILE ORGANICS BY GC/MS (STACK SAMPLING TRAIN)

Maxxam ID		HZV219			HZV220	HZV221		
Sampling Date		2018/10/09			2018/10/09	2018/10/09		
COC Number		32138			32138	32138		
	UNITS	**M0030- T1-#1A/B**	**RDL**	**QC Batch**	**M0030- T2-#4A/B**	**M0030- T3-#3A/B**	**RDL**	**QC Batch**
Surrogate Recovery (%)								
Bromofluorobenzene	%	78		5786207	79	82		5786207
D10-Ethylbenzene (FS)	%	115		5786207				
D4-1,2-Dichloroethane	%	393 (1)		5786207	109	107		5786207
D8-Toluene	%	119		5786207	86	86		5786207

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

TEST SUMMARY

Maxxam ID: HZV219 **Collected:** 2018/10/09
Sample ID: M0030- T1- #1A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5786207	N/A	2018/10/16	Melanie Mabini

Maxxam ID: HZV220 **Collected:** 2018/10/09
Sample ID: M0030- T2- #4A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5786207	N/A	2018/10/16	Melanie Mabini

Maxxam ID: HZV221 **Collected:** 2018/10/09
Sample ID: M0030- T3- #3A/B **Shipped:**
Matrix: Stack Sampling Train **Received:** 2018/10/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
VOST EPA5041A, 8260C for 0030, 0031	GC/MS	5786207	N/A	2018/10/16	Melanie Mabini

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

GENERAL COMMENTS

Sample HZV219 [M0030- T1- #1A/B] : D4-1,2-Dichloroethane surrogate recovery exceeded acceptance range of 133% due to hydrocarbon interference.
Chloromethane, Acetone, Benzene, Toluene, Ethylbenzene, m/p-Xylene, Styrene and o-Xylene exceed calibration range in this sample, results for these analytes are estimates only.

Sample HZV220 [M0030- T2- #4A/B] : Sample was analyzed at a 40X dilution. The DLs were adjusted accordingly.
No d10-ethylbenzene surrogate recovery due to high dilution.

Sample HZV221 [M0030- T3- #3A/B] : Sample was analyzed at a 40X dilution. The DLs were adjusted accordingly.
No d10-ethylbenzene surrogate recovery due to high dilution.

Results relate only to the items tested.

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
5786207	MM2	Spiked Blank	Bromofluorobenzene	2018/10/16		103	%	43 - 131
			D10-Ethylbenzene (FS)	2018/10/16		104	%	47 - 157
			D4-1,2-Dichloroethane	2018/10/16		102	%	64 - 133
			D8-Toluene	2018/10/16		98	%	68 - 121
			Dichlorodifluoromethane (FREON 12)	2018/10/16		93	%	50 - 150
			Chloromethane	2018/10/16		86	%	50 - 150
			Vinyl Chloride	2018/10/16		90	%	50 - 150
			Bromomethane	2018/10/16		100	%	50 - 150
			Chloroethane	2018/10/16		85	%	50 - 150
			Trichlorofluoromethane (FREON 11)	2018/10/16		96	%	50 - 150
			Acetone (2-Propanone)	2018/10/16		110	%	50 - 150
			1,1-Dichloroethylene	2018/10/16		103	%	50 - 150
			Methylene Chloride(Dichloromethane)	2018/10/16		98	%	50 - 150
			1,1-Dichloroethane	2018/10/16		114	%	50 - 150
			trans-1,2-Dichloroethylene	2018/10/16		102	%	50 - 150
			cis-1,2-Dichloroethylene	2018/10/16		112	%	50 - 150
			Chloroform	2018/10/16		113	%	50 - 150
			1,2-Dichloroethane	2018/10/16		113	%	50 - 150
			Methyl Ethyl Ketone (2-Butanone)	2018/10/16		122	%	50 - 150
			1,1,1-Trichloroethane	2018/10/16		113	%	50 - 150
			Carbon Tetrachloride	2018/10/16		115	%	50 - 150
			Benzene	2018/10/16		108	%	50 - 150
			1,1,2-Trichloroethane	2018/10/16		109	%	50 - 150
			1,2-Dichloropropane	2018/10/16		109	%	50 - 150
			Trichloroethylene	2018/10/16		100	%	50 - 150
			Bromodichloromethane	2018/10/16		115	%	50 - 150
			Dibromochloromethane	2018/10/16		116	%	50 - 150
			Toluene	2018/10/16		108	%	50 - 150
			Ethylene Dibromide	2018/10/16		109	%	50 - 150
			Tetrachloroethylene	2018/10/16		110	%	50 - 150
			Chlorobenzene	2018/10/16		107	%	50 - 150
			1,1,1,2-Tetrachloroethane	2018/10/16		114	%	50 - 150
			Ethylbenzene	2018/10/16		109	%	50 - 150
			m / p-Xylene	2018/10/16		108	%	50 - 150
			Styrene	2018/10/16		109	%	50 - 150
			o-Xylene	2018/10/16		109	%	50 - 150
			Bromoform	2018/10/16		113	%	50 - 150
			1,1,2,2-Tetrachloroethane	2018/10/16		129	%	50 - 150
5786207	MM2	Method Blank	Bromofluorobenzene	2018/10/16		104	%	43 - 131
			D10-Ethylbenzene (FS)	2018/10/16		112	%	47 - 157
			D4-1,2-Dichloroethane	2018/10/16		109	%	64 - 133
			D8-Toluene	2018/10/16		100	%	68 - 121
			Dichlorodifluoromethane (FREON 12)	2018/10/16	ND, RDL=0.020		ug	
			Chloromethane	2018/10/16	ND, RDL=0.015		ug	
			Vinyl Chloride	2018/10/16	ND, RDL=0.013		ug	
			Bromomethane	2018/10/16	ND, RDL=0.015		ug	
			Chloroethane	2018/10/16	ND, RDL=0.0090		ug	

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Trichlorofluoromethane (FREON 11)	2018/10/16	ND, RDL=0.010		ug	
			Acetone (2-Propanone)	2018/10/16	ND, RDL=0.045		ug	
			1,1-Dichloroethylene	2018/10/16	ND, RDL=0.011		ug	
			Methylene Chloride(Dichloromethane)	2018/10/16	ND, RDL=0.019		ug	
			1,1-Dichloroethane	2018/10/16	ND, RDL=0.012		ug	
			trans-1,2-Dichloroethylene	2018/10/16	ND, RDL=0.010		ug	
			cis-1,2-Dichloroethylene	2018/10/16	ND, RDL=0.010		ug	
			Chloroform	2018/10/16	ND, RDL=0.011		ug	
			1,2-Dichloroethane	2018/10/16	ND, RDL=0.0070		ug	
			Methyl Ethyl Ketone (2-Butanone)	2018/10/16	ND, RDL=0.036		ug	
			1,1,1-Trichloroethane	2018/10/16	ND, RDL=0.014		ug	
			Carbon Tetrachloride	2018/10/16	ND, RDL=0.016		ug	
			Benzene	2018/10/16	ND, RDL=0.0090		ug	
			1,1,2-Trichloroethane	2018/10/16	ND, RDL=0.016		ug	
			1,2-Dichloropropane	2018/10/16	ND, RDL=0.011		ug	
			Trichloroethylene	2018/10/16	ND, RDL=0.011		ug	
			Bromodichloromethane	2018/10/16	ND, RDL=0.011		ug	
			Dibromochloromethane	2018/10/16	ND, RDL=0.0090		ug	
			Toluene	2018/10/16	ND, RDL=0.014		ug	
			Ethylene Dibromide	2018/10/16	ND, RDL=0.010		ug	
			Tetrachloroethylene	2018/10/16	ND, RDL=0.018		ug	
			Chlorobenzene	2018/10/16	ND, RDL=0.011		ug	
			1,1,1,2-Tetrachloroethane	2018/10/16	ND, RDL=0.010		ug	
			Ethylbenzene	2018/10/16	ND, RDL=0.014		ug	
			m / p-Xylene	2018/10/16	ND, RDL=0.015		ug	
			Styrene	2018/10/16	ND, RDL=0.012		ug	
			o-Xylene	2018/10/16	ND, RDL=0.015		ug	

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Bromoform	2018/10/16	ND, RDL=0.014		ug	
			1,1,2,2-Tetrachloroethane	2018/10/16	ND, RDL=0.014		ug	

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

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

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

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Maxxam Job #: B8R0079
Report Date: 2019/03/06

RWDI Air Inc
Client Project #: 1702401
Site Location: ST. MARYS
Your P.O. #: 1702401

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Maureen Smith, Supervisor, Volatiles

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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B8R0081 / B8R0079

Chain of Custody Form - AIR

11568

Page 1 of 1

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6740 Campobello Rd
Mississauga Ontario ,L5N 2L8
www.maxxamanalytics.com
Toll Free: 1-800-668-0639
Phone: (905) 817-5700
Fax: (905) 817-5777

CLIENT INFORMATION

Company Name: RWDI
Project Manager: Kirk EASTO
e-mail: Kirk.EASTO@RWDI.com
Address:

SECTION

Phone: Fax:
Sampled by: JOF/KNE/MP

ANALYSIS REQUESTED

Field Sample ID	Total Volume Sampled	Flow Rate	Collection Date	Sample Collection Time	OSTC METHOD @N5 (TPM)	USEPA METHOD 29 (METALS)	ENVIRONMENT CANADA RM2 (DIOXINS/FURANS, PAH'S)	USEPA METHOD 26 (HCl + AMMONIA)	USEPA SW846 1030 VOST
LCF-SVOC-T1 (WOODWASTE) (5 PCS)			10/5/18	AM			✓		
LCF-SVOC-T2 (WOODWASTE) (5 PCS)			10/9/18	AM			✓		
LCF-SVOC-T3 (WOODWASTE) X5 PCS)			10/9/18	PM			✓		
LCF-M29-T1 (7PCS)			10/5/18	AM	✓	✓			
LCF-M29-T2 (7PCS)			10/9/18	AM	✓	✓			
LCF-M29-T3 (7PCS)			10/9/18	PM	✓	✓			
LCF-VOST-T1 (2 PCS)			10/9/18	AM					✓
LCF-VOST-T2 (2 PCS)			10/9/18	PM					✓
LCF-VOST-T3 (2 PCS)			10/9/18	PM					✓
LCF-M26-T1 (1 PCS)			10/5/18	AM				✓	
LCF-M26-T2 (1PCS)			10/5/18	PM				✓	
LCF-M26-T3 (1 PCS)			10/5/18	PM				✓	

TAT Requirement

STD 10 Business day ☑
Rush 5 Business day * ☐
Rush 2 Business day * ☐
* need approval from Maxxam

PROJECT INFORMATION

Project #: 1702401
Name: ST. MARYS
PO #: 1702401
Maxxam Quote #:
Maxxam Contact:

REPORTING REQUIREMENTS

Summary Report only ☐
EDD ☐
Regulation

Notes

PROJECT SPECIFIC COMMENTS

* SEE KIRK EASTO FOR PARAMETER LIST*

Client Signature:
Affiliation:
Date/Time: 10/11/18 15:30

Received by: Pardeep Khurana
Affiliation: Maxxam
Date/Time: 2018/10/11 15:27

COC-1031 (04-13) - AB

17.3 / 16.6 / 12.8

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: Method Blank

Field ID#: Method Blank

Number of TICs found:_____0_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.		1,3-Butadiene < 0.025 ug			
2.		Trichlorotrifluoroethane < 0.025 ug			
3.		Cumene < 0.025 ug			
4.		1,3,5-Trimethylbenzene < 0.025 ug			

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: HZV219

Field ID#: M0030-T1-#1A/B

Number of TICs found:_____3_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.	106-99-0	1,3-Butadiene	4.41	1.09	
2.		Trichlorotrifluoroethane < 0.025			
3.	98-82-8	Cumene	11.99	0.19	
4.	108-67-8	1,3,5-Trimethylbenzene	12.78	2.03	

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: HZV220

Field ID#: M0030-T2-#4A/B

Number of TICs found:_____1_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.		1,3-Butadiene < 1			
2.		Trichlorotrifluoroethane < 1			
3.		Cumene < 1			
4.	108-67-8	1,3,5-Trimethylbenzene	12.75	4.4	

Volatile Organics Analysis Data Sheets
Tentatively Identified Compounds

SAMPLE#: HZV221

Field ID#: M0030-T3-#3A/B

Number of TICs found:_____1_____

Concentration Units
ug

	CAS #	Compound Name	RT	Est. Conc.	Match %
1.		1,3-Butadiene < 1			
2.		Trichlorotrifluoroethane < 1			
3.		Cumene < 1			
4.	108-67-8	1,3,5-Trimethylbenzene	12.75	3.5	

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 1804600
Your Project #: 1804600
Site Location: ST. MARYS
Your C.O.C. #: 32718, 32719

Attention: Kirk Easto

RWDI Air Inc
600 Southgate Drive
Guelph, ON
CANADA N1G 4P6

Report Date: 2019/03/08
Report #: R5621742
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B954296
Received: 2019/03/01, 09:48

Sample Matrix: Stack Sampling Train
Samples Received: 13

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Aldehydes + Ketones in Air	13	2019/03/04	2019/03/05	BRL SOP-00229	CARB 430 / Ashland

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

CARBONYL COMPOUNDS BY HPLC (STACK SAMPLING TRAIN)

Maxxam ID		JCF121	JCF122	JCF123		
Sampling Date		2019/02/28 18:00	2019/02/27 11:04	2019/02/27 11:04		
COC Number		32718, 32719	32718, 32719	32718, 32719		
	UNITS	**CARB430- BLANK**	**CARB430- LCF- T1-IMP1**	**CARB430- LCF- T1-IMP2/3**	**RDL**	**QC Batch**
Acrolein	ug/Tot.	ND	3	ND	2	6000434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		JCF124	JCF263	JCF264		
Sampling Date		2019/02/27 13:08	2019/02/27 13:08	2019/02/28 11:00		
COC Number		32718, 32719	32718, 32719	32718, 32719		
	UNITS	**CARB430- LCF- T2-IMP1**	**CARB430- LCF- T2-IMP2/3**	**CARB430- LCF- T3-IMP1**	**RDL**	**QC Batch**
Acrolein	ug/Tot.	ND	ND	ND	2	6000434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		JCF265	JCF266	JCF267		
Sampling Date		2019/02/28 11:00	2019/02/28 13:32	2019/02/28 13:32		
COC Number		32718, 32719	32718, 32719	32718, 32719		
	UNITS	**CARB430- LCF- T3-IMP2/3**	**CARB430- BSLN- T1-IMP1**	**CARB430- BSLN-T1- IMP2/3**	**RDL**	**QC Batch**
Acrolein	ug/Tot.	ND	ND	ND	2	6000434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

Maxxam ID		JCF268	JCF269	JCF270		
Sampling Date		2019/02/28 15:44	2019/02/28 15:44	2019/02/28 18:34		
COC Number		32718, 32719	32718, 32719	32718, 32719		
	UNITS	**CARB430- BSLN- T2-IMP1**	**CARB430- BSLN-T2- IMP2/3**	**CARB430- BSLN- T3-IMP1**	**RDL**	**QC Batch**
Acrolein	ug/Tot.	ND	ND	ND	2	6000434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

CARBONYL COMPOUNDS BY HPLC (STACK SAMPLING TRAIN)

Maxxam ID		JCF271		
Sampling Date		2019/02/28 18:34		
COC Number		32718, 32719		
	UNITS	**CARB430- BSLN-T3- IMP2/3**	**RDL**	**QC Batch**
Acrolein	ug/Tot.	ND	2	6000434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: JCF121 **Collected:** 2019/02/28
Sample ID: CARB430- BLANK **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF122 **Collected:** 2019/02/27
Sample ID: CARB430- LCF- T1- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF123 **Collected:** 2019/02/27
Sample ID: CARB430- LCF- T1- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF124 **Collected:** 2019/02/27
Sample ID: CARB430- LCF- T2- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF263 **Collected:** 2019/02/27
Sample ID: CARB430- LCF- T2- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF264 **Collected:** 2019/02/28
Sample ID: CARB430- LCF- T3- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF265 **Collected:** 2019/02/28
Sample ID: CARB430- LCF- T3- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

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Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

TEST SUMMARY

Maxxam ID: JCF266 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T1- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF267 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T1- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF268 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T2- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF269 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T2- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF270 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T3- IMP1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

Maxxam ID: JCF271 **Collected:** 2019/02/28
Sample ID: CARB430- BSLN- T3- IMP2/3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/03/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Aldehydes + Ketones in Air	LC/UV	6000434	2019/03/04	2019/03/05	Dennis Boodram

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Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
6000434	DEO	Spiked Blank	Acrolein	2019/03/05		99	%	5 - 200
6000434	DEO	RPD	Acrolein	2019/03/05	2.5		%	30
6000434	DEO	Method Blank	Acrolein	2019/03/05	ND,RDL=2		ug/Tot.	

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

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

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

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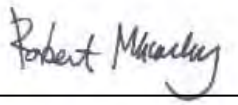
Maxxam Job #: B954296
Report Date: 2019/03/08

RWDI Air Inc
Client Project #: 1804600
Site Location: ST. MARYS
Your P.O. #: 1804600

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Robert Macaulay, Senior Analyst

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Chain of Custody Form - AIR

32718

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Fax: (905) 817-5777

B954296

CAM FCD-01302 /2

Page 1 of 1

ANALYSIS REQUESTED

CLIENT INFORMATION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: KNE@rwdi.com
Address: Guelph,

SECTION

Phone: 519-823-1311 Fax: 519-823-1316
Sampled by: Tom + Will

Field Sample ID	Total Volume Sampled	Flow Rate	Collection Date	Sample Collection Time	Modified CARB 430 - Acrolein
LCF Imp 1 - T1	n/a	.2 lpm	Feb 27/19	11:04	X
LCF Imp 2/3 - T1				~~13:08~~	X
LCF Imp 1 - T2				13:08	X
LCF IMP 2/3 - T2					X
LCF IMP 1 - T3			Feb 28/19	11:00	X
LCF Imp 2/3 - T3					X
Baseline Imp 1 - T1				13:32	X
Baseline Imp 2/3 - T1					X
Baseline Imp 1 - T2				15:44	X
Baseline Imp 2/3 - T2					X
Baseline Imp 1 - T3				18:39	X
Baseline Imp 2/3 - T3					X

TAT Requirement

STD 10 Business day ☐
Rush 5 Business day * ☑
Rush 2 Business day * ☐
* need approval from Maxxam

PROJECT INFORMATION

Project #: 1804600
Name: St. Mary
PO #: 18.4600
Maxxam Quote #: n/a
Maxxam Contact: Clayton Jonkson

REPORTING REQUIREMENTS

Summary Report only ☐
EDD ☐
Regulation

Notes
Please note if this samples are "Industrial Hygiene" samples
If submitting dustfall samples, please indicate the diameter of the jar opening in cm.
PROJECT SPECIFIC COMMENTS

Client Signature: [signature] - Thomas Langille
Affiliation: Env. Tech - RWDI
Date/Time: Feb 28/19 19:00

Received by: [signature]
Affiliation:
Date/Time: 10/9/03/01 09:48 1511515

No - ee

COC-1031 (11/2017)

Chain of Custody Form - AIR

32719

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Toll Free: 1-800-668-0639
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Fax: (905) 817-5777

B954296

CAM FCD-01302 /2

Page 2 of 2

CLIENT INFORMATION

Company Name: RWDI
Project Manager: Kirk Easto
e-mail: KNE@RWDI.com
Address: Guelph

SECTION

Phone: 519-823-1311 Fax: 519-823-1316
Sampled by: Tom L. + Will C.

ANALYSIS REQUESTED

Field Sample ID	Total Volume Sampled	Flow Rate	Collection Date	Sample Collection Time	Modified CARB 430 - Acrolein												
BLANK	NA	NA	Feb 28/19	12:00	X												

TAT Requirement

STD 10 Business day ☐
Rush 5 Business day * ☒
Rush 2 Business day * ☐
* need approval from Maxxam

PROJECT INFORMATION

Project #: 194600
Name: St. Marys
PO #: 1904680
Maxxam Quote #: NA
Maxxam Contact: Clayton Jo

REPORTING REQUIREMENTS

Summary Report only ☐
EDD ☐
Regulation

Notes

Please note if this samples are "Industrial Hygiene" samples
If submitting dustfall samples, please indicate the diameter of the jar opening in cm.

PROJECT SPECIFIC COMMENTS

Client Signature: Thomas J - Thomas Langille
Affiliation: Env. Tech - RWDI
Date/Time: Feb 28/19 1900

Received by:
Affiliation:
Date/Time: 19/03/01 07:48

COC-1031 (11/2017)

APPENDIX J

Dry Gas Meter Calibration Certificate

DGM Console ID: A
DGM Serial #:
Calibration Date: Aug 09, 18
Calibrated by TD

Barometric Pressure	760.71	mmHg
	101.42	kPa
Ambient T	21	°C
%r.H	45.00%	
W	0.0069488	lb/lb
B_{wo}	0.0111	ft³/ft³

LEAK CHECK	DGM (ft³)	WGM (L)
intial value	381.76	688.18
final value	381.90	692.77
time (1 min)	1	1
Pass/Fail	PASS	PASS

Dry Gas Meter Values									Wet Gas Meter Values								Calibration Factors		Tolerance
Δ H	Δ H	Initial Vol.	Final Vol.	Volume (Vd)	Temp inlet	Temp outlet	Temp Avg (td)	Time	Δ M	Δ M	Initial Vol.	Final Vol.	Volume (Vw)	Temp inlet	Temp outlet	Temp (tw)			
(in. H_2O)	(cm H_2O)	(ft³)	(ft³)	(m³)	(°F)	(°F)	(°C)	(min)	Pa	(cm H_2O)	(L)	(L)	(m³)	(°C)	(°C)	(°C)	Y	Δ $H_@$	Y (<±2%)
0.25	0.635	381.90	387.64	0.163	68	74	21.7	20	20	0.20	692.77	857.13	0.164	24	24	24	0.992	1.745	-0.1%
0.25	0.635	387.64	393.52	0.167	74	80	25.0	20	20	0.20	857.13	1024.76	0.168	24	24	24	0.999	1.659	0.6%
0.25	0.635	393.52	399.44	0.168	80	86	28.3	20	20	0.20	1024.76	1191.37	0.167	24	24	24	0.997	1.661	0.4%
0.5	1.270	399.44	407.77	0.236	86	87	30.3	20	20	0.20	1191.37	1424.85	0.233	24	24	24	0.999	1.683	0.6%
0.5	1.270	407.77	416.49	0.247	87	88	30.8	21	20	0.20	1424.85	1667.87	0.243	24	24	24	0.995	1.709	0.2%
0.5	1.270	416.49	424.76	0.234	88	89	31.4	20	20	0.20	1667.87	1898.37	0.231	24	24	24	0.997	1.720	0.4%
1	2.540	424.76	433.44	0.246	89	90	31.9	15	40	0.41	1898.37	2138.95	0.241	24	24	24	0.992	1.777	-0.1%
1	2.540	433.44	442.04	0.244	90	90	32.2	15	40	0.41	2138.95	2377.45	0.239	24	24	24	0.993	1.806	0.0%
1	2.540	442.04	451.33	0.263	90	92	32.8	16	40	0.41	2377.45	2633.97	0.257	24	24	24	0.991	1.773	-0.2%
2	5.080	451.33	461.10	0.277	92	92	33.3	12	60	0.61	2633.97	2903.96	0.270	24	24	24	0.991	1.806	-0.2%
2	5.080	461.10	470.71	0.272	78	79	25.8	12	60	0.61	2903.96	3176.83	0.273	23	23	23	0.997	1.800	0.4%
2	5.080	470.71	480.30	0.272	79	81	26.7	12	60	0.61	3176.83	3447.34	0.271	23	23	23	0.993	1.827	0.0%
4	10.160	480.30	491.59	0.320	81	84	28.1	10	80	0.82	3447.34	3764.03	0.317	23	23	23	0.987	1.860	-0.6%
4	10.160	491.59	502.88	0.320	84	84	28.9	10	80	0.82	3764.03	4080.05	0.316	23	23	23	0.988	1.862	-0.5%
4	10.160	502.88	518.69	0.448	84	85	29.2	14	80	0.82	4080.05	4521.17	0.441	23	23	23	0.986	1.872	-0.7%
																AVERAGE =	**0.9930**	**1.7707**	

Psychrometric Calculator
http://www.sugartech.co.za/psychro/index.php

How to use Pschrometic Calcutor
1) Dry Buld Temp = Ambient Temp of room
2) Select Relat. Humidity
3) Enter Relat. Humidity value
4) Calculate
5) Select IP Unit
6) W= Humidity Ratio

Dry Gas Meter Calibration Certificate

DGM Console ID: E
DGM Serial #:
Calibration Date: Aug 09, 18
Calibrated by JDF

Barometric Pressure	739.04	mmHg
	98.26	kPa
Ambient T	21	°C
%r.H	24.00%	
W	0.0032235	lb/lb
B_{wo}	0.0052	ft³/ft³

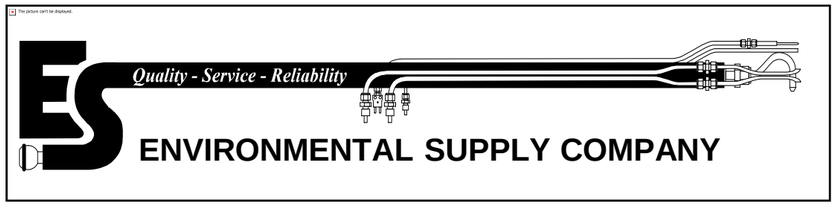
LEAK CHECK	DGM (ft³)	WGM (L)
intial value	677.32	245.22
final value	677.47	247.82
time (1 min)	1	1
Pass/Fail	PASS	PASS

Dry Gas Meter Values									Wet Gas Meter Values								Calibration Factors		Tolerance
Δ H	Δ H	Initial Vol.	Final Vol.	Volume (Vd)	Temp inlet	Temp outlet	Temp Avg (td)	Time	Δ M	Δ M	Initial Vol.	Final Vol.	Volume (Vw)	Temp inlet	Temp outlet	Temp (tw)			
(in. H_2O)	(cm H_2O)	(ft³)	(ft³)	(m³)	(°F)	(°F)	(°C)	(min)	Pa	(cm H_2O)	(L)	(L)	(m³)	(°C)	(°C)	(°C)	Y	Δ $H_@$	Y (<±2%)
0.25	0.635	677.47	683.32	0.166	70	70	21.1	20	20	0.20	247.82	415.12	0.167	20	20	20	1.008	1.675	1.0%
0.25	0.635	683.32	689.24	0.168	70	70	21.1	20	20	0.20	415.12	584.60	0.169	20	20	20	1.009	1.633	1.1%
0.25	0.635	689.24	695.12	0.167	70	70	21.1	20	20	0.20	584.60	752.55	0.168	20	20	20	1.007	1.662	0.9%
0.5	1.270	695.12	703.00	0.223	70	70	21.1	20	20	0.20	752.55	975.50	0.223	20	20	20	0.997	1.889	-0.2%
0.5	1.270	703.00	711.32	0.236	71	71	21.7	20	20	0.20	975.50	1211.01	0.236	20	20	20	0.999	1.690	0.1%
0.5	1.270	711.32	719.76	0.239	71	71	21.7	20	20	0.20	1211.01	1449.60	0.239	20	20	20	0.998	1.647	-0.1%
1	2.540	719.76	728.58	0.250	71	71	21.7	15	40	0.41	1449.60	1699.01	0.249	20	20	20	0.997	1.699	-0.1%
1	2.540	728.58	737.18	0.244	71	71	21.7	15	40	0.41	1699.01	1942.16	0.243	20	20	20	0.997	1.787	-0.1%
1	2.540	737.18	745.84	0.245	72	72	22.2	15	40	0.41	1942.16	2187.05	0.245	20	20	20	0.999	1.759	0.1%
2	5.080	745.84	755.68	0.279	72	72	22.2	12	60	0.61	2187.05	2465.36	0.278	20	20	20	0.997	1.751	-0.2%
2	5.080	755.68	765.25	0.271	72	72	22.2	12	60	0.61	2465.36	2735.94	0.271	20	20	20	0.996	1.852	-0.2%
2	5.080	765.25	774.95	0.275	73	73	22.8	12	60	0.61	2735.94	3009.29	0.273	20	20	20	0.995	1.812	-0.3%
4	10.160	774.95	785.98	0.312	73	73	22.8	10	80	0.82	3009.29	3320.08	0.311	20	20	20	0.990	1.965	-0.8%
4	10.160	785.98	797.02	0.313	73	73	22.8	10	80	0.82	3320.08	3632.08	0.312	20	20	20	0.993	1.950	-0.5%
4	10.160	797.02	808.02	0.311	73	73	22.8	10	80	0.82	3632.08	3942.94	0.311	20	20	20	0.993	1.965	-0.5%
																AVERAGE =	**0.9983**	**1.7824**	

Psychrometric Calculator
http://www.sugartech.co.za/psychro/index.php

How to use Pschrometic Calcutor
1) Dry Buld Temp = Ambient Temp of room
2) Select Relat. Humidity
3) Enter Relat. Humidity value
4) Calculate
5) Select IP Unit
6) W= Humidity Ratio

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

														INITIAL	FINAL	AVG (P_{bar})							
DATE:	July 17, 2018			METER SERIAL #:	16025475							BAROMETRIC PRESSURE (in Hg):		29.89	29.89	29.89							
METER ASSET #:	A0001			CRITICAL ORIFICE SET SERIAL #:	1372S																		
																						IF Y VARIATION EXCEEDS 2.00%,	
																						ORIFICE SHOULD BE RECALIBRATED	
																						↓	
		K'	TESTED				TEMPERATURES °F						ELAPSED										
		FACTOR	VACUUM	DGM READINGS (FT^3)			AMBIENT	DGM INLET		DGM OUTLET		DGM	TIME (MIN)	DGM ΔH	(1)	(2)	(3)	Y				
ORIFICE #	RUN #	(AVG)	(in Hg)	INITIAL	FINAL	NET (V_m)		INITIAL	FINAL	INITIAL	FINAL	AVG	θ	(in H_2O)	V_m (STD)	V_{cr} (STD)	Y	VARIATION (%)		$\Delta H_@$			
48	1	0.8139	15.5	56.500	61.567	5.067	70	70	70	70	70	70.0	5.00	3.2	5.0835	5.2851	1.040			1.6162			
48	2	0.8139	15.5	61.567	66.635	5.068	71	70	71	70	71	70.5	5.00	3.2	5.0797	5.2802	1.039			1.6178			
48	3	0.8139	15.5	66.635	71.737	5.102	71	71	72	71	71	71.3	5.00	3.2	5.1065	5.2802	1.034			1.6155			
																AVG =	1.038	1.19		1.6165			
52	1	0.6199	18.0	75.800	81.258	5.458	72	73	74	71	72	72.5	7.00	2.0	5.4340	5.6249	1.035			1.7346			
52	2	0.6199	18.0	81.258	86.725	5.467	72	74	75	72	72	73.3	7.00	2.0	5.4353	5.6249	1.035			1.7322			
52	3	0.6199	18.0	86.725	92.192	5.467	72	75	76	72	73	74.0	7.00	2.0	5.4277	5.6249	1.036			1.7297			
																AVG =	1.035	0.97		1.7322			
54	1	0.4227	20.0	11.200	16.688	5.488	77	79	80	78	79	79.0	10.00	0.85	5.3828	5.4538	1.013			1.5767			
54	2	0.4227	20.0	16.688	22.202	5.514	76	80	80	79	79	79.5	10.00	0.85	5.4033	5.4589	1.010			1.5723			
54	3	0.4227	20.0	22.202	27.718	5.516	76	80	80	79	79	79.5	10.00	0.85	5.4052	5.4589	1.010			1.5723			
																AVG =	1.011	-1.40		1.5737			
56	1	0.3086	22.0	28.500	33.720	5.220	75	81	81	80	81	80.8	13.00	0.45	5.0983	5.1858	1.017			1.5536			
56	2	0.3086	22.0	33.720	38.915	5.195	77	81	81	81	80	80.8	13.00	0.45	5.0739	5.1761	1.020			1.5595			
56	3	0.3086	22.0	38.915	44.135	5.220	76	81	81	80	81	80.8	13.00	0.45	5.0983	5.1809	1.016			1.5565			
																AVG =	1.018	-0.75		1.5565			

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **1.026**

AVERAGE $\Delta H_@$ = **1.6197**

(1) $V_m\,(std) = K_1\ V_m \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\,(std) = K' \sqrt{\dfrac{P_{bar}\,\theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

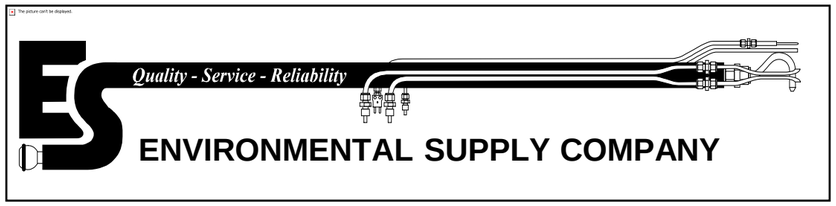
T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \dfrac{V_{cr}\,(std)}{V_m\,(std)}$ = DGM calibration factor

$\Delta H_@ = \left(\dfrac{0.75\ \theta}{V_{cr}(std)}\right)^2 \Delta H \left(\dfrac{V_m(std)}{V_m}\right)$

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE:	July 17, 2018	METER SERIAL #:	16025487	BAROMETRIC PRESSURE (in Hg):	INITIAL 29.89	# FINAL 29.91	AVG (P_{bar}) 29.90	IF Y VARIATION EXCEEDS 2.00%,
METER ASSET #:	A06010	CRITICAL ORIFICE SET SERIAL #:	1372S					ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS (FT^3) FINAL	DGM READINGS (FT^3) NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH ($in H_2O$)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
48	1	0.8139	17.5	2.084	7.411	5.327	75	81	81	80	81	80.8	5.00	4.1	5.2512	5.2621	1.002		2.0526
48	2	0.8139	17.5	7.411	12.719	5.308	77	81	81	81	81	81.0	5.00	4.1	5.2301	5.2523	1.004		2.0593
48	3	0.8139	17.5	12.719	18.085	5.366	76	81	81	81	81	81.0	5.00	4.1	5.2872	5.2572	0.994		2.0555
																AVG =	1.000	0.22	2.0558
52	1	0.6199	19.0	25.002	30.705	5.703	76	81	81	80	80	80.5	7.00	2.5	5.6026	5.6058	1.001		2.1541
52	2	0.6199	19.0	30.705	36.395	5.690	76	81	82	81	80	81.0	7.00	2.5	5.5846	5.6058	1.004		2.1522
52	3	0.6199	19.0	36.395	42.091	5.696	77	82	84	79	81	81.5	7.00	2.5	5.5854	5.6005	1.003		2.1542
																AVG =	1.002	0.44	2.1535
54	1	0.4227	21.0	45.768	51.384	5.616	76	84	84	82	82	83.0	10.00	1.1	5.4729	5.4607	0.998		2.0221
54	2	0.4227	21.0	51.384	56.997	5.613	75	84	84	82	82	83.0	10.00	1.1	5.470	5.4658	0.999		2.0184
54	3	0.4227	21.0	56.997	62.624	5.627	75	84	85	82	83	83.5	10.00	1.1	5.4786	5.4658	0.998		2.0165
																AVG =	0.998	0.02	2.0190
56	1	0.3086	22.0	64.909	70.281	5.372	76	85	86	83	83	84.3	13.00	0.53	5.2158	5.1827	0.994		1.8212
56	2	0.3086	22.0	70.281	75.640	5.359	76	86	86	83	82	84.3	13.00	0.53	5.2032	5.1827	0.996		1.8212
56	3	0.3086	22.0	75.640	81.060	5.420	77	86	86	82	83	84.3	13.00	0.53	5.2624	5.1778	0.984		1.8246
																AVG =	0.991	-0.68	1.8224

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.998**

AVERAGE $\Delta H_@$ = **2.013**

(1) $V_m\,(std) = K_1\ V_m \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\,(std) = K' \sqrt{\dfrac{P_{bar}\,\theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \dfrac{V_{cr}\,(std)}{V_m\,(std)}$ = DGM calibration factor

$\Delta H_@ = \left(\dfrac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H \left(\dfrac{V_m(std)}{V_m}\right)$

VOST Calibration Certificate

Calibration Date: 21-Feb-18
DGM Console ID: RWDI - VOST - Clean Air
DGM Serial #: RWDI No. 1107
Barometric Pressure: 101.32 kPa 1013.2 mbar
W (lb/lb) 0.007624056
%r.H 44.00% **B_{wo} (ft^3/ft^3)** 0.0121 Ambient T 21 C
Calibration Done By: TD

leak check	VOST	WGM
intial value	0	33.78
final value	2.4	34.05
time (1 min)	1 min	1 min
Pass/Fail	PASS	PASS

Dry Gas Meter Values											Wet Gas Meter Values						Calibration	
	Rotameter	Volume (Vd)			Temperature				Time	Δ M	Volume (Vw)			Temp (t_w)			Factor	Tolerance
Δ H (" H_2O)	(Middle of Ball) (L/min)	Initial (L)	Final (L)	Total (L)	inlet (^oF)	outlet (^oF)	Avg (t_d) (^oF)	Avg (t_d) (^oC)	(min)	(hPa H_2O)	Initial (L)	Final (L)	Total (L)	inlet (^oC)	outlet (^oC)	Avg (t_w) (^oC)	Y	± 2%
0.7	0.5	0.00	7.01	7.01	68	70	69.0	20.6	10	5	34.05	41.17	7.12	22	22	22	1.002	-1.1%
0.7	0.5	7.01	13.75	6.75	71	72	71.5	21.9	10	5	41.17	48.08	6.91	23	23	23	1.012	-0.2%
0.7	0.5	13.75	22.04	8.29	72	73	72.5	22.5	12	5	48.08	56.54	8.46	23	23	23	1.009	-0.4%
Average				7.35			71.0						7.50			22.7	1.008	
1.2	1.0	22.04	36.09	14.05	73	73	73.0	22.8	10	10	56.54	70.81	14.27	23	23	23	1.009	-0.4%
1.2	1.0	36.09	50.14	14.04	74	76	75.0	23.9	10	10	70.81	85.01	14.20	23	23	23	1.009	-0.5%
1.2	1.0	50.14	64.20	14.06	76	78	77.0	25.0	10	10	85.01	99.15	14.14	23	23	23	1.007	-0.7%
Average				14.05			75.0						14.20			23.0	1.008	
2.2	1.5	64.20	81.45	17.25	78	79	78.5	25.8	11	20	99.15	116.48	17.33	23	23	23	1.016	0.3%
2.2	1.5	81.45	97.25	15.81	79	79	79.0	26.1	10	20	116.48	132.38	15.9	23	23	23	1.018	0.5%
2.2	1.5	97.25	113.02	15.76	79	79	79.0	26.1	10	20	132.38	148.17	15.79	23	23	23	1.014	0.0%
Average				16.27			78.8						16.34			23.0	1.016	
3	1.9	113.02	127.82	14.80	79	79	79.0	26.1	5	40	148.17	162.92	14.75	23	23	23	1.026	1.2%
3	1.9	127.82	140.24	12.42	79	79	79.0	26.1	6	40	162.92	175.25	12.33	23	23	23	1.022	0.8%
3	1.9	140.24	152.72	12.48	79	79	79.0	26.1	5	40	175.25	187.59	12.34	23	23	23	1.018	0.4%
Average				13.23			79.0						13.14			23.0	1.022	
																AVERAGE =	**1.013**	

For Calculating W(lb/lb)
http://www.sugartech.co.za/psychro/index.php

How to use Pschrometic Calcutor
1) Dry Buld Temp = Ambient Temp of room
2) Select Relat. Humidity
3) Enter Relat. Humidity value
4) Calculate
5) Select IP Unit
6) W= Humidity Ratio

S-Type Pitot tube calibration

Pitot ID	7' #1	Date	Sept. 11, 2018
Calibrated By	Derek Ottens	$C_{p\ (std)}$	0.998
Temperature F^{o}	71.4	Static	0.3
Barometric $_{inHG}$	30.2		

Fan Speed (Htz)	FPM	Nozzle Size	$\Delta P_{(STD)}$	$\Delta P_{(S\text{-}Type)}$	$C_{p\ (S\text{-}TYPE)}$	Pitot Factor C_P
35	2803.08	.125"	0.49	0.72	0.823308	0.827
42	3302.113		0.68	0.99	0.827118	
49	3648.182		0.83	1.2	0.830002	
55	4142.184		1.07	1.55	0.829195	
60	4386.6		1.2	1.75	0.826423	
35	2745.278	.187"	0.47	0.68	0.829707	0.824
42	3374.167		0.71	1.05	0.820663	
49	3840.886		0.92	1.35	0.823868	
55	4199.85		1.1	1.6	0.827498	
60	4477.055		1.25	1.85	0.820351	
35	2774	.250"	0.48	0.71	0.820582	0.823
42	3278		0.67	0.99	0.821014	
49	3820		0.91	1.35	0.819378	
55	4142		1.07	1.55	0.829195	
60	4477		1.25	1.82	0.827084	
35	2803.08	.325"	0.49	0.72	0.823308	0.821
42	3350.321		0.7	1.05	0.814864	
49	3648.182		0.83	1.22	0.82317	
55	4142.184		1.07	1.57	0.823896	
60	4477.055		1.25	1.85	0.820351	
35	2715.916	.375"	0.46	0.66	0.833177	0.830
42	3127.536		0.61	0.89	0.826229	
49	3648.182		0.83	1.2	0.830002	
55	4142.184		1.07	1.55	0.829195	
60	4477.055		1.25	1.8	0.831667	
35	2803.08	0.435"	0.49	0.774	0.794069	0.802
42	3350.321		0.7	1.1	0.796129	
49	3735.056		0.87	1.4	0.786731	
55	4142.184		1.07	1.6	0.816136	
60	4565.718		1.3	1.95	0.814864	
35	2774.33	.500"	0.48	0.76	0.79313	0.801
42	3302.113		0.68	1.07	0.795597	
49	3861.704		0.93	1.45	0.79926	
55	4142.184		1.07	1.65	0.803675	
60	4386.6		1.2	1.8	0.814864	

S-Type Pitot tube calibration

Pitot ID	7ft #3	Date	September 11, 2018
Calibrated By	Derek Ottens	$C_{p\ (std)}$	0.998
Temperature F^{o}	72	Static	0.25
Barometric $_{inHG}$	29.92		

Fan Speed (Htz)	FPM	Nozzle Size	$\Delta P_{(STD)}$	$\Delta P_{(S\text{-}Type)}$	$C_{p\ (S\text{-}TYPE)}$	Pitot Factor C_P
35	2656.218	.125"	0.44	0.59	0.861848	0.845
42	3228.45		0.65	0.88	0.857721	
49	3691.874		0.85	1.2	0.839942	
55	4103.289		1.05	1.5	0.834987	
60	4477.055		1.25	1.8	0.831667	
35	2625.861	.187"	0.43	0.61	0.837915	0.838
42	3228.45		0.65	0.92	0.838867	
49	3713.528		0.86	1.25	0.827799	
55	4103.289		1.05	1.5	0.834987	
60	4565.718		1.3	1.8	0.848137	
35	2626	.250"	0.43	0.59	0.851998	0.840
42	3204		0.64	0.91	0.836951	
49	3756		0.88	1.25	0.837369	
55	4200		1.1	1.6	0.827498	
60	4566		1.3	1.8	0.848137	
35	2625.861	.325"	0.43	0.64	0.81804	0.834
42	3203.52		0.64	0.89	0.846302	
49	3713.528		0.86	1.3	0.811723	
55	4199.85		1.1	1.5	0.854636	
60	4386.6		1.2	1.7	0.838488	
35	2564.067	.375"	0.41	0.54	0.869612	0.848
42	3153.068		0.62	0.85	0.852348	
49	3691.874		0.85	1.15	0.858007	
55	4199.85		1.1	1.6	0.827498	
60	4477.055		1.25	1.8	0.831667	
35	2625.861	0.435"	0.43	0.59	0.851998	0.839
42	3228.45		0.65	0.9	0.848137	
49	3691.874		0.85	1.2	0.839942	
55	4103.289		1.05	1.5	0.834987	
60	4477.055		1.25	1.85	0.820351	
35	2656.218	.500"	0.44	0.65	0.821108	0.835
42	3153.068		0.62	0.89	0.832974	
49	3670.093		0.84	1.15	0.852945	
55	4199.85		1.1	1.55	0.840739	
60	4565.718		1.3	1.9	0.825516	

Praxair Canada Inc.
41 Consolidated Drive
Paris, Ontario
N3L 3G2
Tel.: (519) 442-6373
Fax: (519) 442-1540

Issue Date: October 21,2010

To: RWDI

Attn: ---

Praxair Order Number: 11685646
Customer Order Number: ---
Customer Reference Number: ---

Product Lot Number: Y787029402
Product Part Number: NI CD20CO10P-AS

CERTIFICATE OF ANALYSIS

(Primary Standard)

Cylinder Serial Number	*Components*	*Requested Concentration*	*Certified Concentration*	*Analytical Principle*/ Instrument*	*Analytical Uncertainty*
CC262955	Carbon Dioxide	20%	20.00%	L	+/- 0.02%
	Carbon Monoxide	0.05%	0.050%	L	+/- 0.02%
	Oxygen	21%	21.00%	L	+/- 0.02%
	Nitrogen	Balance	Balance		

Cylinder Style: AS
Cylinder Pressure @ 70°F(21°C): 2000

Valve Outlet Connection: CGA 590
Filling Method: Gravimetric
Date of Fill: Oct 21, 2010

Approved Signer: _____ (Lab Technician)

Counter Signer: _____ (Quality Assurance Reviewer)

This gas calibration cylinder standard prepared by Praxair Distribution is considered a certified standard. It is prepared by gravimetric, volumetric, or partial pressure techniques. The calibration standard provided is certified against Praxair Reference Materials which are either prepared by weights traceable to the National Institute of Standards and Technology (NIST), Measurement Canada or by using NIST Standard Reference Materials where available.

Note: All expressions for concentration (e.g., % or ppm) are for gas phase, by volume (e.g., ppmv) unless otherwise noted

*Key to Analytical Principle:

A. Flame Ionization with Methanizer
B. Gas Chromatography with Discharge Ionization Detector
C. Gas Chromatography with Electrolytic Conductivity Detector
D. Gas Chromatography with Flame Ionization Detector
E. Gas Chromatography with Flame Photometric Detector
F. Gas Chromatography with Helium Ionization Detector
G. Gas Chromatography with Methanizer Carbonizer
H. Oxygen Analyzer with Fuel Cell
I. Oxygen Analyzer with Electrolytic Cell
J. Gas Chromatography with Thermal Conductivity Detector
K. Chemiluminesence
L. Gravimetric Methods
M. Infrared – FTIR or NDIR
N. Electrochemical
O. Paramagnetic
P. Specific Moisture Analyzer
Q. Total Hydrocarbon Analyzer
R. Wet Chemical
S. Detector Tube
T. Odour

IMPORTANT
The information contained herein has been prepared at your request by personnel within Praxair Distribution. While we believe the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall liability of Praxair Distribution arising out of the use of the information contained herein exceed the fee established for providing such information.

Praxair Distribution, Inc,
6055 Brent Drive
Toledo, OH 43611
Tel: (419) 729-7732 Fax:(419) 729-2411
PGVP ID: F12015

DocNumber: 000010172

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR PKG PARIS P/H 80271
41 CONSOLIDATED DR
PARIS ON N3L 3G

Praxair Order Number: 31691213
Customer P. O. Number:
Customer Reference Number:

Fill Date: 6/24/2015
Part Number: NI CD10CO24E-AS
Lot Number: 0624UB15
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	6/29/2023	NIST Traceable
Cylinder Number:	EB0024904	Analytical Uncertainty:
152 ppm	CARBON MONOXIDE	± 0.4 %
10.3 %	CARBON DIOXIDE	± 0.8 %
10.0 %	OXYGEN	± 0.2 %
Balance	NITROGEN	

Certifcation Information: *Certification Date:* 6/29/2015 *Term:* 96 Months *Expiration Date:* 6/29/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1.
Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: CARBON MONOXIDE

Requested Concentration: 150 ppm
Certified Concentration: 152 ppm
Instrument Used: MKS 2031
Analytical Method: FOURIER-TRANSFORM INFRAR
Last Multipoint Calibration: 6/24/2015

First Analysis Data:						Date:	6/29/2015
Z: 0	R: 250.4	C: 152	Conc: 151.92				
R: 250.5	Z: 0	C: 152	Conc: 151.92				
Z: 0	C: 152	R: 251	Conc: 151.92				
UOM: PPM		Mean Test Assay:	151.92 PPM				

Reference Standard Type: GMIS
Ref. Std. Cylinder # : DT0004193
Ref. Std. Conc: 250.5 PPM
Ref. Std. Traceable to SRM # : 2636A
SRM Sample # : 57-F-15
SRM Cylinder # : FF30792

Second Analysis Data:						Date:	
Z: 0	R: 0	C: 0	Conc: 0				
R: 0	Z: 0	C: 0	Conc: 0				
Z: 0	C: 0	R: 0	Conc: 0				
UOM: PPM		Mean Test Assay:	0 PPM				

2. Component: CARBON DIOXIDE

Requested Concentration: 10.0 %
Certified Concentration: 10.3 %
Instrument Used: MKS 2031
Analytical Method: FOURIER-TRANSFORM INFRAR
Last Multipoint Calibration: 6/25/2015

First Analysis Data:						Date:	6/29/2015
Z: 0	R: 20.2	C: 10.3	Conc: 10.266				
R: 20.1	Z: 0	C: 10.3	Conc: 10.266				
Z: 0	C: 10.3	R: 20.2	Conc: 10.266				
UOM: %		Mean Test Assay:	10.266 %				

Reference Standard Type: GMIS
Ref. Std. Cylinder # : CC318717
Ref. Std. Conc: 20.1%
Ref. Std. Traceable to SRM # : 2745
SRM Sample # : 9-C-03
SRM Cylinder # : CAL016000

Second Analysis Data:						Date:	
Z: 0	R: 0	C: 0	Conc: 0				
R: 0	Z: 0	C: 0	Conc: 0				
Z: 0	C: 0	R: 0	Conc: 0				
UOM: %		Mean Test Assay:	0 %				

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information con tained herein exceed the fee established for providing such information.

PRAXAIR

Praxair Distribution, Inc,
6055 Brent Drive
Toledo, OH 43611
Tel: (419) 729-7732 Fax:(419) 729-2411
PGVP ID: F12015

DocNumber: 000010172

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

3 . Component: OXYGEN

Requested Concentration:	10.0 %
Certified Concentration:	10.0 %
Instrument Used:	Servomex 575
Analytical Method:	Paramagnetic
Last Multipoint Calibration:	6/23/2015

First Analysis Data:						**Date:**	6/29/2015
Z:	0	**R:**	22.33	**C:**	9.97	**Conc:**	9.97
R:	22.33	**Z:**	0	**C:**	9.97	**Conc:**	9.97
Z:	0	**C:**	9.97	**R:**	22.33	**Conc:**	9.97
UOM:	%					**Mean Test Assay:**	9.97 %

Analyzed by: Mike Monnette For

Reference Standard Type:	GMIS
Ref. Std. Cylinder # :	EB0054984
Ref. Std. Conc:	22.33
Ref. Std. Traceable to SRM # :	2659a
SRM Sample # :	71-D-04
SRM Cylinder # :	Cal05785

Second Analysis Data:						**Date:**	
Z:	0	**R:**	0	**C:**	0	**Conc:**	0
R:	0	**Z:**	0	**C:**	0	**Conc:**	0
Z:	0	**C:**	0	**R:**	0	**Conc:**	0
UOM:	%					**Mean Test Assay:**	0 %

Certified by: Rolonda Kaywood

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information con tained herein exceed the fee established for providing such information.

APPENDIX K

K1 Operating Conditions - Baseline

Operating Parameter	Quantity of LCF (tonnes/hr)	Conventional Fuel Feed Rate - Kiln (tonnes/hr)	Conventional Fuel Feed Rate - Calciner (tonnes/hr)	Clinker Production Rate (tonnes/d)	Feed Rate of Industrial by-products (tonnes/hr)	Kiln Operating Status
Operational Limits	**< 4 tph**	**None**	**None**	**None**	**None**	**Normal**
Measurement	**Continuous**	**Continuous**	**Continuous**	**Continous**	**Continuous**	**-**
Maximum	**2.0**	**-**	**-**	**-**	**-**	
Average	**-**	**8.4**	**15.2**	**5189.5**	**26.6**	
Date and Time						
30-Sep-18 11:00	0	8.86	13.94	5120.38	0.00	Baseline
30-Sep-18 12:00	0	8.90	13.53	5103.81	34.88	Baseline
30-Sep-18 13:00	0	8.89	13.24	4858.86	34.04	Baseline
30-Sep-18 14:00	0	8.65	13.42	5169.09	34.64	Baseline
30-Sep-18 15:00	0	8.49	13.55	5238.54	33.54	Baseline
30-Sep-18 16:00	0	8.51	14.69	5303.67	33.34	Baseline
01-Oct-18 07:00	0	8.06	15.67	5535.23	30.33	Baseline
01-Oct-18 08:00	0	8.18	15.49	5535.24	31.41	Baseline
01-Oct-18 09:00	0	8.19	15.93	5535.78	27.01	Baseline
01-Oct-18 10:00	0	8.22	14.91	5468.81	27.49	Baseline
01-Oct-18 11:00	0	8.29	15.14	5353.04	28.09	Baseline
01-Oct-18 12:00	0	8.41	14.37	5303.09	28.74	Baseline
01-Oct-18 13:00	0	8.73	14.78	5279.78	26.88	Baseline
01-Oct-18 14:00	0	8.31	15.72	5381.32	29.92	Baseline
01-Oct-18 15:00	0	8.21	14.80	5163.52	29.71	Baseline
01-Oct-18 16:00	0	8.40	13.75	4820.77	23.88	Baseline
02-Oct-18 08:00	0	8.46	15.57	5369.21	35.48	Baseline
02-Oct-18 09:00	0	8.48	15.38	5307.39	34.01	Baseline
02-Oct-18 10:00	0	8.46	15.32	5315.70	33.22	Baseline
02-Oct-18 11:00	0	8.34	16.04	5369.60	33.81	Baseline
02-Oct-18 12:00	0	8.60	14.48	4989.59	33.78	Baseline
28-Feb-19 11:00 [(1)]	2	8.39	14.92	4995.84	10.70	Baseline
28-Feb-19 12:00	0	8.61	15.86	4987.40	10.64	Baseline
28-Feb-19 13:00	0	8.57	16.47	4999.21	10.61	Baseline
28-Feb-19 14:00	0	8.85	15.76	4996.73	12.19	Baseline
28-Feb-19 15:00	0	8.85	15.92	4998.64	26.04	Baseline
28-Feb-19 16:00	0	8.32	16.00	4998.24	25.77	Baseline
28-Feb-19 17:00	0	7.28	17.05	4998.34	24.92	Baseline
28-Feb-19 18:00	0	7.31	18.17	4999.78	25.67	Baseline

[(1)] Period of transition from LCF test concluding at 11:00 am to the baseline test commencing at 11:30 am on February 28th.

K2 Operating Conditions - LCF

Operating Parameter	Quantity of LCF (tonnes/hr)	Conventional Fuel Feed Rate - Kiln (tonnes/hr)	Conventional Fuel Feed Rate - Calciner (tonnes/hr)	Clinker Production Rate (tonnes/d)	Feed Rate of Industrial by-products (tonnes/hr)	Kiln Operating Status
Operational Limits	**< 4 tph**	**None**	**None**	**None**	**None**	**Normal**
Measurement	**Continuous**	**Continuous**	**Continuous**	**Continous**	**Continuous**	**-**
Maximum	**4.0**	**-**	**-**	**-**	**-**	
Average	**-**	**8.0**	**14.1**	**5369.0**	**29.0**	
Date and Time						
05-Oct-18 08:00	3	8.69	13.78	5167.65	33.86	LCF
05-Oct-18 09:00	4	8.58	13.20	5403.42	33.30	LCF
05-Oct-18 10:00	4	8.28	13.44	5505.79	33.98	LCF
05-Oct-18 11:00	4	8.08	13.29	5573.48	33.94	LCF
05-Oct-18 12:00	3	8.09	14.01	5726.05	13.15	LCF
05-Oct-18 13:00	4	8.25	14.72	5618.42	33.77	LCF
09-Oct-18 09:00	3	8.32	13.62	5508.77	34.19	LCF
09-Oct-18 10:00	4	8.25	13.52	5508.57	34.31	LCF
09-Oct-18 11:00	4	8.19	13.73	5556.45	31.83	LCF
09-Oct-18 12:00	4	8.19	13.58	5715.97	30.39	LCF
09-Oct-18 13:00	4	8.25	13.39	5587.37	32.71	LCF
09-Oct-18 14:00	4	8.33	13.15	5705.37	33.86	LCF
09-Oct-18 15:00	4	8.23	13.22	5730.10	34.61	LCF
09-Oct-18 16:00	4	8.20	13.00	5627.77	34.66	LCF
09-Oct-18 17:00	4	8.21	12.81	5455.04	34.61	LCF
09-Oct-18 18:00	4	8.20	12.79	5493.49	33.31	LCF
27-Feb-19 09:00	4	7.10	15.59	5002.87	24.04	LCF
27-Feb-19 10:00	4	7.00	15.83	5003.04	25.94	LCF
27-Feb-19 11:00	4	6.89	15.89	5003.00	30.52	LCF
27-Feb-19 12:00	4	6.68	16.08	5003.00	32.61	LCF
27-Feb-19 13:00	1	6.69	16.92	5004.14	33.84	LCF
28-Feb-19 08:00	1	8.47	15.35	4993.27	11.83	LCF
28-Feb-19 09:00	4	8.69	14.22	4968.38	10.71	LCF
28-Feb-19 10:00	4	8.46	13.94	4993.54	10.63	LCF

K3 Continuous Emissions Monitoring - Baseline

Date and Time	Opacity %	Normalized stack SO2 (g/tonne Clinker)	Normalized stack NOx (g/tonne Clinker)	Kiln Temperature - K5 [2] (°C)	Gas Residence Time Kiln	Calciner Temperature (°C)	Gas Residence Time Calciner	Pressure Control (top of Preheat Tower) Negative Pressure	Raw Mill Negative Pressure	Kiln Operating Status
Operational Limits	**< 20**	**None**	**None**	**> 800°C**	**> 6 seconds**	**> 850°C**	**> 3 seconds**	**< 0 kPa**	**< 0 kPa**	**Normal**
Measurement	**Continous**	**Continous**	**Continous**	**1-hr Rolling Average**	**1-hr Rolling Average**	**1-hr Rolling Average**	**1-hr Rolling Average**	**Continuous**	**Continuous**	**-**
Maximum	**5.8**	**4376.7**	**1756.2**	**830.3**	**10.5**	**905.7**	**3.8**	**-7.1**	**-0.4**	
Minimum	**2.7**	**1368.5**	**1364.8**	**804.3**	**9.0**	**897.3**	**3.4**	**-8.9**	**-1.2**	
Average	**4.0**	**2347.9**	**1475.4**	**821.5**	**9.6**	**902.3**	**3.6**	**-8.5**	**-1.1**	
30-Sep-18 11:00	4.15	4376.70	1630.76	827.15	9.69	904.23	3.56	-8.94	-0.38	Baseline
30-Sep-18 12:00	3.80	2872.39	1457.59	827.94	9.92	904.09	3.63	-8.83	-1.19	Baseline
30-Sep-18 13:00	3.82	3067.37	1534.14	828.73	9.95	904.37	3.64	-8.87	-1.20	Baseline
30-Sep-18 14:00	3.84	2302.16	1408.62	829.52	10.46	903.60	3.80	-8.84	-1.15	Baseline
30-Sep-18 15:00	3.80	2380.54	1439.62	830.30	9.83	904.07	3.60	-8.81	-1.22	Baseline
30-Sep-18 16:00	3.83	3001.68	1481.78	829.89	9.70	901.70	3.56	-8.74	-1.18	Baseline
01-Oct-18 07:00	3.89	2910.79	1600.51	816.12	9.23	903.48	3.41	-8.70	-1.12	Baseline
01-Oct-18 08:00	3.91	2766.33	1377.18	818.42	9.18	904.08	3.40	-8.75	-1.12	Baseline
01-Oct-18 09:00	3.87	2728.14	1463.15	820.75	9.18	904.14	3.40	-8.85	-1.13	Baseline
01-Oct-18 10:00	3.78	1869.36	1381.04	822.89	9.18	904.56	3.40	-8.84	-1.12	Baseline
01-Oct-18 11:00	3.81	1989.11	1471.20	823.13	9.29	903.84	3.43	-8.80	-1.14	Baseline
01-Oct-18 12:00	3.82	1710.18	1416.36	822.87	9.49	904.99	3.50	-8.82	-1.14	Baseline
01-Oct-18 13:00	3.81	2148.68	1502.34	822.61	9.58	903.27	3.52	-8.85	-1.14	Baseline
01-Oct-18 14:00	3.87	1868.92	1441.59	822.35	9.62	903.77	3.54	-8.90	-1.16	Baseline
01-Oct-18 15:00	3.77	1368.47	1450.36	822.09	9.44	905.30	3.48	-8.85	-1.18	Baseline
01-Oct-18 16:00	3.75	1851.93	1460.72	821.83	9.84	904.26	3.60	-8.73	-1.16	Baseline
02-Oct-18 08:00	3.88	1945.96	1364.80	819.30	9.32	904.04	3.57	-8.79	-1.16	Baseline
02-Oct-18 09:00	3.85	1867.18	1465.46	819.40	9.05	904.09	3.49	-8.84	-1.14	Baseline
02-Oct-18 10:00	3.80	2010.28	1418.40	819.51	9.22	902.98	3.52	-8.89	-1.16	Baseline
02-Oct-18 11:00	3.86	2209.37	1461.00	819.63	9.21	904.13	3.52	-8.89	-1.16	Baseline
02-Oct-18 12:00	3.80	2060.76	1756.21	819.74	9.04	905.73	3.49	-8.75	-1.13	Baseline
28-Feb-19 11:00	5.78	n/a	n/a	827.47	9.53	898.10	3.73	-8.08	-0.99	Baseline
28-Feb-19 12:00	5.36	n/a	n/a	823.76	9.54	897.73	3.73	-8.20	-1.01	Baseline
28-Feb-19 13:00	4.44	n/a	n/a	815.57	9.65	898.05	3.73	-8.10	-1.07	Baseline
28-Feb-19 14:00	4.75	n/a	n/a	809.00	9.77	898.52	3.72	-7.90	-1.07	Baseline
28-Feb-19 15:00	3.90	n/a	n/a	826.72	9.69	897.77	3.73	-8.08	-1.06	Baseline
28-Feb-19 16:00	4.62	n/a	n/a	823.46	9.78	897.28	3.73	-7.85	-1.12	Baseline
28-Feb-19 17:00	3.71	n/a	n/a	809.48	9.93	897.51	3.73	-7.33	-1.10	Baseline
28-Feb-19 18:00	2.72	n/a	n/a	804.26	10.16	897.34	3.73	-7.13	-1.06	Baseline

[1] ND = No Good Data for Calculation, n/a = not applicable to test period

[2] Cyclone K5 Top Temperature was used as the surrogate parameter for the Kiln Temperature. See rationale in Appendix K.

K4 Continuous Emissions Monitoring - LCF

Date and Time	Opacity %	Normalized stack SO2 (g/tonne Clinker)	Normalized stack NOx (g/tonne Clinker)	Kiln Temperature - K5 [2] (°C)	Gas Residence Time Kiln	Calciner Temperature (°C)	Gas Residence Time Calciner	Pressure Control (top of Preheat Tower) Negative Pressure	Raw Mill Negative Pressure	Kiln Operating Status
Operational Limits	**< 20**	**None**	**None**	**> 800°C**	**> 6 seconds**	**> 850°C**	**> 3 seconds**	**< 0 kPa**	**< 0 kPa**	**Normal**
Measurement	**Continous**	**Continous**	**Continous**	**1-hr Rolling Average**	**1-hr Rolling Average**	**1-hr Rolling Average**	**1-hr Rolling Average**	**Continuous**	**Continuous**	**-**
Maximum	**5.7**	**2637.5**	**1740.3**	**830.0**	**10.1**	**906.6**	**3.8**	**-7.1**	**-1.0**	
Minimum	**3.7**	**1599.1**	**1290.5**	**800.2**	**8.6**	**897.4**	**3.3**	**-8.7**	**-1.2**	
Average	**4.2**	**2186.0**	**1452.0**	**815.7**	**9.6**	**902.2**	**3.5**	**-8.1**	**-1.1**	
05-Oct-18 08:00	3.88	2637.43	1454.65	815.71	10.09	905.50	3.66	-8.73	-1.17	LCF
05-Oct-18 09:00	3.79	2289.90	1657.37	816.79	9.92	904.32	3.60	-8.64	-1.20	LCF
05-Oct-18 10:00	3.75	1717.41	1740.32	817.87	9.64	903.31	3.47	-8.62	-1.20	LCF
05-Oct-18 11:00	3.70	1599.07	1594.49	818.63	9.51	903.99	3.42	-8.50	-1.22	LCF
05-Oct-18 12:00	3.75	1914.75	1639.17	818.01	9.44	902.92	3.38	-8.66	-0.98	LCF
05-Oct-18 13:00	3.85	1867.99	1444.09	817.22	9.52	903.75	3.30	-8.67	-1.16	LCF
09-Oct-18 09:00	3.80	2080.70	1419.07	800.18	9.96	906.61	3.41	-8.39	-1.16	LCF
09-Oct-18 10:00	3.83	2255.08	1460.16	807.71	9.82	903.02	3.41	-8.37	-1.16	LCF
09-Oct-18 11:00	3.84	2080.60	1420.53	813.18	9.74	903.69	3.41	-8.39	-1.18	LCF
09-Oct-18 12:00	3.86	2058.61	1385.62	813.56	9.70	904.83	3.39	-8.35	-1.17	LCF
09-Oct-18 13:00	3.89	2138.67	1359.77	813.92	9.51	904.04	3.30	-8.35	-1.15	LCF
09-Oct-18 14:00	3.94	2565.24	1290.50	814.36	9.09	904.28	3.37	-8.37	-1.15	LCF
09-Oct-18 15:00	4.32	2264.68	1329.04	816.63	8.91	903.65	3.31	-8.40	-1.16	LCF
09-Oct-18 16:00	3.97	2452.10	1391.59	815.88	8.63	904.62	3.30	-8.40	-1.11	LCF
09-Oct-18 17:00	3.89	2637.53	1306.83	815.41	8.84	903.58	3.35	-8.41	-1.14	LCF
09-Oct-18 18:00	4.00	2415.59	1338.15	815.88	9.18	904.59	3.44	-8.44	-1.13	LCF
27-Feb-19 09:00	5.65	n/a	n/a	811.39	9.90	898.24	3.72	-7.12	-1.01	LCF
27-Feb-19 10:00	3.82	n/a	n/a	813.77	9.97	897.79	3.72	-7.13	-1.01	LCF
27-Feb-19 11:00	4.01	n/a	n/a	813.76	9.87	897.65	3.72	-7.11	-1.00	LCF
27-Feb-19 12:00	4.13	n/a	n/a	810.73	9.85	899.16	3.72	-7.08	-1.01	LCF
27-Feb-19 13:00	5.26	n/a	n/a	811.96	9.92	897.91	3.72	-7.14	-1.09	LCF
28-Feb-19 08:00	5.48	n/a	n/a	829.43	9.70	898.40	3.76	-7.98	-0.98	LCF
28-Feb-19 09:00	4.54	n/a	n/a	825.68	9.56	898.93	3.73	-7.95	-0.96	LCF
28-Feb-19 10:00	4.80	n/a	n/a	829.98	9.62	897.42	3.74	-7.99	-0.97	LCF

[1] ND = No Good Data for Calculation, n/a = not applicable to test period

[2] Cyclone K5 Top Temperature was used as the surrogate parameter for the Kiln Temperature. See rationale in Appendix K.

Table K5: ECA Limit Comparisons - LCF

	Kiln	
Parameter	**Stack Testing Results[1]**	**ECA Limit [2]**
Limits in Schedule B of the C of A (0469-9YUNSK)		
Particulate Matter	7.97 mg/Rm^3	50 mg/Rm^3
Cadmium	0.215 µg/Rm^3	7 µg/Rm^3
Lead	5.41 µg/Rm^3	60 µg/Rm^3
Mercury	2.44 µg/Rm^3	20 µg/Rm^3
Dioxins and Furans	14.7 pg/Rm^3 ITEQ	80 pg/Rm^3 ITEQ
HCl	6.86 mg/Rm^3	27 mg/Rm^3
Opacity	3.80 %	20%

Notes:

[1] - Concentration referenced to 25 ^{o} C, 101.3kPa, and 11% oxygen

[2] - Refer to Appendix A for the Amended Certificate of Approval

Hourly averages used for opacity

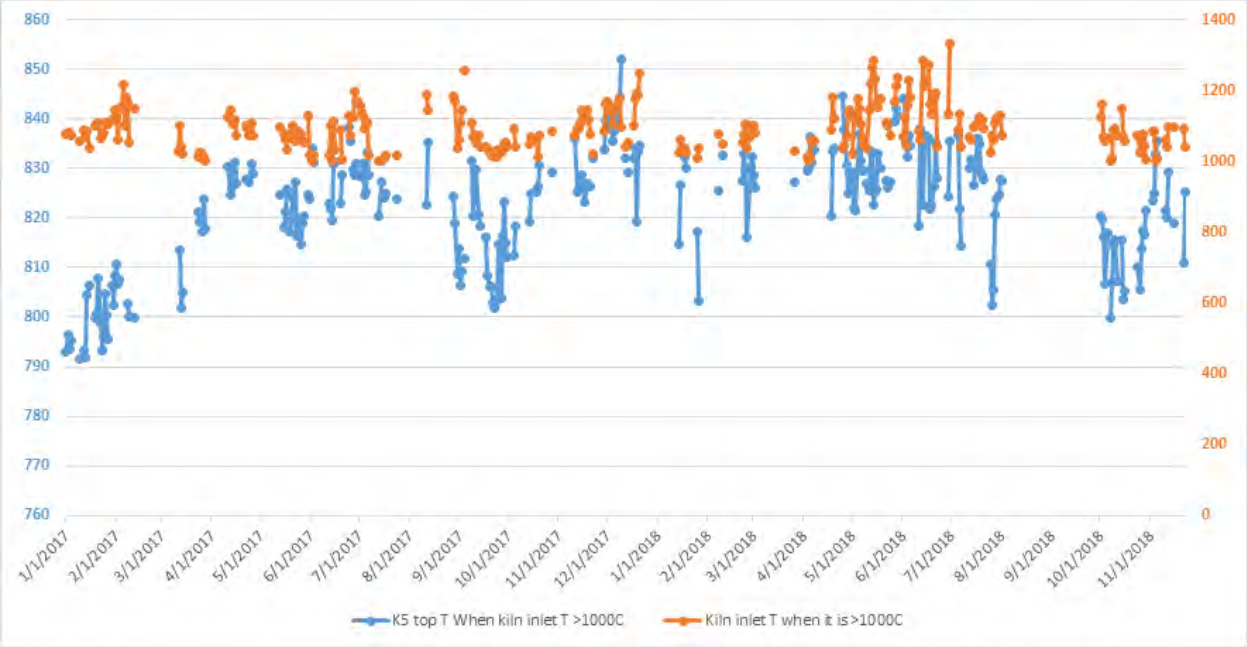
Surrogate Parameter for Temperature in the Kiln

The Bowmanville facility's ECA requires that the kiln temperature must remain no less than 1000˚C during the use of low carbon alternative fuels (LCF) as specified in Schedule E of the ECA. Due to the high system temperatures, temperature probes cannot be physically installed inside the kiln and instead as approved by the Ministry, a temperature probe at the kiln inlet is used to predict the temperature inside the kiln. Due to constant material buildups, the readings of this temperature probe are unreliable, and this probe must be brought offline for cleaning on a weekly basis which create complications for source testing.

As such, SMC has adopted an alternative surrogate parameter, the temperature probe for the K5 cyclone which is connected to the LCF interlock system. When the temperature for K5 cyclone reaches 800˚C, the temperature inside the cement kiln is expected to be higher than 1000˚C. A data graph supporting this surrogate parameter is presented below.

SMC is proposing to amend Schedule E of their ECA to reflect this change.

Temperature Graph



Note: The graph shows that when K5 top temperature (in blue) is higher than 800˚C, the kiln inlet temperature is higher than 1000˚C.

APPENDIX L

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Cement

Date: Sept 30 Test: Baseline M29-T1

Filter ID: 1807235B

Sample Loc. Main stack XAD Trap ID: n/a

Train ID: n/a

Pre-weights By: KMB Post-weights By: KMB

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Silica/100g	889.7	725.6	
2	" "	803.3	781.7	
3	empty	637.6	634.5	
4	4% KMnO4/10% H2SO4	767.9	766.5	
5	"	729.1	731.7	
6	Silica	934.0	913.4	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1 Kg	1000.0	✓	KE
Post-weights				

Comments:

Nozzle Measurements:

1 0.211
2 0.211
3 0.210
4 0.211

Avg 0.211

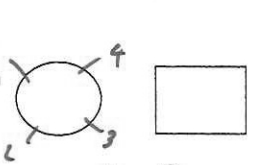
Signature

Sept 30
Date

— Isokinetic Sampling Train Data Sheet —

BASELINE

Operator Signature: [signature]



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29 | Start Time: 12:06 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDF | Finish Time: | Pitot Check: Good.
Client: St Marys Cement | Traverse: 1 - 2 | Traverse Dir.: IN - OUT | Date: Sept 30/18 | Port length: 6" | Page: 1 of 2

Dn: .211 | Cp: .824 | Bws: %6 | dH@: 1.5 | Y: .998 | Pbar: 30.3 | Pstatic: -.4 | CO2: 11 | O2: 10 | Pitot ID: 7#7

E ENV-RESOLUG-01

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.79	.85		34.63	331	249	246	54	65	65		
	2.5	.79	.83	35.96	36.10	300	247	245	43	65	65	0	
	5	.79	.85	37.46	37.35	300	252	252	39	65	65	0	
2	7.5	.79	.87	38.71	38.68	290	250	251	38	64	65	0	
	10	.79	.88	40.06	40.03	280	250	251	38	66	66	0	
	12.5	.79	.88	41.41	41.40	280	251	251	38	68	67	0	
3	15	.79	.90	42.78	42.76	275	250	251	39	69	66	0	
	17.5	.79	.90	44.14	44.14	275	250	250	39	70	66	0	
	20	.79	.90	45.52	45.52	275	250	250	39	70	66	0	
4	22.5	.79	.90		46.90	270	250	248	40	71	67	0	
	25	.79	.90	48.29	48.29	271	249	250	40	71	67	0	
	27.5	.75	.86	49.68	49.67	270	248	250	40	72	67	0	
5	30	.75	.88	51.02	51.02	270	250	249	40	73	68	0	
	32.5	.75	.88	52.37	52.37	270	250	249	40	73	68	0	
	35	.75	.88		53.74	270	248	250	39	73	68	0	
6	37.5	.75	.91	55.09	55.09	264	246	249	40	73	69	0	
	40	.70	.83	56.45	56.45	264	246	249	40	73	69	0	
	42.5	.70	.83		57.76	263	251	249	40	73	69	0	
7	45	.63	.75	59.09	59.09	263	249	250	39	74	69	0	
	47.5	.63	.75	60.35	60.36	262	250	251	39	74	69	0	
	50	.63	.75	61.62	61.62	263	250	251	39	74	69	0	
8	52.5	.63	.75	62.86	62.88	263	250	252	40	74	70	0	
	55	.63	.75	64.14	64.13	260	249	249	40	74	70	0	
	57.5	.63	.75		65.39	260	249	250	40	75	70	0	
	60			66.65	66.65								
1	0	.63	.75		66.65	261	253	253	44	72	71	0	-15:10 START
	2.5	.63	.75	67.82	67.91	260	252	254	41	74	71	0	
	5	.63	.75	69.17	69.15	259	250	249	45	75	71	0	
2	7.5	.63	.75	70.41	70.45	260	250	252	45	75	71	0	
	10	.63	.75	71.71	71.74	258	250	249	40	76	71	0	
	12.5	.63	.75	73.00	73.00	256	251	252	40	76	72	0	
3	15	.63	.75	74.27	74.25	254	250	249	40	76	72	0	
	17.5	.70	.85	75.52	75.51	257	250	249	40	76	72	0	
	20	.70	.85	76.85	76.84	258	251	250	41	77	72	0	
4	22.5	.70	.85	78.18	78.15	258	251	250	41	77	72	0	
	25	.70	.85	79.49	79.49	258	250	252	41	77	73	0	
	27.5	.76	.85	80.83	80.84	258	251	250	41	75	73	0	
5	30	.73	.85	82.18	82.20	258	250	251	41	77	73	0	
	32.5	.73	.85	83.57	83.57	257	250	248	41	77	73	0	
	35	.73	.85	84.95	84.95	256	250	252	41	77	73	0	
6	37.5	.75	.90	86.32	86.34	256	249	247	41	77	74	0	
	40	.75	.90	87.73	87.73	256	250	250	41	77	74	0	
	42.5	.75	.90	89.12	89.11	254	251	252	41	76	73	0	
7	45	.75	.90	90.50	90.49	253	250	252	41	76	73	0	
	47.5	.75	.90	91.98	91.89	256	250	247	41	76	73	0	
	50	.75	.90	93.27	93.25	256	251	252	41	77	73	0	
8	52.5	.90	.96	94.64	94.63	255	250	250	41	77	73	0	
	55	.80	.96	96.06	96.06	255	248	248	41	76	73	0	
	57.5	.80	.96	97.49	97.50	254	250	253	42	76	73	0	
	60				98.92								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) 4.01 at 12 vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End 34.63 | Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____ | % Difference _____

5510

— Isokinetic Sampling Train Data Sheet —

Operator Signature:

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M-29 BASELINE | Start Time: 14:18 15:25 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: SDP | Finish Time: 15:15 16:23 | Pitot Check: Geroff
Client: St Marys Cement | Traverse: 3-4 | Traverse Dir.: IN - OUT | Date: 6a/30/18 | Port length: 6" | Page: 2 of 2

SAME AS PAGE #1

Dn: _____ Cp: _____ Bws: %6 dH@: _____ Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID 7 (#7)

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.83	1.00		98.97	266	250	250	40	73	73		
	2.5	.83	1.00	100.38	100.38	260	249	245	43	74	73		
	5	.83	1.00	101.84	101.80	260	251	245	41	74	73		
2	7.5	.83	1.00	103.26	103.26	260	251	246	40	75	73		
	10	.83	1.00		104.71	260	252	249	43	75	73		
	12.5	.83	1.00	106.17	106.15	260	255	253	40	75	73		
3	15	.83	1.00	107.61	107.62	260	246	246	40	75	73		
	17.5	.83	1.00	109.03	109.06	260	251	250	40	75	73		
	20	.83	1.00	110.52	110.51	260	255	250	40	75	73		
4	22.5	.75	.90		111.99	255	253	245	45	76	73		
	25	.75	.90	113.38	113.37	256	251	245	45	76	73		
	27.5	.75	.90	114.76	114.74	257	248	247	47	75	73		
5	30	.75	.90	116.13	116.13	256	251	249	42	76	73		
	32.5	.75	.90	117.52	117.51	256	247	249	42	75	73		
	35	.75	.90	118.90	118.80	257	252	248	42	75	73		
6	37.5	.75	.90	120.19	120.25	256	250	248	42	75	73		
	40	.78	.95	121.64	121.64	254	246	249	43	74	73		
	42.5	.78	.85	122.98	122.98	256	250	251	43	76	73		
7	45	.70	.85		124.27	258	251	251	43	75	72		
	47.5	.85	.80	125.71	125.72	255	252	251	43	73	72		
	50	.80	.73	127.01	127.04	253	249	250	42	75	72		
8	52.5	.60	.73	128.24	128.25	253	249	250	45	76	73		
	55	.60	.73	129.60	129.50	251	254	251	43	76	73		
	57.5	.60	.73		130.76	251	251	245	43	76	73		
	60			132.00	132.02								15:25 START
1	0	.66	.73		132.02	251	251	248	45	73	73		
	2.5	.60	.73	133.26	133.27	251	250	248	45	73	73		
	5	.60	.73		134.65	251	251	249	43	74	73		
2	7.5	.60	.73		135.78	252	249	249	43	74	73		
	10	.60	.73	137.02	137.04	251	252	249	43	75	73		
	12.5	.65	.80		138.29	250	253	252	43	75	73		
3	15	.85	.99	139.58	139.62	252	248	252	43	76	73		
	17.5	.75	.91	140.91	140.99	253	251	251	42	75	73		
	20	.70	.85	142.38	142.38	254	249	248	43	75	73		
4	22.5	.75	.91	143.72	143.74	253	250	248	43	75	73		
	25	.75	.91	145.13	145.13	254	251	251	46	76	73		
	27.5	.71	.91	146.52	146.52	253	248	250	44	76	73		
5	30	.75	.91		147.89	254	249	249	44	76	73		
	32.5	.80	.97	149.28	149.29	254	249	248	44	76	73		
	35	.80	.97	150.72	150.74	254	252	249	44	76	73		
6	37.5	.80	.97	152.18	152.16	254	254	252	44	76	73		
	40	.80	.97	153.62	153.63	253	250	251	44	76	73		
	42.5	.80	.97	155.07	155.16	253	250	250	44	76	73		
7	45	.88	.97	156.54	156.57	254	252	251	45	75	72		
	47.5	.80	.97	157.97	157.99	256	249	250	45	75	72		
	50	.80	.97	159.41	159.42	253	251	251	45	75	72		
8	52.5	.80	.97	160.96	160.88	256	251	251	45	75	72		
	55	.80	.97	162.32	162.32	256	250	250	45	75	72		
	57.5	.80	.97		163.76	255	251	251	46	75	72		
	60				165.12								

Pretest Leak Check Rate (cfm) ≤.02 at 5 vacuum ("Hg) Leak Vol Start 65.62 Leak Vol. End 65.42
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: '1804600 Client: St. Marys Cement

Date: Oct 1 Test: Baseline 1-M29-T2

Filter ID: 1807359

Sample Loc. Main stack XAD Trap ID: n/a

Train ID: n/c

Pre-weights By: RMF Post-weights By: RMF

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	[illegible]	882.8	737.6	
2	" "	797.2	750.5	
3	Empty	644.3	635.7	
4	[illegible]	769.0	762.8	
5	" "	748.4	745.9	
6	Silica		835.3	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights	1 kg	1000.0	✓	VE

Comments:

Nozzle Measurements:
1
2
3
4

Avg

Signature

Date

— Isokinetic Sampling Train Data Sheet —

BASECINE

Operator Signature: _____

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-12 | Start Time: 8:57 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDT | Finish Time: _____ | Pitot Check: 6000
Client: St Marys Cement | Traverse: 1-2 | Traverse Dir.: IN-OUT | Date: 10/01/18 | Port length: 6" | Page: 1 of 2

Dn: .21 | Cp: .83 | Bws: %6 | dH@: _____ | Y: .998 | Pbar: _____ | Pstatic: -.4 | CO2: 16 | O2: 15 | Pitot ID: 7'-1

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.8	.93		167.10	255	249	250	45	52	52		
	2.5	.8	.93	168.47	168.37	255	250	250	44	52	52		
	5	.8	.93	169.34	169.68	255	249	250	44	53	52		
2	7.5	.8	.93	171.05	71.02	248	251	251	45	54	52		
	10	.8	.93	172.39	72.78	248	250	250	49	56	52		
	12.5	.8	.93	73.75	75.73	249	249	250	45	57	53		
3	15	.8	.93	75.11	75.09	248	248	250	45	58	53		
	17.5	.8	.93	76.47	76.45	250	248	248	46	60	54		
	20	.75	.88	77.84	77.80	249	249	250	46	61	54		
4	22.5	.75	.81	79.15	79.12	250	250	250	46	61	54		
	25	.75	.88	[illegible]	80.41	250	250	250	46	61	54		
	27.5	.75	.88	81.76	81.73	250	250	250	45	63	56		
5	30	.75	.88	83.08	83.07	250	249	251	44	63	56		
	32.5	.75	.88	84.38	84.35	250	248	248	43	63	57		
	35	.75	.88	85.71	85.68	250	249	249	43	64	57		
6	37.5	.75	.91	87.04	87.02	250	248	248	42	65	58		
	40	.75	.91	88.38	88.37	251	250	250	41	66	58		
	42.5	.65	.79	89.73	89.71	250	251	251	41	66	59		
7	45	.65	.79	90.98	90.97	251	250	251	41	66	59		
	47.5	.61	.73	92.24	92.22	250	249	248	42	67	59		
	50	.61	.73	93.45	93.45	250	250	250	42	66	59		
8	52.5	.61	.73	94.68	94.64	250	250	250	42	67	59		
	55	.61	.73		95.90	248	251	249	42	67	59		
	57.5	.61	.73	97.14	97.18	250	251	250	40	68	61		
	60				98.46								
1	0	.61	.73		98.46	247	251	250	40	68	61		10:04
	2.5	.61	.73	99.76	99.67	250	250	250	39	66	62		
	5	.61	.73	100.91	100.88	250	251	249	38	66	62		
2	7.5	.61	.75	102.12	102.10	250	248	251	38	67	63		
	10	.61	.75	103.34	103.35	250	249	249	39	68	65		
	12.5	.61	.75	104.59	104.59	250	250	250	39	68	62		
3	15	.61	.75	105.83	105.85	250	248	250	39	66	64		
	17.5	.75	.90	107.09	107.09	248	250	250	39	69	64		
	20	.75	.91	108.46	108.50	250	250	251	39	69	64		
4	22.5	.75	.91	109.77	109.77	250	251	250	40	70	65		
	25	.75	.91		111.11	250	250	250	40	70	65		
	27.5	.75	.91		112.49	250	250	250	40	70	65		
5	30	.75	.91	113.67	113.87	250	250	251	40	71	65		
	32.5	.75	.91	115.25	115.25	250	249	250	40	71	66		
	35	.75	.91		116.58	250	250	250	40	71	66		
6	37.5	.75	.91		117.85	250	250	250	40	71	66		
	40	.85	1.02		119.20	250	250	250	40	71	66		
	42.5	.85	1.02	120.67	120.67	249	250	250	40	71	66		
7	45	.85	1.02	122.04	122.05	249	250	250	40	72	66		
	47.5	.85	1.02	123.52	123.40	251	250	251	41	72	67		
	50	.85	1.02	124.83	124.87	251	250	251	41	72	67		
8	52.5	.85	1.02	126.34	126.29	250	251	249	41	72	68		
	55	.85	1.02		127.71	250	251	250	41	72	68		
	57.5	.85	1.02	129.18	129.13	250	251	250	41	72	68		
	60				130.55								

Pretest Leak Check Rate (cfm) 2.01 at 12 vacuum ("Hg) | Leak Vol Start 166.67 | Leak Vol. End 166.98
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Baseline

Operator Signature: _____

178.64

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T2 | Start Time: 11:16 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDF | Finish Time: 15:21 | Pitot Check: _____
Client: St Marys Cement | Traverse: 3-4 | Traverse Dir.: _____ | Date: 10/01/18 | Port length: 6" | Page: 2 of 2

SAME AS PAGE 1

Dn: _____ Cp: _____ Bws: %6 dH@: _____ Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID_____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	0.87	1.1		230.55	251	251	249	57	71	69	Ø	
	2.5	0.87	1.1		232.02	251	247	251	42	73	69	Ø	
	5	0.87	1.1		233.50	251	248	251	42	74	70	Ø	
2	7.5	0.87	1.1		234.95	251	246	249	42	75	70	Ø	
	10	0.87	1.1		236.40	250	251	249	42	76	70	Ø	
	12.5	0.87	1.1		237.73	251	252	250	42	77	70	Ø	
3	15	0.85	1.10		239.26	250	252	251	43	77	71	Ø	
	17.5	0.85	1.10		240.60	250	250	249	43	78	71	Ø	
	20	0.85	1.10		242.06	250	249	249	43	78	71	Ø	
4	22.5	0.85	1.10	243.55	243.49	250	251	249	43	78	72	Ø	
	25	0.85	1.10	244.96	244.89	254	251	251	43	78	72	Ø	
	27.5	.80	.96	246.36	246.31	250	251	250	43	78	72	Ø	
5	30	.80	.96	247.73	247.77	250	250	249	43	78	73	Ø	
	32.5	.80	.96	249.14	249.12	250	248	251	44	79	73	Ø	
	35	.80	.96	250.56	250.56	249	251	250	44	79	73	Ø	
6	37.5	.80	.96	252.00	252.00	250	249	249	44	79	74	Ø	
	40	.80	.96		253.30	249	250	251	45	79	74	Ø	
	42.5	.75	.92	254.74	254.71	250	251	251	44	79	74	Ø	
7	45	.75	.92	256.11	256.07	250	251	251	44	79	74	Ø	
	47.5	.75	.92	257.49	257.46	250	251	250	44	79	74	Ø	
	50	.75	.92	258.86	258.85	250	250	249	47	80	74	Ø	
8	52.5	.75	.95		260.25	250	250	251	47	80	74	Ø	
	55	.75	.95	261.65	261.63	250	250	250	47	80	74	Ø	
	57.5	.75	.95	263.03	263.01	250	246	249	46	80	75	Ø	
	60				264.41								
1	0	.80	.98		264.41	247	252	250	46	77	75	Ø	-12:21 START
	2.5	.80	.98	265.86	265.87	249	248	249	45	78	76	Ø	
	5	.80	.98	267.28	267.25	250	251	250	44	79	75	Ø	
2	7.5	.75	.92		268.66	249	248	251	44	79	75	Ø	
	10	0.8	.98		270.04	249	249	249	44	79	75	Ø	
	12.5	0.8	.98		271.50	249	249	249	44	79	75	Ø	
3	15	0.8	.98		272.91	249	251	251	46	80	76	Ø	
	17.5	0.8	.98		274.33	249	251	250	46	80	76	Ø	
	20	.82	1.01		275.80	250	251	250	46	80	75	Ø	
4	22.5	.87	1.01		277.27	249	249	250	46	80	76	Ø	
	25	.87	1.01	278.74	278.64	250	252	250	47	80	76	Ø	
	27.5	.87	1.01	280.11	280.05	250	251	250	47	80	76	Ø	
5	30	.82	1.01	281.52	281.50	251	251	250	47	80	76	Ø	
	32.5	.85	1.04	282.97	282.93	249	250	250	47	80	76	Ø	
	35	.85	1.04	284.42	284.38	250	250	250	47	80	76	Ø	
6	37.5	.85	1.04	285.87	285.85	250	251	250	47	80	76	Ø	
	40	.85	1.00		287.35	250	251	250	47	80	76	Ø	
	42.5	.85	1.00		288.83	250	251	251	47	80	76	Ø	
7	45	.85	1.00	290.32	290.30	250	249	248	47	80	76	Ø	
	47.5	.85	1.00	291.79	291.79	250	249	248	47	80	76	Ø	
	50	.85	1.00		293.26	250	250	251	47	80	76	Ø	
8	52.5	.85	1.00		294.75	250	250	251	47	80	75	Ø	
	55	.85	1.00	296.24	296.23	250	250	250	49	80	76	Ø	
	57.5	.85	1.00	297.72	297.69	250	250	250	49	80	76	Ø	
	60				299.16								

Pretest Leak Check Rate (cfm) 1.01 at 8 vacuum ("Hg) Leak Vol Start 299.16 Leak Vol. End 299.26
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: '1804600 Client: St. Marys Cement

Date: Oct 2/18 Test: Baseline M29-T3

Filter ID:

Sample Loc. Main Stack XAD Trap ID:

Train ID:

Pre-weights By: KMF Post-weights By:

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	5% HNO_3 / 10% H_2O	899.8	737.0	
2	" "	778.4	748.2	
3	empty	639.6	637.0	
4	4% $KMnO_4$ / 10% H_2SO_4	773.6	770.7	
5	" "	762.0	761.6	
6	Silica	856.2	825.4	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights				

Comments:

Nozzle Measurements:
1
2
3
4

Avg

Signature

Date

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____

4 3 1 2

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29 Baseline T3 | Start Time: 8:08 9:16 | Stack D.: 216" | 5:10
Job Number: 1804600 | Source: Main Stack | Operators: KME | Finish Time: 9:09 10:16 | Pitot Check: Good
Client: St Marys Cement | Traverse: _____ | Traverse Dir.: _____ | Date: Oct 2/18 | Port length: 6" | Page: 1 of 2

Dn: .210 Cp: .86 Bws: %6 dH@: 1.8 Y: .996 Pbar: 30.3 Pstatic: -.7 CO2: 15 O2: 10 Pitot ID: 7'

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.79	.97		345.89	245	251	251	43	55	56	/	
	2.5	.76	.93	703	349.33	245	251	250	40	57	55	0	
	5	.84	1.0	348.44	342.12	245	252	250	40	58	55	0	
2	7.5	.82	.98	352.58	350.52	246	249	250	40	59	55	0	
	10	.80	.98	1.98	351.93	246	249	251	40	61	55	0	
	12.5	.80	.98		353.29	252	250	251	40	61	55	0	
3	15	.75	.91		354.67	246	250	250	41	63	55	0	
	17.5	.74	.91		357.00	247	248	250	41	63	55	0	
	20	.75	.92		357.35	247	250	250	40	65	58	0	
4	22.5	.75	.92	8.75	358.70	247	248	250	40	65	58	0	
	25	.75	.92		360.05	248	250	248	40	65	58	0	
	27.5	.75	.92	361.45	361.43	249	250	248	41	65	58	0	
5	30	.71	.87		362.82	249	245	249	41	65	58	0	
	32.5	.71	.87	4.19	364.14	249	250	250	41	65	58	0	
	35	.71	.87	365.49	365.48	248	250	250	40	65	58	0	
6	37.5	.71	.87		366.84	248	250	248	40	65	58	0	
	40	.66	.80	368.20	368.14	248	250	250	40	65	58	0	
	42.5	.66	.80		369.40	247	250	250	40	65	58	0	
7	45	.66	.80		370.72	248	247	250	40	65	56	0	
	47.5	.65	.79	72.03	372.00	246	252	248	40	65	58	0	
	50	.60	.74		373.25	245	250	250	41	65	58	0	
8	52.5	.60	.74	74.50	374.48	245	250	250	41	65	54	0	
	55	.61	.75		375.70	244	250	250	41	65	58	0	
	57.5	.61	.75		376.55	245	241	250	41	65	58	0	
	60	/	/	/	378.20	/	/	/	/	/	/	/	
1	0	.84	1.0		378.20	243	251	245	43	65	58	0	
	2.5	.84	1.05	79.68	379.62	245	250	251	37	71	66	0	
	5	.84	1.05	81.20	381.20	245	249	250	37	71	60	0	
2	7.5	.80	.98	268	382.68	244	249	251	37	71	60	0	
	10	.80	.98		383.87	246	249	251	39	71	60	0	
	12.5	.84	1.0	386	385.25	247	251	250	39	74	62	0	
3	15	.84	1.03		386.66	245	250	250	39	74	62	0	
	17.5	.84	1.03	87.14	388.14	249	251	251	39	74	62	0	
	20	.80	.98		389.54	247	247	250	39	74	62	0	
4	22.5	.80	.98		390.96	246	245	250	40	74	62	0	
	25	.78	.96		392.38	249	250	251	41	74	62	0	
	27.5	.74	.90	393.61	393.78	250	250	251	41	74	62	0	
5	30	.72	.88		395.15	249	252	250	40	76	70	0	
	32.5	.72	.88		396.56	246	251	251	40	76	70	0	
	35	.72	.88		397.86	246	251	250	40	76	70	0	
6	37.5	.72	.88		399.20	246	252	250	40	76	70	0	
	40	.70	.86		400.54	246	250	250	40	76	70	0	
	42.5	.70	.86		401.87	247	249	249	41	78	70	0	
7	45	.70	.86		403.21	247	249	250	41	76	70	0	
	47.5	.65	.82		404.54	247	250	250	41	76	70	0	
	50	.62	.76		405.87	247	255	250	41	76	70	0	
8	52.5	.62	.76		407.12	248	249	251	41	76	70	0	
	55	.62	.76	839	408.37	248	250	250	41	76	70	0	
	57.5	.62	.76		409.62	249	250	250	41	76	70	0	
	60	/	/	/	410.88	/	/	/	/	/	/	/	

Pretest Leak Check Rate (cfm) .001 at 8 vacuum ("Hg) Leak Vol Start 395.89 Leak Vol. End 395.89
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Baseline

Operator Signature: IKE

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T3 | Start Time: 10:31 11:41 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: _____ | Finish Time: 11:31 12:41 | Pitot Check: OK
Client: St Marys Cement | Traverse: 3/4 | Traverse Dir.: _____ | Date: 04/21/16 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: C Bws: %6 dH@: See Page #1 Y: 7 998 Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID 7E1

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.86	1.1		410.58	247	240	245	42	74	73	/	
	2.5	.80	1.1	411.38	413.38	247	247	247	40	74	73	0	
	5	.86	1.1		413.89	247	249	250	40	74	73	0	
2	7.5	.86	1.1	5.38	415.27	247	252	250	40	74	73	0	
	10	.86	1.1		416.65	248	248	250	40	74	73	0	
	12.5	.86	1.1		418.10	248	249	251	41	74	73	0	
3	15	.82	1.0		419.42	249	249	250	41	74	73	0	
	17.5	.82	1.0	422.88	420.97	248	251	250	41	76	74	0	
	20	.84	1.0		422.40	247	251	250	41	76	74	0	
4	22.5	.84	1.0	423.88	423.87	246	250	251	42	78	74	0	
	25	.84	1.0		425.02	245	251	250	42	78	74	0	
	27.5	.84	1.0	6.50	426.70	245	250	250	44	78	74	0	
5	30	.80	.98		428.20	249	245	245	44	78	74	0	
	32.5	.80	.98	9.65	429.61	247	248	250	44	80	75	0	
	35	.80	.98		431.03	247	253	250	44	80	75	0	
6	37.5	.72	.88		432.47	247	248	250	43	81	77	0	
	40	.72	.88		433.81	247	251	249	45	81	77	0	
	42.5	.72	.88	5.18	435.15	249	248	250	45	81	77	0	
7	45	.66	.81		436.48	248	250	250	45	81	77	0	
	47.5	.66	.81	7.79	437.79	248	250	251	45	81	77	0	
	50	.66	.81		439.12	249	250	251	45	81	77	0	
8	52.5	.66	.81		440.42	249	251	250	45	81	77	0	
	55	.70	.86		441.73	250	251	251	45	81	77	0	
	57.5	.70	.86		443.07	247	251	252	45	81	77	0	
	60	/	/	/	444.44	/	/	/	/	/	/	/	
1	0	.70	.86		444.84	249	250	250	50	78	78	0	
	2.5	.70	.86	5.79	445.77	250	249	249	52	78	78	0	
	5	.70	.86		447.12	249	249	249	50	78	78	0	
2	7.5	.70	.86		448.44	249	250	250	48	82	78	0	
	10	.70	.86		449.77	249	249	250	49	82	78	0	
	12.5	.70	.86		451.13	249	249	250	47	82	78	0	
3	15	.78	.96	2.48	452.45	251	250	250	49	82	78	0	
	17.5	.79	.97		453.86	252	252	250	49	82	78	0	
	20	.79	.97		455.28	252	250	251	49	82	78	0	
4	22.5	.84	1.0	5.72	456.72	252	251	251	49	82	78	0	
	25	.84	1.0		458.17	253	250	250	49	82	78	0	
	27.5	.84	1.0	9.75	459.66	252	248	250	49	82	78	0	
5	30	.84	1.0		461.11	253	249	250	50	82	78	0	
	32.5	.90	1.1		462.61	252	251	250	50	82	78	0	
	35	.85	1.1		464.13	253	246	250	50	82	78	0	
6	37.5	.90	1.1	5.65	465.63	252	253	250	50	82	78	0	
	40	.90	1.1		467.16	253	252	250	50	82	78	0	
	42.5	.90	1.1	467.70	468.70	253	246	252	50	82	78	0	
7	45	.90	1.1		470.22	253	245	250	52	82	78	0	
	47.5	.89	1.1	71.76	471.75	252	250	250	52	82	78	0	
	50	.89	1.1		473.26	253	251	250	52	82	78	0	
8	52.5	.86	1.1	4.78	474.78	252	250	251	52	82	78	0	
	55	.90	1.1		476.27	253	250	251	52	82	78	0	
	57.5	.90	1.1		477.78	252	249	249	53	82	78	0	
	60	/	/	/	479.30	/	/	/	/	/	/	/	

Thermocouple Calibration

Pretest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____ Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) 0.01 at 5 vacuum ("Hg) Leak Vol Start 477.30 Leak Vol. End 479.45 % Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Sept 30 Test: SWC-T1 - Baseline

Filter ID: n/a

Sample Loc. Main - Base XAD Trap ID: #4

Train ID: #1

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Bits	707.5	507.4	
2	ethylene Glycol	785.2	758.6	
3	empty	591.3	591.3	
4	Silica	856.0	846.2	
5	Condenser	319.4	317.1	
6	Trap	355.4	350.4	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1kg	1000.0	✓	MP
Post-weights				

Comments:

Nozzle Measurements:

1 0.211
2 0.24
3 0.211
4 0.24

Avg 0.211

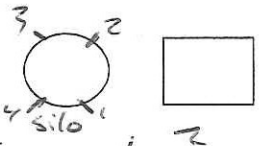
Signature

Date

— Isokinetic Sampling Train Data Sheet —

Baseline

Operator Signature: KWB



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SDC-T1 | Start Time: 12:06 13:10 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: KWE/MP | Finish Time: 13:06 14:10 | Pitot Check: Good
Client: St Marys Cement | Traverse: 1&2 | Traverse Dir.: In/Out | Date: Sept 30 | Port length: 6" | Page: 1 of 2

Dn: .211 | Cp: .8338 | Bws: %6 | dH@: 1.791 | Y: 0.993 MSC-A | Pbar: 30.3 | Pstatic: -.7 | CO2: 15 | O2: 10 | Pitot ID: T-3

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	ΔP Comments
1	0	0.80	1.0		179.88	300	242	253	53	70	70	/	66
	2.5	0.96	1.1	111.3)	181.30	294	247	250	47	71	70	-5	57
	5	1.0	1.2	182.80	183.74	290	247	249	47	70	70	-7	37
2	7.5	1.0	1.2		184.34	287	240	250	47	70	70	-7	37
	10	.90	1.2	185.94	185.50	284	240	250	45	72	70	-8	37
	12.5	.90	1.2	186.35	187.40	284	240	250	45	72	70	-8	37
3	15	.92	1.2	190.5	189.02	282	240	250	45	72	70	-8	37
	17.5	.90	1.2		190.52	281	240	251	45	72	70	-8	37
	20	.89	1.2	192.00	192.05	281	240	251	45	72	70	-8	37
4	22.5	.93	1.2		193.67	279	241	251	45	72	70	-8	38
	25	.92	1.2		195.28	278	241	251	45	73	70	-8	37
	27.5	.89	1.2	199.50	198.86	277	241	250	45	72	70	-8	47
5	30	.88	1.1	201.36	198.45	276	240	246	44	78	70	-8	37
	32.5	.88	1.1	199.9	200.00	275	241	249	44	78	70	-8	37
	35	.86	1.1	201.46	201.51	272	241	250	44	78	70	-8	37
6	37.5	.86	1.1		203.00	273	240	250	44	78	71	-8	37
	40	.84	1.1	204.46	204.50	272	240	250	44	78	71	-8	37
	42.5	.84	1.1		206.00	271	241	251	44	78	71	-8	37
7	45	.80	1.0	207.51	207.51	271	241	250	44	78	71	-8	37
	47.5	.80	1.0		208.99	270	239	250	44	79	71	-7	38
	50	.82	1.0	210.42	210.48	270	238	250	44	79	71	-7	38
8	52.5	.76	.95		211.96	270	240	251	44	79	71	-7	38
	55	.76	.95		213.41	270	244	251	44	79	71	-7	38
	57.5	.76	.95		214.82	269	240	249	45	80	72	-7	38
	60	—	—		216.23	—	—	—	—	—	—	—	—
1	0	.82	1.0		216.23	270	240	250	45	79	72	-7	38
	2.5	.77	.96	217.66	217.73	269	238	240	45	79	72	-7	38
	5	.79	1.0		219.16	268	242	250	46	80	73	-7	38
2	7.5	.80	1.0		220.60	268	238	250	45	80	73	-7	38
	10	.80	1.0	222.0?	222.05	267	238	250	45	80	73	-7	38
	12.5	.76	.95		223.50	266	239	249	45	80	73	-7	38
3	15	.79	1.0		224.90	267	241	251	46	82	74	-7	39
	17.5	.75	1.0	226.33	226.33	266	238	250	46	82	74	-7	39
	20	.80	1.0		227.77	267	240	250	47	82	77	-7	40
4	22.5	.86	1.1		229.20	267	239	250	47	82	74	-7	40
	25	.86	1.1		230.65	266	239	250	47	82	74	-7	40
	27.5	.86	1.1		232.14	266	240	250	47	82	74	-7	40
5	30	.86	1.1		233.61	265	241	250	47	82	74	-7	40
	32.5	.80	1.1		234.77	266	241	250	47	82	75	-7	40
	35	.86	1.1		236.54	265	239	249	47	82	75	-7	40
6	37.5	.86	1.1		238.00	264	240	250	48	82	75	-7	41
	40	.86	1.1	239.46	239.45	265	238	240	48	82	75	-7	41
	42.5	.86	1.1		240.92	263	239	249	48	82	75	-7	41
7	45	.84	1.1		242.34	265	241	251	48	82	75	-7	41
	47.5	.84	1.1		243.83	264	240	250	48	82	75	-7	41
	50	.85	1.1		245.30	264	240	250	48	82	75	-7	41
8	52.5	.87	1.1		246.75	263	239	250	48	82	75	-7	44
	55	.90	1.2	248.25	248.20	263	240	250	48	82	75	-7	45
	57.5	.87	1.2		249.73	263	240	250	48	82	75	-7	45
	60	—	—	—	251.27	—	—	—	—	—	—	—	—

Pretest Leak Check Rate (cfm) .101 at 15 vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End 179.88
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration
Ambient temp 55 | Probe Temp 55
% Difference 0

— Isokinetic Sampling Train Data Sheet —

Operator Signature: [signature]

Baseline

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SUDE-T1 | Start Time: 14:18 15:25 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: KW/MP | Finish Time: 15:18 16:25 | Pitot Check: 0.90
Client: St Marys Cement | Traverse: 3 + 4 | Traverse Dir.: N Sout | Date: Sept 30 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: _____ Bws: %6 dH@: ~~Sec~~ Y: Pase Pbar: 29 Pstatic: _____ CO2: _____ O2: _____ Pitot ID 71

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	ΔH @ °F	Comments
1	0	.82	1.05		251.27	263	239	247	52	78	75	—	44	
	2.5	.80	1.0	252.70	252.78	265	240	251	51	79	75	-7	50	
	5	.80	1.0		254.25	262	240	251	51	79	75	-7	50	
2	7.5	.80	1.0		255.71	262	241	249	52	80	81	-7	52	
	10	.74	1.0		257.16	264	240	251	51	80	75	-7	52	
	12.5	.76	1.0	258.56	258.64	263	241	251	52	80	75	-7	52	
3	15	.72	.92		260.06	262	240	249	52	80	75	-7	52	
	17.5	.74	.95		261.51	263	240	245	53	80	74	-7	54	
	20	.74	.95		262.92	264	239	254	53	80	74	-7	54	
4	22.5	.74	.95	264.29	264.35	264	239	250	53	80	74	-7	54	
	25	.74	.95		265.81	265	235	252	53	80	74	-7	54	
	27.5	.74	.95		267.20	265	241	252	54	81	74	-7	56	
5	30	.72	.92		268.62	264	240	250	54	81	74	-7	56	
	32.5	.70	.88		270.00	264	241	246	54	81	74	-7	56	
	35	.72	.86		271.40	266	239	252	54	81	74	-7	50	
6	37.5	.70	.88		272.74	265	241	252	51	81	74	-7	42	
	40	.66	.83		274.15	265	240	249	51	81	74	-7	42	
	42.5	.66	.83	275.45	275.50	264	240	248	51	81	74	-7	42	
7	45	.66	.83		276.83	264	240	252	49	81	74	-7	40	
	47.5	0.62	.78		278.16	264	240	251	49	81	74	-6	40	
	50	.62	.78		279.47	264	240	252	49	81	74	-6	40	
8	52.5	.62	.78		280.80	262	240	250	49	81	74	-6	40	
	55	.64	.81		282.10	262	240	252	48	81	74	-6	41	
	57.5	.66	.83		283.42	262	239	248	48	81	74	-6	41	
	60	—	—	—	284.77	—	—	—	—	—	—	—	—	
1	0	.66	.83		284.77	261	240	251	51	77	74	-7	43	
	2.5	.62	.78	285.07	286.10	261	240	245	50	77	74	-7		
	5	.62	.78		287.38	260	239	245	48	77	74	-7	44	
2	7.5	.64	.81		288.71	260	241	247	48	77	74	-7	45	
	10	.64	.81	90.01	290.00	261	240	252	48	77	74	-7	45	
	12.5	.64	.81		291.36	262	240	239	48	77	74	-7	45	
3	15	.68	.90		292.71	262	240	239	48	77	74	-7	45	
	17.5	.68	.90	294.04	294.04	262	241	250	49	77	74	-7	47	
	20	.68	.90		295.43	262	240	250	49	77	74	-7	47	
4	22.5	.72	.91		296.82	262	240	249	50	80	74	-7	48	
	25	.72	.91	88.17	298.20	262	240	251	50	80	74	-7	48	
	27.5	.72	.91		299.61	261	239	250	50	80	74	-7	50	
5	30	.72	.91		301.00	263	239	249	50	80	74	-7	50	
	32.5	.72	.91		302.40	263	240	250	50	80	74	-7	50	
	35	.73	.91		303.78	263	241	250	50	80	74	-7	50	
6	37.5	.73	.92		305.16	263	239	241	51	80	73	-7	52	
	40	.75	.95	306.52	306.55	263	240	250	51	80	73	-7	52	
	42.5	.75	.95	307.92	308.00	262	240	249	52	80	73	-7	53	
7	45	.75	.95	309.37	309.38	263	240	250	52	81	73	-7	53	
	47.5	.75	.95		310.77	263	238	251	52	81	73	-7	54	
	50	.76	.96		312.22	263	241	250	52	81	73	-7	54	
8	52.5	.76	.96		313.60	264	240	248	52	81	73	-7	54	
	55	.75	.95		315.00	263	236	239	52	81	72	-7	54	
	57.5	.75	.95		316.41	262	241	242	51	81	72	-7	55	
	60	—	—	—	317.81	—	—	—	—	—	—	—	—	

Pretest Leak Check Rate (cfm) 4.02 at 12 vacuum ("Hg) Leak Vol Start 317.81 Leak Vol. End 318.01
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 1 Test: SVOC-T2-Baseline

Filter ID: n/a

Sample Loc. Main - Baseline XAD Trap ID: #9

Train ID: #2

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Bis Cine	683.1	487.0	
2	ethyle Glycol	782.7	757.2	
3	empty	832.4	832.0	
4	Silica	855.2	846.1	
5	Cond.	271.3	270.4	
6	Trap	356.4	344.6	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1kg	1000.1	✓	MP
Post-weights	1kg	100.1	✓	MP

Comments:

Nozzle Measurements:
1
2
3
4

Avg

Signature

Date

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SUSC-T2 | Start Time: 8:57 10:04 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: KW/MP | Finish Time: 9:57 10:04 | Pitot Check: ✓
Client: St Marys Cement | Traverse: _____ | Traverse Dir.: _____ | Date: Oct 1 | Port length: 6" | Page: 1 of 7

Dn: .41 Cp: .838 Bws: %6 dH@: 1.77 Y: 0.993 MC-3 Pbar: _____ Pstatic: -.7 CO2: 16 O2: 15 Pitot ID 7'

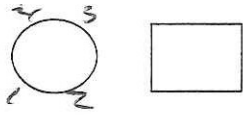
Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	XAD oF Comments
1	0	.87	1.1		363.87	255	240	249	45	52	52	/	41
	2.5	.87	1.1	65.34	365.37	255	240	249	44	53	52	-5	36
	5	.87	1.1	66.84	366.77	255	239	249	44	53	52	-5	36
2	7.5	.88	1.1		368.17	254	241	241	42	56	52	-5	36
	10	.87	1.1		369.59	255	239	250	42	54	52	-5	36
	12.5	.87	1.1		371.00	253	238	240	41	59	53	-5	36
3	15	.87	1.1		372.38	256	241	251	41	59	53	-5	36
	17.5	.87	1.1		373.91	257	241	249	41	59	53	-5	36
	20	.84	1.0		375.44	256	241	249	41	65	56	-5	37
4	22.5	.90	1.1		376.93	257	239	250	41	65	56	-5	37
	25	.90	1.1	78.43	378.36	257	241	251	41	65	56	-5	37
	27.5	.90	1.1		379.84	257	239	248	41	68	58	-5	38
5	30	.83	1.05		381.31	258	240	249	41	68	58	-5	39
	32.5	.84	1.05		382.75	258	241	251	41	70	59	-5	39
	35	.84	1.05		384.20	258	241	251	41	70	59	-5	39
6	37.5	.84	1.05		385.62	257	240	250	41	70	59	-5	39
	40	.84	1.05		387.04	258	240	250	41	70	59	-5	39
	42.5	.82	1.05		388.21	259	240	250	41	72	60	-5	38
7	45	.82	1.05		389.95	257	239	251	41	72	62	-5	38
	47.5	.76	1.0		391.36	258	240	250	41	72	62	-5	38
	50	.76	1.0		392.76	258	240	249	42	72	63	-5	39
8	52.5	.76	1.0	394.15	394.15	258	239	249	42	72	63	-5	39
	55	.76	1.0		395.58	259	240	250	42	73	63	-5	39
	57.5	.76	1.0		396.96	258	240	250	42	73	63	-5	39
	60	/	/	/	398.37	/	/	/	/	/	/	/	/
1	0	.74	1.0		398.37	260	240	250	44	69	62	-5	40
	2.5	.74	1.0		399.81	260	240	252	43	71	65	-5	40
	5	.79	1.0		401.25	259	240	252	43	71	65	-5	40
2	7.5	.79	1.0	2.70	402.68	259	239	248	42	72	65	-5	40
	10	.80	1.0		404.12	259	241	250	42	73	65	-5	40
	12.5	.80	1.0		405.57	258	240	250	42	73	65	-5	40
3	15	.80	1.0		407.00	259	238	251	42	73	65	-5	40
	17.5	.84	1.1		408.41	258	240	251	42	73	65	-5	40
	20	.84	1.1		409.90	258	242	249	42	73	65	-5	40
4	22.5	.84	1.1	411.33	411.33	258	240	250	42	73	65	-5	40
	25	.86	1.1	412.78	412.88	258	240	249	42	76	66	-5	41
	27.5	.88	1.1		414.38	259	239	250	42	76	66	-5	41
5	30	.88	1.1		414.88	259	241	251	43	76	67	-5	42
	32.5	.88	1.1	416.39	416.39	259	240	250	43	76	67	-5	42
	35	.88	1.1		418.87	258	240	252	43	76	67	-5	42
6	37.5	.88	1.1		420.25	258	239	250	44	76	67	-5	42
	40	.88	1.1		421.75	259	240	250	45	76	67	-5	42
	42.5	.88	1.1		423.24	257	240	250	45	76	67	-5	42
7	45	.90	1.1		424.70	259	241	250	45	76	67	-5	42
	47.5	.90	1.1		426.15	259	241	250	45	76	67	-5	42
	50	.90	1.1		427.65	256	239	250	45	78	69	-6	45
8	52.5	.90	1.1		429.13	256	241	250	45	78	69	-6	45
	55	.90	1.1		430.60	256	241	251	45	78	69	-6	45
	57.5	.90	1.1		432.10	258	239	251	45	78	69	-6	45
	60	/	/	/	433.53	/	/	/	/	/	/	/	/

Pretest Leak Check Rate (cfm) 4.01 at 13 vacuum ("Hg) Leak Vol Start 363.60 Leak Vol. End 363.87
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SUDC M29-T2 | Start Time: 11:16 12:21 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: _____ | Finish Time: 12:16 13:21 | Pitot Check: OKO
Client: St Marys Cement | Traverse: 3/4 | Traverse Dir.: _____ | Date: OCT 1 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: _____ Bws: see case 1 %6 dH@: _____ Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID 7'

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	X140 oF Comments
1	0	.85	1.1		426.53	238	242	248	53	71	70	/	60
	2.5	.85	1.1		434.99	254	240	250	55	71	70	-6	60
	5	.66	1.1		436.42	255	239	250	49	75	70	-6	48
2	7.5	.82	1.0		437.85	258	240	251	49	75	70	-6	48
	10	.83	1.0		439.30	257	241	251	49	75	70	-6	48
	12.5	.84	1.0		440.75	258	240	250	51	79	71	-6	52
3	15	.82	1.0		442.20	257	240	250	51	79	71	-6	52
	17.5	.82	1.0		443.64	257	239	250	51	79	71	-6	52
	20	.84	1.0		445.10	257	240	250	52	80	72	-6	53
4	22.5	.87	1.0		446.53	257	240	250	52	80	72	-6	53
	25	.82	1.0		448.00	256	239	250	53	81	72	-6	57
	27.5	.82	1.0		449.46	256	240	250	53	81	72	-6	57
5	30	.82	1.0		450.95	256	240	250	53	81	72	-6	57
	32.5	.82	1.0		452.40	[illegible]	240	252	53	81	72	-6	57
	35	.82	1.0		453.95	257	241	250	55	81	73	-6	59
6	37.5	.76	1.0		455.40	256	239	251	56	81	73	-6	60
	40	.76	1.0		456.74	256	239	251	56	81	73	-6	60
	42.5	.76	1.0		458.17	258	239	256	56	81	73	-6	60
7	45	.66	.86		459.65	257	238	251	56	81	73	-6	60
	47.5	.67	.86		461.00	257	241	240	56	81	73	-6	62
	50	.66	.85	462.32	462.32	257	241	250	57	81	73	-6	62
8	52.5	.75	.97		463.70	257	240	250	57	81	73	-6	62
	55	.75	.97		465.05	257	240	250	57	81	73	-6	60
	57.5	.75	.97		466.50	256	240	250	56	81	73	-6	47
	60	/	/	/	467.92	/	/	/	/	/	/	/	/
1	0	0.68	.87		467.92	250	235	250	53	76	74	-6	49
	2.5	.68	.87	469.25	469.20	257	240	250	53	76	74	-6	46
	5	.68	.87		470.64	257	240	250	53	76	74	-6	46
2	7.5	.72	.96	471.97	471.97	256	240	252	53	76	74	-6	46
	10	.72	.96	473.33	473.36	256	239	250	49	81	74	-6	47
	12.5	.72	.96		474.72	257	235	245	49	81	74	-6	47
3	15	.72	.96	476.08	476.20	257	235	249	49	81	74	-6	47
	17.5	.72	.96	477.50	477.60	257	232	250	49	81	74	-6	47
	20	.72	.96	478.96	478.96	257	242	250	49	81	74	-6	47
4	22.5	.72	.96		480.32	256	238	250	48	81	74	-6	47
	25	.79	1.0		481.70	257	238	250	49	81	74	-6	47
	27.5	.79	1.0		483.15	257	242	250	49	81	74	-6	47
5	30	.81	1.0		484.60	257	240	249	49	81	74	-6	47
	32.5	.81	1.0		486.02	257	238	250	49	81	74	-6	47
	35	.82	1.0		487.45	258	240	250	49	81	74	-6	47
6	37.5	.82	1.0		488.91	257	239	249	51	82	75	-6	46
	40	.82	1.0		490.35	250	241	251	51	82	75	-6	46
	42.5	.82	1.0		491.77	258	249	251	51	82	75	-6	46
7	45	.84	1.0		493.27	257	249	251	51	82	75	-6	46
	47.5	.84	1.0		494.15	255	245	251	51	82	75	-6	46
	50	.84	1.0		497.52	257	249	251	51	82	75	-6	46
8	52.5	.84	1.0		[illegible]	257	249	251	52	82	75	-6	49
	55	.84	1.0		498.95	257	249	251	54	82	75	-6	53
	57.5	.44	1.0		500.36	257	249	251	54	82	75	-6	53
	60	/	/	/	501.80	/	/	/	/	/	/	/	/

Thermocouple Calibration

Pretest Leak Check Rate (cfm) 2.02 at 12 vacuum ("Hg) Leak Vol Start 501.80 Leak Vol. End 501.92 Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____ % Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 2 Test: SUC-T3 - Baseline

Filter ID: n/a

Sample Loc. Main XAD Trap ID: # 2

Train ID: #3

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Big Imp	690.9	487.3	
2	Eagle Claw	777.5	754.8	
3	empty	633.3	633.1	
4	Silica	853.7	843.1	
5	Cond.	319.0	318.2	
6	Trap	357.2	344.3	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights				

Comments:

Nozzle Measurements:
1
2
3
4

Avg

Signature

Date

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: T3 | Start Time: 8:08 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: NL/MS | Finish Time: _____ | Pitot Check: _____
Client: St Marys Cement | Traverse: 2 | Traverse Dir.: OUT | Date: Oct 2 '18 | Port length: 6" | Page: 1 of 2

Dn: 0.211 | Cp: 0.84 | Bws: %6 | dH@: 1.79 | Y: ~~1.000~~ 0.993 | Pbar: 29.55 / 36.30 | Pstatic: _____ | CO2: _____ | O2: _____ | Pitot ID _____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	0.88	0.9		502.35	254	238	248	45	57	56	5	40 8:08
	2.5	0.85	1.1	502.50	503.50	253	240	248	44	57	56	5	35
	5	0.82	1.12	504.58	505.16	253	242	251	44	58	56	5	36
2	7.5	0.92	1.2	506.66	506.66	255	240	249	43	60	56	5	52
	10	0.88	1.15	508.20	508.17	254	240	250	43	61	57	5	35
	12.5	0.86	1.15	509.64	509.70	252	241	251	43	63	57	5	35
3	15	0.83	1.07	510.80	511.15	253	241	251	43	64	57	5	36
	17.5	0.84	1.08	512.65	512.67	254	240	250	44	65	58	5	35
	20	0.85	1.12		514.13	253	239	250	43	66	58	5	33
4	22.5	0.84	1.1	515.62	515.67	255	239	250	43	68	59	5	36
	25	0.85	1.1	517.11	517.10	256	240	251	43	69	59	5	36
	27.5	0.84	1.1	518.59	518.56	255	238	249	44	70	60	5	36
5	30	0.83	1.1	520.06	520.02	256	239	250	43	70	60	5	36
	32.5	0.83	1.1	521.46	521.55	256	240	249	43	71	61	5	36
	35	0.83	1.1	523.08	522.96	257	242	250	43	72	62	5	37
6	37.5	0.82	1.05	524.45	524.42	256	239	249	43	72	62	5	37
	40	0.83	1.07	525.87	525.88	256	240	249	43	73	62	5	36
	42.5	0.82	1.05	527.33	527.34	256	240	250	43	74	63	5	36
7	45	0.83	1.07	528.79	528.80	256	240	250	42	74	63	5	36
	47.5	0.75	0.93		530.21	255	241	251	42	75	64	5	36
	50	0.73	0.93	531.64	531.67	255	239	249	42	75	64	5	36
8	52.5	0.76	0.99	533.07	533.06	255	239	249	42	76	65	5	36
	55	0.79	0.99	534.47	534.50	255	240	249	42	77	65	5	36
	57.5	0.77	0.97	535.91	535.91	254	240	251	42	77	66	5	36
	60				537.34								9:08
1	0	0.85	1.12		537.34	254	241	250	48	70	68	5	41 9:16
	2.5	0.84	1.1	538.81	538.83	254	240	252	45	73	68	5	37
	5	0.84	1.1		540.30	254	240	253	44	74	68	6	35
2	7.5	0.9	1.1	541.76	541.76	255	240	249	44	74	68	6	36
	10	0.84	1.1	543.19	543.28	256	239	251	44	75	68	6	37
	12.5	0.83	1.05	544.75	544.77	256	241	251	44	76	68	6	38
3	15	0.8	1.0	546.23	546.24	255	239	250	44	77	69	6	38
	17.5	0.8	1.0	547.69	547.67	256	240	249	45	78	69	6	38
	20	0.78	0.99	549.13	549.13	257	240	249	45	78	69	6	38
4	22.5	0.78	0.99	550.55	550.57	254	239	251	46	79	70	6	38
	25	0.79	0.99	551.99	552.00	255	240	250	45	79	70	6	38
	27.5	0.77	0.99		553.42	255	240	250	45	80	70	6	38
5	30	0.74	1.0		554.86	255	239	250	45	80	71	6	38
	32.5	0.76	1.0		556.30	254	240	249	45	81	71	6	38
	35	0.78	1.0	557.70	557.73	255	240	248	45	81	71	6	38
6	37.5	0.78	0.99		559.20	254	240	247	45	81	71	6	38
	40	0.73	0.94	560.65	~~559.20~~	255	240	250	46	81	71	6	40
	42.5	0.73	0.94		562.05	256	240	250	46	82	72	6	41
7	45	0.65	0.82	563.41	563.47	256	239	249	48	82	73	6	41
	47.5	0.65	0.82		564.81	257	240	250	47	82	73	6	41
	50	0.67	0.82	566.09	566.15	256	240	249	47	83	73	6	46
8	52.5	0.65	0.80	567.46	567.47	257	241	250	48	83	74	6	48
	55	0.65	0.8		568.79	257	239	249	49	83	74	6	48
	57.5	0.65	0.8		570.10	256	240	249	49	83	74	6	48
	60				571.39								10:16

Pretest Leak Check Rate (cfm) .1 at 15 vacuum ("Hg) | Leak Vol Start 502.00 | Leak Vol. End 502.35
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration
Ambient temp 7 | Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: 13 | Start Time: 10:31 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: MC/MP | Finish Time: 12:49 | Pitot Check: ✓
Client: St Marys Cement | Traverse: 4 | Traverse Dir.: DUT | Date: 10/2/18 | Port length: 6" | Page: 2 of 2

Dn: .211 Cp: .84 Bws: %6 dH@: 1.8 Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID_____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	0.81	1.04		571.4	256	240	245	53	76	75	6	54
	2.5	0.81	1.04		572.88	254	240	250	52	77	75	6	55
	5	0.85	1.1	573.32	574.35	256	238	250	52	78	74	6	54
2	7.5	0.85	1.1	575.85	575.84	256	240	248	53	79	74	6	55
	10	0.8	1.03	577.32	577.33	252	240	250	52	79	74	6	55
	12.5	0.83	1.04		578.80	254	240	244	53	80	74	6	56
3	15	0.85	1.05		580.27	255	240	244	53	80	74	6	56 Ice
	17.5	0.83	1.05		581.76	255	240	248	50	81	74	6	40
	20	0.83	1.05		583.25	254	240	251	50	81	74	6	38
4	22.5	0.83	1.05	584.71	584.75	254	240	250	48	82	75	6	37
	25	0.83	1.05		586.22	251	240	248	48	82	75	6	37
	27.5	0.83	1.05		587.69	253	240	248	47	82	75	6	37
5	30	0.78	1.0		589.15	255	242	250	47	82	75	6	37
	32.5	0.78	1.0		590.63	253	240	248	47	83	75	6	37
	35	0.78	1.0	592.05	592.08	250	240	248	47	83	75	6	37
6	37.5	0.7	0.9		593.52	253	240	248	47	83	75	6	37
	40	0.76	0.98		594.77	253	240	247	46	83	75	6	38
	42.5	0.76	0.98		596.35	253	241	250	46	83	75	6	37
7	45	0.74	0.96		597.78	257	241	250	46	83	75	6	37
	47.5	0.74	0.96		599.22	257	240	250	46	83	75	6	38
	50	0.74	0.96		600.64	256	240	250	46	84	76	6	38
8	52.5	0.74	0.96		602.07	257	240	250	46	84	76	6	38
	55	0.74	0.96		603.49	253	241	244	47	84	76	6	39
	57.5	0.74	0.96		604.90	258	240	247	48	84	76		40
	60				606.33								
1	0	0.76	0.98		606.33	258	240	250	52	78	78	6	41
	2.5	0.76	0.98		607.78	256	241	249	51	79	77	6	41
	5	0.76	0.98	609.18	609.24	254	242	245	50	80	76	6	40
2	7.5	0.74	0.96		610.68	253	243	249	50	80	76	6	41
	10	0.74	0.96		612.15	252	243	247	49	81	76	6	43
	12.5	0.74	0.96	613.52	613.55	254	239	248	49	81	76	6	43
3	15	0.74	0.96		614.97	254	240	249	49	82	76	6	44
	17.5	0.76	0.98		616.39	254	239	250	49	82	76	6	45
	20	0.76	0.98		617.83	254	240	251	49	82	76	6	46
4	22.5	0.81	1.02		619.26	254	241	250	49	82	76	6	46
	25	0.81	1.02	620.70	620.74	254	243	251	50	82	77	6	47
	27.5	0.79	1.0		622.21	254	245	250	52	83	77	6	47
5	30	0.84	1.07		623.65	260	241	251	51	83	77	6	44
	32.5	0.84	1.07		625.14	260	242	250	52	84	77	6	51
	35	0.84	1.07		626.103	260	244	250	51	84	77	6	51
6	37.5	0.87	1.12		628.15	260	244	250	51	84	77	6	50
	40	0.87	1.12	629.62	629.64	260	245	250	52	85	77	6	50
	42.5	0.87	1.12		631.15	260	245	250	52	85	78	6	50
7	45	0.87	1.12		632.62	260	245	250	52	85	78	6	48
	47.5	0.85	1.09		634.19	261	245	251	53	85	78	6	46
	50	0.85	1.09		635.68	261	245	250	53	85	78	6	45
8	52.5	0.85	1.09		637.18	261	245	250	53	85	78	6	45
	55	0.83	1.05		638.68	261	245	250	56	86	78	6	48
	57.5	0.83	1.05		640.16	261	245	250	54	86	79	6	50 12:40
	60				641.65								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____ Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) .013 at 15 vacuum ("Hg) Leak Vol Start 641.65 Leak Vol. End 641.81 % Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: '1804600 Client: St. Marys Cement

Date: ~~Oct 3/18~~ Oct 5/18 Test: LCF ~~AH~~ fuels - T1 - M29

Filter ID: 18072361

Sample Loc. Main Stack XAD Trap ID:

Train ID:

Pre-weights By: KME Post-weights By: KME

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	5% HNO_3/10% H_2O_2	890.5	709.8	
2	"	765.2	742.7	
3	empty	640.2	637.7	
4	4% KMnO4/10% H_2SO_4	746.1	~~773.6~~	763.4
5	"	756.4	~~760~~	757.2
6	Silica	874.8	~~856.2~~	853.6
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1kg	1000.0	✓	KME
Post-weights				

Comments:

Nozzle Measurements:
1 0.210
2 0.210
3 0.211
4 0.210

Avg 0.210

Signature

Oct 5
Date

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature:

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T1 | Start Time: 8:44 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: SDF | Finish Time: | Pitot Check: GOOD
Client: St Marys Cement | Traverse: 1-2 | Traverse Dir.: IN-OUT | Date: 10/05/18 | Port length: 6" | Page: 1 of 2

Dn: .21 | Cp: 6.83 | Bws: %6 0.99 | dH@: 1.74 | Y: 0.998 F | Pbar: | Pstatic: -0.7 | CO2: 12 | O2: 15 | Pitot ID: 71

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.85			525.39	254	256	250	43	52	52		
	2.5	.85	1.00	527.21	527.18	256	249	250	42	53	52	-0	
	5	.85	1.00	528.61	528.60	256	250	247	41	53	52	-0	
2	7.5	.85	1.00	530.03	530.04	256	251	250	40	61	59	-0	TEST PAUSED
	10	.85	1.00	531.48	531.43	256	249	250	37	62	58	-0	@ 8:50
	12.5	.85	1.00	532.92	532.87	256	250	250	37	62	58	-0	RESUMED @ 9:32
3	15	.85	1.00	534.31	534.30	256	250	249	37	66	60	-0	
	17.5	.80	.95		535.91	258	250	251	37	67	60	-0	
	20	.80	.95	537.32	537.29	257	258	249	38	68	60	-0	
4	22.5	.80	.95	538.70	538.66	259	250	250	39	69	61	-0	
	25	.75	.92		540.11	258	251	251	39	71	62	-0	
	27.5	.75	.92	541.47	541.46	257	250	250	38	70	62	-0	
5	30	.75	.92		542.79	252	250	250	38	70	62	-0	
	32.5	.75	.92		544.12	257	250	250	38	70	62	-0	
	35	.75	.92		545.50	256	250	248	39	70	62	-0	
6	37.5	.75	.92	546.86	546.85	256	249	247	39	71	64	-0	
	40	.75	.92	548.22	548.19	255	251	249	35	76	69	-0	
	42.5	.75	.92		549.56	257	250	250	40	71	64	-0	
7	45	.69	.74	550.93	550.97	255	249	248	40	71	65	-0	
	47.5	.69	.75	552.17	552.14	255	250	248	40	71	65	-0	
	50	.69	.75	553.39	553.39	255	251	249	40	72	65	-0	
8	52.5	.67	.75	554.64	554.64	255	251	250	40	72	66	-0	
	55	.67	.75	555.89	555.90	255	250	249	40	72	66	-0	
	57.5	.67	.75		557.15	255	249	249	40	73	66	-0	
	60	.70		558.40	558.42								
1	0	.67	.75		558.42	255	250	250	42	71	67	-0	
	2.5	.67	.75		559.67	255	250	250	41	72	67	-0	
	5	.67	.75	560.89	560.88								
2	7.5				562.12								
	10	.60	.72		563.35	255	250	249	41	73	69	-0	
	12.5	.66	.72	564.61	564.63	255	250	249	41	74	69	-0	
3	15	.70	.86	565.86	565.87	255	250	249	41	76	69	-0	
	17.5	.71	.88	567.15	567.15	255	250	250	41	74	69	-0	
	20	.72	.88		568.50	255	249	249	43	75	69	-0	
4	22.5	.72	.88	569.85	569.82	255	250	251	43	75	69	-0	
	25	.72	.88	571.15	571.19	255	249	250	41	[illegible]	[illegible]	-0	71
	27.5	.72	.87	572.37	572.40	255	250	250	41	72	70	-0	
5	30	.73	.96	573.63	573.63	256	250	250	42	73	70	-0	
	32.5	.80	1.05	575.27	575.28	253	251	250	42	75	70	-0	
	35	.80	1.05	576.66	576.66	256	250	249	42	76	70	-0	
6	37.5	.8	1.05		578.12	256	251	251	42	76	70	-0	
	40	.8	1.05	579.58	579.55	256	251	250	43	75	71	-0	
	42.5	.8	1.05	580.98	581.0	255	250	250	42	76	71	-0	
7	45	.8	1.05	582.43	582.43	255	250	250	43	75	71	-0	
	47.5	.8	1.05	583.86	583.89	256	255	250	44	76	71	-0	
	50	.8	1.05		585.30	255	251	249	43	76	71	-0	
8	52.5	.80	1.05	586.73	586.73	255	249	248	43	77	71	-0	
	55	.80	1.05		588.10	255	249	249	43	77	71	-0	
	57.5	.80	1.05		589.60	254	250	250	43	75	73	-0	
	60				591.02								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) <.02 at 10 vacuum ("Hg") | Leak Vol Start 575.77 | Leak Vol. End 575.78 | Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg") | Leak Vol Start _____ | Leak Vol. End _____ | % Difference _____

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature:

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T1 | Start Time: 11:42 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDF | Finish Time: 13:58 | Pitot Check: Good
Client: St Marys Cement | Traverse: _____ | Traverse Dir.: IN-OUT SAME AS PG# 1 | Date: 10/05/18 | Port length: 6" | Page: 2 of 2

Dn: ~ | Cp: ~ | Bws: %6 | dH@: — | Y: — | Pbar: — | Pstatic: ~0.7 | CO2: — | O2: — | Pitot ID: —

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.83	1.05		591.03	255	250	250	41	74	72		
	2.5	.83	1.08	592.48	592.43	256	251	252	43	73	71		
	5	.83	1.08	593.88	593.89	255	249	251	46	74	71		
2	7.5	.83	1.08		595.37	256	251	236	44	76	71		
	10	.83	1.1	596.82	596.75	256	248	256	40	75	72		
	12.5	.83	1.08	598.30	598.24	256	246	241	46	75	72		
3	15	.82	1.08	599.69	599.66	256	255	247	39	75	72		
	17.5	.82	1.08		601.38	256	265	247	36	75	73		
	20	.82	1.08		603.50	256	251	249	37	75	72		
4	22.5	.82	1.08	604.98	604.92	255	248	246	38	76	72		60 & 60
	25	.82	1.08	605.55	605.59	255	250	254	38	76	72		
	27.5	.82	1.08	607.33	607.35	255	250	247	36	76	72		
5	30	.82	1.08	608.81	608.78	255	250	247	38	76	72		
	32.5	.82	1.08	610.24	610.27	255	251	249	37	76	72		
	35	.82	1.08		611.77	255	251	245	37	76	72		
6	37.5	.82	1.0		613.16	255	249	247	37	76	72		
	40	.70	.90		614.66	255	245	247	37	76	72		
	42.5	.70	.90		616.06	255	245	245	37	76	72		
7	45	.70	.86		617.34	250	250	250	38	76	72		
	47.5	.70	.86		618.67	256	251	250	38	76	72		
	50	.70	.86		620.00	265	250	250	39	76	72		
8	52.5	.70	.86		621.32	273	251	251	40	76	72		
	55	.70	.86			273	251	251	40	76	72		
	57.5	.70	.86		623.95	296	252	256	40	76	72		
	60				625.27								
1	0	.70	.86		625.27	292	251	254	40	77	72		
	2.5	.80	.92	626.58	626.60	287	251	250	41	73	71		
	5	.80	.92	628.00	627.91	277	249	253	46	73	71		
2	7.5	.80	.92		629.60	275	249	251	43	73	72		
	10	.80	.92	630.81	630.78	270	249	249	43	77	72		
	12.5	.76	.92	632.20	632.13	264	250	249	44	76	73		
3	15	.76	.92	633.52	633.48	265	251	250	44	77	73		
	17.5	.76	.95	634.87	634.85	262	249	247	45	79	75		
	20	.76	.95	636.25	636.24	267	249	251	45	79	74		
4	22.5	.76	.95		637.63	267	250	251	45	79	74		
	25	.76	.95	639.03	639.01	260	252	247	47	79	76		
	27.5	.76	.95		640.4	258	250	252	46	79	76		
5	30	.76	.95	641.80	641.79	258	250	252	46	79	76		
	32.5	.86	1.05		643.18	257	250	252	46	80	75		
	35	.86	1.05	644.61	644.61	257	250	252	40	80	75		
6	37.5	.86	1.05		646.04	255	249	251	40	80	75		
	40	.80	1.05	647.45	647.50	255	249	251	46	80	76		
	42.5	.90	1.05		648.93	250	250	253	47	83	77		
7	45	.86	1.05	650.37	650.37	252	249	249	47	83	77		
	47.5	.90	1.05		651.80	252	250	249	45	83	77		
	50	.86	1.05	653.24	653.20	252	250	251	45	83	77		
8	52.5	.80	1.05		654.70	252	250	251	45	83	77		
	55	.80	1.05		656.12	251	247	248	44	83	77		
	57.5	.80	1.05		657.54	251	248	248	44	83	77		
	60				659.00								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____ | Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) <.01 at 9 vacuum ("Hg) | Leak Vol Start 659.00 | Leak Vol. End 659.17 | % Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 9/24 Test: LCF - M29 T2

Filter ID: 18072362

Sample Loc. Main Stack XAD Trap ID: n/a

Train ID: n/a

Pre-weights By: KME Post-weights By: KME

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	H2O2 / H2O	949.8	743.0	
2	" "	788.1	741.8	
3	empty	643.3 ~~648.4~~	637.0	
4	KMnO4 / H2SO4	765.0	765.3	
5	" "	742.4	742.0	
6	Silica	981.5	961.0	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1kg	1000.0	✓	KME
Post-weights	1kg	1000.0	✓	KME

Comments:

Nozzle Measurements:
1
2
3
4

Avg

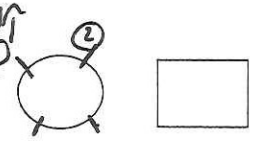
Signature

Date

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature:



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T2 | Start Time: 9:25 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDP | Finish Time: | Pitot Check: Good
Client: St Marys Cement | Traverse: 1-2 | Traverse Dir.: IN-OUT | Date: Oct 9/2024 | Port length: 6" | Page: 1 of 7

Dn: .21 | Cp: .8 | Bws: %6 | dH@: .998 | Y: 1.82 | Pbar: 30 | Pstatic: -.07 | CO2: 12.0 | O2: 6 | Pitot ID: 7-1

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.74	.91		693.17	255	249	250	40	72	72		
	2.5	.74	.95	694.56	694.60	255	250	250	40	72	77	0	
	5	.74	.95		695.97	257	249	250	56	73	72	0	
2	7.5	.74	.95	697.36	697.35	258	251	251	55	74	77	0	
	10	.70	.90		698.72	254	250	252	50	75	77	0	
	12.5	.70	.90	700.06	700.05	257	250	253	55	76	73	0	
3	15	.70	.90		701.41	257	252	247	56	78	73	0	
	17.5	.70	.90	702.75	702.76	253	250	249	56	77	73	0	
	20	.70	.90		704.13	253	251	251	56	77	73	0	
4	22.5	.70	.90	705.47	705.49	255	251	247	56	77	74	0	
	25	.75	.95		706.88	255	250	251	56	78	74	0	
	27.5	.75	.93	708.19	708.23	252	250	251	56	75	74	0	
5	30	.75	.93		709.62	253	251	251	56	79	74	0	
	32.5	.76	.90	710.97	711.00	253	251	250	56	79	74	0	
	35	.70	.90		712.36	254	250	250	56	80	75	0	
6	37.5	.70	.90	713.71	713.71	253	249	252	56	80	75	0	
	40	.70	.90		715.06	255	251	250	56	80	75	0	
	42.5	.70	.90	716.41	716.41	253	250	249	57	81	75	0	
7	45	.65	.85		717.77	254	250	252	56	80	75	0	
	47.5	.65	.85	719.07	718.	253	249	249	55	80	76	0	
	50	.65	.85		720.42	254	249	253	55	80	76	0	
8	52.5	.65	.83	721.72	721.75	253	249	248	56	81	76	0	
	55	.65	.83		723.04	253	250	249	56	81	76	0	
	57.5	.67	.79	724.34	724.34	253	250	250	57	81	77	0	
	60				725.61	253	249	252	55	81	77	0	-> START TIME 10:31
1	0	.62	.79		725.61	253	250	251	55	81	77	0	
	2.5	.62	.79	726.58	726.57	253	252	248	56	81	77	0	
	5	.62	.79		728.14	252	249	250	55	81	77	0	
2	7.5	.62	.79	729.91	729.93	252	249	250	55	81	77	0	
	10	.62	.79		730.31	253	250	251	55	82	77	0	
	12.5	.62	.79	731.99	731.99	252	249	248	55	82	78	0	
3	15	.70	.90		733.25	252	249	247	55	83	78	0	
	17.5	.70	.90	734.61	734.62	253	249	251	55	82	78	0	
	20	.70	.90		735.97	251	251	249	56	82	78	0	
4	22.5	.70	.90	737.33	737.37	252	249	251	55	82	78	0	
	25	.66	.85		738.67	251	250	251	56	82	78	0	
	27.5	.66	.85		740.00	251	250	251	56	82	78	0	
5	30	.66	.85	741.32	741.31	251	250	251	56	82	78	0	
	32.5	.66	.85		742.63	251	250	250	56	82	78	0	
	35	.70	.90	743.95	743.94	252	250	250	56	82	78	0	
6	37.5	.70	.90		745.29	252	250	250	56	82	78	0	
	40	.70	.90	746.65	746.65	253	251	247	57	82	79		
	42.5	.70	.90		748.01	252	250	251	57	82	79	0	
7	45	.70	.90	749.37	749.38	252	249	250	58	83	79	0	
	47.5	.70	.90		750.75	253	250	248	58	83	79	0	
	50	.70	.90	752.11	752.11	255	248	250	58	83	79	0	
8	52.5	.70	.90		753.29	252	250	251	58	83	79	0	
	55	.70	.90	754.55	754.52	252	250	251	58	83	79	0	
	57.5	.70	.90		756.28	252	250	251	58	83	79	0	
	60				757.54								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) 4.01 at 12 vacuum ("Hg) | Leak Vol Start 690.90 | Leak Vol. End 693.12 | Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____ | % Difference _____

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature:

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: M29-T2 | Start Time: 11:40 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: JDF | Finish Time: 13:52 | Pitot Check: Good
Client: St Marys Cement | Traverse: 3-4 | Traverse Dir.: OUT-IN | Date: 10/09/15 | Port length: 6" | Page: 2 of 2

SAME AS PG# 1

Dn: — Cp: — Bws: %6 dH@: — Y: — Pbar: — Pstatic: — CO2: — O2: — Pitot ID —

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.75	.96		757.57	251	250	250	[illegible]	80	80	-	
	2.5	.75	.96	758.98	759.00	251	250	250	55	82	81	Ø	
	5	.75	.96		760.38	252	249	249	58	83	80	Ø	
2	7.5	.75	.96	761.79	761.79	252	250	250	58	83	80	Ø	
	10	.75	.96		763.17	251	249	249	55	84	81	Ø	
	12.5	.75	.96	764.58	764.58	252	249	249	54	84	81	Ø	
3	15	.75	.96		765.97	253	249	250	53	85	81	Ø	
	17.5	.75	.96	767.38	767.36	251	249	251	53	85	81	Ø	
	20	.75	.96		768.75	252	250	250	53	85	81	Ø	
4	22.5	.75	.96	770.17	770.17	252	250	250	53	85	81	Ø	
	25	.75	.96		771.58	252	246	250	52	86	82	Ø	
	27.5	.65	.85	772.95	772.93	253	248	251	53	86	82	Ø	
5	30	.65	.85		774.26	252	249	252	53	86	82	Ø	
	32.5	.65	.85	775.51	775.60	252	251	246	52	86	82	Ø	
	35	.65	.85	776.91	776.91	252	251	247	52	86	82	Ø	
6	37.5	.65	.85		778.22	251	251	249	53	86	82	Ø	
	40	.65	.85		779.55	250	251	248	53	86	82	Ø	
	42.5	.65	.85		780.88	252	252	251	55	86	83	Ø	
7	45	.65	.85	782.19	782.20	252	252	251	55	86	82	Ø	
	47.5	.60	.80		783.51	251	250	250	54	87	83	Ø	
	50	.60	.80	784.78	784.80	250	249	248	55	87	83	Ø	
8	52.5	.65	.73		786.09	251	250	249	55	87	83	Ø	
	55	.55	.75	787.30	787.29	250	251	251	55	86	83	Ø	
	57.5	.55	.73		788.50	252	250	247	55	86	83	Ø	
	60				789.72								
1	0	.75	.96		789.73	251	250	250	55	80	83	—	12:51 START
	2.5	.75	.96	791.15	791.12	253	250	250	59	85	82	Ø	
	5	.75	.96		792.52	252	249	248	58	85	84	Ø	-2792.53 (GMR-ACTUAL)
2	7.5	.75	.96	793.95	793.95	254	251	253	57	86	84	Ø	
	10	.75	.96		795.34	255	251	251	57	85	84	Ø	
	12.5	.80	1.05	796.76	796.74	256	249	251	57	88	85	Ø	
3	15	.80	1.05		798.19	255	249	250	57	88	85	Ø	
	17.5	.80	1.05	799.65	799.65	256	252	251	59	91	85	Ø	
	20	.80	1.05		801.12	255	250	250	58	92	85	Ø	
4	22.5	.80	1.05	802.59	802.59	251	250	250	58	92	85	Ø	
	25	.80	1.05		804.04	255	250	250	58	93	86	Ø	
	27.5	.75	.96	805.51	805.51	256	250	250	58	93	86	Ø	
5	30	.75	.96		806.95	253	251	252	58	94	87	Ø	
	32.5	.75	.96	808.40	808.38	253	251	252	58	94	87	Ø	
	35	.75	.96		809.76	252	251	251	59	94	88	Ø	
6	37.5	.75	.96	811.23	811.20	252	251	251	59	94	88	Ø	
	40	.75	.96		812.63	251	249	250	60	95	89	Ø	
	42.5	.75	.96	814.07	814.07	251	249	250	60	95	89	Ø	
7	45	.75	.96		815.46	252	249	249	61	95	90	Ø	
	47.5	.75	.96	816.90	816.87	252	251	250	61	95	90	Ø	
	50	.75	.96		818.28	255	250	249	62	96	91	Ø	
8	52.5	.75	.96	819.72	819.71	252	250	249	62	96	91	Ø	
	55	.75	.96		821.13	251	250	250	62	96	91	Ø	
	57.5	.75	.96	822.57	822.56	253	250	250	62	96	91	Ø	
	60				823.98								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) 2.01 at 12 vacuum ("Hg) Leak Vol Start 23.58 Leak Vol End 24.12 Ambient temp — Probe Temp —
Posttest Leak Check Rate (cfm) — at — vacuum ("Hg) Leak Vol Start — Leak Vol End — % Difference —

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 9/2018 Test: LCF-M29-T3

Filter ID: 18072303

Sample Loc. Mainstack XAD Trap ID: n/a

Train ID: n/a

Pre-weights By: KME Post-weights By: _____

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	5% HNO3/4% H2O2	~~807.8~~ 920.6	725.0	
2	" "	802.8	755.5	
3	empty	636.3	632.8	
4	4% KMnO4/10% H2SO4	736.7	733.5	
5	" "	757.1	759.3	
6	Silica	918.7	893.7	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights				

Comments:

Nozzle Measurements:
1 _____
2 _____
3 _____
4 _____

Avg

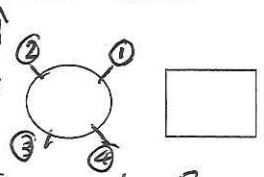
_____ Signature

_____ Date

81-82
63.22

— Isokinetic Sampling Train Data Sheet —

Operator Signature:



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: LCF M29-T3 | Start Time: 14:36 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: SDF | Finish Time: | Pitot Check: Good
Client: St Marys Cement | Traverse: 1-2 | Traverse Dir.: IN->OUT | Date: 10/09/15 | Port length: 6" | Page: 1 of 2

Dn: .210 | Cp: .824 | Bws: %6 | dH@: .099 | Y: 1.82 | Pbar: 30 | Pstatic: -0.7 | CO2: 1.20 | O2: 16 | Pitot ID: 7'

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.75	1.00		824.25	252	250	251	69	91	91		
	2.5	.75	1.00	825.68	825.73	252	250	251	65	91	91	0	
	5	.75	1.00		827.17	250	248	251	57	91	91	0	
2	7.5	.75	1.00	828.60	828.63	250	249	250	56	89	90	0	
	10	.75	1.00		830.10	253	250	251	55	92	98	0	
	12.5	.75	1.00	831.53	831.56	252	250	255	55	93	91	0	
3	15	.70	.95		833.02	252	250	250	55	93	91	0	
	17.5	.70	.95	834.41	834.44	251	250	250	55	93	91	0	
	20	.70	.95		835.86	253	249	251	55	93	91	0	
4	22.5	.70	.95		837.26	253	250	249	56	95	90	0	
	25	.70	.94	838.65	838.70	254	250	248	55	94	91	0	
	27.5	.70	.94		840.10	255	250	249	55	95	90	0	
5	30	.70	.94	841.49	841.50	255	250	250	56	95	90	0	
	32.5	.70	.94		842.92	258	251	245	55	97	90	0	
	35	.70	.95	844.31	844.34	257	249	255	55	97	90	0	
6	37.5	.70	.95		845.75	257	250	250	55	97	90	0	
	40	.70	.95	847.14	847.18	256	250	250	55	97	91	0	
	42.5	.70	.95		848.59	257	250	248	56	98	90	0	
7	45	.70	.95	849.98	849.98	258	250	249	56	98	91	0	
	47.5	.65	.87		851.43	258	250	252	56	98	91	0	
	50	.65	.87		58 52.81	257	250	252	56	98	91	0	
8	52.5	.65	.87		8 5415	254	250	250	56	98	91	0	
	55	.65	.87		855.52	258	250	251	56	96	91	0	
	57.5	.65	.87		856.89	258	250	249	56	96	91	0	
	60				858.26								
1	0	.65	.87		858.26	258	250	249	56	96	91	0	15:42 START
	2.5	.65	.87	859.60	859.63	258	250	248	59	93	91	0	
	5	.65	.87		860.98	258	250	253	58	92	91	0	
2	7.5	.65	.87	862.32	862.34	257	250	251	58	96	91	0	
	10	.60	.80		863.72	256	250	250	59	97	92	0	
	12.5	.60	.80	865.01	865.02	256	251	250	60	97	91	0	
3	15	.65	.87		866.31	258	250	250	60	97	91	0	
	17.5	.65	.87	867.65	867.66	258	250	251	60	97	91	0	
	20	.65	.87		869.00	257	250	251	61	97	92	0	
4	22.5	.65	.87		870.37	257	250	251	61	97	92	0	
	25	.70	.92		871.72	256	250	251	61	97	92	0	
	27.5	.70	.93		873.12	256	250	251	61	97	92	0	
5	30	.70	.94		874.52	256	250	251	61	97	92	0	
	32.5	.70	.94		875.96	257	250	249	63	99	92	0	
	35	.70	.94		877.38	257	250	250	63	99	92	0	
6	37.5	.70	.94		878.79	257	250	250	63	99	92	0	
	40	.70	.94		880.21	257	250	250	63	99	92	0	
	42.5	.70	.94		881.62	256	250	250	64	100	93	0	
7	45	.70	.94		883.02	257	251	250	65	99	93	0	
	47.5	.70	.94		884.45	256	250	251	65	99	93	0	
	50	.70	.94		885.86	257	250	251	65	99	93	0	
8	52.5	.70	.94		887.26	257	250	251	66	98	93	0	
	55	.70	.94		888.65	257	250	251	67	99	93	0	
	57.5				890.14	256	251	250	67	99	93	0	
	60				891.43								

Pretest Leak Check Rate (cfm) .02 at 12 vacuum ("Hg) | Leak Vol Start 824.23 | Leak Vol. End 824.25
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Operator Signature:

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: CCF M29-T3 | Start Time: 4:45 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: SDT | Finish Time: 6:54 | Pitot Check: Geeo
Client: St Marys Cement | Traverse: 3-4 | Traverse Dir.: IN-OUT | Date: 10/09/18 | Port length: 6" | Page: 2 of 2

SAMPLE AS PG#1

Dn: \ | Cp: — | Bws: %6 | dH@: — | Y: — | Pbar: — | Pstatic: — | CO2: — | O2: — | Pitot ID —

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Comments
1	0	.65	.87		891.446	255	250	250	69	98	93		
	2.5	.65	.87	897.78	892.79	255	250	250	69	98	93	0	
	5	.65	.87		894.15	256	251	250	67	97	93	0	
2	7.5	.65	.87	895.49	895.52	257	249	257	61	98	93	0	
	10	.65	.87		896.88	257	249	250	60	96	93	0	
	12.5	.65	.87	898.27	898.25	258	251	251	59	99	93	0	
3	15	.65	.87		899.59	257	248	250	58	99	95	0	
	17.5	.70	.94		900.97	258	251	251	58	99	93	0	
	20	.70	.95	902.36	902.38	257	251	248	57	99	93	0	
4	22.5	.70	.95		903.81	256	250	248	57	99	95	0	
	25	.90	.93	905.20	905.23	257	250	249	57	99	94	0	
	27.5	.70	.93		906.63	257	251	246	57	99	93	0	
5	30	.70	.93		908.04	257	251	246	57	99	93	0	
	32.5	.70	.93	909.43	909.46	257	251	249	56	99	93	0	
	35	.65	.87		910.86	257	249	250	57	99	94	0	
6	37.5	.65	.87	912.20	912.24	257	250	249	57	99	94	0	
	40	.65	.87		913.59	256	250	251	57	99	94	0	
	42.5	.65	.87	914.93	914.94	256	250	252	57	99	94	0	
7	45	.60	.80		916.29	255	250	248	57	99	94	0	
	47.5	.60	.80		917.61	256	250	250	58	100	94	0	
	50	.60	.80	918.90	918.91	256	250	250	58	100	94	0	
8	52.5	.60	.80	920.20	920.22	258	250	255	58	100	94	0	
	55	.60	.80		921.52	255	250	247	58	100	94	0	
	57.5	.60	.80		922.83	255	250	247	59	100	94	0	
	60				924.12								
1	0	.60	.80		924.13	255	250	257	59	100	94	0	5:54
	2.5	.60	.80		925.43	256	250	249	61	100	94	0	
	5	.60	.80	926.72	926.75	255	250	252	60	98	94		
2	7.5	.60	.80		928.07	255	249	251	60	98	94	0	
	10	.60	.80	929.38	929.37	255	249	251	61	98	96	0	
	12.5	.60	.80	930.66	930.68	255	250	251	60	98	94	0	
3	15	.65	.87	931.97	931.99	255	250	249	60	99	94	0	
	17.5	.65	.87		933.35	258	250	254	60	99	94	0	
	20	.65	.87	934.69	934.69	259	250	256	60	99	96	0	
4	22.5	.65	.87		936.05	260	251	247	60	100	94	0	
	25	.75	1.00	937.39	937.40	261	249	251	61	99	94	0	
	27.5	.75	1.00		938.81	262	251	249	61	99	94	0	
5	30	.75	1.00	940.31	940.35	265	250	250	61	100	94	0	
	32.5	.75	1.00		941.79	260	250	251	61	100	96	0	
	35	.75	1.00		943.26	267	251	250	61	99	94	0	
6	37.5	.75	1.00	944.76	944.73	267	251	250	61	99	94	0	
	40	.75	1.00		946.18	259	250	254	62	100	95	0	
	42.5	.75	1.00	947.64	947.63	259	250	251	62	100	94	0	
7	45	.75	1.00		949.09	259	249	252	62	100	94	0	
	47.5	.75	1.00	950.53	950.53	260	250	250	62	100	94	0	
	50	.75	1.00		951.99	260	250	251	62	100	94	0	
8	52.5	.75	1.00		953.44	259	248	247	60	100	95	0	
	55	.75	1.00		954.88	260	250	250	59	101	95	0	
	57.5				956.33	259	251	251	59	101	95	0	
	60				957.96								

Thermocouple Calibration

Pretest Leak Check Rate (cfm) ____ at ____ vacuum ("Hg) Leak Vol Start ____ Leak Vol. End ____ Ambient temp ____ Probe Temp ____

Posttest Leak Check Rate (cfm) 4.01 at 12 vacuum ("Hg) Leak Vol Start 57.76 Leak Vol. End 57.93 % Difference ____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 5 Test: LCF - SJDC-T1

Filter ID: n/a

Sample Loc. Main - LCF XAD Trap ID: #6

Train ID: # 4

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Bigimp	692.7	500.0	
2	ethyleneGlycol	795.6	786.5	
3	Empty	647.1	646.1	
4	Silica	857.6	846.8	
5	Cond	311.7	310.7	
6	Trap	369.9	356.4	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights				

Comments:

Nozzle Measurements:
1
2
3
4

Avg

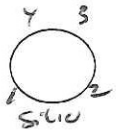
Signature

Date

— Isokinetic Sampling Train Data Sheet —

LCF ~~PRT~~ Final

Operator Signature: _____



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SVOC-T1 | Start Time: 8:44 10:30 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: KMB/MP | Finish Time: 9:24 11:30 | Pitot Check: Good
Client: St Marys Cement | Traverse: 1/2 | Traverse Dir.: N Side | Date: Oct 5 | Port length: 6" | Page: 1 of ___

Dn: .211 | Cp: .838 | Bws: %6 | dH@: 1.79 | Y: 0.993 A | Pbar: _____ | Pstatic: -0.7 | CO2: 12 | O2: 15 | Pitot ID: 7-3

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	Xmp oF	Comments
1	0	.87	1.1		642.48	263	241	250	45	53	53	/	52	
	2.5	.87	1.1	644.68	647.70	263	239	237	48	54	53	6	39	
	5	.87	1.1	649.20	652.20	263	235	237	48	54	53	6	39	9:50 keys
2	7.5	.87	1.1		657.65	264	242	250	47	62	59	6	40	pump
	10	.85	1.1	648.15	648.14	264	242	251	47	62	59	6	40	9:31 restarted.
	12.5	.85	1.1	650.64	650.63	264	242	251	47	62	59	6	40	
3	15	.86	1.1		652.10	265	242	251	47	62	59	6	40	
	17.5	.88	1.1		653.56	264	243	251	44	70	60	6	41	
	20	.85	1.1		655.03	265	235	245	44	70	60	6	41	
4	22.5	.87	1.1		656.50	265	240	250	44	70	60	6	41	
	25	.87	1.1	655.00	658.00	266	240	251	43	72	62	6	42	
	27.5	.87	1.1		659.45	265	239	250	43	72	62	6	42	
5	30	.87	1.1		660.77	266	240	251	43	72	62	6	42	
	32.5	.87	1.1		662.45	265	238	247	43	72	62	6	42	
	35	.87	1.1		663.92	265	239	250	44	74	64	6	44	
6	37.5	.89	1.1		665.41	264	238	247	44	74	64	6	44	
	40	.89	1.1	6.93	366.90	264	241	251	44	74	64	6	44	
	42.5	.89	1.1		668.48	264	241	251	44	74	64	6	44	
7	45	.81	1.0		669.91	264	241	255	44	74	64	6	44	
	47.5	.81	1.0		671.35	264	235	257	44	74	64	6	44	
	50	.80	1.0		672.81	264	240	250	46	75	66	7	48	
8	52.5	.78	1.0		674.24	264	240	251	46	75	66	7	48	
	55	.80	1.0		675.66	265	241	250	47	75	66	7	49	
	57.5	.80	1.0		677.10	264	241	251	47	76	67	7	49	
	60	/	/	/	678.52	/	/	/	/	/	/	/	/	
1	0	.80	1.0		678.52	265	240	248	47	76	67	7	45	
	2.5	.82	1.0		680.00	265	240	248	48	76	67	7	52	
	5	.82	1.0			265	241	248	49	76	67	7	54	
2	7.5	.82	1.0		682.87	266	237	250	48	76	67	7	54	
	10	.82	1.0		684.30	266	239	249	50	75	68	7	54	
	12.5	.82	1.0	685.76	685.75	266	240	250	52	75	68	7	54	
3	15	.87	1.1		687.19	266	239	247	50	75	68	7	54	
	17.5	.87	1.1	8.18	688.65	266	240	249	50	75	68	7	54	
	20	.90	1.2		690.15	265	239	249	52	75	68	8	54	
4	22.5	.87	1.1		691.63	266	240	251	50	75	68	8	54	
	25	.87	1.1		693.22	264	238	248	52	75	68	8	54	
	27.5	.87	1.1		694.75	264	238	248	52	75	68	8	54	
5	30	.87	1.1		696.26	265	240	250	52	75	68	8	54	
	32.5	.87	1.1		697.77	264	237	248	52	75	68	8	54	
	35	.87	1.1		699.30	264	240	250	51	76	70	8	57	
6	37.5	.87	1.1		700.81	265	241	252	51	76	70	8	57	
	40	.90	1.2		702.31	265	240	251	51	76	70	8	57	
	42.5	.90	1.2		703.87	265	240	251	51	76	70	8	51	
7	45	.90	1.2		705.40	264	240	249	51	76	70	8	51	
	47.5	.90	1.2	6.92	706.96	264	240	249	51	76	70	8	54	
	50	.90	1.2		708.51	264	240	249	51	76	70	8	54	
8	52.5	.87	1.1		710.05	263	238	245	51	76	72	8	54	
	55	.87	1.1		711.48	263	240	245	51	76	70	8	54	
	57.5	.87	1.1		713.11	263	240	248	51	76	70	8	55	
	60	/	/	/	714.64	/	/	/	/	/	/	/	/	

Pretest Leak Check Rate (cfm) <.01 at 10 vacuum ("Hg) | Leak Vol Start 642.91 | Leak Vol. End 643.18
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration
Ambient temp 40 | Probe Temp 40
% Difference 0

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature: ICE

Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SUOCT1 | Start Time: 11:42 12:58 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: _____ | Finish Time: 13:42 13:58 | Pitot Check: DOD
Client: St Marys Cement | Traverse: _____ | Traverse Dir.: _____ | Date: 0005 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: _____ Bws: %6 SFE dH@: _____ Y: Angel Pbar: 102.34kPa Pstatic: -0.7 CO2: _____ O2: _____ Pitot ID _____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	XAD oF	Comments
1	0	.82	1.0		714.64	263	236	251	50	70	70	6	55	
	2.5	.84	1.1	6.09	716.09	262	238	251	54	72	70	6	55	
	5	.84	1.1		717.57	263	240	251	54	72	70	6	55	
2	7.5	.84	1.1		719.05	265	241	251	54	72	70	6	44	
	10	.84	1.0		720.54	263	240	249	54	72	70	6	44	
	12.5	.84	1.0		721.95	265	246	249	50	75	70	6	44	
3	15	.82	1.0		723.51	265	246	249	50	75	70	6	44	
	17.5	.82	1.0		724.94	265	240	252	50	75	70	6	44	
	20	.82	1.0		726.38	264	238	248	48	76	70	6	44	
4	22.5	.78	1.0		727.80	264	238	251	48	76	70	6	44	
	25	.78	1.0		729.25	265	241	251	48	76	70	6	44	
	27.5	.80	1.0		730.67	264	241	251	48	76	70	6	44	
5	30	.76	.98		732.12	264	239	241	48	76	70	6	44	
	32.5	.76	.98		733.52	264	233	241	48	76	70	6	44	
	35	.76	.98		734.95	264	234	250	48	76	70	6	44	
6	37.5	.76	.98		736.37	265	237	249	48	76	70	6	44	
	40	.70	.90		737.77	266	237	250	48	76	70	6	44	
	42.5	.70	.90		739.15	266	237	251	46	81	71	7	45	
7	45	.65	.84	740.50	740.51	267	238	250	46	81	71	7	45	
	47.5	.65	.84		741.84	267	241	251	46	81	71	7	45	
	50	.65	.84		743.15	269	240	251	46	81	71	7	45	
8	52.5	.64	.83		744.48	272	240	250	46	81	71	7	45	
	55	.64	.83		745.80	290	240	250	46	81	71	7	45	
	57.5	.62	.77		746.12	295	237	250	46	81	71	7	45	
	60	/	/	/	748.41	/	/	/	/	/	/	/	/	
1	0	.70	.90		748.41	300	240	250	51	77	73	7	51	* test paused for RAW MILL DOWN
	2.5	.70	.90	749.76	749.76	284	241	251	51	77	73	7	51	
	5	.70	.90		751.12	283	240	249	55	79	74	7	55	
2	7.5	.70	.90		752.54	280	240	250	55	79	74	7	55	
	10	.70	.90		753.92	280	240	248	55	79	74	7	55	
	12.5	.80	.90		755.27	277	240	250	56	82	76	7	58	
3	15	.80	1.0		756.72	272	237	250	55	85	76	7	48	
	17.5	.80	1.0		758.15	271	239	250	55	85	76	7	48	
	20	.76	.98		759.62	270	239	250	55	85	76	7	48	
4	22.5	.79	1.0	761.03	761.04	268	241	251	56	85	75	7	46	
	25	.79	.99		762.51	266	240	250	55	84	75	7	46	
	27.5	.80	.99		763.91	266	240	250	52	83	75	7	47	
5	30	.82	1.0		765.37	264	240	251	52	83	75	7	47	
	32.5	.82	1.0		766.82	264	240	251	52	83	79	7	47	
	35	.82	1.0		768.27	263	238	249	52	85	79	7	47	
6	37.5	.82	1.0	7.73	769.72	262	235	250	52	85	79	7	47	
	40	.82	1.0		771.15	261	242	251	52	83	79	7	47	
	42.5	.82	1.0		772.61	261	242	251	52	83	79	7	47	
7	45	.86	1.2		774.10	261	239	249	50	91	82	7	50	
	47.5	.86	1.2	5.67	775.61	260	239	251	50	91	82	7	50	
	50	.86	1.2		777.16	260	242	250	50	91	82	7	50	
8	52.5	.86	1.2		778.73	260	240	251	50	91	82	7	50	
	55	.86	1.2		780.26	261	240	249	50	91	82	7	50	
	57.5	.86	1.2		781.80	259	240	249	50	91	82	7	50	
	60	/	/	/	783.32	/	/	/	/	/	/	/	/	

Thermocouple Calibration

Pretest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____ Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) <.01 at 14 vacuum ("Hg) Leak Vol Start 778.37 Leak Vol. End 783.52 % Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 9 Test: LCF-SUOC-T2

Filter ID: N/A

Sample Loc. Main -LCF XAD Trap ID: #7

Train ID: #5

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Bis Comp	743.4	503.1	
2	ethyle Glycol	805.9	773.6	
3	empty	648.7	648.5	
4	Silica	871.0	858.4	
5	Condeser	293.3	292.2	
6	Trap	363.7	355.0	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights	1Kg	999.9	✓	MP
Post-weights	1Kg	1000.0	✓	MP

Comments:

Nozzle Measurements:
1
2
3
4

Avg

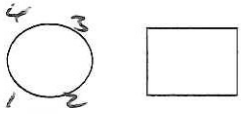
Signature

Date

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature: _____



Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SURC-T2 | Start Time: 09:25 10:31 | Stack D.: 216" | Pitot Check: Good

Job Number: 1804600 | Source: Main Stack | Operators: KW/MP | Finish Time: 10:25 | 5:10

Client: St Marys Cement | Traverse: 1/2 | Traverse Dir.: N-out | Date: Oct 9/2015 | Port length: 6" | Page: 1 of 2

Dn: .211 | Cp: .8 | Bws: %6 | dH@: 1.74 | Y: 1.00 | Pbar: _____ | Pstatic: +.8 -0.6 | CO2: 7.0 | O2: 11 | Pitot ID 71

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	x10 oF	Comments
1	0	.77	1.0		783.72	259	240	250	69	76	75	-1	65	
	2.5	.77	1.0	785.27	785.25	260	242	250	65	76	75	-5	57	
	5	.77	1.0	786.68	786.67	260	240	250	64	77	76	-5	52	
2	7.5	.77	1.0		788.10	260	240	250	62	78	75	-6	53	
	10	.76	.98	788.53	789.49	260	239	250	62	78	75	-6	53	
	12.5	.75	.95		790.91	260	237	250	61	80	76	-6	53	
3	15	.75	.95	792.33	792.34	260	240	256	60	82	76	-6	54	
	17.5	.75	.95	3.76	793.76	260	239	250	60	82	76	-6	54	
	20	.75	.95	7	795.17	261	240	250	60	82	76	-6	54	
4	22.5	.76	.96		796.58	260	240	250	60	82	76	-6	54	
	25	.77	1.0	797.99	797.98	260	240	250	60	86	78	-6	57	
	27.5	.80	1.05		799.42	260	236	249	60	86	78	-6	57	
5	30	.75	.99		800.91	260	241	249	60	85	78	-6	58	
	32.5	.76	.96	802.32	802.35	261	246	250	60	88	79	-6	58	
	35	.76	.96	3.76	803.77	260	237	240	60	84	79	-6	58	
6	37.5	.76	.96		805.22	260	231	244	60	85	79	-6	58	
	40	.75	.95		806.61	261	237	251	61	89	80	-6	57	
	42.5	.76	.95		808.02	260	235	251	61	89	80	-6	55	
7	45	.70	.91	809.45	809.45	260	239	249	61	89	80	-6	59	
	47.5	.68	.89		810.82	260	234	250	61	91	81	-6	63	
	50	.68	.89		812.18	260	234	251	61	91	81	-6	63	
8	52.5	.69	.90		813.56	261	229	251	61	91	81	-6	56	
	55	.70	.91		814.95	260	229	251	658	92	82	-6	54	
	57.5	.70	.91		816.34	260	230	251	59	92	82	-6	54	
	60	/	/	/	817.73	/	/	/	/	/	/	/	/	
1	0	.70	.91		817.73	260	226	250	58	91	83	-6	58	
	2.5	.70	.91	819.10	819.10	260	228	250	57	92	83	-6	55	
	5	.72	.95	820.50	820.51	261	228	249	56	93	84	-6	56	
2	7.5	.72	.95		821.93	260	236	251	56	94	84	-6	54	
	10	.72	.95		823.33	260	234	250	56	93	84	-6	55	
	12.5	.72	.95		824.75	259	231	250	56	93	84	-6	55	
3	15	.74	.99		826.15	260	231	252	56	93	84	-6	55	
	17.5	.74	.99	7.57	827.61	260	231	252	56	93	84	-6	55	
	20	.73	.98		829.04	258	233	250	56	93	84	-6	55	
4	22.5	.73	.98	830.46	830.48	258	228	250	54	91	84	-6	55	
	25	.74	.98		831.91	258	229	251	58	93	84	-6	55	
	27.5	.74	.99		833.35	258	225	251	54	93	84	-6	55	
5	30	.76	.99		834.78	259	229	251	56	93	84	-6	57	
	32.5	.76	.99		836.23	259	230	251	59	88	83	-6	57	
	35	.76	.99	7.67	837.67	260	231	251	59	88	82	-6	57	
6	37.5	.76	.99		839.14	260	228	251	55	88	82	-6	57	
	40	.76	.99		840.57	260	232	250	59	88	82	-6	57	
	42.5	.78	.99		842.02	260	236	250	59	88	82	-6	58	
7	45	.76	.99	843.48	843.48	260	233	250	59	88	82	-6	58	
	47.5	.76	.99		844.98	260	241	251	59	88	82	-6	58	
	50	.76	.99		846.42	261	240	251	59	86	82	-6	58	
8	52.5	.74	.99		847.82	260	241	251	59	85	82	-6	58	
	55	.76	.99		849.28	260	240	249	59	86	82	-6	58	
	57.5	.76	.99		849.71	260	240	249	59	88	82	-6	58	
	60	/	/	/	852.14	/	/	/	/	/	/	/	/	

Pretest Leak Check Rate (cfm) <.01 at 14 vacuum ("Hg) | Leak Vol Start 783.50 | Leak Vol. End 783.72

Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) | Leak Vol Start _____ | Leak Vol. End _____

Thermocouple Calibration

Ambient temp 62 | Probe Temp 63

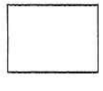
% Difference 2.2%

— Isokinetic Sampling Train Data Sheet —

LCF

Operator Signature: [signature]





Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SVOC-T2 | Start Time: 11:40 12:51 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: _____ | Finish Time: 12:40 13:51 | Pitot Check: DNO
Client: St Marys Cement | Traverse: 3/4 | Traverse Dir.: _____ | Date: Oct 4 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: _____ Bws: %6 6 dH@: _____ Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID_____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	XAD o/=	Comments
1	0	.78	.99		852.14	260	242	252	70	84	82	/	62	
	2.5	.76	.94	3.57	853.68	260	242	252	64	85	93	-7	57	
	5	.75	.98		855.07	260	241	250	62	86	83	-7	56	
2	7.5	.75	.98		858.52	260	240	251	62	80	83	-7	56	
	10	.75	.98		857.98	260	240	250	60	85	82	-7	56	
	12.5	.75	.98		859.42	261	240	250	60	88	82	-7	56	
3	15	.72	.95		860.88	260	240	249	60	86	82	-7	56	
	17.5	.72	.95	862.28	862.30	261	241	250	59	89	83	-7	57	
	20	.72	.95		863.72	262	241	250	59	89	83	-7	58	
4	22.5	.72	.95		865.20	262	240	250	59	89	83	-7	58	
	25	.72	.95		866.58	262	238	250	59	85	83	-7	58	
	27.5	.72	.95		868.00	262	240	251	59	89	83	-7	58	
5	30	.72	.95		869.42	262	240	251	60	90	83	-7	59	
	32.5	.68	.90	870.82	870.85	262	239	249	60	90	83	-7	59	
	35	.68	.90		872.26	261	240	250	60	90	83	-7	59	
6	37.5	.68	.90		873.61	261	240	250	60	90	83	-7	59	
	40	.72	.95		875.02	261	240	251	60	90	83	-7	59	
	42.5	.72	.95		876.42	261	240	251	62	90	84	-7	63	
7	45	.62	.82		877.86	262	240	251	62	90	84	-7	63	
	47.5	.64	.84		879.20	261	240	250	62	90	84	-7	63	
	50	.66	.87	880.52	880.53	260	240	250	62	90	84	-7	63	
8	52.5	.64	.85		881.94	262	240	250	62	90	84	-7	63	
	55	.64	.85		883.26	261	240	251	62	90	84	-7	64	
	57.5	.64	.85		884.60	262	240	251	62	90	84	-7	64	
	60	/	/	/	885.97	/	/	/	/	/	/	/	/	
1	0	.70	.92		885.97	262	244	247	66	86	84	/	66	
	2.5	.72	.87	887.37	887.39	261	237	250	66	88	84	-7	66	
	5	.67	.87		888.76	261	240	249	66	88	85	-7	66	
2	7.5	.67	.88		890.11	261	239	257	66	88	85	-7	66	
	10	.67	.88		891.47	261	239	252	66	88	85	-7	66	
	12.5	.68	.89		892.85	262	242	253	67	92	86	-7	66	
3	15	.70	.90		894.22	261	240	248	65	93	86	-7	65	
	17.5	.70	.90		895.65	261	241	239	65	93	86	-7	65	
	20	.70	.90		897.02	261	241	251	64	93	86	-7	64	
4	22.5	.70	.90		898.44	261	240	251	64	93	86	-7	64	
	25	.70	.90		899.85	260	240	246	64	92	86	-7	64	
	27.5	.67	.88		901.20	260	240	247	64	92	86	-7	63	
5	30	.65	.87		902.62	259	241	250	64	92	86	-7	62	
	32.5	.66	.87		904.01	259	240	245	64	92	86	-7	62	
	35	.66	.87		905.38	258	240	250	64	92	86	-7	62	
6	37.5	.60	.80		906.75	258	239	242	64	92	86	-7	62	
	40	.60	.81		908.08	258	240	242	63	92	88	-7	61	
	42.5	.60	.81		909.38	258	237	252	63	100	90	-7	62	
7	45	.56	.76		910.70	258	240	253	63	100	92	-7	62	
	47.5	.56	.75		912.00	257	241	256	63	100	92	-7	62	
	50	.56	.75	913.25	913.27	258	240	251	63	100	92	-7	62	
8	52.5	.56	.75	914.52	914.55	258	241	251	63	100	92	-7	63	
	55	.56	.75		915.80	258	241	251	63	100	92	-7	63	
	57.5	.56	.75		917.86	259	241	251	63	100	92	-7	63	
	60	/	/	/	918.32	/	/	/	/	/	/	/	/	

Pretest Leak Check Rate (cfm) 4.01 at 10 vacuum ("Hg) Leak Vol Start 918.32 Leak Vol. End 918.44
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

RWDI AIR Inc.
Consulting Engineers

Moisture Analysis Data Sheet

Project No: 1804600 Client: St. Marys Bowmanville

Date: Oct 9 Test: LCF-Suc-T3

Filter ID: n/a

Sample Loc. Main ε LCF XAD Trap ID: #8

Train ID: #6

Pre-weights By: MP Post-weights By: MP

Impinger #	Impinger Contents	Final Weight (g)	Initial Weight (g)	Net Condensate (g)
1	Bubbler	712.2	482.4	
2	ethyle Glycol	773.0	739.7	
3	empty	641.6	640.8	
4	Silica	892.6	879.9	
5	Cond.	274.6	273.0	
6	Trap	365.4	355.1	
7				
8				
TOTAL				

Balance QA Check:

	Actual (g)	Measured (g)	Error < 5%	Initials
Pre-weights				
Post-weights				

Comments:

Nozzle Measurements:
1
2
3
4

Avg

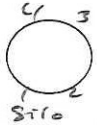
Signature

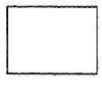
Date

— Isokinetic Sampling Train Data Sheet —

5.81
54.15

Operator Signature: _____





Job Name: St Marys Cement | Plant: Bowmanville | Test No.: SUDC-T3 | Start Time: 2:36 3:42 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: [illegible] | Finish Time: 3:31 4:42 | Pitot Check: Good
Client: St Marys Cement | Traverse: 1/2 | Traverse Dir.: _____ | Date: Oct 9/2018 | Port length: 6" | Page: 1 of 2

Dn: .26 | Cp: .8 | Bws: %6 | dH@: 1.74 | Y: 1.02 MSC-2 | Pbar: _____ | Pstatic: -.65 | CO2: 20 | O2: 15 | Pitot ID 7'

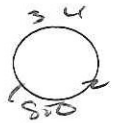
Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	XHP oF	Comments
1	0	.77	.97		918.77	256	238	241	70	93	93	-	69	
	2.5	.72	.97	920.15	920.25	259	238	241	71	90	90	-5	44	
	5	.70	.87	921.62	921.62	259	241	252	69	90	91	-5	45	
2	7.5	.72	.97		922.82	259	241	251	64	90	91	-5	47	
	10	.72	.97		924.35	260	240	251	66	92	91	-5	47	
	12.5	.72	.97		925.77	260	240	250	64	92	91	-5	47	
3	15	.70	.93		927.20	260	240	250	65	94	91	-5	48	
	17.5	.70	.93		928.63	260	240	251	65	95	91	-5	48	
	20	.70	.93	930.00	930.03	261	240	250	65	95	91	-5	48	
4	22.5	.70	.92	931.40	931.47	262	240	251	65	95	91	-5	48	
	25	.70	.93		932.89	263	240	251	65	97	91	-5	51	
	27.5	.67	.89		934.30	265	240	250	65	97	91	-5	52	
5	30	.67	.89		935.68	265	239	250	65	97	91	-5	52	
	32.5	.67	.89		937.07	265	239	251	66	97	91	-5	56	
	35	.70	.94		938.45	267	239	252	66	97	91	-5	56	
6	37.5	.60	.80		939.86	266	240	250	66	97	91	-5	56	
	40	.66	.88		941.25	266	240	249	66	98	91	-5	56	
	42.5	.66	.88	942.61	942.61	265	240	250	66	98	91	-5	50	
7	45	.56	.75		944.00	266	241	251	66	98	91	-5	56	
	47.5	.56	.75		945.27	267	240	249	66	98	91	-5	58	
	50	.56	.75		946.52	267	241	250	66	98	91	-5	58	
8	52.5	.57	.76		947.78	266	241	252	66	98	91	-5	58	
	55	.58	.78		949.06	266	240	250	66	95	91	-5	59	
	57.5	.58	.78		950.40	266	240	259	66	95	91	-5	59	
	60	"	"	"	951.67	266	"	"	"	"	"	"	"	
1	0	.62	.82		951.67	266	239	250	66	95	91	-5	60	
	2.5	.68	.89		953.05	267	238	251	66	94	91	-5	60	
	5	.68	.89		954.45	266	238	251	66	94	91	-5	60	
2	7.5	.58	.77		955.87	265	239	250	66	94	91	-5	60	
	10	.58	.77		957.24	265	239	250	66	94	91	-5	49	
	12.5	.58	.77		958.51	265	240	250	65	94	91	-5	49	
3	15	.66	.88		959.79	266	240	251	65	94	91	-5	50	
	17.5	.66	.88		961.15	265	241	250	65	94	91	-5	50	
	20	.66	.88		962.50	265	241	250	65	94	91	-5	50	
4	22.5	.66	.88		963.84	266	240	250	64	93	92	-5	50	
	25	.66	.88		965.20	266	240	250	64	93	92	-5	50	
	27.5	.66	.88		966.54	265	239	250	64	93	92	-5	51	
5	30	.70	.93		967.89	266	240	250	64	93	92	-5	52	
	32.5	.70	.92		969.27	266	240	250	64	93	92	-5	53	
	35	.70	.92		970.66	266	240	250	64	93	92	-5	53	
6	37.5	.70	.92		972.05	265	240	249	64	93	92	-5	53	
	40	.70	.92		973.47	265	240	249	64	93	92	-5	53	
	42.5	.70	.92		974.52	266	240	249	64	93	92	-5	53	
7	45	.70	.92		976.21	264	240	250	64	93	92	-5	53	
	47.5	.70	.92		977.63	265	240	250	64	93	92	-5	53	
	50	.70	.92		979.03	265	240	250	64	93	92	-5	53	
8	52.5	.70	.92		980.48	265	240	250	64	93	92	-5	53	
	55	.70	.92		981.82	265	240	250	64	93	92	-5	52	
	57.5	.70	.92		983.22	265	240	251	64	93	92	-5	51	
	60	"	"	"	984.62	"	"	"	"	"	"	"	"	

Pretest Leak Check Rate (cfm) 4.01 at 12 vacuum ("Hg) Leak Vol Start 918.44 Leak Vol. End 918.72
Posttest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____

Thermocouple Calibration
Ambient temp _____ Probe Temp _____
% Difference _____

— Isokinetic Sampling Train Data Sheet —

Operator Signature: _____





Job Name: St Marys Cement | Plant: Bowmanville | Test No.: LCF SVOC-T3 | Start Time: 4:48 5:54 | Stack D.: 216"
Job Number: 1804600 | Source: Main Stack | Operators: KW/MM | Finish Time: 5:48 6:54 | Pitot Check: OK
Client: St Marys Cement | Traverse: 8 pt | Traverse Dir.: N-S | Date: Oct 9/20 | Port length: 6" | Page: 2 of 2

Dn: _____ Cp: _____ Bws: %6 dH@: _____ Y: _____ Pbar: _____ Pstatic: _____ CO2: _____ O2: _____ Pitot ID_____

Pt. (#)	Time (min)	Velocity Press. ("H20)	Orifice Press. ("H20)	Gas Meter Reading Desired (ft3)	Gas Meter Reading Actual (ft3)	Stack Temp. (oF)	Probe Temp. (oF)	Box Temp. (oF)	Imp. Temp. (oF)	Meter Inlet (oF)	Meter Outlet (oF)	Vac. Press. ("Hg)	XAD Comments of
1	0	.65	.90		784.62	263	237	250	70	96	94	-5	54
	2.5	.65	.90	786.00	786.01	263	239	250	70	96	94	-5	54
	5	.65	.90		787.40	263	239	250	70	96	94	-5	51
2	7.5	.65	.90		988.80	263	240	250	70	96	94	-5	50
	10	.65	.90		790.20	265	241	251	60	96	94	-5	50
	12.5	.65	.90		991.60	263	241	251	60	96	94	-5	51
3	15	.66	.85		993.00	263	241	251	60	96	94	-5	51
	17.5	.66	.88		994.36	263	241	251	61	96	94	-5	51
	20	.66	.88		795.72	264	240	251	61	96	94	-5	51
4	22.5	.62	.87		797.09	262	239	250	62	96	94	-5	50
	25	.64	.85	8.39	998.40	262	240	250	62	96	94	-5	50
	27.5	.64	.85		999.75	263	241	250	62	96	94	-5	51
5	30	.60	.80		1.12	262	241	250	62	95	94	-5	52
	32.5	.62	.80		2.40	262	241	250	62	93	94	-5	52
	35	.60	.80		3.7	262	240	250	62	92	94	-5	60
6	37.5	.60	.80		5.0	261	239	250	62	92	94	-5	52 52
	40	.60	.80		6.30	262	240	250	62	92	94	-5	52
	42.5	.60	.80		7.61	261	240	251	62	92	94	-5	51
7	45	.56	.75		8.91	261	240	251	62	92	94	-5	51
	47.5	.56	.75		10.22	262	239	249	62	92	94	-5	51
	50	.56	.75		11.50	262	240	249	62	92	94	-5	51
8	52.5	.56	.75		12.77	261	240	250	62	92	94	-5	51
	55	.56	.75		14.05	261	240	250	62	92	94	-5	51
	57.5	.56	.75		15.34	261	240	250	62	92	94	-5	51
	60	/	/	/	16.62	/	/	/	/	/	/	/	/
1	0	.56	.75		16.62	261	239	240	71	92	94	-5	52
	2.5	.56	.75	17.87	17.89	261	240	250	66	93	94	-5	52
	5	.56	.75		19.14	261	240	250	64	93	94	-5	51
2	7.5	.60	.80		20.45	261	240	250	64	93	94	-5	51
	10	.60	.80		21.72	263	241	250	64	93	93	-5	52
	12.5	.60	.80		23.02	263	240	251	64	93	93	-5	51
3	15	.66	.88		24.34	263	240	250	64	93	93	-5	50
	17.5	.66	.88		25.67	264	239	250	62	93	93	-5	49
	20	.66	.88	27.03	27.02	264	241	251	60	93	93	-5	48
4	22.5	.74	.98		28.35	266	240	250	61	93	93	-5	48
	25	.74	.98		29.78	267	240	250	61	93	93	-5	49
	27.5	.74	.98		31.23	267	240	249	61	93	93	-5	49
5	30	.78	1.0		32.68	268	240	250	61	93	93	-5	49
	32.5	.78	1.0		34.18	269	240	250	62	93	93	-5	51
	35	.82	1.1		35.67	269	240	250	62	93	93	-5	51
6	37.5	.82	1.1	37.18	37.19	267	240	250	63	93	93	-5	53
	40	.80	1.1		38.71	265	239	249	63	93	93	-5	51
	42.5	.80	1.1		40.22	266	239	250	65	93	93	-5	51
7	45	.80	1.1		41.69	266	240	250	63	93	93	-5	51
	47.5	.80	1.1		43.19	268	240	250	63	93	93	-5	51
	50	.80	1.1		44.72	267	240	250	63	93	93	-5	52
8	52.5	.90	1.1		46.25	266	238	250	63	93	93	-5	51
	55	.80	1.1		47.75	267	242	250	63	93	93	-5	53
	57.5	.80	1.1		49.24	266	241	250	64	93	94	-5	56
	60	/	/	/	50.74	/	/	/	/	/	/	/	/

Thermocouple Calibration

Pretest Leak Check Rate (cfm) _____ at _____ vacuum ("Hg) Leak Vol Start _____ Leak Vol. End _____ Ambient temp _____ Probe Temp _____
Posttest Leak Check Rate (cfm) 4.01 at 12 vacuum ("Hg) Leak Vol Start 50.74 Leak Vol. End 50.86 % Difference _____

VOST Sampling

Project #: 180460	Client: SMC	Console ID : VOST
Date: Oct 5	Test: ~~AH~~ Fuels LCF	Console Y : 1013
Sample Location:	Filter I.D.:	Operator : MP

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 10:30					Pair # 1			Leak Check: <0.01 @ 12	
0	0.6	0.00	52	52	-2.0	N/a	257	45	0.3
5									
10									
15									
20	0.6	5.92	55	55	-3.0		258	47	0.3
25									
30									
35									
40	0.6	11.82	57	57	-3.0		258	49	0.3
45									
50									
55									
60	0.6	17.42	59	59	-3.0		258	50	0.3
Test 1 End Time = 11:30								Leak Check: <0.1 @ 3 "Hg	
Test 2 Start Time = 12:30 Oct 9					Pair # 4			Leak Check: <0.1 @ 12 "Hg	
0	0.6	0.00	54	54	-2.5	n/a	260	46	0.3
5									
10									
15									
20	0.6	6.54	54	54	-3.0		259	46	0.3
25									
30									
35									
40	0.6	13.21	54	54	-3.0		257	46	0.3
45									
50									
55									
60	0.6	17.45	54	54	-3.0		257	46	0.3
Test 2 End Time = 13:30								Leak Check: <0.1 @ 3.0 "Hg	
Test 3 Start Time = 13:40					Pair #3			Leak Check: <0.01 @ 10 "Hg	
0	0.6	0.00	50	50	-2.5	n/a	259	47	0.3
5									
10									
15									
20	.6	5.81	49	49	-3.0		259	45	0.3
25									
30									
35									
40	.6	11.45	50	50	-3.0		259	45	0.3
45									
50									
55									
60	.6	17.02	50	50	-3.0		257	44	0.3
Test 3 End Time = 14:40								Leak Check: <0.1 @ 3 "Hg	

VOST Sampling

Project #: 1504600	Client: SMC	Console ID : VOST
Date: Sept 30, 2004	Test: - VOST-T1-T3 - Baseline	Console Y : 1.013
Sample Location:	Filter I.D.: n/a	Operator : MP

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 12:00			Pair #9						Leak Check: Good, <.01"Hg @17
0	0.6	0.00	59	59	-2.5	n/a	257	57	.3
5									
10									
15									
20	0.6	6.12	59	60	-3.5		259	52	.3
25									
30									
35									
40	0.6	12.03	60	60	-3.5		257	48	.3
45									
50									
55									
60	0.6	17.92	60	60	-3.5		257	52	.3
Test 1 End Time = 13:10									Leak Check: <.01"Hg @41"
Test 2 Start Time = 12:20			Oct 1	Pair #8					Leak Check: <.01" @ 12"
0	0.6	0.00	62	62	-2.5		257	59	0.3
5									
10									
15									
20	0.6	6.12	63	63	-3.0		259	55	0.3
25									
30									
35									
40	0.6	11.92	64	64	-3.0		257	57	0.3
45									
50									
55									
60	0.6	18.16	63	63	-3.0		257	52	0.3
Test 2 End Time = 12:20									Leak Check: <.01 @ 30"
Test 3 Start Time = 9:30			Oct 2	Pair #7					Leak Check: <.01 @ 12"Hg
0	0.6	0.00	63	63	-2.0		259	59	0.3
5									
10									
15									
20	0.6	6.23	63	63	-3.0		257	57	0.3
25									
30									
35									
40	0.6	12.12	63	63	-3.0		258	52	0.3
45									
50									
55									
60	0.6	17.47	63	63	-3.0		258	52	0.3
Test 3 End Time = 10:30									Leak Check: <.01 @ 30"Hg

Midget Impinger Sampling

Project #: 1804100	Client: SMC	Console ID : VOST
Date: Sept 30	Test: Baseline	Console Y : 1.013
Sample Location: Kiln	Filter I.D.: N/A	Operator : MP

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 13:10								Leak Check: No bubbles ✓	
0	2.3	0.00	45	45	-2.0	N/A	N/A	45	2.0
5	2.3	10.20	45	45	-2.0			45	
10	2.3	20.91	45	45	-2.0				
15	2.3	32.54	46	46	-2.0				
20	2.3	46.23	47	47	-2.0			45	2.0
25	2.3	56.33	47	47	-2.0				
30	2.3	66.41	48	48	-2.0				
35	2.3	76.92	49	47	-2.0				
40	2.3	87.21	51	51	-2.0			45	2.0
45	2.3	97.31	51	51	-2.0				
50	2.3	108.00	52	52	-2.0				
55	2.3	118.12	53	53	-2.0				
60	2.3	128.48	54	54	-2.0			45	2.0
Test 1 End Time = 4:00								Leak Check: ✓ No bubbles	
Oct1 Test 2 Start Time = 10:20								Leak Check: ✓ No bubble	
0	2.3	0.0	54	54	-2.0	N/A	N/A	50	2.0
5	2.3	10.90	54	54	-2.0			50	2.0
10	2.3	21.51	54	54	-2.0			50	2.0
15	2.3	32.87	54	54	-2.0			50	2.0
20	2.3	43.03	54	54	-2.0			50	2.0
25	2.3	53.05	55	55	-2.0			50	2.0
30	2.3	64.12	55	55	-2.0			51	2.0
35	2.3	74.81	56	56	-2.0			52	2.0
40	2.3	85.17	56	56	-2.0			52	2.0
45	2.3	95.18	56	56	-2.0			52	2.0
50	2.3	105.37	56	56	-2.0			52	2.0
55	2.3	115.91	58	58	-2.0			52	2.0
60	2.3	126.26	58	58	-2.0			52	2.0
Test 2 End Time = 11:20								Leak Check: No bubbles ✓	
Test 3 Start Time = 10:30								Leak Check: ✓	
Oct2 0	2.3	0.00	53	53	-3.0	N/A	N/A	47	2.0
5	2.3	9.87	53	53	-3.0			47	2.0
10	2.3	19.97	53	53	-3.0			47	2.0
15	2.3	29.85	54	54	-3.0			47	2.0
20	2.3	40.13	54	54	-3.0			49	2.0
25	2.3	50.10	54	54	-3.0			49	2.0
30	2.3	60.07	55	55	-3.0			50	2.0
35	2.3	70.02	55	55	-3.0			50	2.0
40	2.3	80.05	56	56	-3.0			50	2.0
45	2.3	90.11	56	56	-3.0			51	2.0
50	2.3	100.07	56	56	-3.0			51	2.0
55	2.3	110.21	58	58	-3.0			52	2.0
60	2.3	120.34	57	57	-3.0			52	2.0
Test 3 End Time = 11:30								Leak Check: No bubble ✓	

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : VOST
Date: Oct 5	Test: LCF	Console Y : 1.013
Sample Location: Kiln	Filter I.D.: n/a	Operator : MP

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 9:10								Leak Check: No bubble ✓	
0	2.3	0.00	78	78	-3.0	n/a	n/a	68	2.0
5	2.3	10.02	78	78	-3.0			59	2.0
10	2.3	20.03	78	78	-3.0			59	2.0
15	2.3	30.41	78	78	-3.0			60	2.0
20	2.3	40.62	78	78	-3.0			60	2.0
25	2.3	50.31	78	78	-3.0			60	2.0
30	2.3	60.27	79	79	-3.0			60	2.0
35	2.3	70.19	79	79	-3.0			60	2.0
40	2.3	80.27	79	79	-3.0			60	2.0
45	2.3	90.33	80	80	-3.0			60	2.0
50	2.3	100.34	80	80	-3.0			61	2.0
55	2.3	110.40	81	81	-3.0			61	2.0
60	2.3	120.46	81	81	-3.0			62	2.0
Test 1 End Time = 10:10								Leak Check: ✓ No bubble	
Test 2 Start Time = 10:20								Leak Check: 0 lpm no bubbles	
0	2.3	0.00	79	79	-3.0	n/a	n/a	75	2.0
5	2.3	10.03	79	79	-3.0			61	2.0
10	2.3	20.51	79	79	-3.0			60	2.0
15	2.3	30.97	79	79	-3.0			60	2.0
20	2.3	41.07	79	79	-3.0			60	2.0
25	2.3	51.00	79	79	-3.0			60	2.0
30	2.3	60.71	79	79	-3.0			60	2.0
35	2.3	70.99	80	80	-3.0			59	2.0
40	2.3	82.81	80	80	-3.0			58	2.0
45	2.3	92.99	80	80	-3.0			58	2.0
50	2.3	102.97	81	81	-3.0			59	2.0
55	2.3	112.98	81	81	-3.0			61	2.0
60	2.3	123.43	81	81	-3.0			62	2.0
Test 2 End Time = 11:20								Leak Check: 0 lpm no bubbles	
Test 3 Start Time = 11:30								Leak Check: 0 lpm no bubbles	
0	2.3	0.00	79	79	-3.0	n/a	n/a	75	2.0
5	2.3	9.97	79	79	-3.0			62	2.0
10	2.3	19.99	79	79	-3.0			60	2.0
15	2.3	30.01	80	80	-3.0			60	2.0
20	2.3	40.02	80	80	-3.0			60	2.0
25	2.3	50.02	80	80	-3.0			59	2.0
30	2.3	60.07	80	80	-3.0			60	2.0
35	2.3	70.09	81	81	-3.0			60	2.0
40	2.3	80.11	81	81	-3.0			60	2.0
45	2.3	90.10	81	81	-3.0			60	2.0
50	2.3	100.22	81	81	-3.0			61	2.0
55	2.3	110.28	81	81	-3.0			61	2.0
60	2.3	120.32	81	81	-3.0			62	2.0
Test 3 End Time = 12:30								Leak Check: 0 lpm no bubbles	

Oct 9

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : VOST B
Date: Feb 28 2019	Test: 1 Carb 430 Baseline	Console Y : 1.008
Sample Location: Bomanville, ON	Filter I.D.:	Operator : ML

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 11:32								Leak Check:	0 lpm
0	0.75	0.00	3	3	0				0.3
5	0.75	1.412	3	3	0				0.3
10	0.75	2.922	3	3	0				0.3
15	0.75	4.381	3	3	0				0.3
20	0.75	6.005	3	3	0				0.3
25	0.75	7.621	3	3	0				0.3
30	0.75	9.342	3	3	0				0.3
35	0.75	11.189	3	3	0				0.3
40	0.7	12.366	3	3	0				0.3
45	0.75	13.805	3	3	0				0.3
50	0.75	15.354	3	3	0				0.3
55	0.75	16.884	3	3	0				0.3
60	0.75	18.322							
Test 1 End Time =								Leak Check:	

Test 2 Start Time =								Leak Check:	
0	0.75	18.322	3	3	0				0.3
5	0.75	19.743	3	3	0				0.3
10	0.75	20.998	3	3	0				0.3
15	0.75	22.460	3	3	0				0.3
20	0.75	23.952	4	4	0				0.3
25	0.75	25.596	4	4	0				0.3
30	0.75	27.261	4	4	0				0.3
35	0.75	28.937	4	4	0				0.3
40	0.75	30.632	4	4	0				0.3
45	0.75	32.163	4	3	0				0.3
50	0.75	33.739	3	3	0				0.3
55	0.75	35.311	3	3	0				0.3
60	0.75	36.862	3	3	0				0.3
Test 2 End Time = 13:32								Leak Check:	0 lpm

Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : Vos+ D
Date: Feb 28 2019	Test: 2 Carb 430 Baseline	Console Y : 1.0056
Sample Location: Bomanville, ON	Filter I.D.:	Operator :

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 3:04								Leak Check:	0/pm
0	0.75	0.00	-1	-1	0				0.3
5	0.75	1.597	-1	-1	0				0.3
10	0.75	3.066	-1	-1	0				0.3
15	0.75	4.687	-1	-1	0				0.3
20	0.75	6.111	-1	-1	0				0.3
25	0.75	7.723	-1	-1	0				0.3
30	0.75	9.308	-1	-2	0				0.3
35	0.75	10.821	-1	-2	0				0.3
40	0.75	12.342	-2	-2	0				0.3
45	0.75	13.836	-2	-2	0				0.3
50	0.70	15.366	-2	-2	0				0.3
55	0.75	16.871	-2	-2	0				0.3
60	0.75	18.479	-2	-2	0				0.3
Test 1 End Time =								Leak Check:	
Test 2 Start Time =								Leak Check:	
0	0.75	18.479	-2	-2	0				0.3
5	0.75	19.906	-1	-2	0				0.3
10	0.75	21.620	-1	-2	0				0.3
15	0.75	23.023	-1	-1	0				0.3
20	0.75	24.686	-1	-1	0				0.3
25	0.75	26.127	-1	-1	0				0.3
30	0.75	27.772	-1	-1	0				0.3
35									
40									
45									
50									
55									
60									
Test 2 End Time = 16:34								Leak Check:	0/pm
Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : VOSJ B
Date: Feb 28 2019	Test: 3 Carb 430 Baseline	Console Y : 1.0026
Sample Location: Bomanville, ON	Filter I.D.:	Operator :

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 4:39								Leak Check:	0 1pm
0	0.75	0.00	-1	-1	0				0.3
5	.75	1.531	-1	-1	0				0.3
10	.75	3.069	-2	-2	0				0.3
15	.75	4.593	-2	-2	0				0.3
20	.75	6.142	-2	-2	0				0.3
25	.75	7.669	-2	-2	0				0.3
30	.75	9.312	-2	-2	0				0.3
35	.75	10.806	-3	-3	0				0.3
40	.75	12.522	-3	-3	0				0.3
45	.75	14.062	-3	-3	0				0.3
50	.75	15.467	-3	-3	0				0.3
55	.75	16.942	-3	-3	0				0.3
60	.75	18.405	-3	-3	0				0.3
Test 1 End Time =								Leak Check:	
Test 2 Start Time =								Leak Check:	
0	.75	18.405	-3	-3	0				0.3
5	.75	19.912	-3	-2	0				0.3
10	.75	21.402	-3	-2	0				0.3
15	.75	22.408	-3	-1	0				0.3
20	.75	24.513	-3	-1	0				0.3
25	.75	26.005	-1	-1	0				0.3
30	.75	27.569	-1	-1	0				0.3
35									
40									
45									
50									
55									
60									
Test 2 End Time = 15:09								Leak Check:	0 1pm
Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

STACK GAS FLOW RATE DATA SHEET 4/6

Project #:	18044600	Client:	St. Marys Bowmanville
Date:	28-Feb-18	Test:	T1 (Baseline)
Sample Location:	Main Stack	Time:	11:45
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	0.84
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	4.9	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 10.7 O2 (%) 16.6 CO (ppm)_____ NOx (ppm) _____ Other: _____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	0.28	232	0.°	0.94		
2	10.6	0.66			0.68		
3	18.4	0.92			0.84		
4	27	0.96			0.92		
5	36.5	0.98			0.93		
6	47.5	1.04			0.90		
7	61.1	1.02			0.88		
8	81	0.95			0.94		

Point	Position (in.)	Traverse 3			Traverse 4		
1	3.5	0.54			045		
2	10.6	0.73			0.72		
3	18.4	0.86			0.88		
4	27	0.80			0.98		
5	36.5	0.86			0.95		
6	47.5	0.94			0.98		
7	61.1	0.92			0.94		
8	81	1.06			1.00		

STACK GAS FLOW RATE DATA SHEET

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Project #:	1404600.	Client:	St. Marys Bowmanville
Date:	28-Feb-18	Test:	T.2 (Baseline)
Sample Location:		Time:	3:30
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	.76
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	4.7	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 9.8 O2 (%) 14.9 CO (ppm)____ NOx (ppm) ____ Other: ____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	0.20	228	0°	0.52		
2	10.6	0.58			0.34		
3	18.4	0.68			0.52		
4	27	0.92			0.96		
5	36.5	1.02			0.9		
6	47.5	0.96			0.92		
7	61.1	0.98			0.96		
8	81	0.92			0.92		

Point	Position (in.)	Traverse 3			Traverse 4		
1	3.5	0.41			0.42		
2	10.6	0.67			0.62		
3	18.4	0.89			0.86		
4	27	0.95			0.88		
5	36.5	0.94			0.94		
6	47.5	0.88			1.02		
7	61.1	0.92			0.98		
8	81	0.94			0.92		

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STACK GAS FLOW RATE DATA SHEET

Project #:	1804600	Client:	St. Marys Bowmanville
Date:	28-Feb-18	Test:	T3 (Baseline)
Sample Location:		Time:	4:50
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	72
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	4.9	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 10.2 O2 (%) 15.3 CO (ppm)_____ NOx (ppm) _____ Other: _____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	21	231	0.°	52		
2	10.6	91			78		
3	18.4	96			95		
4	27	92			86		
5	36.5	1.04			94		
6	47.5	96			96		
7	61.1	1.02			96		
8	81	96	D	4	96		

Point	Position (in.)	Traverse 3			Traverse 4		
1	3.5	36			42		
2	10.6	56			56		
3	18.4	86			63		
4	27	84			92		
5	36.5	1.02			1.04		
6	47.5	1.00			96		
7	61.1	93			86		
8	81	94			0.92		

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : VOST B
Date: Feb. 27 2018	Test: 1 CCR6 450 LCF	Console Y : 1.006
Sample Location:	Filter I.D.:	Operator : WSC

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 9:04								Leak Check: ✓ 0 lpm	
0	.8	0.000	-2	-1	0	~	—		0.3
5	.6	1.797	-2	-1	0				0.3
10	.6	3.342	-3	-1	0				0.3
15	.6	4.411	-3	-1	0				0.3
20	.6	5.501	-4	-4	0				0.3
25	.6	7.082	-4	-4	0				0.3
30	.6	8.648	-4	-4	0				0.3
35	.6	10.104	-4	-4	0				0.3
40	.6	11.418	-4	-4	0				0.3
45	.6	12.323	-4	-4	0				0.3
50	.6	13.424	-4	-4	0				0.3
55	.6	14.401	-4	-4	0				0.3
60	.6	15.686	-4	-4	0				0.3
Test 1 End Time =								Leak Check:	

freeze ↑ up

freeze ↑ up

Test 2 Start Time =								Leak Check:	
0	.6	17.266	-4	-4	0				0.3
5	.6	18.432	-4	-4	0				0.3
10	.6	20.025	-4	-4	0				0.3
15	.6	21.666	-4	-4	0				0.3
20	.6	23.229	-4	-4	0				0.3
25	.6	24.503	-4	-4	0				0.3
30	.6	25.740	-4	-4	0				0.3
35	.6	26.951	-4	-4	0				0.3
40	.6	28.299	-4	-4	0				0.3
45	.6	29.588	-4	-4	0				0.3
50									
55									
60									
Test 2 End Time = 11:04								Leak Check: 0 lpm	

✓ freeze up

Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : VOST B
Date: Feb 27 2019	Test: 2 CaNb 430 LCF	Console Y : 1.006
Sample Location:	Filter I.D.:	Operator : mc

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 11:09								Leak Check:	✓ 0lpm
0	.75	0.00	-4	-4	0				0.3
5	.6	1.919	-4	-4	0				0.28
10	.65	3.955	-4	-4	0				0.3
15	.65	6.233	-4	-4	0				0.3
20	.65	7.741	-4	-4	0				0.3
25	.6	9.477	-4	-4	0				0.3
30	.6	11.225	-4	-4	0				0.3
35	.75	13.119	-4	-4	0				0.3
40	.75	14.935	-4	-5	0				0.3
45	.70	16.350	-4	-4	0				0.3
50	.70	17.883	-5	-5	0				0.3
55	.70	19.262	-5	-5	0				0.3
60	.70	20.831	-5	-5	0				0.3
Test 1 End Time =								Leak Check:	
Test 2 Start Time =								Leak Check:	
0	.70	20.831	-5	-5	0				0.3
5	.70	22.393	-5	-5	0				0.3
10	.70	24.020	-5	-5	0				0.3
15	.70	25.532	-5	-5	0				0.3
20	.70	27.011	-5	-5	0				0.3
25	.70	28.488	-5	-5	0				0.3
30	.70	30.198	-5	-5	0				0.3
35	.70	32.170	-5	-5	0				0.3
40	.70	33.817	-5	-5	0				0.3
45	.70	35.367	-5	-5	0				0.3
50	.70	36.998	-5	-5	0				0.3
55									
60									
Test 2 End Time = 13:09								Leak Check:	0 lpm
Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

Midget Impinger Sampling

Project #: 1804600	Client: SMC	Console ID : Vost B
Date: Feb 28 2019	Test: 3 Cwb 450 LCF	Console Y : 1.006
Sample Location: Bomanville, ON	Filter I.D.:	Operator : MC

Time (min)	Orifice Press ("H_2O)	Meter Volume (L)	Meter Temp Inlet	Meter Temp Outlet	Vacuum (in Hg)	Filter Box Temp (°F)	Probe Temp (°F)	Condensor Temp (°F)	Sampling Rate (L/min)
Test 1 Start Time = 9:00								Leak Check:	0 lpm
0	0.8	0.00	-2	-3	0				0.3
5	0.75	1.625	-2	-3	0				0.3
10	0.75	3.233	-1	-2	0				0.3
15	0.75	4.696	-1	-2	0				0.3
20	0.75	6.201	0	-1	0				0.3
25	0.75	7.765	0	-1	0				0.3
30	0.75	9.633	0	0	0				0.3
35	0.75	11.264	0	0	0				0.3
40	0.75	12.594	0	1	0				0.3
45	0.75	13.961	0	1	0				0.3
50	0.75	15.647	0	1	0				0.3
55	0.75	16.164	0	1	0				0.3
60	0.75	18.704	1	1	0				0.3
Test 1 End Time =								Leak Check:	
Test 2 Start Time =								Leak Check:	
0	0.75	18.704	1	1	0				0.3
5	0.75	20.248	1	1	0				0.3
10	0.75	21.786	1	1	0				0.3
15	0.75	23.311	1	1	0				0.3
20	0.75	24.799	1	1	0				0.3
25	0.75	26.331	1	1	0				0.3
30	0.75	27.887	1	1	0				0.3
35	0.75	29.302	2	2	0				0.3
40	0.75	30.812	2	2	0				0.3
45	0.75	32.178	3	3	0				0.3
50	0.75	33.607	3	3	0				0.3
55									
60									
Test 2 End Time = 11:00 AM								Leak Check:	0 lpm
Test 3 Start Time =								Leak Check:	
0									
5									
10									
15									
20									
25									
30									
35									
40									
45									
50									
55									
60									
Test 3 End Time =								Leak Check:	

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STACK GAS FLOW RATE DATA SHEET

1901750

Project #:	~~1804600~~	Client:	St. Marys Bowmanville
Date:	27-Feb-18	Test:	~~[illegible]~~ Carb 430 T1 (LCF)
Sample Location:		Time:	9:20
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	0.70
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	5.6	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 11.2 O2 (%) 5.9 CO (ppm)_____ NOx (ppm) _____ Other: _____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	0.24	226	0°	.24		
2	10.6	0.70			.48		
3	18.4	0.64			0.66		
4	27	0.72			0.68		
5	36.5	0.80			0.69		
6	47.5	0.96			0.74		
7	61.1	0.88			0.72		
8	81	0.81			0.7		

Point	Position (in.)	Traverse 3			Traverse 4		
1	3.5	.20			.22		
2	10.6	.44			.42		
3	18.4	.64			.66		
4	27	.72			.64		
5	36.5	.72			.78		
6	47.5	.74			.74		
7	61.1	.76			.78		
8	81	.68			.69		

STACK GAS FLOW RATE DATA SHEET

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Project #:	1804600	Client:	St. Marys Bowmanville
Date:	27-Feb-18	Test:	T2 (LCF) Carb 430
Sample Location:		Time:	11:40
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	5.76	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 11.1 O2 (%) 7.9 CO (ppm)_____ NOx (ppm) _____ Other: _____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	0.08	232	0°	0.32		
2	10.6	0.14	↓	↓	0.50		
3	18.4	0.66			0.60		
4	27	0.84			0.66		
5	36.5	0.80			0.68		
6	47.5	0.76			0.70		
7	61.1	0.76			0.64		
8	81	0.74	↓	↓	0.72		
Point	Position (in.)	Traverse 3			Traverse 4		
1	3.5	0.17			0.14		
2	10.6	0.38			0.44		
3	18.4	0.56			0.60		
4	27	0.60			0.58		
5	36.5	0.64			0.62		
6	47.5	0.66			0.64		
7	61.1	0.64			0.66		
8	81	0.68			0.70		

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STACK GAS FLOW RATE DATA SHEET

Project #:		Client:	St. Marys Bowmanville
Date:	28-Feb-18	Test:	T3 (LCF) Carb 430
Sample Location:		Time:	10 am
Barometric Pressure Pb ("Hg):		Static Pressure Ps ("H2O):	0.86
Pitot Coefficient Cp:	0.823	Pitot ID:	RWDI 10' S-Type
Manometer ID:		Thermocouple ID:	
Stack Diameter (in):	216	Length x Width:	N/A
Gas Moisture (%)	5.0	Gas Mol Wt. (wet) Ms:	
		Pitot Leak Check:	✓
		Pitot Orientation Check:	✓
		Manometer Zero & Level:	✓

CO2 (%): 11.2 O2 (%) 18.4 CO (ppm)_____ NOx (ppm) _____ Other: _____

Point	Position (in.)	Traverse 1 dP ("H_2O)	Traverse 1 Temp Ts (°F)	Traverse 1 Cyclonic Angles	Traverse 2 dP ("H_2O)	Traverse 2 Temp Ts (°F)	Traverse 2 Cyclonic Angles
1	3.5	0.10	229	.42	0°		
2	10.6	0.46		.74			
3	18.4	0.72		0.76			
4	27	0.89		0.89			
5	36.5	0.70		1.1			
6	47.5	0.77		0.97			
7	61.1	0.80		0.98			
8	81	0.79		0.91			

Point	Position (in.)	Traverse 3 dP	Traverse 3 Temp Ts	Traverse 3 Cyclonic Angles	Traverse 4 dP	Traverse 4 Temp Ts	Traverse 4 Cyclonic Angles
1	3.5	.40		30			
2	10.6	.63		60			
3	18.4	.82		86			
4	27	.86		93			
5	36.5	90		89			
6	47.5	83		82			
7	61.1	84		.89			
8	81	0.71		.94			

APPENDIX M

Appendix M – Assessment of Statistically Significant Change

The methodology for determining statistically significant change was originally developed for the SMC St. Marys cement plant's alternative fuel demonstration project conducted in May 2011. This methodology has been peer reviewed by the Town of St. Marys and by the MECP.

1.1.1.1 Determination of Contaminants for which Change can be Assessed

In order to assess statistically significant changes, it is first necessary to identify contaminants for which change can be assessed. For those contaminants whose measured stack concentrations are essentially at or below the detection limit under all operating conditions, statistically significant changes cannot be assessed. As summarized in Table 12, 59 contaminants are essentially at or below their detection limits under both operating conditions.

1.1.1.2 Determination of Statistically Significant Change

The following methodology is used to determine statistically significant change:

- Compare emissions during the baseline and LCF source tests for each contaminant.
- If the emissions during the LCF source test are higher than those during the baseline, AERMOD modelling is performed for both the baseline and LCF source tests to determine the percentage of the POI limit for both conditions.
- If the difference in percentage of the POI limit (resulting from the kiln stack emissions only) between baseline and LCF operating conditions is more than 1, the contaminant has a statistically significant change during the use of LCF relative to the baseline condition.

AERMOD modelling was performed for a total of 18 contaminants under both operating conditions.

As presented in Table 12, one contaminant, NOx is deemed to have a statistically significant change in its percentage of maximum POI limits between baseline and LCF conditions.

1.1.1.3 Explanation of Statistically Significant Changes

A review of recent CEM data for NOx show that the change observed between the baseline and LCF conditions is well within normal variation that occurs when only conventional fuel is being used. Further, the clinker production rate during the LCF source test was slightly higher than during the baseline test. On a normalized basis, the average NOx emission rates during the LCF source test were actually slightly lower than the emission rate during the baseline source test (i.e. NOx baseline and NOx LCF were 1.48 kg/tonne of clinker and 1.45 kg/tonne of clinker, respectively.).

As such, the change observed during the LCF test is not statistically significant.

In summary, the data shows no statistically significant changes in kiln stack emissions and POI concentrations of the tested contaminants as a result of the use of LCF, relative to baseline conditions.