Covanta Durham York Renewable Energy Limited Partnership.

Interim AMESA Evaluation Report

COVANTA REPORT NUMBER: 4053

TEST CONTRACTOR: ORTECH ENVIRONMENTAL

Approved by: _____

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1.0 Overview

The Long Term Sampling System (LTSS) provided by AMESA is subject to two separate and sequential evaluation steps. Step 1 is to evaluate the isokinetic sample characteristics of the AMESA system to determine if the system is extracting an isokinetic sample as compared to the reference method for flow. This step used test data obtained during the October emissions test plan. The AMESA LTSS needs to be evaluated on a long term basis because the amount of gas that is sampled determines the amount of dioxin/furan that is exposed to and collected by the cartridge.

Step 2 commenced with installation of the cartridge after isokinetics were confirmed as being acceptable. The goal is to complete a statistical comparison of results from the LTSS with results from Environment Canada EPS 1/RM/2, EPS 1/RM/23 and Method EPS 1/RM/3 testing (Reference Method for Source Testing: Measurement of Releases of Selected Semi-volatile Organic Compounds from Stationary Sources, referred to as RM23 going forward, for dioxins/furans. The evaluation will be completed in accordance with the principles of 40 CFR 60, Appendix B, Performance Specification 4 (PS 4) which requires procedures at 40 CFR 60 PS2 to conduct relative accuracy (RA) testing. RA testing requires a series of 12 tests, each with a four (4) hour duration. The LTSS results must satisfy two different criteria to be considered valid for characterizing emissions; 1) be within +/- 10 percent as calculated pursuant to PST4 or +/- 5 % of the applicable standard of 60 pg-TEQ/RM3/11 (5 % of 60 is 3 pg-TEQ/RM3/11), and 2) the isomer distributions have not changed versus the reference method. The currently available RA results indicate that the AMESA system has not demonstrated RA correlation with the RM23 compliance test results, as they exceeded the +/- 10 % requirement. (Note: literature search has confirmed that no LTSS installed anywhere has demonstrated RA within the +/-10% criteria).

At the time of this interim report we have completed the initial isokinetic sampling evaluation and three (3) representative and coincident stack measurements of dioxin/furan from both units using both AMESA and RM23. . Additional testing will occur until there are a total of twelve paired sets of results for each of the two units to complete the relative accuracy component of PS 4.

2.0 Isokinetic Evaluation

In order to evaluate the operation of the Amesa LTSS, an isokinetic sampling evaluation was performed on the Unit 1 and Unit 2 sampling systems on September 28 - October 2, 2015. An isokinetic sampling rate assures that the stack gas entering any sampling train is representative of the effluent gas in the duct; the sampling system is designed to collect effluent in the train without bias. This unbiased sampling can be verified by measuring dry stack gas flow in the duct (Q_s), corrected to standard temperature and pressure, with a known stack cross sectional area (A_s), and concurrently extracting a dry, metered volume into the Amesa LTSS sampling train (corrected to standard temperature and pressure), using a sample nozzle with known cross sectional area (A_n). The dry, metered volume measured by the Amesa LTSS is then converted to a flow rate (Q_n) by dividing the sample volume by the sampling time. The isokinetic ratio is calculated as:

$$100 \times \frac{\frac{Q_s}{A_s}}{\frac{Q_n}{A_n}} = \text{Isokinetic Ratio}$$

where:

Q = Dry Standard Stack Flow, m^3/min

A = Stack Cross Sectional Area, m^2

Q = Dry Standard Nozzle Flow, m^3/min

A = Nozzle Cross Sectional Area, m^2

The specified range is 95 – 115% isokinetic flow. A minimum of nine flow measurements were to be taken on each unit.

2.1 Data Collection:

On September 28, thirteen flow traverses were completed on Unit 1, and fourteen flow traverses were completed on Unit 2. Certain paired sets (reference flue gas flow rate and AMESA flow rate) were not available because the AMESA was not logging the amount of flue gas being processed by the LTSS (runs 1 thru 4 on Unit 1 and run 1 thru 8 on Unit 2) during the traverse. The missing paired sets were replaced with AMESA LTSS data and flue gas traverse data from several compliance test runs flue gas flow traverse were paired with Amesa LTSS data recorder logs in 30 minute increments. Table 2-1 below summarizes the origin of paired data sets for each of the nine reference flow measurements.

Table 2-1: Reference Flow Measurements

	Unit 1	**Unit 2**
1	Flow Traverse #5 - #6 (avg)	Flow Traverse #9 - #14 (avg)
2	Flow Traverse #7 - #13 (avg)	M29 #1
3	M26A #1	M29 #2
4	M26A #2	M29 #3
5	M29 #1	M26A #1
6	M29 #2	M26A #2
7	SVOC #1	SVOC #1
8	SVOC #2	SVOC #2
9	SVOC #3	SVOC #3

2.2 Calculations and Results:

The detailed calculations used to determine the isokinetic parameter of each unit are provided as Appendix A. AMESA LTSS data used in that calculation are provided as Appendix B. Appendix E provides the ORTECH report inclusive of field data and calculations. The results are summarized below:

Parameter	Unit 1	Unit 2
9 run average	108	106

The results from Unit 1 and Unit 2 AMESA LTSS were within the AMESA acceptable range of 95 to 115 %, therefore both units were deemed to have met the standard during this initial test.

The ability to maintain an isokinetic flow is understood to be a key parameter for any long term dioxin sampling system. This includes the ability of the system to automatically adjust to changes in flow due to changes in duct flow rate. Therefore this isokinetic test will be repeated during subsequent AMESA LTSS field test programs.

3.0 AMESA LTSS Test Data

3.1 Overview of AMESA System

The AMESA Long Term Sampling System (LTSS) is comprised of three major components; 1) Sample probe 2) Amesa trap box at the sampling location 3) Support cabinet in the CEMS shelter. The operation and maintenance manuals provided with the LTSS were followed throughout the sampling period associated with this report.

The cartridges obtained from ALS were cleaned and re-charged to ensure that there was not any contamination present at the start of any sample event. Cartridges are removed after sampling is complete, sealed, and are then sent to ALS for extraction and analysis. They are then cleaned for re-use. The probe and sample system is run continuously during the sample period and cleaned after sampling is complete through a manually initiated blow back feature that uses clean air to remove solid material that may have accumulated inside the probe

3.2 Test Data

The initial attempt on October 1st and 2nd to secure a paired set of dioxin/furan results (RM23 and AMESA) did not yield representative results that enabled a valid comparison. All field samples were managed by the same laboratory where laboratory procedures did not include the full set of cleanup procedures necessary to remove interference.

The archived samples from ALS laboratory were delivered to a second and independent laboratory, SGS Environmental Services, for the purpose of analyzing the samples for interference. Appendix C provides the SGS report and a note from their laboratory director that confirms the presence of interference and their opinion that the amount of interference cannot be quantified.

Appendix D provides a comparison of the isomer distribution from the ALS and SGS analysis. Figure D.1 and D.2 provides a graphical comparison of the results with Figure D.3 and D.4 providing the linear regression comparison that yielded a coefficient of fit (R^2) of 97.5 % for Unit 1 and 99.6 % for Unit 2.

The conclusion is that both labs identified interference. ALS has assigned an estimate of 15 % to the TEQ which should somehow be related to the increased weight attributable to the interference however the method to assign that value is not understood given that there were twelve samples submitted for analysis. SGS has considerable experience in the analysis of samples from similar units and has stated that in their experience it is not possible to determine the actual bias, and that the samples are considered to be compromised to an unknown extent.

3.3 Results

The current set of data available for evaluation is limited to paired sets of samples taken on October 28th and 29th. Table 1 presents the coincident sample times that verify that the RM23 and AMESA system were sampling flue gas at the same time. The laboratory results from RM23 and AMESA LTSS for Unit 1 are provided in Table 2 with Unit 2 results provided as Table 3. All results represents laboratory procedures that used a third cleanup procedure that according to laboratory reports has less interference.

Table 1. Sample times for RM 23 and AMESA LTSS

Run	Unit 1				Unit 2			
	RM 23		AMESA		RM23		AMESA	
	Start	Stop	Start	Stop	Start	Stop	Start	Stop
1	13:15	17:28	13:12	17:32	12:28	16:40	12:20	16:47
2	8:36	13:50	8:39	13:53	8:42	13:32	9:04	13:34
3	15:25	19:45	15:27	19:48	15:30	19:36	15:26	19:47

Table 2. Unit 1 Results: RM23 and AMESA LTSS

Reference Info		Unit 1					
		pg/RM3/11			pg-TEQ/RM3/11 (a)		
Test Date	Run	RM23	AMESA	AMESA/RM23	RM23	AMESA	AMESA/RM23
28-Oct	1	1,637	35,200	21.50	<25.9	<843	32.5
29-Oct	2	2,019	9,020	4.47	<29.6	<273	9.2
29-Oct	3	1,515	3,409	2.25	<25.5	<121	4.7

(a) NATO/CCMS (1989) toxicity equivalency factors with full detection limit.

Table 3. Unit 1 Results: RM23 and AMESA LTSS

Reference Info		Unit 2					
		pg/RM3/11			pg-TEQ/RM3/11 (a)		
Test Date	Run	RM23	AMESA	AMESA/RM23	RM23	AMESA	AMESA/RM23
28-Oct	1	772	13,653	17.69	<19.5	<559	28.7
29-Oct	2	1,017	5,659	5.56	<23.8	<258	10.8
29-Oct	3	1,025	3,421	3.34	<23.2	<182	7.8

(a) NATO/CCMS (1989) toxicity equivalency factors with full detection limit.

Table 4 presents the calculated relative accuracy results for Unit 1 AMESA LTSS when using the data in Table 2. Table 5 presents the calculated relative accuracy results for Unit 2 AMESA LTSS when using the data in Table 3.

Table 4 – Relative Accuracy – AMESA LTSS – Unit 1

Date	Start Time	Stop time	Run	Run Used	Reference Method pg-TEQ	CEM Monitor pg-TEQ	Difference pg-TEQ
10/28/2015	13:15	17:28	1	Yes	25.9	843	-817.1
10/29/2015	8:36	13:50	2	Yes	29.6	273	-243.4
10/29/2015	15:25	19:45	3	Yes	25.5	121	-95.5
					Average CEM Value		412.33
					Average RM Value		27.00
					Mean Difference		-385.33
					Number Of Runs		3
					Standard deviation		381.163
					T - Value		4.303
					Confidence Coefficient		946.9385
					Bias		**-561.6**
					Relative Accuracy (RM)		**4934.3%**

Table 5 - Relative Accuracy – AMESA LTSS – Unit 2

Date	Start Time	Stop time	Run	Run Used	Reference Method pg-TEQ	CEM Monitor pg-TEQ	Difference pg-TEQ
10/28/2015	12:28	16:40	1	Yes	19.5	559	-539.5
10/29/2015	8:42	13:32	2	Yes	23.8	258	-234.2
10/29/2015	15:30	19:36	3	Yes	23.2	182	-158.8
					Average CEM Value		333.00
					Average RM Value		22.17
					Mean Difference		-310.83
					Number Of Runs		3
					Standard deviation		201.588
					T - Value		4.303
					Confidence Coefficient		500.8122
					Bias		**-190.0**
					Relative Accuracy (RM)		**3661.6%**

The initial relative accuracy and bias calculations are summarized below;

	Unit 1	Unit 2
Relative Accuracy as %	4934.3	3661.6
Bias	- 561.6	- 190

This initial data base of paired data will be increased through additional paired sets of RM23 and AMESA cartridges. This initial set of data indicates that the standards of Performance Specification 4 are not being met.

Appendix A – Isokinetic flow rate calculations

Tables A-1 and A-2 show a summary of the calculations and results for the isokinetic ratio for each Unit.

Table A-1: Unit 1 Isokinetic Ratio Calculation

Amesa Date/time	dry metered volume m3	Q_n flow, dry standard m3/min	A_n nozzle area m2	dry reference flowrate m3/sec	Q_s flow, dry standard m3/min	A_s stack area m2	**Isokinetic Ratio** Qs/As Qn/An
28-09-15/16:58	43.065			Flow Traverse #5 - #6 averaged			
28-09-15/17:28	43.412	0.0116	0.0000196	15.7	942	1.48	**108**
28-09-15/17:58	43.796			Flow Traverse #7 - #13 averaged			
28-09-15/18:28	44.163	0.0125	0.0000196	16.8	1008	1.48	**107**
29-09-15/08:58	54.552						
29-09-15/09:28	54.913						
29-09-15/09:58	55.280						
29-09-15/10:28	55.621						
29-09-15/10:58	55.970						
29-09-15/11:28	56.301						
29-09-15/11:58	56.645						
29-09-15/12:28	56.988						
29-09-15/12:58	57.327			M26A #1			
29-09-15/13:28	57.663	0.0115	0.0000196	15.5	930	1.48	**107**
29-09-15/13:58	57.993						
29-09-15/14:28	58.323						
29-09-15/14:58	58.651						
29-09-15/15:28	58.970						
29-09-15/15:58	59.290						
29-09-15/16:28	59.613						
29-09-15/16:58	59.950						
29-09-15/17:28	60.279			M26A #2			
29-09-15/17:38	60.410	0.0110	0.0000196	15.2	912	1.48	**110**
30-09-15/11:43	72.667						
30-09-15/12:13	73.010						
30-09-15/12:43	73.344						
30-09-15/13:13	73.671			M29 #1			
30-09-15/13:43	74.005	0.0111	0.0000196	15.2	912	1.48	**108**

Table A-1 (continued): Unit 1 Isokinetic Ratio Calculation

Amesa Date/time	dry metered volume m3	Q_n flow, dry standard m3/min	A_n nozzle area m2	dry reference flowrate m3/sec	Q_s flow, dry standard m3/min	A_s stack area m2	**Isokinetic Ratio** Qs/As / Qn/An
30-09-15/14:43	74.704						
30-09-15/15:13	75.053						
30-09-15/15:43	75.409						
30-09-15/16:13	75.761						
30-09-15/16:43	76.108			M29 #2			
30-09-15/17:13	76.458	0.0117	0.0000196	15.7	942	1.48	**107**
01-10-15/11:17	0.327						
01-10-15/11:47	0.674						
01-10-15/12:17	0.999						
01-10-15/12:47	1.353						
01-10-15/13:17	1.710						
01-10-15/13:47	2.036						
01-10-15/14:17	2.352						
01-10-15/14:47	2.688			SVOC #1			
01-10-15/15:05	2.889	0.0112	0.0000196	15.0	900	1.48	**107**
02-10-15/08:11	0.315						
02-10-15/08:41	0.638						
02-10-15/09:11	0.951						
02-10-15/09:41	1.264						
02-10-15/10:11	1.580						
02-10-15/10:41	1.901						
02-10-15/11:11	2.222						
02-10-15/11:41	2.550			SVOC #2			
02-10-15/11:57	2.717	0.0106	0.0000196	14.2	852	1.48	**106**
02-10-15/13:05	0.316						
02-10-15/13:35	0.633						
02-10-15/14:05	0.946						
02-10-15/14:35	1.267						
02-10-15/15:05	1.597						
02-10-15/15:35	1.915						
02-10-15/16:05	2.225						
02-10-15/16:35	2.541			SVOC #3			
02-10-15/16:40	2.603	0.0106	0.0000196	14.4	864	1.48	**108**

UNIT 1 NINE RUN ISOKINETIC AVERAGE = 108%

ACCEPTABLE RANGE = 95 - 115%

Table A-2: Unit 2 Isokinetic Ratio Calculation

Amesa Date/time	dry metered volume m3	Q_n flow, dry standard m3/min	A_n nozzle area m2	dry reference flowrate m3/sec	Q_s flow, dry standard m3/min	A_s stack area m2	**Isokinetic Ratio** Qs/As Qn/An
28-09-15/17:59	37.725			Flow Traverses #9 - #14 averaged			
28-09-15/18:29	38.099	0.0125	0.0000196	16.4	984	1.48	**105**
29-09-15/08:59	48.700						
29-09-15/09:29	49.050						
29-09-15/09:59	49.399						
29-09-15/10:29	49.746						
29-09-15/10:59	50.093						
29-09-15/11:29	50.438						
29-09-15/11:59	50.787			M29 #1			
29-09-15/12:29	51.147	0.0117	0.0000196	15.1	906	1.48	**103**
29-09-15/13:29	51.838						
29-09-15/13:59	52.179						
29-09-15/14:29	52.519						
29-09-15/14:59	52.860						
29-09-15/15:29	53.202			M29 #2			
29-09-15/15:59	53.541	0.0114	0.0000196	15.1	906	1.48	**106**
29-09-15/16:29	53.884						
29-09-15/16:59	54.234						
29-09-15/17:29	54.585						
29-09-15/18:06	54.946						
29-09-15/18:36	55.298			M29 #3			
29-09-15/19:06	55.650	0.0112	0.0000196	15.2	912	1.48	**108**
30-09-15/11:36	67.587						
30-09-15/12:06	67.949						
30-09-15/12:36	68.307						
30-09-15/13:06	68.671						
30-09-15/13:36	69.035						
30-09-15/14:06	69.401			M26A #1			
30-09-15/14:36	69.772	0.0121	0.0000196	16.4	984	1.48	**107**
30-09-15/16:06	70.882						
30-09-15/16:36	71.242						
30-09-15/17:06	71.604						
30-09-15/17:36	71.973						
30-09-15/18:06	72.332						
30-09-15/18:36	72.687						
30-09-15/19:06	73.047			M26A #2			
30-09-15/19:36	73.409	0.0120	0.0000196	16.1	966	1.48	**106**

Table A-2 (continued): Unit 2 Isokinetic Ratio Calculation

Amesa Date/time	dry metered volume m3	Q_n flow, dry standard m3/min	A_n nozzle area m2	dry reference flowrate m3/sec	Q_s flow, dry standard m3/min	A_s stack area m2	**Isokinetic Ratio** Qs/As Qn/An
01-10-15/12:44	0.313						
01-10-15/13:14	0.629						
01-10-15/13:44	0.955						
01-10-15/14:14	1.276						
01-10-15/14:44	1.589						
01-10-15/15:14	1.895						
01-10-15/15:44	2.204						
01-10-15/16:14	2.526			SVOC #1			
01-10-15/16:31	2.712	0.0106	0.0000196	14.1	846	1.48	**106**
02-10-15/08:12	0.323						
02-10-15/08:42	0.666						
02-10-15/09:12	0.986						
02-10-15/09:42	1.290						
02-10-15/10:12	1.595						
02-10-15/10:42	1.899						
02-10-15/11:12	2.207						
02-10-15/11:42	2.519			SVOC #2			
02-10-15/11:58	2.683	0.0105	0.0000196	14.3	858	1.48	**109**
02-10-15/13:06	0.321						
02-10-15/13:36	0.633						
02-10-15/14:06	0.940						
02-10-15/14:36	1.254						
02-10-15/15:06	1.574						
02-10-15/15:36	1.886						
02-10-15/16:06	2.187						
02-10-15/16:36	2.494			SVOC #3			
02-10-15/16:39	2.531	0.0104	0.0000196	13.8	828	1.48	**105**

UNIT 2 NINE RUN ISOKINETIC AVERAGE = 106%

ACCEPTABLE RANGE = 95 –115%

Appendix B – Isokinetic data from AMESA Long term Sampling System

COVANTA CANADA - STACK UNIT 1

Runtimerecord:	[TGVNMD] [....m3]
28-09-15/16:54	43.065
28-09-15/17:28	43.412
28-09-15/17:58	43.796
28-09-15/18:28	44.163
28-09-15/18:58	44.528
28-09-15/19:28	44.891
28-09-15/19:58	45.255
28-09-15/20:28	45.62
28-09-15/20:58	45.984
28-09-15/21:28	46.341
28-09-15/21:58	46.697
28-09-15/22:28	47.052
28-09-15/22:58	47.409
28-09-15/23:28	47.76
28-09-15/23:58	48.121
29-09-15/00:28	48.471
29-09-15/00:58	48.82
29-09-15/01:28	49.172
29-09-15/01:58	49.529
29-09-15/02:28	49.887
29-09-15/02:58	50.24
29-09-15/03:28	50.592
29-09-15/03:58	50.943
29-09-15/04:28	51.294
29-09-15/04:58	51.647
29-09-15/05:28	52.004
29-09-15/05:58	52.368
29-09-15/06:28	52.717
29-09-15/06:58	53.097
29-09-15/07:28	53.472
29-09-15/07:58	53.831
29-09-15/08:28	54.193
29-09-15/08:58	54.552
29-09-15/09:28	54.913

29-09-15/09:58	55.28
29-09-15/10:28	55.621
29-09-15/10:58	55.97
29-09-15/11:28	56.301
29-09-15/11:58	56.645
29-09-15/12:28	56.988
29-09-15/12:58	57.327
29-09-15/13:28	57.663
29-09-15/13:58	57.993
29-09-15/14:28	58.323
29-09-15/14:58	58.651
29-09-15/15:28	58.97
29-09-15/15:58	59.29
29-09-15/16:28	59.613
29-09-15/16:58	59.95
29-09-15/17:28	60.279
29-09-15/17:38	60.41
29-09-15/18:13	60.745
29-09-15/18:43	61.099
29-09-15/19:13	61.43
29-09-15/19:43	61.757
29-09-15/20:13	62.084
29-09-15/20:43	62.42
29-09-15/21:13	62.759
29-09-15/21:43	63.097
29-09-15/22:13	63.425
29-09-15/22:43	63.752
29-09-15/23:13	64.084
29-09-15/23:43	64.433
30-09-15/00:13	64.76
30-09-15/00:43	65.089
30-09-15/01:13	65.435
30-09-15/01:43	65.779
30-09-15/02:13	66.117
30-09-15/02:43	66.455
30-09-15/03:13	66.788
30-09-15/03:43	67.126
30-09-15/04:13	67.462
30-09-15/04:43	67.8
30-09-15/05:13	68.152
30-09-15/05:43	68.511
30-09-15/06:13	68.853
30-09-15/06:43	69.191

30-09-15/07:13	69.564
30-09-15/07:43	69.902
30-09-15/08:13	70.245
30-09-15/08:43	70.581
30-09-15/09:13	70.92
30-09-15/09:43	71.268
30-09-15/10:13	71.622
30-09-15/10:43	71.971
30-09-15/11:13	72.313
30-09-15/11:43	72.667
30-09-15/12:13	73.01
30-09-15/12:43	73.344
30-09-15/13:13	73.671
30-09-15/13:43	74.005
30-09-15/14:13	74.358
30-09-15/14:43	74.704
30-09-15/15:13	75.053
30-09-15/15:43	75.409
30-09-15/16:13	75.761
30-09-15/16:43	76.108
30-09-15/17:13	76.458
30-09-15/17:43	76.816
30-09-15/18:13	77.157
30-09-15/18:43	77.49
30-09-15/19:13	77.826
30-09-15/19:43	78.165
01-10-15/11:17	0.327
01-10-15/11:47	0.674
01-10-15/12:17	0.999
01-10-15/12:47	1.353
01-10-15/13:17	1.71
01-10-15/13:47	2.036
01-10-15/14:17	2.352
01-10-15/14:47	2.688
01-10-15/15:05	2.889
02-10-15/08:11	0.315
02-10-15/08:41	0.638
02-10-15/09:11	0.951
02-10-15/09:41	1.264
02-10-15/10:11	1.58
02-10-15/10:41	1.901
02-10-15/11:11	2.222
02-10-15/11:41	2.55

02-10-15/11:57	2.717
02-10-15/13:05	0.316
02-10-15/13:35	0.633
02-10-15/14:05	0.946
02-10-15/14:35	1.267
02-10-15/15:05	1.597
02-10-15/15:35	1.915
02-10-15/16:05	2.225
02-10-15/16:35	2.541
02-10-15/16:40	2.603

Appendix B – AMESA Data – Unit 2

COVANTA CANADA - STACK UNIT 2

Runtimerecord:	[TGVNMD] [....m3]
28-09-15/16:59	
28-09-15/17:29	37.34
28-09-15/17:59	37.725
28-09-15/18:29	38.099
28-09-15/18:59	38.475
28-09-15/19:29	38.863
28-09-15/19:59	39.241
28-09-15/20:29	39.617
28-09-15/20:59	39.986
28-09-15/21:29	40.351
28-09-15/21:59	40.713
28-09-15/22:29	41.078
28-09-15/22:59	41.444
28-09-15/23:29	41.805
28-09-15/23:59	42.169
29-09-15/00:29	42.526
29-09-15/00:59	42.885
29-09-15/01:29	43.248
29-09-15/01:59	43.606
29-09-15/02:29	43.966
29-09-15/02:59	44.326
29-09-15/03:29	44.685
29-09-15/03:59	45.046
29-09-15/04:29	45.41
29-09-15/04:59	45.774
29-09-15/05:29	46.144
29-09-15/05:59	46.522
29-09-15/06:29	46.889
29-09-15/06:59	47.25
29-09-15/07:29	47.632
29-09-15/07:59	47.985
29-09-15/08:29	48.342
29-09-15/08:59	48.7
29-09-15/09:29	49.05
29-09-15/09:59	49.399
29-09-15/10:29	49.746
29-09-15/10:59	50.093

29-09-15/11:29	50.438
29-09-15/11:59	50.787
29-09-15/12:29	51.147
29-09-15/12:59	51.497
29-09-15/13:29	51.838
29-09-15/13:59	52.179
29-09-15/14:29	52.519
29-09-15/14:59	52.86
29-09-15/15:29	53.202
29-09-15/15:59	53.541
29-09-15/16:29	53.884
29-09-15/16:59	54.234
29-09-15/17:29	54.585
29-09-15/18:06	54.946
29-09-15/18:36	55.298
29-09-15/19:06	55.65
29-09-15/19:36	56.001
29-09-15/20:06	56.371
29-09-15/20:36	56.727
29-09-15/21:06	57.085
29-09-15/21:36	57.441
29-09-15/22:06	57.79
29-09-15/22:36	58.138
29-09-15/23:06	58.488
29-09-15/23:36	58.841
30-09-15/00:06	59.196
30-09-15/00:36	59.546
30-09-15/01:06	59.899
30-09-15/01:36	60.254
30-09-15/02:06	60.613
30-09-15/02:36	60.972
30-09-15/03:06	61.335
30-09-15/03:36	61.691
30-09-15/04:06	62.049
30-09-15/04:36	62.406
30-09-15/05:06	62.763
30-09-15/05:36	63.131
30-09-15/06:06	63.504
30-09-15/06:36	63.887
30-09-15/07:06	64.28
30-09-15/07:36	64.667
30-09-15/08:06	65.029
30-09-15/08:36	65.387

30-09-15/09:06	65.751
30-09-15/09:36	66.114
30-09-15/10:06	66.479
30-09-15/10:36	66.848
30-09-15/11:06	67.215
30-09-15/11:36	67.587
30-09-15/12:06	67.949
30-09-15/12:36	68.307
30-09-15/13:06	68.671
30-09-15/13:36	69.035
30-09-15/14:06	69.401
30-09-15/14:36	69.772
30-09-15/15:06	70.153
30-09-15/15:36	70.521
30-09-15/16:06	70.882
30-09-15/16:36	71.242
30-09-15/17:06	71.604
30-09-15/17:36	71.973
30-09-15/18:06	72.332
30-09-15/18:36	72.687
30-09-15/19:06	73.047
30-09-15/19:36	73.409
30-09-15/20:06	73.77
01-10-15/12:44	0.313
01-10-15/13:14	0.629
01-10-15/13:44	0.955
01-10-15/14:14	1.276
01-10-15/14:44	1.589
01-10-15/15:14	1.895
01-10-15/15:44	2.204
01-10-15/16:14	2.526
01-10-15/16:31	2.712
02-10-15/08:12	0.323
02-10-15/08:42	0.666
02-10-15/09:12	0.986
02-10-15/09:42	1.29
02-10-15/10:12	1.595
02-10-15/10:42	1.899
02-10-15/11:12	2.207
02-10-15/11:42	2.519
02-10-15/11:58	2.683
02-10-15/13:06	0.321
02-10-15/13:36	0.633

02-10-15/14:06	0.94
02-10-15/14:36	1.254
02-10-15/15:06	1.574
02-10-15/15:36	1.886
02-10-15/16:06	2.187
02-10-15/16:36	2.494
02-10-15/16:39	2.531

FINAL LAB REPORT

Extracts

A8304

29-Oct-2015

Prepared by

SGS NORTH AMERICA

Prepared for

Covanta Energy Group, Inc.

Joe Aldina

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This report is approved by

Heather Distel

Senior Project Scientist/Team Lead

PROJECT INFORMATION SUMMARY *(When applicable, see QC Annotations for details)*

Client Project	Extracts
SGS Project #	A8304
Analytical Protocol(s)	Method 23
No. Samples Submitted	10
Additional QC Sample(s)	0
No. Laboratory Method Blanks	1
No. OPRs / Batch CS3	0
Date Received	17-Oct-15
Condition Received	Good
Temperature upon Receipt (ºC)	14.9
Extraction within Holding Time	Yes
Analysis within Holding Time	Yes

QC ANNOTATIONS:

1. Please see Appendices attached for data qualifier/attribute and lab identifier descriptions which may be contained in the project.

2. Sample WG2185607-3 has extraction recoveries that are above the accepted limit., From the results it looks like the sample may not have been split 5 ways, but the documentation from ALS stated all samples were split.

APPENDIX A: GENERAL DATA QUALIFIERS / DATA ATTRIBUTES

B	The analyte was found in the method blank, at a concentration that was at least 10% of the concentration in the sample.
C	Two or more congeners co-elute. In EDDs, C denotes the lowest IUPAC congener in a co-elution group and additional co-eluters for the group are shown with the number of the lowest IUPAC co-eluter.
E	The reported concentration exceeds the calibration range (upper point of the calibration curve) and is an estimated value.
EMPC	Represents an Estimated Maximum Possible Concentration. EMPCs arise in cases where the signal/noise ratio is not sufficient for peak identification (the determined ion-abundance ratio is outside the allowed theoretical range), or where there is a co-eluting interference.
H/h	If the standard recovery is below the method or SOP specified value “H” is assigned. If the obtained value is less than half the specified value “h” is assigned.
J	Indicates that an analyte has a concentration below the reporting limit (lowest point of the calibration curve) and is an estimated value.
ND	Indicates a non-detect.
NR or R	Indicates a value that is not reportable.
PR	Due to interference, the associated congener is poorly resolved.
QI	Indicates the presence of a quantitative interference.
SI	Denotes “Single Ion Mode” and is utilized for PCBs where the secondary ion trace has a significantly elevated noise level due to background PFK. Responses for such peaks are calculated using an EMPC approach based solely on the primary ion area(s) and may be considered estimates.
U	The analyte was not detected. The estimated detection limit (EDL) may be reported for this analyte.
V	The labeled standard recovery was found to be outside of the method control limits.

APPENDIX B: DRBC/TMDL SPECIFIC DATA QUALIFIERS / DATA ATTRIBUTES

J	The reported result is an estimate. The value is less than the minimum calibration level but greater than the estimated detection limit (EDL).
U	The analyte was not detected in the sample at the estimated detection limit (EDL).
E	The reported concentration is an estimate. The value exceeds the upper calibration range (upper point of the calibration curve).
D	Dilution Data. Result was obtained from the analysis of a dilution.
B	Analyte found in the sample and associated method blank.
C	Co-eluting congener
Cxx	Co-elutes with the indicated congener, data is reported under the lowest IUPAC congener. 'Xx' denotes the IUPAC number with the lowest numerical designated congener.
NR	Analyte is not reportable because of problems in sample preparation or analysis.
V	Labeled standard recovery is not within method control limits.
X	Results from re-injection/repeat/second-column analysis.
EMPC	Estimated maximum possible concentration. Indicates that a peak is identified but did not meet the method specified ion-abundance ratio.

APPENDIX C: LAB IDENTIFIERS

AR	Indicates use of the archived portion of the sample extract.
CU	Indicates a sample that required additional clean-up prior to MS injection/processing.
D	Indicates a dilution of the sample extract. The number that follows the "D" indicates the dilution factor.
DE	Indicates a dilution performed with the addition of ES (extraction standard) solution.
DUP	Designation for a duplicate sample.
MS	Designation for a matrix spike.
MSD	Designation for a matrix spike duplicate.
RJ	Indicates a reinjection of the sample extract.
S	Indicates a sample split. The number that follows the "S" indicates the split factor.

SGS CERTIFICATIONS

Arkansas	88-0682
California (ELAP)	Interim ELAP Cert #2914
CLIA	34D1013708
Connecticut	PH-0258
USDA Soil Permit	P330-14-00135
DoD	2726.01
Florida (Primary NELAP)	E87634
ISO 17025/IEC	2726.01
Louisiana	4115
Maine	#2014020
Massachusetts	M-NC919
Minnesota (Primary NELAP For Method 23)	Lab #037-999-459 Cert #688823
New Jersey	NC100
New York	11685
North Carolina DWR	481
North Dakota	R-197
Oregon	NC200002
Pennsylvania	68-03675
South Carolina	Lab #99029 Cert #99029002
Texas	T104704260-13-5
US Coast Guard	16714/159.317/SGS
Virginia	Lab #460214 Cert #3006
Washington	C913
West Virginia	293

Rev. 04-Sep-2014

A8304 - TEQ

Sample Summary Part 1

SGS

Method 23

Analyte	WG2185607-1	WG2185607-2	WG2185607-3	L1682779-1	L1682779-2	L1682779-3	L1682779-5	L1682779-6	L1682779-7	M23 ES#2 20ul
	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
2,3,7,8-TCDD	(6.68)	1110	1140	(8.12)	(12.0)	(8.73)	(7.55)	(9.78)	(5.78)	(3.78)
1,2,3,7,8-PeCDD	(7.30)	[5280]	[5330]	[193]	[156]	[225]	[161]	[99.4]	[148]	(5.07)
1,2,3,4,7,8-HxCDD	(5.35)	4480	4530	753	651	1070	329	196	313	(3.81)
1,2,3,6,7,8-HxCDD	(5.42)	4720	4680	2070	1690	2900	1040	623	980	(3.86)
1,2,3,7,8,9-HxCDD	(4.93)	4400	4580	827	657	1060	444	270	406	(3.51)
1,2,3,4,6,7,8-HpCDD	(6.39)	5200	5310	16100	13900	23000	5260	3330	5010	(5.31)
OCDD	(8.46)	9100	9120	11300	9880	16000	2750	1870	2780	(6.21)
2,3,7,8-TCDF	(5.35)	949	953	40.2	35.7	49.5	49.2	31.9	37.9	(2.83)
1,2,3,7,8-PeCDF	(4.53)	4920	4920	128	107	149	150	82.1	125	(2.34)
2,3,4,7,8-PeCDF	(4.72)	4780	4720	601	491	747	513	311	437	(2.44)
1,2,3,4,7,8-HxCDF	(4.79)	4750	4570	780	658	1080	405	244	362	(3.41)
1,2,3,6,7,8-HxCDF	(4.39)	5080	5110	974	768	1270	544	340	476	(3.13)
2,3,4,6,7,8-HxCDF	(4.84)	5150	4990	2180	1760	2780	1020	632	947	(3.45)
1,2,3,7,8,9-HxCDF	(5.29)	4950	4920	114	104	135	118	[81.9]	68.8	(3.77)
1,2,3,4,6,7,8-HpCDF	[10.6}	4560	4710	4300	3610	6070	1350	784	1250	[7.91]
1,2,3,4,7,8,9-HpCDF	(5.89)	4450	4780	1030	869	1350	416	246	363	(3.49)
OCDF	107	8760	8560	2730	2430	3690	910	676	896	102
ITEF TEQ (ND=0; EMPC=0)	**1.07**	**7350**	**7340**	**1310**	**1080**	**1740**	**733**	**439**	**654**	**0.102**
ITEF TEQ (ND=0; EMPC=EMPC)	**0.213**	**9990**	**10000**	**1410**	**1160**	**1850**	**814**	**497**	**728**	**0.181**
ITEF TEQ (ND=DL/2; EMPC=0)	**8.67**	**7350**	**7340**	**1320**	**1090**	**1750**	**739**	**448**	**659**	**5.38**
ITEF TEQ (ND=DL/2; EMPC=EMPC)	**8.76**	**9990**	**10000**	**1410**	**1160**	**1850**	**817**	**502**	**730**	**5.44**
ITEF TEQ (ND=DL; EMPC=EMPC)	**17.3**	**9990**	**10000**	**1410**	**1170**	**1860**	**821**	**507**	**733**	**10.7**
Checkcode	109-182-CKK	008-371-DGL	611-736-PPX	020-383-FCZ	593-514-VHJ	215-857-TQQ	773-039-VMG	183-223-QNV	554-583-FCL	609-577-JWT
Lab ID	8304_13682_DF_001	8304_13682_DF_002	8304_13682_DF_003	8304_13682_DF_004	8304_13682_DF_005	8304_13682_DF_006	8304_13682_DF_007	8304_13682_DF_008	8304_13682_DF_009	8304_13682_DF_010

( ) = DL
[ ] = EMPC

A8304 - WHO-2005-TEQ

Sample Summary Part 1

SGS

Method 23

Analyte	WG2185607-1	WG2185607-2	WG2185607-3	L1682779-1	L1682779-2	L1682779-3	L1682779-5	L1682779-6	L1682779-7	M23 ES#2 20ul
	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
2,3,7,8-TCDD	(6.68)	1110	1140	(8.12)	(12.0)	(8.73)	(7.55)	(9.78)	(5.78)	(3.78)
1,2,3,7,8-PeCDD	(7.30)	[5280]	[5330]	[193]	[156]	[225]	[161]	[99.4]	[148]	(5.07)
1,2,3,4,7,8-HxCDD	(5.35)	4480	4530	753	651	1070	329	196	313	(3.81)
1,2,3,6,7,8-HxCDD	(5.42)	4720	4680	2070	1690	2900	1040	623	980	(3.86)
1,2,3,7,8,9-HxCDD	(4.93)	4400	4580	827	657	1060	444	270	406	(3.51)
1,2,3,4,6,7,8-HpCDD	(6.39)	5200	5310	16100	13900	23000	5260	3330	5010	(5.31)
OCDD	(8.46)	9100	9120	11300	9880	16000	2750	1870	2780	(6.21)
2,3,7,8-TCDF	(5.35)	949	953	40.2	35.7	49.5	49.2	31.9	37.9	(2.83)
1,2,3,7,8-PeCDF	(4.53)	4920	4920	128	107	149	150	82.1	125	(2.34)
2,3,4,7,8-PeCDF	(4.72)	4780	4720	601	491	747	513	311	437	(2.44)
1,2,3,4,7,8-HxCDF	(4.79)	4750	4570	780	658	1080	405	244	362	(3.41)
1,2,3,6,7,8-HxCDF	(4.39)	5080	5110	974	768	1270	544	340	476	(3.13)
2,3,4,6,7,8-HxCDF	(4.84)	5150	4990	2180	1760	2780	1020	632	947	(3.45)
1,2,3,7,8,9-HxCDF	(5.29)	4950	4920	114	104	135	118	[81.9]	68.8	(3.77)
1,2,3,4,6,7,8-HpCDF	[10.6}	4560	4710	4300	3610	6070	1350	784	1250	[7.91]
1,2,3,4,7,8,9-HpCDF	(5.89)	4450	4780	1030	869	1350	416	246	363	(3.49)
OCDF	107	8760	8560	2730	2430	3690	910	676	896	102
WHO-2005 TEQ (ND=0; EMPC=0)	**0.0322**	**6290**	**6290**	**1180**	**971**	**1570**	**625**	**374**	**561**	**0.0306**
WHO-2005 TEQ (ND=0; EMPC=EMPC)	**0.138**	**11600**	**11600**	**1370**	**1130**	**1800**	**786**	**481**	**709**	**0.11**
WHO-2005 TEQ (ND=DL/2; EMPC=0)	**9.9**	**6290**	**6290**	**1190**	**984**	**1580**	**633**	**385**	**569**	**6.3**
WHO-2005 TEQ (ND=DL/2; EMPC=EMPC)	**9.98**	**11600**	**11600**	**1370**	**1130**	**1800**	**790**	**486**	**712**	**6.37**
WHO-2005 TEQ (ND=DL; EMPC=EMPC)	**19.8**	**11600**	**11600**	**1380**	**1140**	**1810**	**794**	**491**	**715**	**12.6**
Checkcode	109-182-CKK	008-371-DGL	611-736-PPX	020-383-FCZ	593-514-VHJ	215-857-TQQ	773-039-VMG	183-223-QNV	554-583-FCL	609-577-JWT
Lab ID	8304_13682_DF_001	8304_13682_DF_002	8304_13682_DF_003	8304_13682_DF_004	8304_13682_DF_005	8304_13682_DF_006	8304_13682_DF_007	8304_13682_DF_008	8304_13682_DF_009	8304_13682_DF_010

( ) = DL
[ ] = EMPC

A8304 - Totals

Sample Summary Part 2

SGS

Method 23

Analyte	WG2185607-1	WG2185607-2	WG2185607-3	L1682779-1	L1682779-2	L1682779-3	L1682779-5	L1682779-6	L1682779-7	M23 ES#2 20ul
	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
Totals										
TCDDs	0	1130	1140	1550	1280	1920	1600	941	1380	0
PeCDDs	0	0	6.12	8460	7520	11500	7680	4250	6520	0
HxCDDs	0	13600	13800	25200	22000	38000	12800	7380	11200	0
HpCDDs	0	5240	5330	33600	29700	50000	10400	6430	10100	0
OCDD	0	9100	9120	11300	9880	16000	2750	1870	2780	0
TCDFs	0	967	972	2060	2290	2540	2290	1370	1900	0
PeCDFs	0	9820	9860	4970	4280	6440	4630	2510	3990	0
HxCDFs	0	19900	19600	10700	8710	14400	5420	3160	4740	0
HpCDFs	0	9010	9490	8470	7250	12000	2880	1700	2660	0
OCDF	107	8760	8560	2730	2430	3690	910	676	896	102
Total PCDD/Fs (ND=0; EMPC=0)	**107**	**77600**	**77900**	**109000**	**95300**	**156000**	**51300**	**30300**	**46100**	**102**
Total PCDD/Fs (ND=0; EMPC=EMPC)	**118**	**82900**	**83200**	**109000**	**95900**	**157000**	**51700**	**30700**	**46500**	**110**
Checkcode	109-182-CKK	008-371-DGL	611-736-PPX	020-383-FCZ	593-514-VHJ	215-857-TQQ	773-039-VMG	183-223-QNV	554-583-FCL	609-577-JWT
Lab ID	8304_13682_DF_001	8304_13682_DF_002	8304_13682_DF_003	8304_13682_DF_004	8304_13682_DF_005	8304_13682_DF_006	8304_13682_DF_007	8304_13682_DF_008	8304_13682_DF_009	8304_13682_DF_010

( ) = DL
[ ] = EMPC

A8304 - Others

Sample Summary
Part 3 (dry weight)

SGS

Method23

Analyte	WG2185607-1	WG2185607-2	WG2185607-3	L1682779-1	L1682779-2	L1682779-3	L1682779-5	L1682779-6	L1682779-7	M23 ES#2 20ul
	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
Other PCDD/Fs (ND=0, EMPC=0)										
Other TCDD	0	20	0	1550	1280	1920	1600	941	1380	0
Other PeCDD	0	0	6.12	8460	7520	11500	7680	4250	6520	0
Other HxCDD	0	0	10	21550	19002	32970	10987	6291	9501	0
Other HpCDD	0	40	20	17500	15800	27000	5140	3100	5090	0
Other TCDF	0	18	19	2020	2250	2490	2240	1340	1860	0
Other PeCDF	0	120	220	4241	3682	5544	3967	2120	3428	0
Other HxCDF	0	0	10	6650	5420	9140	3330	1940	2890	0
Other HpCDF	0	0	0	3140	2771	4580	1114	670	1047	0
Checkcode	109-182-CKK	008-371-DGL	611-736-PPX	020-383-FCZ	593-514-VHJ	215-857-TQQ	773-039-VMG	183-223-QNV	554-583-FCL	609-577-JWT
Lab ID	8304_13682_DF_001	8304_13682_DF_002	8304_13682_DF_003	8304_13682_DF_004	8304_13682_DF_005	8304_13682_DF_006	8304_13682_DF_007	8304_13682_DF_008	8304_13682_DF_009	8304_13682_DF_010

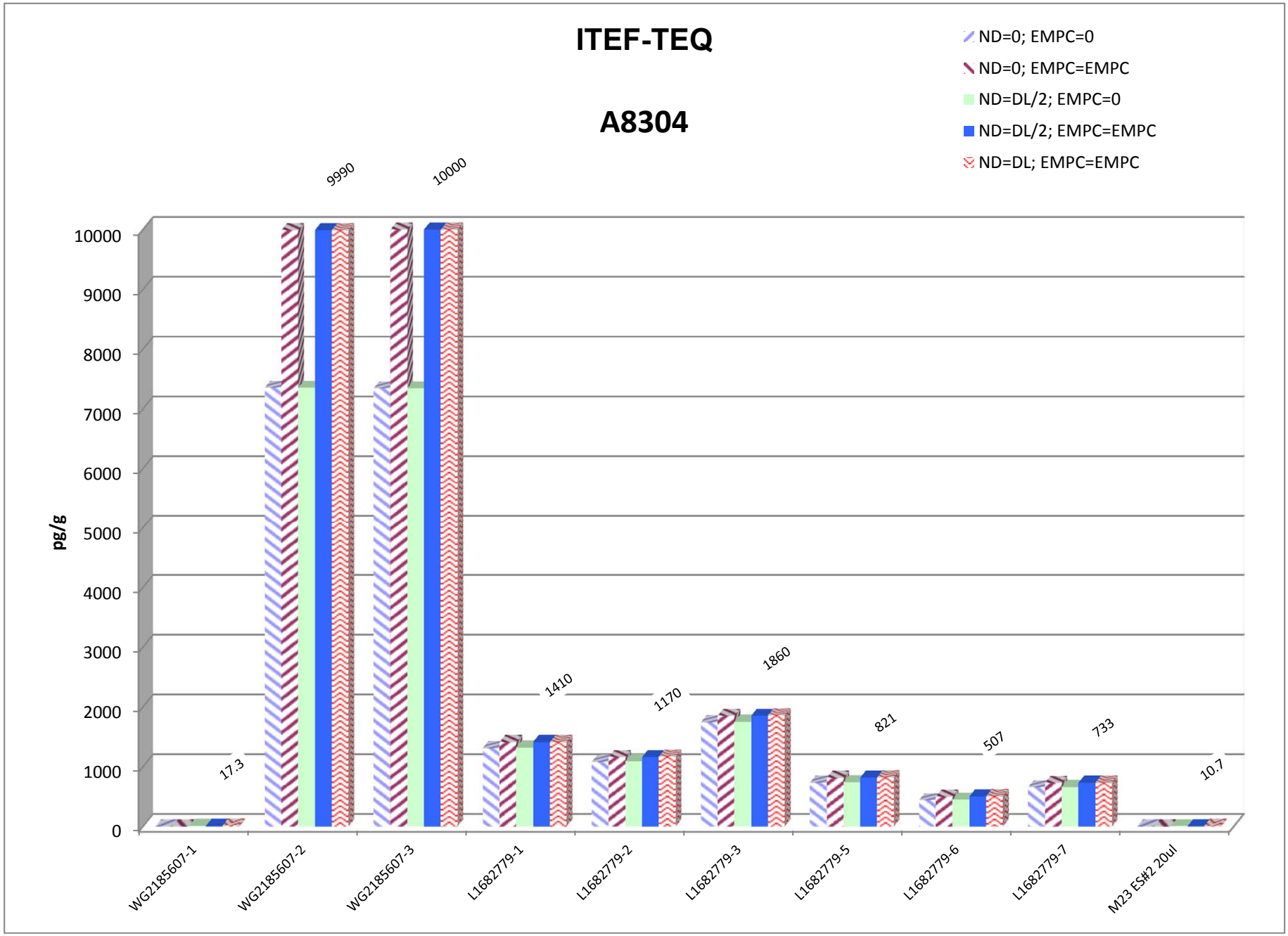
( ) = DL
[ ] = EMPC

A8304 - DLs

Sample Summary
Part 5 (DLs)

Method 23

Analyte	WG2185607-1	WG2185607-2	WG2185607-3	L1682779-1	L1682779-2	L1682779-3	L1682779-5	L1682779-6	L1682779-7	M23 ES#2 20ul
	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
2,3,7,8-TCDD	6.68	4.85	0.687	8.12	12	8.73	7.55	9.78	5.78	3.78
1,2,3,7,8-PeCDD	7.3	8.53	2.12	7.93	13.6	13.4	9.92	12.1	9.82	5.07
1,2,3,4,7,8-HxCDD	5.35	4.74	0.858	10	16.4	15.9	7.4	10.9	7.29	3.81
1,2,3,6,7,8-HxCDD	5.42	4.8	0.869	10.2	16.6	16.1	7.49	11.1	7.39	3.86
1,2,3,7,8,9-HxCDD	4.93	4.37	0.79	9.25	15.1	14.7	6.81	10.1	6.72	3.51
1,2,3,4,6,7,8-HpCDD	6.39	6.84	1.59	15	22.6	19.4	12.2	12.8	10.5	5.31
OCDD	8.46	7.6	1.55	20.1	19.7	24.8	15.4	13	13	6.21
2,3,7,8-TCDF	5.35	4.38	0.553	9.03	8.89	9.61	8.51	8.28	6.89	2.83
1,2,3,7,8-PeCDF	4.53	4.62	0.634	14.5	17.9	18.7	15.6	9.98	10.7	2.34
2,3,4,7,8-PeCDF	4.72	4.82	0.662	15.2	18.6	19.5	16.3	10.4	11.1	2.44
1,2,3,4,7,8-HxCDF	4.79	5.49	0.987	20.5	21.6	31.5	16	13.2	15.5	3.41
1,2,3,6,7,8-HxCDF	4.39	5.04	0.906	18.8	19.8	28.9	14.7	12.1	14.2	3.13
2,3,4,6,7,8-HxCDF	4.84	5.55	0.997	20.7	21.8	31.9	16.1	13.3	15.6	3.45
1,2,3,7,8,9-HxCDF	5.29	6.06	1.09	22.6	23.9	34.8	17.6	14.5	17.1	3.77
1,2,3,4,6,7,8-HpCDF	4.77	3.4	0.729	11.2	13	18.6	8.18	7.5	6.15	2.82
1,2,3,4,7,8,9-HpCDF	5.89	4.2	0.901	13.8	16	23	10.1	9.27	7.6	3.49
OCDF	12.6	8.12	1.69	21.4	23.6	21.5	13.4	15.8	12.8	7.5
Checkcode	109-182-CKK	008-371-DGL	611-736-PPX	020-383-FCZ	593-514-VHJ	215-857-TQQ	773-039-VMG	183-223-QNV	554-583-FCL	609-577-JWT
Lab ID	8304_13682_DF_001	8304_13682_DF_002	8304_13682_DF_003	8304_13682_DF_004	8304_13682_DF_005	8304_13682_DF_006	8304_13682_DF_007	8304_13682_DF_008	8304_13682_DF_009	8304_13682_DF_010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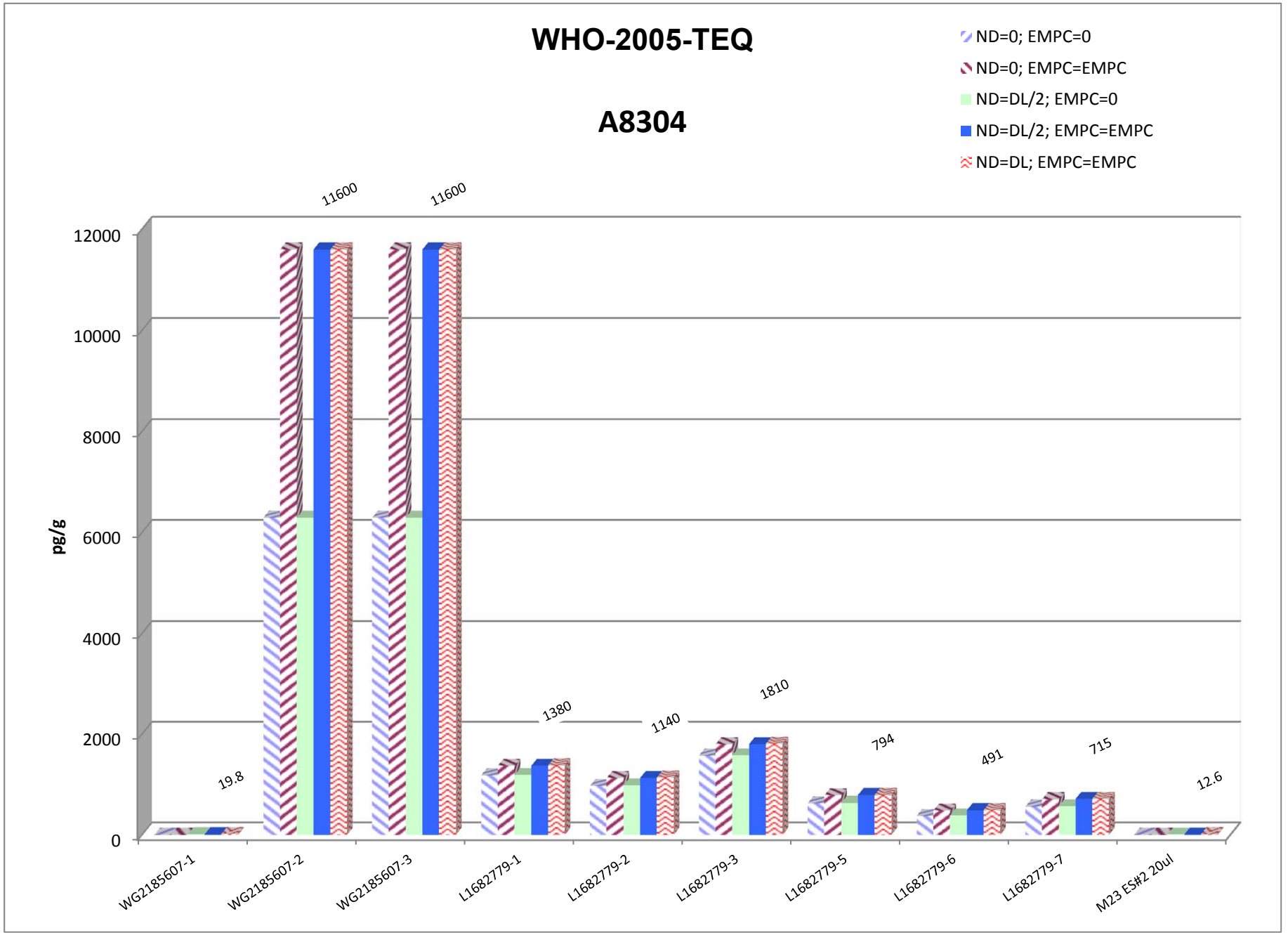
ND=0; EMPC=EMPC
ND=DL/2; EMPC=0
ND=DL/2; EMPC=EMPC
ND=DL; EMPC=EMPC
pg/g
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
17.3
9990
10000
1410
1170
1860
821
507
733
10.7
WG2185607-1
WG2185607-2
WG2185607-3
L1682779-1
L1682779-2
L1682779-3
L1682779-5
L1682779-6
L1682779-7
M23 ES#2 20ul


WHO-2005-TEQ
A8304
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ND=DL/2; EMPC=0
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ND=DL; EMPC=EMPC
pg/g
12000
10000
8000
6000
4000
2000
0
19.8
11600
11600
1380
1140
1810
794
491
715
12.6
WG2185607-1
WG2185607-2
WG2185607-3
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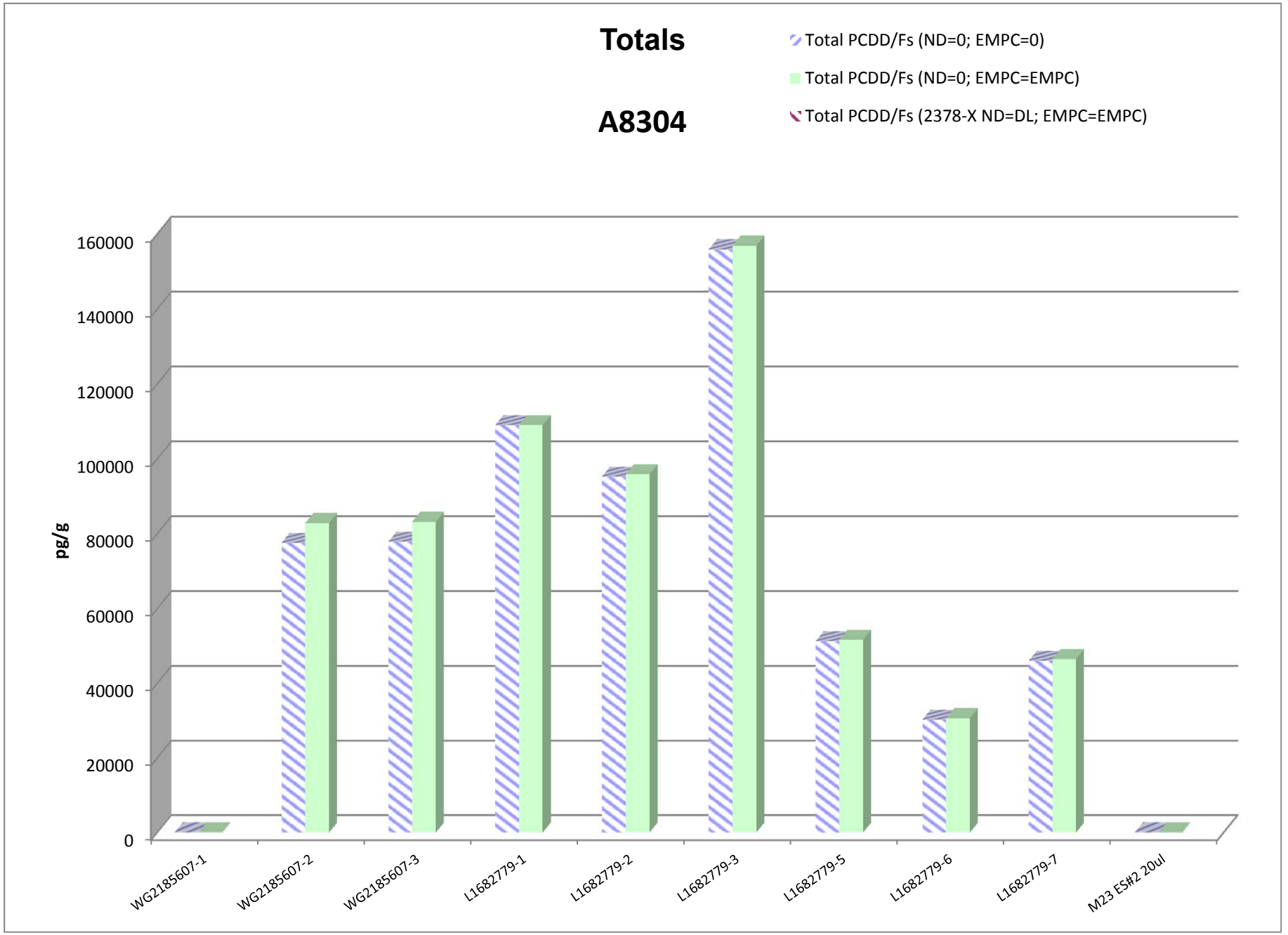
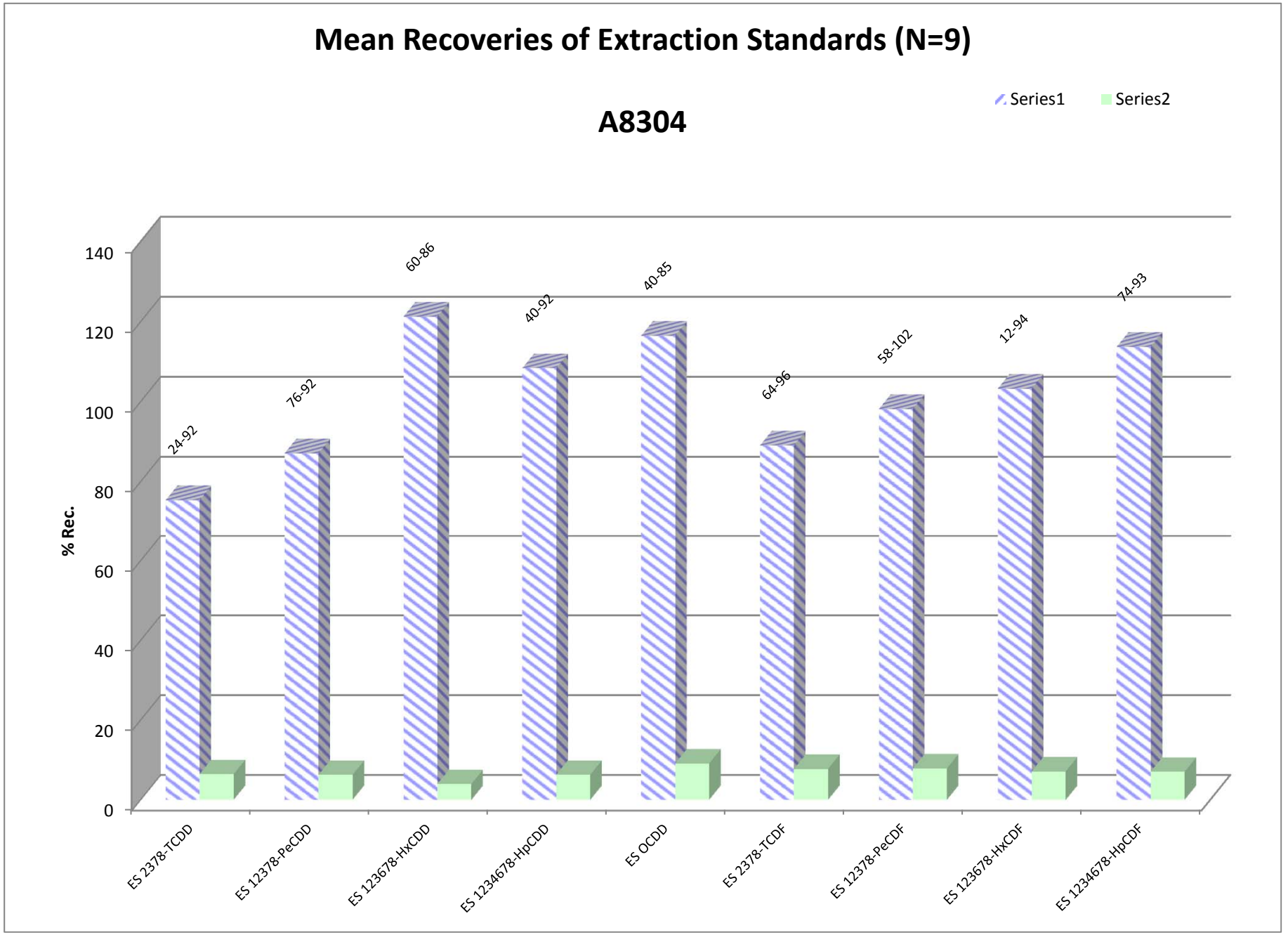
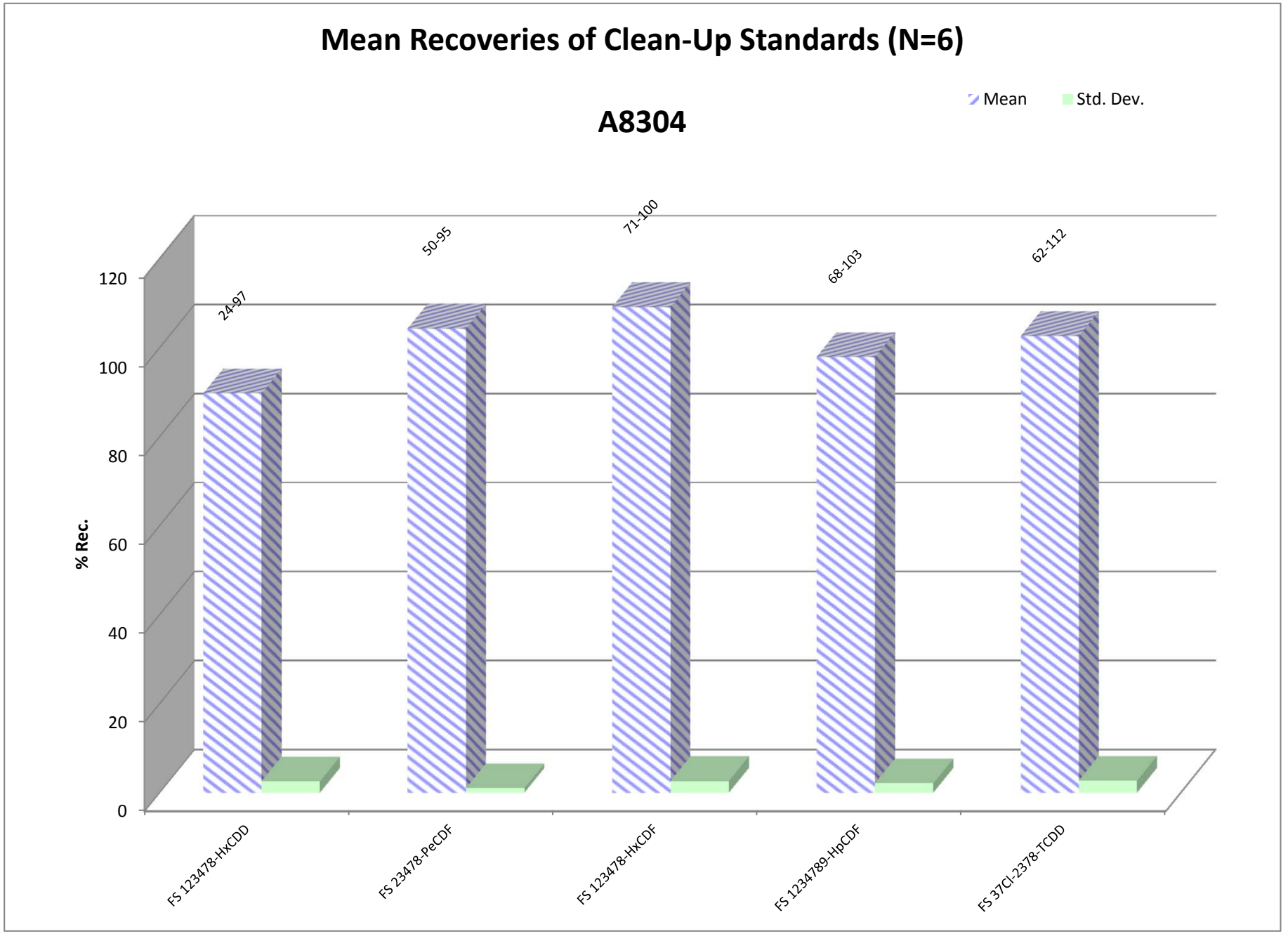
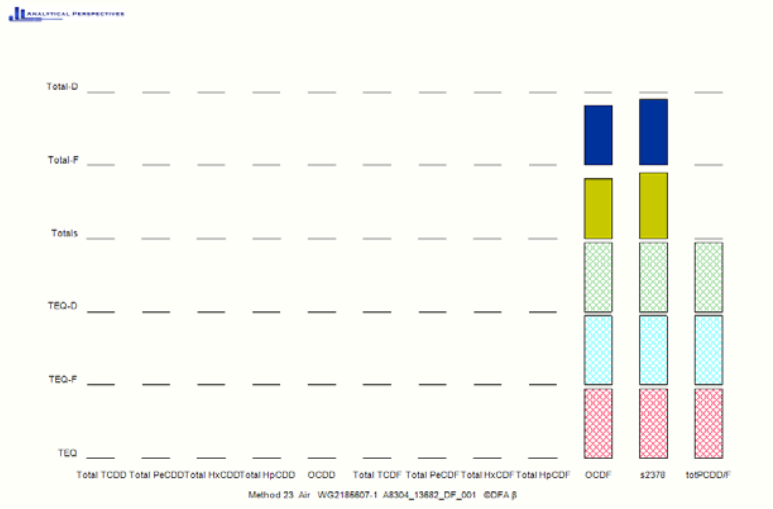
L1682779-7
M23 ES#2 20ul

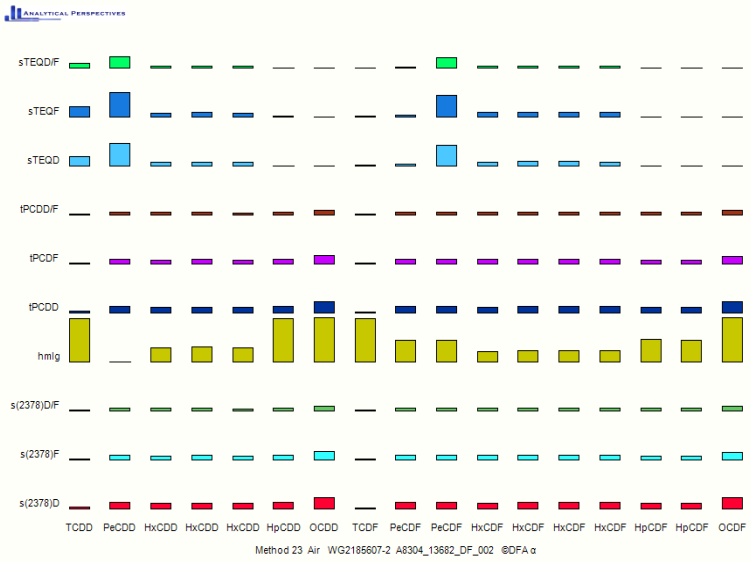

Totals
A8304
Total PCDD/Fs (ND=0; EMPC=0)
Total PCDD/Fs (ND=0; EMPC=EMPC)
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)
pg/g
160000
140000
120000
100000
80000
60000
40000
20000
0
WG2185607-1
WG2185607-2
WG2185607-3
L1682779-1
L1682779-2
L1682779-3
L1682779-5
L1682779-6
L1682779-7
M23 ES#2 20ul

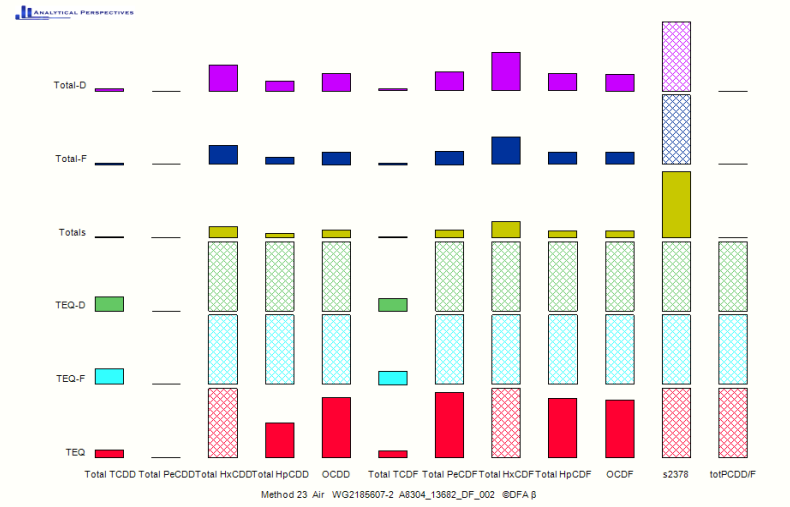

Mean Recoveries of Extraction Standards (N=9)
A8304
Series1
Series2
% Rec.
0
20
40
60
80
100
120
140
24-92
76-92
60-86
40-92
40-85
64-96
58-102
12-94
74-93
ES 2378-TCDD
ES 12378-PeCDD
ES 123678-HxCDD
ES 1234678-HpCDD
ES OCDD
ES 2378-TCDF
ES 12378-PeCDF
ES 123678-HxCDF
ES 1234678-HpCDF

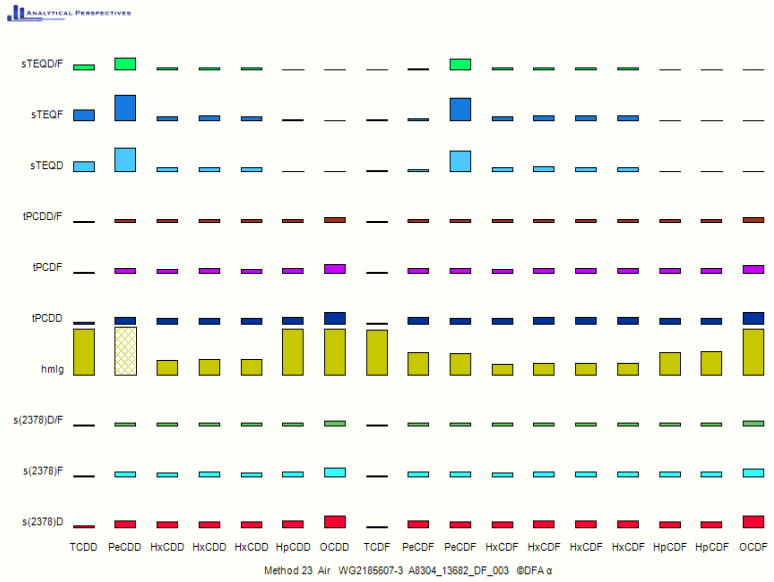

Mean Recoveries of Clean-Up Standards (N=6)
A8304
Mean
Std. Dev.
% Rec.
120
100
80
60
40
20
0
24-97
50-95
71-100
68-103
62-112
FS 123478-HxCDD
FS 23478-PeCDF
FS 123478-HxCDF
FS 1234789-HpCDF
FS 37Cl-2378-TCDD

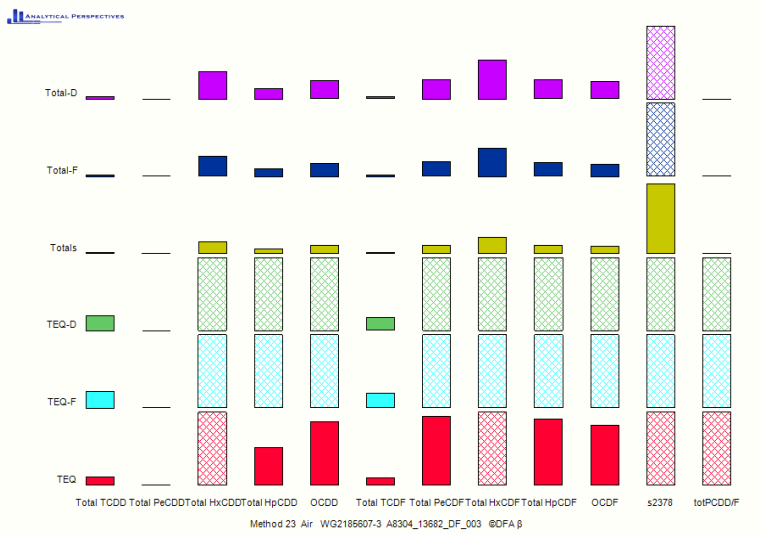

sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air WG2185607-1 A8304_13682_DF_001 ©DFA α

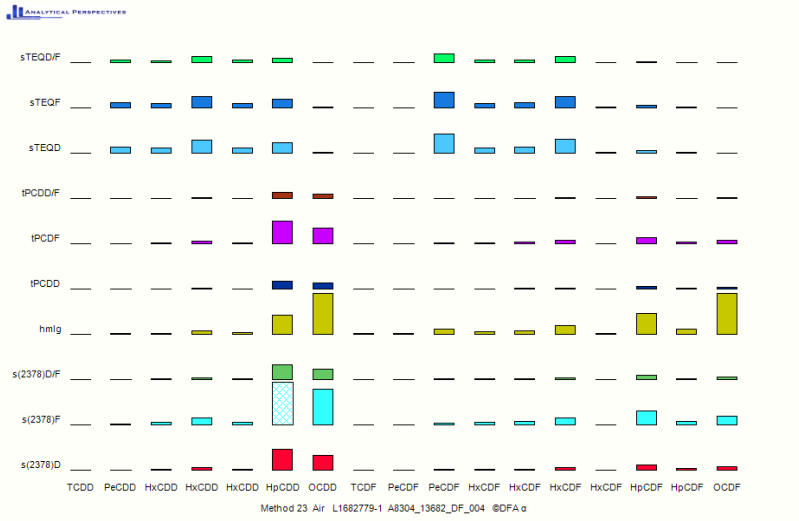

Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air WG2185607-1 A8304_13682_DF_001 ©DFA β

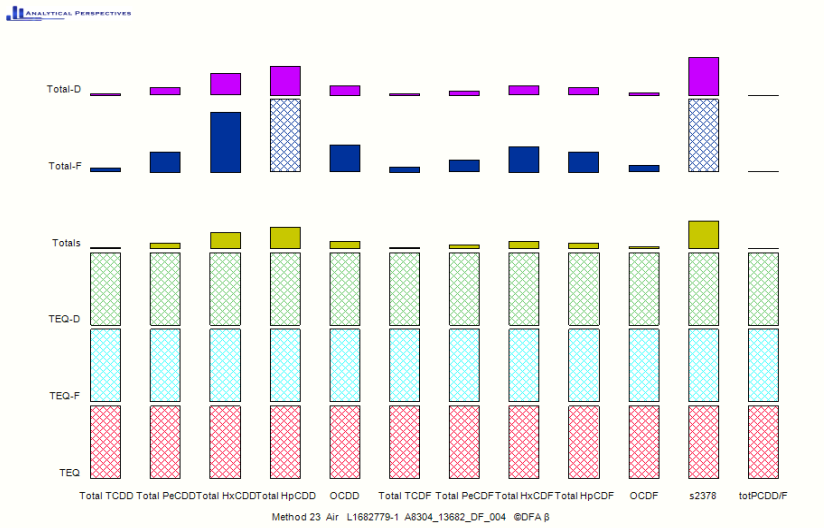

sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air WG2185607-2 A8304_13682_DF_002 ©DFA α

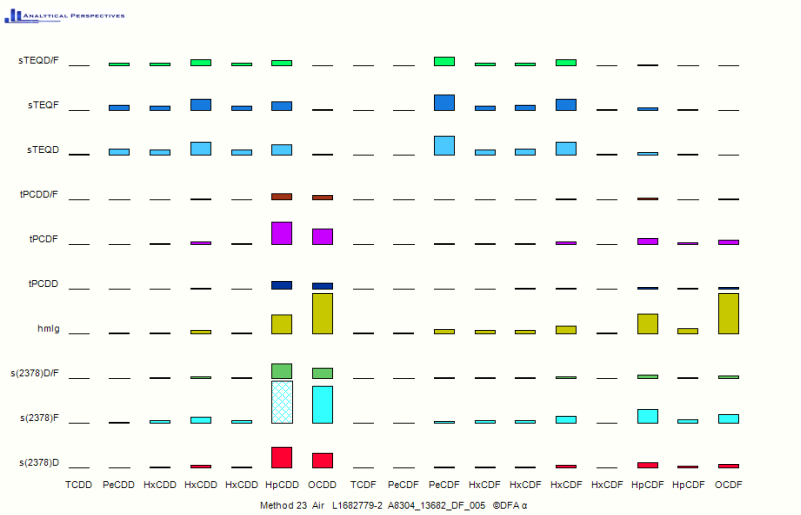

Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air WG2185607-2 A8304_13682_DF_002 ©DFA β

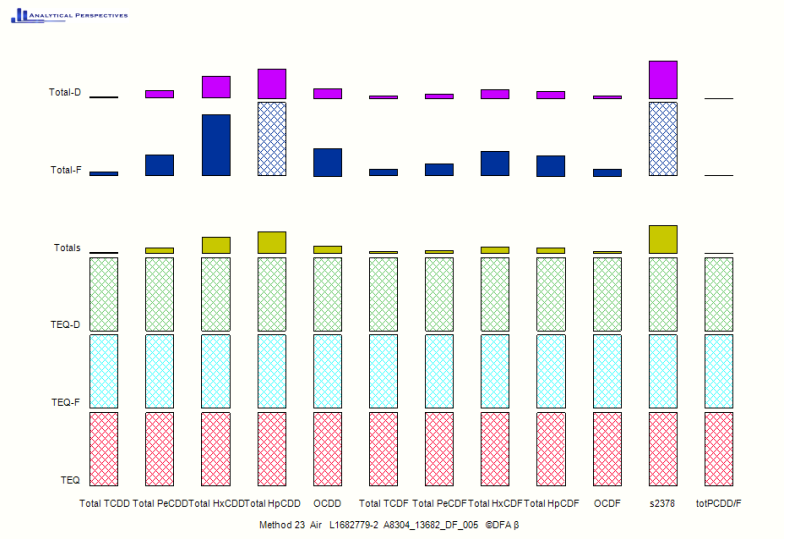

ANALYTICAL PERSPECTIVES
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air WG2185607-3 A8304_13682_DF_003 ©DFA α

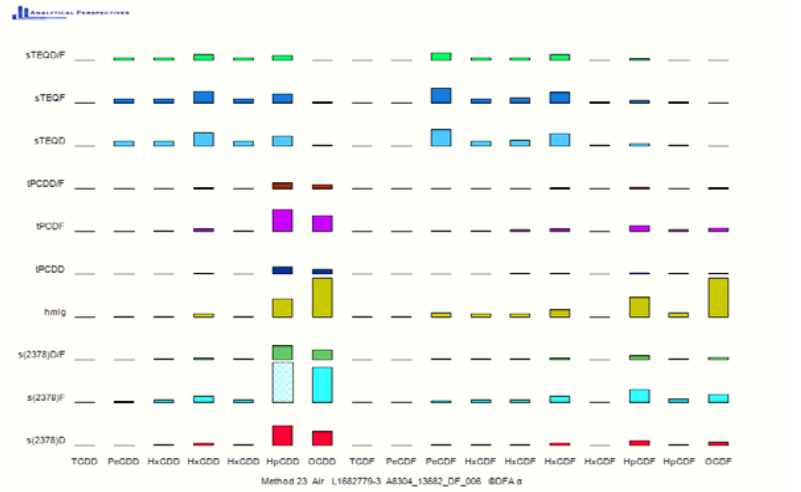

ANALYTICAL PERSPECTIVES
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air WG2185607-3 A8304_13682_DF_003 ©DFA β

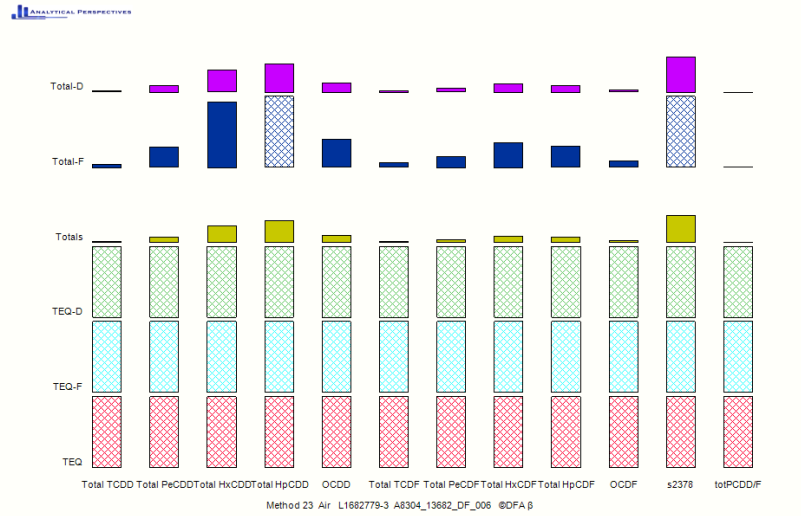

ANALYTICAL PERSPECTIVES
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-1 A8304_13682_DF_004 ©DFA α

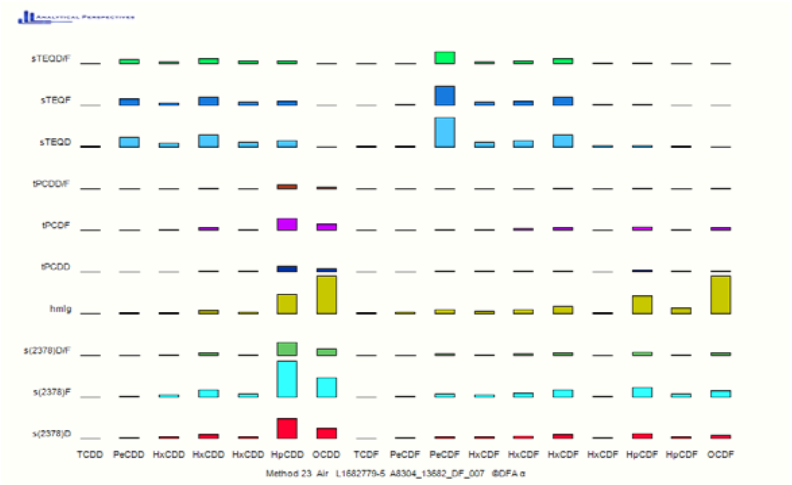

ANALYTICAL PERSPECTIVES
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air L1682779-1 A8304_13682_DF_004 ©DFA β

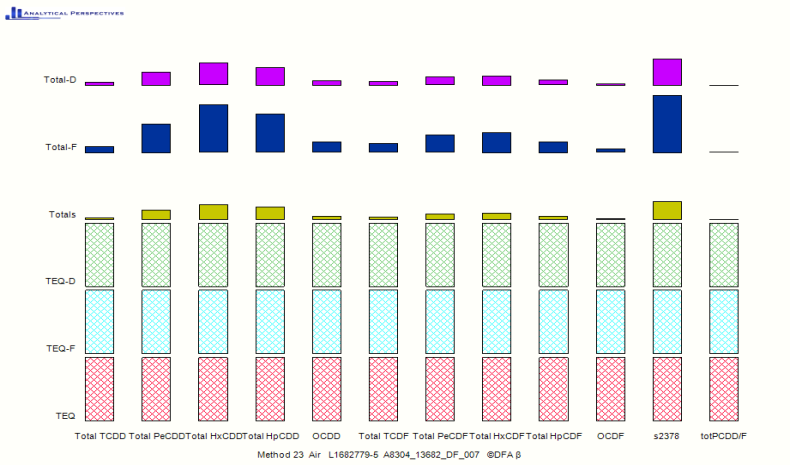

Analytical Perspectives
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-2 A8304_13682_DF_005 ©DFA α


Analytical Perspectives
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air L1682779-2 A8304_13682_DF_005 ©DFA β


Analytical Perspectives
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-3 A8304_13682_DF_006 ©DFA α


Analytical Perspectives
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air L1682779-3 A8304_13682_DF_006 ©DFA β


sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-5 A8304_13682_DF_007 ®DFA α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Total-F
Totals
TEQ-D
TEQ-F
TEQ
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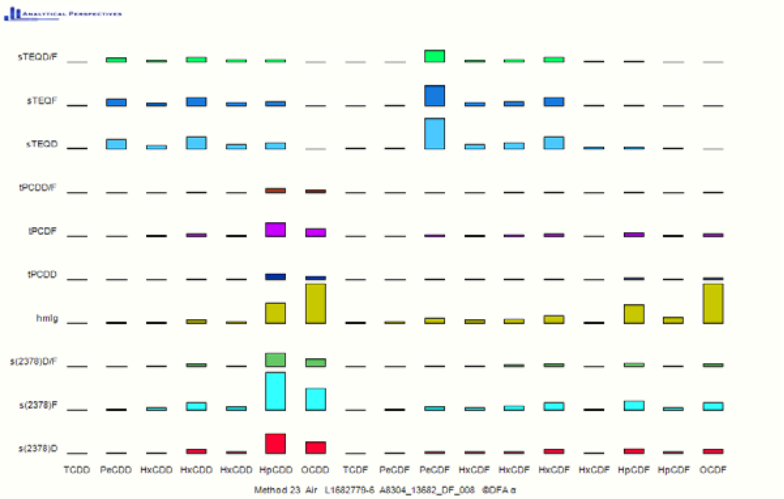
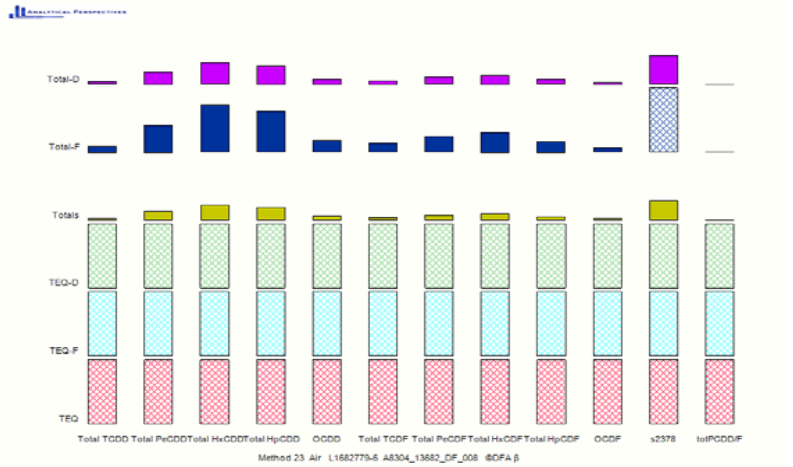
Method 23 Air L1682779-5 A8304_13682_DF_007 ®DFA β


sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-5 A8304_13682_DF_008 ®DFA α


Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
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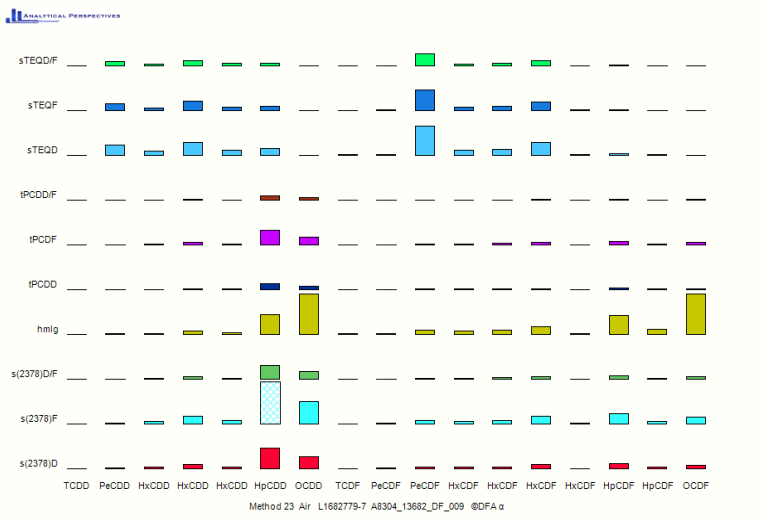
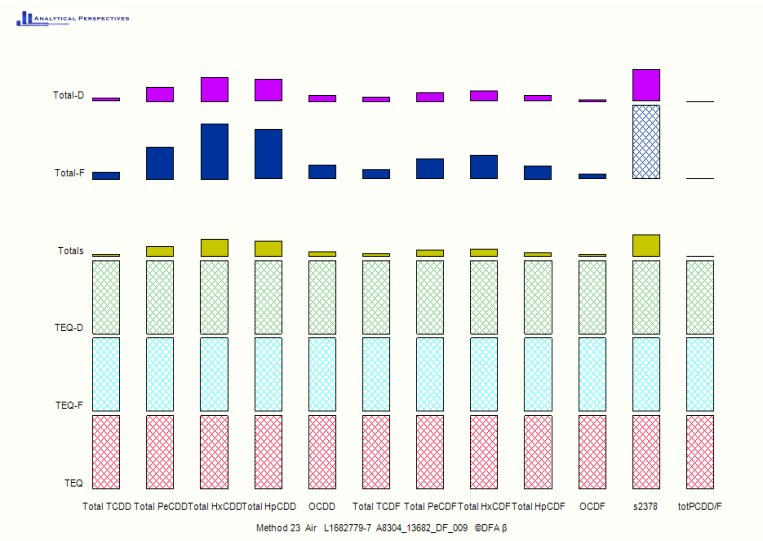
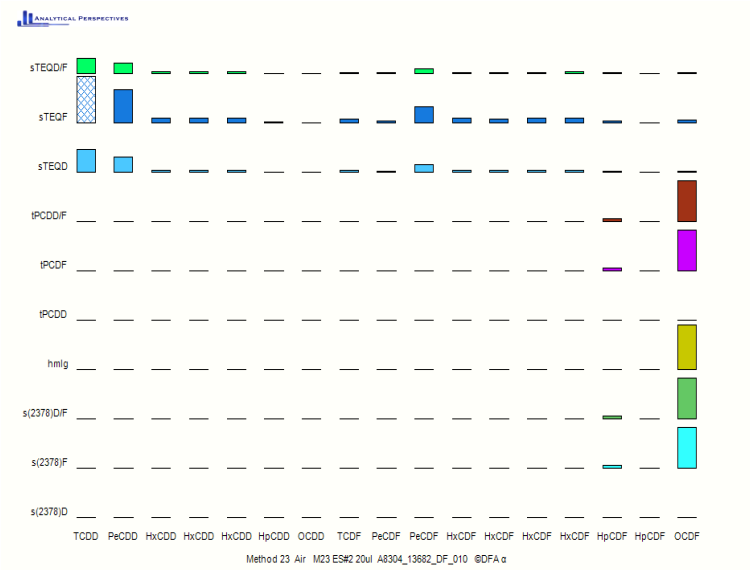
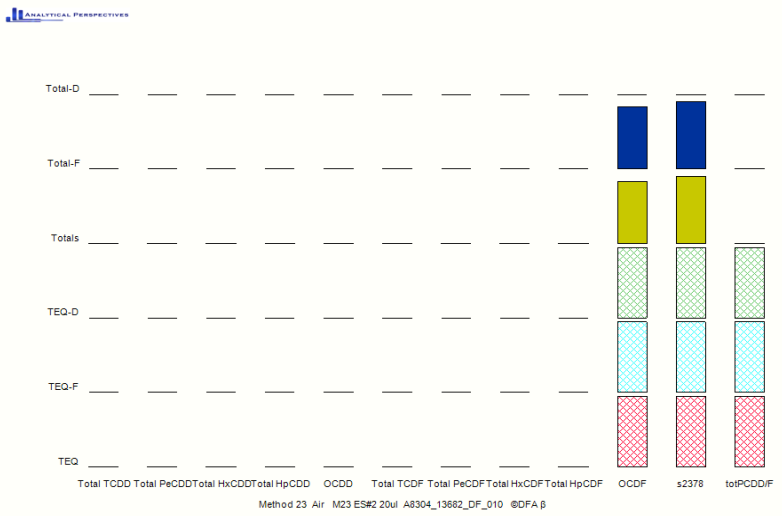
Method 23 Air L1682779-5 A8304_13682_DF_008 ®DFA β


Analytical Perspectives
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air L1682779-7 A8304_13682_DF_009 ©DFA α


Analytical Perspectives
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air L1682779-7 A8304_13682_DF_009 ©DFA β


Analytical Perspectives
sTEQD/F
sTEQF
sTEQD
tPCDD/F
tPCDF
tPCDD
hmlg
s(2378)D/F
s(2378)F
s(2378)D
TCDD PeCDD HxCDD HxCDD HxCDD HpCDD OCDD TCDF PeCDF PeCDF HxCDF HxCDF HxCDF HxCDF HpCDF HpCDF OCDF
Method 23 Air M23 ES#2 20ul A8304_13682_DF_010 ©DFA α


Analytical Perspectives
Total-D
Total-F
Totals
TEQ-D
TEQ-F
TEQ
Total TCDD Total PeCDD Total HxCDD Total HpCDD OCDD Total TCDF Total PeCDF Total HxCDF Total HpCDF OCDF s2378 totPCDD/F
Method 23 Air M23 ES#2 20ul A8304_13682_DF_010 ©DFA β

Sample ID: WG2185607-1 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_001	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	15:10:01

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	6.68			ES 2378-TCDD	77.3	
12378-PeCDD	ND	7.3			ES 12378-PeCDD	94.5	
123478-HxCDD	ND	5.35					
123678-HxCDD	ND	5.42			ES 123678-HxCDD	124	
123789-HxCDD	ND	4.93					
1234678-HpCDD	ND	6.39			ES 1234678-HpCDD	120	
OCDD	ND	8.46			ES OCDD	125	
2378-TCDF	ND	5.35			ES 2378-TCDF	90.5	
12378-PeCDF	ND	4.53			ES 12378-PeCDF	105	
23478-PeCDF	ND	4.72					
123478-HxCDF	ND	4.79					
123678-HxCDF	ND	4.39			ES 123678-HxCDF	114	
234678-HxCDF	ND	4.84					
123789-HxCDF	ND	5.29					
1234678-HpCDF	EMPC		10.6	J	ES 1234678-HpCDF	125	
1234789-HpCDF	ND	5.89					
OCDF	107			J			
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	n/a	
Total TCDD	ND	6.68	ND		FS 23478-PeCDF	n/a	
Total PeCDD	ND	7.3	ND		FS 123478-HxCDF	n/a	
Total HxCDD	ND	8.11	ND		FS 1234789-HpCDF	n/a	
Total HpCDD	ND	6.39	ND		FS 37Cl-2378-TCDD	n/a	
					CS 123789-HxCDF	122	
Total TCDF	ND	5.35	ND				
Total PeCDF	ND	9.24	ND				
Total HxCDF	ND	13.3	ND				
Total HpCDF	ND		10.6				
Total PCDD/Fs	**107**		**118**				
ITEF TEQs							
TEQ: ND=0	0.107		0.213				
TEQ: ND=DL/2	8.67	8.57	8.76				
TEQ: ND=DL	17.2	17.1	17.3				

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Sample ID: WG2185607-2

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_002	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	16:03:34

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	1,110				ES 2378-TCDD	78.8	
12378-PeCDD	EMPC		5,280		ES 12378-PeCDD	92.5	
123478-HxCDD	4,480						
123678-HxCDD	4,720				ES 123678-HxCDD	120	
123789-HxCDD	4,400						
1234678-HpCDD	5,200				ES 1234678-HpCDD	105	
OCDD	9,100				ES OCDD	122	
2378-TCDF	949				ES 2378-TCDF	92.9	
12378-PeCDF	4,920				ES 12378-PeCDF	103	
23478-PeCDF	4,780						
123478-HxCDF	4,750						
123678-HxCDF	5,080				ES 123678-HxCDF	107	
234678-HxCDF	5,150						
123789-HxCDF	4,950						
1234678-HpCDF	4,560				ES 1234678-HpCDF	115	
1234789-HpCDF	4,450						
OCDF	8,760						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	n/a	
Total TCDD	1,130		1,130		FS 23478-PeCDF	n/a	
Total PeCDD	ND		5,280		FS 123478-HxCDF	n/a	
Total HxCDD	13,600		13,600		FS 1234789-HpCDF	n/a	
Total HpCDD	5,240		5,240		FS 37Cl-2378-TCDD	n/a	
					CS 123789-HxCDF	116	
Total TCDF	967		967				
Total PeCDF	9,820		9,850				
Total HxCDF	19,900		19,900				
Total HpCDF	9,010		9,010				
Total PCDD/Fs	**77,600**		**82,900**				
ITEF TEQs							
TEQ: ND=0	7350		9990				
TEQ: ND=DL/2	7350	7.98	9990				
TEQ: ND=DL	7360	16	9990				

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Sample ID: WG2185607-3 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_003	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	16:57:08

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	1,140				ES 2378-TCDD	448	V
12378-PeCDD	EMPC		5,330		ES 12378-PeCDD	497	V
123478-HxCDD	4,530						
123678-HxCDD	4,680				ES 123678-HxCDD	568	V
123789-HxCDD	4,580						
1234678-HpCDD	5,310				ES 1234678-HpCDD	525	V
OCDD	9,120				ES OCDD	619	V
2378-TCDF	953				ES 2378-TCDF	528	V
12378-PeCDF	4,920				ES 12378-PeCDF	549	V
23478-PeCDF	4,720						
123478-HxCDF	4,570						
123678-HxCDF	5,110				ES 123678-HxCDF	534	V
234678-HxCDF	4,990						
123789-HxCDF	4,920						
1234678-HpCDF	4,710				ES 1234678-HpCDF	552	V
1234789-HpCDF	4,780						
OCDF	8,560						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	n/a	
Total TCDD	1,140		1,140		FS 23478-PeCDF	n/a	
Total PeCDD	6.12		5,340		FS 123478-HxCDF	n/a	
Total HxCDD	13,800		13,800		FS 1234789-HpCDF	n/a	
Total HpCDD	5,330		5,330		FS 37Cl-2378-TCDD	n/a	
					CS 123789-HxCDF	n/a	
Total TCDF	972		974				
Total PeCDF	9,860		9,860				
Total HxCDF	19,600		19,600				
Total HpCDF	9,490		9,490				
Total PCDD/Fs	**77,900**		**83,200**				
ITEF TEQs							
TEQ: ND=0	7340		10000				
TEQ: ND=DL/2	7340	1.42	10000				
TEQ: ND=DL	7340	2.85	10000				

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Sample ID: L1682779-1

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_004	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	17:50:40

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	8.12			ES 2378-TCDD	72.5	
12378-PeCDD	EMPC		193		ES 12378-PeCDD	87.4	
123478-HxCDD	753						
123678-HxCDD	2,070				ES 123678-HxCDD	124	
123789-HxCDD	827						
1234678-HpCDD	16,100				ES 1234678-HpCDD	109	
OCDD	11,300				ES OCDD	120	
2378-TCDF	40.2				ES 2378-TCDF	86.6	
12378-PeCDF	128				ES 12378-PeCDF	95	
23478-PeCDF	601						
123478-HxCDF	780						
123678-HxCDF	974				ES 123678-HxCDF	94.9	
234678-HxCDF	2,180						
123789-HxCDF	114			J			
1234678-HpCDF	4,300				ES 1234678-HpCDF	110	
1234789-HpCDF	1,030						
OCDF	2,730						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	90.7	
Total TCDD	1,550		1,570		FS 23478-PeCDF	105	
Total PeCDD	8,460		8,650		FS 123478-HxCDF	114	
Total HxCDD	25,200		25,200		FS 1234789-HpCDF	98.1	
Total HpCDD	33,600		33,600		FS 37Cl-2378-TCDD	107	
					CS 123789-HxCDF	112	
Total TCDF	2,060		2,130				
Total PeCDF	4,970		5,020				
Total HxCDF	10,700		10,700				
Total HpCDF	8,470		8,470				
Total PCDD/Fs	**109,000**		**109,000**				
ITEF TEQs							
TEQ: ND=0	1310		1410				
TEQ: ND=DL/2	1320	16.5	1410				
TEQ: ND=DL	1320	32.9	1410				

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Sample ID: L1682779-2

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_005	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	18:44:15

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	12			ES 2378-TCDD	75.6	
12378-PeCDD	EMPC		156		ES 12378-PeCDD	92.3	
123478-HxCDD	651						
123678-HxCDD	1,690				ES 123678-HxCDD	128	
123789-HxCDD	657						
1234678-HpCDD	13,900				ES 1234678-HpCDD	117	
OCDD	9,880				ES OCDD	124	
2378-TCDF	35.7				ES 2378-TCDF	87	
12378-PeCDF	107			J	ES 12378-PeCDF	103	
23478-PeCDF	491						
123478-HxCDF	658						
123678-HxCDF	768				ES 123678-HxCDF	103	
234678-HxCDF	1,760						
123789-HxCDF	104			J			
1234678-HpCDF	3,610				ES 1234678-HpCDF	116	
1234789-HpCDF	869						
OCDF	2,430						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	86.8	
Total TCDD	1,280		1,590		FS 23478-PeCDF	104	
Total PeCDD	7,520		7,670		FS 123478-HxCDF	108	
Total HxCDD	22,000		22,000		FS 1234789-HpCDF	98.4	
Total HpCDD	29,700		29,700		FS 37Cl-2378-TCDD	102	
					CS 123789-HxCDF	108	
Total TCDF	2,290		2,380				
Total PeCDF	4,280		4,330				
Total HxCDF	8,710		8,710				
Total HpCDF	7,250		7,250				
Total PCDD/Fs	**95,300**		**95,900**				
ITEF TEQs							
TEQ: ND=0	1080		1160				
TEQ: ND=DL/2	1090	22	1160				
TEQ: ND=DL	1100	44	1170				

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Sample ID: L1682779-3

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_006	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	19:37:47

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	8.73			ES 2378-TCDD	68.2	
12378-PeCDD	EMPC		225		ES 12378-PeCDD	77.7	
123478-HxCDD	1,070						
123678-HxCDD	2,900				ES 123678-HxCDD	117	
123789-HxCDD	1,060						
1234678-HpCDD	23,000				ES 1234678-HpCDD	105	
OCDD	16,000				ES OCDD	112	
2378-TCDF	49.5				ES 2378-TCDF	82.6	
12378-PeCDF	149				ES 12378-PeCDF	87.1	
23478-PeCDF	747						
123478-HxCDF	1,080						
123678-HxCDF	1,270				ES 123678-HxCDF	98.3	
234678-HxCDF	2,780						
123789-HxCDF	135						
1234678-HpCDF	6,070				ES 1234678-HpCDF	107	
1234789-HpCDF	1,350						
OCDF	3,690						

Totals					Standard	SS/AS/FS/TS Recoveries	
					FS 123478-HxCDD	90.5	
Total TCDD	1,920		1,980		FS 23478-PeCDF	106	
Total PeCDD	11,500		11,700		FS 123478-HxCDF	110	
Total HxCDD	38,000		38,000		FS 1234789-HpCDF	99.8	
Total HpCDD	50,000		50,000		FS 37Cl-2378-TCDD	99	
					CS 123789-HxCDF	104	
Total TCDF	2,540		2,630				
Total PeCDF	6,440		6,480				
Total HxCDF	14,400		14,400				
Total HpCDF	12,000		12,000				
Total PCDD/Fs	**156,000**		**157,000**				
ITEF TEQs							
TEQ: ND=0	1740		1850				
TEQ: ND=DL/2	1750	22.6	1850				
TEQ: ND=DL	1750	45.1	1860				

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Sample ID: L1682779-5

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_007	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	20-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	23:18:29

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	7.55			ES 2378-TCDD	71.7	
12378-PeCDD	EMPC		161		ES 12378-PeCDD	81.7	
123478-HxCDD	329						
123678-HxCDD	1,040				ES 123678-HxCDD	117	
123789-HxCDD	444						
1234678-HpCDD	5,260				ES 1234678-HpCDD	106	
OCDD	2,750				ES OCDD	107	
2378-TCDF	49.2				ES 2378-TCDF	83.3	
12378-PeCDF	150				ES 12378-PeCDF	91.8	
23478-PeCDF	513						
123478-HxCDF	405						
123678-HxCDF	544				ES 123678-HxCDF	99.6	
234678-HxCDF	1,020						
123789-HxCDF	118			J			
1234678-HpCDF	1,350				ES 1234678-HpCDF	110	
1234789-HpCDF	416						
OCDF	910						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	86.3	
Total TCDD	1,600		1,630		FS 23478-PeCDF	104	
Total PeCDD	7,680		7,840		FS 123478-HxCDF	109	
Total HxCDD	12,800		12,800		FS 1234789-HpCDF	98.9	
Total HpCDD	10,400		10,400		FS 37Cl-2378-TCDD	103	
					CS 123789-HxCDF	112	
Total TCDF	2,290		2,510				
Total PeCDF	4,630		4,680				
Total HxCDF	5,420		5,420				
Total HpCDF	2,880		2,880				
Total PCDD/Fs	**51,300**		**51,700**				
ITEF TEQs							
TEQ: ND=0	733		814				
TEQ: ND=DL/2	739	15.6	817				
TEQ: ND=DL	745	31.2	821				

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Sample ID: L1682779-6

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_008	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	21-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	00:12:02

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	9.78			ES 2378-TCDD	72.6	
12378-PeCDD	EMPC		99.4	J	ES 12378-PeCDD	83.2	
123478-HxCDD	196						
123678-HxCDD	623				ES 123678-HxCDD	118	
123789-HxCDD	270						
1234678-HpCDD	3,330				ES 1234678-HpCDD	105	
OCDD	1,870				ES OCDD	108	
2378-TCDF	31.9				ES 2378-TCDF	85.7	
12378-PeCDF	82.1			J	ES 12378-PeCDF	94.4	
23478-PeCDF	311						
123478-HxCDF	244						
123678-HxCDF	340				ES 123678-HxCDF	98.8	
234678-HxCDF	632						
123789-HxCDF	EMPC		81.9	J			
1234678-HpCDF	784				ES 1234678-HpCDF	109	
1234789-HpCDF	246						
OCDF	676						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	92.2	
Total TCDD	941		959		FS 23478-PeCDF	104	
Total PeCDD	4,250		4,430		FS 123478-HxCDF	107	
Total HxCDD	7,380		7,380		FS 1234789-HpCDF	98.7	
Total HpCDD	6,430		6,430		FS 37Cl-2378-TCDD	104	
					CS 123789-HxCDF	111	
Total TCDF	1,370		1,400				
Total PeCDF	2,510		2,580				
Total HxCDF	3,160		3,240				
Total HpCDF	1,700		1,700				
Total PCDD/Fs	**30,300**		**30,700**				
ITEF TEQs							
TEQ: ND=0	439		497				
TEQ: ND=DL/2	448	15.6	502				
TEQ: ND=DL	456	31.2	507				

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Sample ID: L1682779-7

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_009	Date Extracted:	n/a
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	21-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	01:05:35

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	5.78			ES 2378-TCDD	71.9	
12378-PeCDD	EMPC		148		ES 12378-PeCDD	81.5	
123478-HxCDD	313						
123678-HxCDD	980				ES 123678-HxCDD	119	
123789-HxCDD	406						
1234678-HpCDD	5,010				ES 1234678-HpCDD	100	
OCDD	2,780				ES OCDD	103	
2378-TCDF	37.9				ES 2378-TCDF	85.6	
12378-PeCDF	125				ES 12378-PeCDF	92.9	
23478-PeCDF	437						
123478-HxCDF	362						
123678-HxCDF	476				ES 123678-HxCDF	99.5	
234678-HxCDF	947						
123789-HxCDF	68.8			J			
1234678-HpCDF	1,250				ES 1234678-HpCDF	107	
1234789-HpCDF	363						
OCDF	896						
Totals					**Standard**	**SS/AS/FS/TS Recoveries**	
					FS 123478-HxCDD	91.9	
Total TCDD	1,380		1,410		FS 23478-PeCDF	103	
Total PeCDD	6,520		6,830		FS 123478-HxCDF	107	
Total HxCDD	11,200		11,200		FS 1234789-HpCDF	93.8	
Total HpCDD	10,100		10,100		FS 37Cl-2378-TCDD	101	
					CS 123789-HxCDF	111	
Total TCDF	1,900		1,910				
Total PeCDF	3,990		3,990				
Total HxCDF	4,740		4,740				
Total HpCDF	2,660		2,660				
Total PCDD/Fs	**46,100**		**46,500**				
ITEF TEQs							
TEQ: ND=0	654		728				
TEQ: ND=DL/2	659	13.1	730				
TEQ: ND=DL	664	26.1	733				

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Sample ID: M23 ES#2 20ul

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	Covanta Energy Group, Inc.	Matrix:	Air	Lab Project ID:	A8304	Date Received:	17-Oct-2015
Project ID:	Extracts	Weight/Volume:	1	Lab Sample ID	A8304_13682_DF_010	Date Extracted:	20-Oct-2015
Date Collected:	20-Oct-2015			QC Batch No:	13682	Date Analyzed:	21-Oct-2015
		Split:	5	Dilution:	-	Time Analyzed:	01:59:08

Analyte	Conc. (pg)	DL (pg)	EMPC (pg)	Qualifiers	Standard	ES Recoveries	Qualifiers
2378-TCDD	ND	3.78			ES 2378-TCDD	90.4	
12378-PeCDD	ND	5.07			ES 12378-PeCDD	93.5	
123478-HxCDD	ND	3.81					
123678-HxCDD	ND	3.86			ES 123678-HxCDD	125	
123789-HxCDD	ND	3.51					
1234678-HpCDD	ND	5.31			ES 1234678-HpCDD	109	
OCDD	ND	6.21			ES OCDD	128	
2378-TCDF	ND	2.83			ES 2378-TCDF	108	
12378-PeCDF	ND	2.34			ES 12378-PeCDF	112	
23478-PeCDF	ND	2.44					
123478-HxCDF	ND	3.41					
123678-HxCDF	ND	3.13			ES 123678-HxCDF	115	
234678-HxCDF	ND	3.45					
123789-HxCDF	ND	3.77					
1234678-HpCDF	EMPC		7.91	J	ES 1234678-HpCDF	125	
1234789-HpCDF	ND	3.49					
OCDF	102			J			

Totals					Standard	SS/AS/FS/TS Recoveries	
					FS 123478-HxCDD	n/a	
Total TCDD	ND	3.78	ND		FS 23478-PeCDF	n/a	
Total PeCDD	ND	5.07	ND		FS 123478-HxCDF	n/a	
Total HxCDD	ND	5.8	ND		FS 1234789-HpCDF	n/a	
Total HpCDD	ND	5.31	ND		FS 37Cl-2378-TCDD	n/a	
					CS 123789-HxCDF	n/a	
Total TCDF	ND	2.83	ND				
Total PeCDF	ND	4.79	ND				
Total HxCDF	ND	13.7	ND				
Total HpCDF	ND		7.91				
Total PCDD/Fs	**102**		**110**				
ITEF TEQs							
TEQ: ND=0	0.102		0.181				
TEQ: ND=DL/2	5.38	5.28	5.44				
TEQ: ND=DL	10.7	10.6	10.7				

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Appendix C – Analytical results from SGS Environmental Services

The Final Lab Report prepared by SGS North America provides analysis of archive samples provided by ALS. The Sample Summary includes ALS sample log information including blank, lab control sample and three runs from each of the two units.

The note provided by Dr. Bryan Vining is provided to explain SGS's interpretation of results.

SGS received the dioxin/furan emission test (DF) archive samples from ALS laboratory and completed high resolution gas chromatography/high resolution mass spectroscopy (GC-HRMS) analyses for all samples. The analyses indicate the presence of chlorinated diphenyl ethers (DPEs) in these samples. DPEs interfere with quantifying the amount of many of the polychlorinated dibenzofuran (PCDF) isomers that are required to be analyzed in the DF analytical method. It is SGS' experience that it is not possible to determine the actual bias to the analyses caused by the presence of DPEs, and, thus, the analyses of these samples from ALS are considered compromised to an unknown extent.

The GC-HRMS analyses also indicated the presence of PCB-169 (a polychlorinated biphenyl isomer). This PCB causes interference in determining the quantities of some polychlorinated dibenzodioxin (PCDD) isomers required for analysis in the DF method. In the GC-HRMS PCDD/F analytical method, PCB-169 interferes with the 12378 penta-dioxin isomer, which is important in the calculation of toxic equivalence. The bias caused by PCB-169 cannot be quantified for these DF archives.

Digitally signed by Bryan Vining
DN: cn=Bryan Vining, o=SGS North America, ou=Environmental Services, email=bryan.vining@sgs.com, c=US
Date: 2015.10.23 17:15:47 -04'00'

Appendix D – Comparison of isomer distribution – ALS and SGS

Detectable concentrations from lab data sheets (as picograms) in Appendix C were used to construct a weight percent distribution of each isomer for comparison with the ALS distribution. The Estimated Maximum Possible Concentration (EMPC) or detection limit was used if an absolute value was not reported. Figure D.1 provides a comparison (ALS and SGS) of results for Unit 1 with Figure D.2 providing a comparison of results for Unit 2. Figure D.3 provides a linear regression correlation of the ALS and SGS isomer distribution for Unit 1 with D.4 providing a linear regression correlation of the ALS and SGS isomer distribution for Unit 1.

Figure D.1

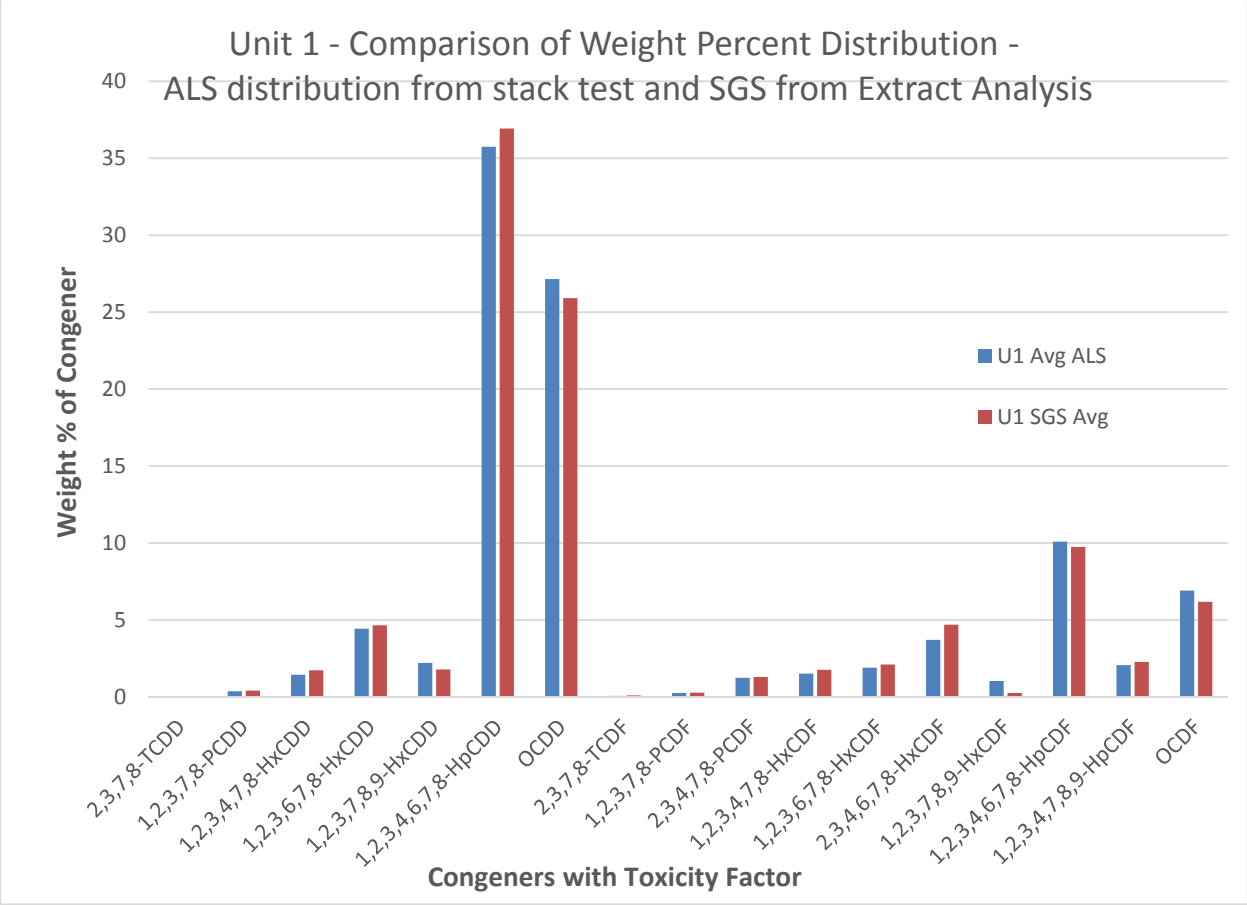


Figure D.2

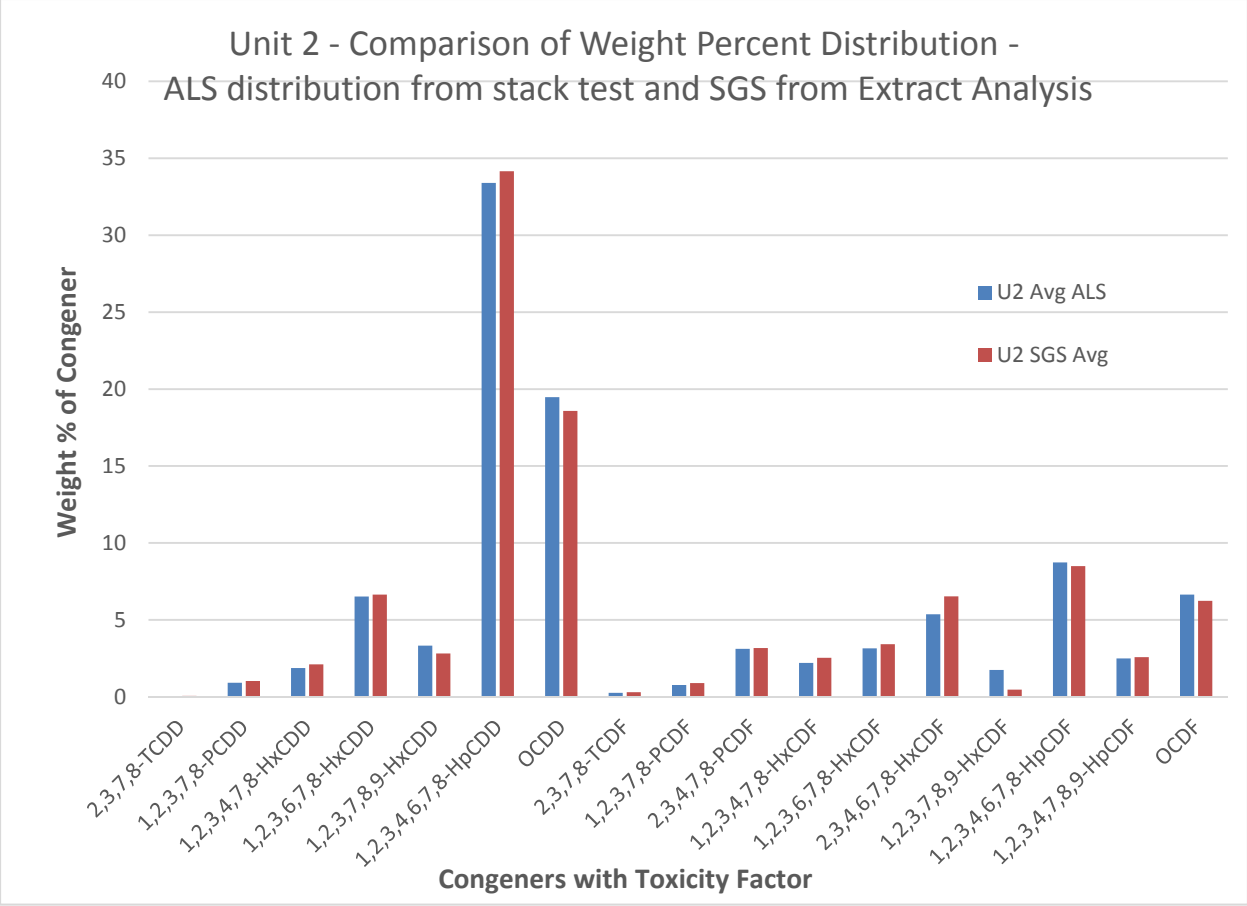

Unit 2 - Comparison of Weight Percent Distribution -
ALS distribution from stack test and SGS from Extract Analysis
Weight % of Congener
40
35
30
25
20
15
10
5
0
U2 Avg ALS
U2 SGS Avg
2,3,7,8-TCDD
1,2,3,7,8-PCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TCDF
1,2,3,7,8-PCDF
2,3,4,7,8-PCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Congeners with Toxicity Factor

Figure D.3 Linear Regression Correlation: ALS and SGS Isomer Distribution

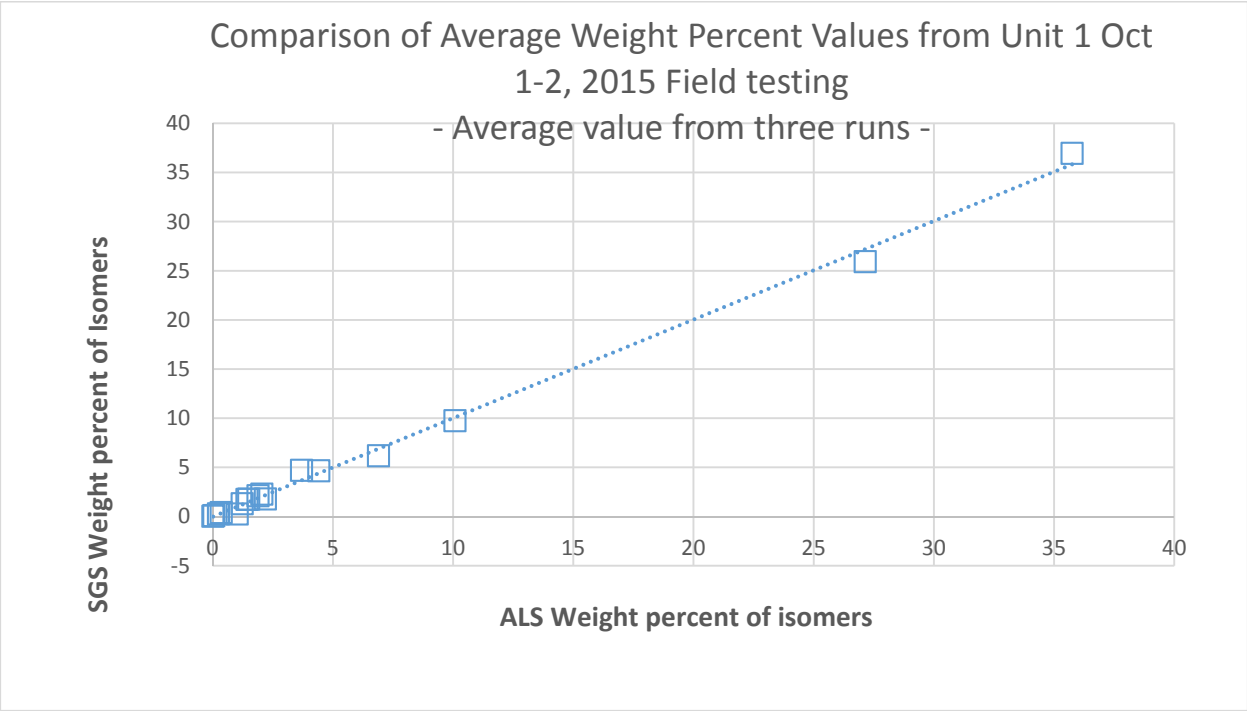
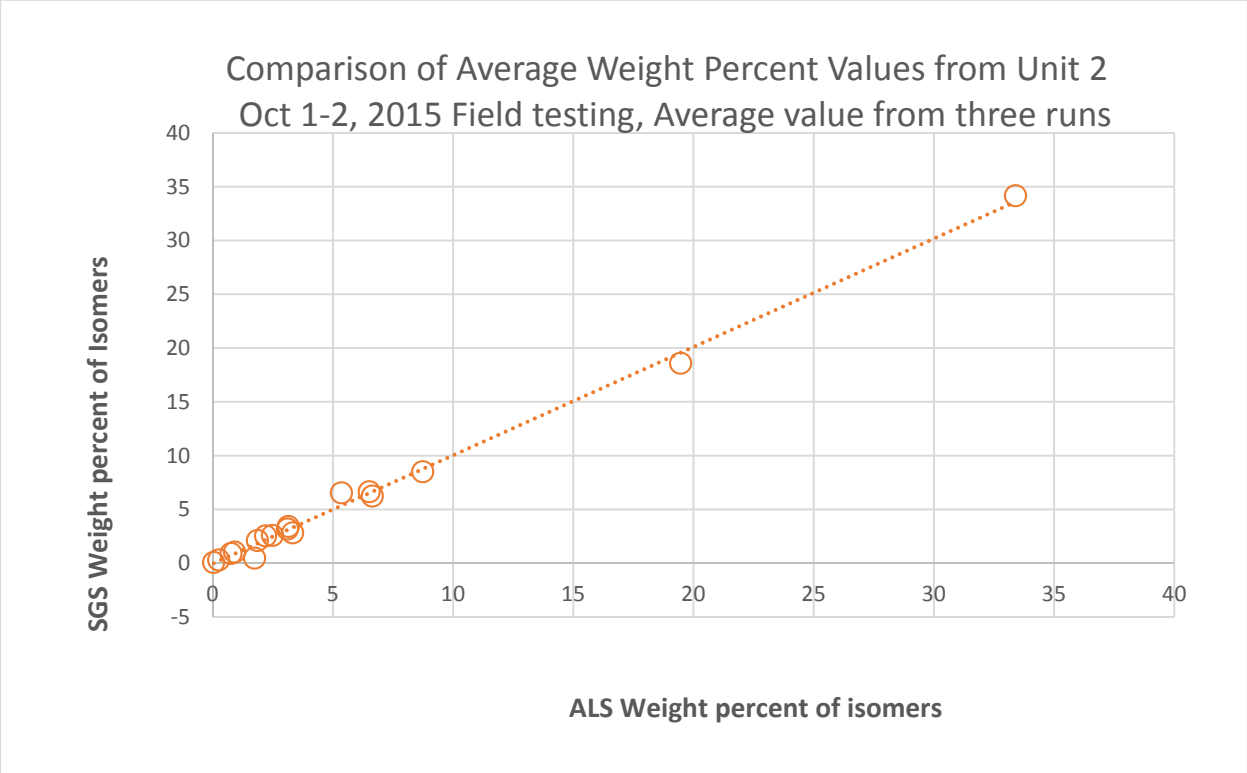


Figure D.4 Linear Regression Correlation: ALS and SGS Isomer Distribution



Appendix E. ORTECH Volumetric Flow rate Measurements

Report No. | 21546-6

ORTECH

Report:

Covanta Durham York Renewable Energy Limited Partnership
Volumetric Flowrate Measurements at Boiler BH Outlets

Date: October 8, 2015



Report:

Covanta Durham York Renewable Energy Limited Partnership
Volumetric Flowrate Measurements at Boiler BH Outlets

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Report No.: 21546-6
5 pages, 7 Appendices

Revision History

Version	Date	Summary Changes/Purpose of Revision
1	October 8, 2015	None

Table of Contents

1. INTRODUCTION

ORTECH Environmental (ORTECH) was requested by Covanta Durham York Renewable Energy Limited Partnership to complete volumetric flowrates measurements and moisture content tests at the BH Outlet sampling location on each Boiler at the Durham York Energy Centre (DYEC) located in Clarington, Ontario.

Volumetric flowrates were measured at the BH Outlet sampling location on each Boiler on September 28, 2015. Thirteen sets of volumetric flowrates were measured at the Boiler No. 1 BH Outlet and fourteen sets of volumetric flowrates were measured at the Boiler No. 2 BH Outlet for comparison to the facility's AMESA Dioxin and Furan sampling monitor measurements.

Volumetric flowrates were also measured at each BH Outlet during the compliance test program, from the isokinetic sampling trains, between September 29 and October 2, 2015.

A summary of the gas velocities volumetric flowrates measured at each location is provided in Appendix 1.

2. SAMPLING METHODOLOGY

The volumetric flowrate measurements completed on September 28, 2015 were conducted using an S-type pitot tube and a Type-K thermocouple in accordance with the Ontario Source Testing Code Methods 1 to 3. Reference method moisture content tests were also completed in conjunction with the flow measurements in accordance with Ontario Source Testing Code Method 4.

The velocity profile field data sheets and the velocity and volumetric flowrate calculations for Boiler No. 1 and Boiler No. 2 are provided in Appendix 2 and Appendix 3, respectively. The moisture field data sheets are provided in Appendix 4.

The velocity was calculated using the equations provided in Section 5.0 of Ontario Source Testing Code Method 2. Velocity is defined as:

$$U_s = 128.6\, C_p \sqrt{[(\Delta P\, T_s)/(M_s\, P_s)]}$$

where:

- U_s = stack gas velocity (at a point), m/s
- C_p = pitot tube coefficient
- T_s = absolute stack gas temperature, K
- ΔP = stack gas velocity pressure head, kPa
- M_s = stack gas molecular weight, wet basis kg/mol
- P_s = absolute stack gas pressure, kPa

Stack gas physical parameters and volumetric flowrates were also measured during the compliance testing program using the isokinetic sampling trains. Triplicate sets of volumetric flowrates were conducted at each sampling location from the Particulate and Acid Gases trains, Metals trains and Semi-Volatile Organic Compounds (SVOC) test trains. The isokinetic output summary sheets for compliance tests conducted at Boiler No. 1 and Boiler No. 2 are provided in Appendix 5 and Appendix 6, respectively.

The calibration data for the flow and moisture measurement equipment is provided in Appendix 7.

3. RESULTS

Volumetric flowrates were measured at the BH Outlet sampling location on each Boiler on September 28, 2015. Thirteen sets of volumetric flowrates were measured at the Boiler No. 1 BH Outlet and fourteen sets of volumetric flowrates were measured at the Boiler No. 2 BH Outlet for comparison to the facility's AMESA Dioxin and Furan sampling monitor.

Volumetric flowrates were also measured at each BH Outlet during the compliance test program, from the isokinetic sampling trains, between September 29 and October 2, 2015. Triplicate sets of volumetric flowrates were conducted at each sampling location from the Particulate and Acid Gases trains, Metals trains and Semi-Volatile Organic Compounds (SVOC) test trains.

A summary of the gas velocities and volumetric flowrates measured at each location is provided in Appendix 1.

APPENDIX 1

Summary of Results
(2 pages)

Covanta - Durham York Energy Centre
Boiler No. 1 BH Outlet
Stack Gas Physical Parameters and Volumetric Flowrates

Test Train	Test No.	Sample Date	Sampling Period	Gas Temp. °C	Moisture by Volume %	Gas Velocity m/s	Static Pressure kPa	Absolute Pressure kPa	Carbon Dioxide by Volume % *	Oxygen by Volume % *	Actual Flowrate m^3/s	Dry Reference Flowrate Rm^3/s **	Wet Reference Flowrate Rm^3/s**
Velocity	1	September 28, 2015	13:46 - 13:56	139	15.8	17.3	-2.81	98.7	11.1	8.14	25.5	15.1	18.0
Velocity	2	September 28, 2015	14:16 - 14:23	138	15.9	17.4	-2.81	98.7	11.6	7.39	25.7	15.2	18.1
Velocity	3	September 28, 2015	14:24 - 14:31	140	15.9	17.9	-2.81	98.7	12.2	6.85	26.5	15.7	18.6
Velocity	4	September 28, 2015	14:49 - 14:56	139	15.9	17.1	-2.81	98.7	11.0	8.14	25.3	15.0	17.8
Velocity	5	September 28, 2015	17:19 - 17:26	140	20.1	18.8	-2.96	98.2	11.1	8.09	27.8	15.5	19.4
Velocity	6	September 28, 2015	17:27 - 17:32	140	20.1	19.2	-2.96	98.2	10.9	8.21	28.4	15.9	19.9
Velocity	7	September 28, 2015	17:33 - 17:38	140	20.1	19.8	-3.16	98.0	10.9	8.21	29.3	16.4	20.5
Velocity	8	September 28, 2015	17:39 - 17:46	143	20.1	21.0	-3.16	98.0	11.3	7.72	31.1	17.2	21.6
Velocity	9	September 28, 2015	17:47 - 17:52	143	20.1	20.7	-3.16	98.0	11.7	7.57	30.5	16.9	21.2
Velocity	10	September 28, 2015	17:53 - 18:00	144	20.1	20.8	-3.16	98.0	11.1	8.11	30.7	17.0	21.3
Velocity	11	September 28, 2015	18:04 - 18:11	142	20.1	19.7	-3.14	98.1	10.9	8.25	29.1	16.2	20.2
Velocity	12	September 28, 2015	18:12 - 18:16	141	20.1	20.5	-3.14	98.1	11.1	8.03	30.3	16.9	21.1
Velocity	13	September 28, 2015	18:17 - 18:24	141	20.1	20.6	-3.14	98.1	11.6	7.62	30.5	17.0	21.2
M26A	1	September 29, 2015	9:11 - 13:41	130	16.4	17.6	-2.79	97.6	11.3	7.67	26.1	15.5	18.6
M26A	2	September 29, 2015	14:41 - 17:53	130	16.1	17.2	-2.79	97.6	11.4	7.69	25.4	15.2	18.1
M26A	3	October 1, 2015	16:22 - 19:37	135	17.5	17.2	-2.71	99.1	11.6	7.54	25.4	15.0	18.2
M29	1	September 30, 2015	8:07 - 13:46	140	15.9	17.5	-2.79	98.1	11.2	7.91	25.9	15.2	18.1
M29	2	September 30, 2015	14:48 - 17:01	140	16.4	18.1	-2.79	98.2	11.1	7.92	26.8	15.7	18.8
M29	3	October 1, 2015	7:41 - 9:54	138	16.5	17.3	-2.71	99.0	11.6	7.62	25.6	15.1	18.1
SVOC	1	October 1, 2015	10:48 - 15:05	136	16.1	16.9	-2.71	99.0	11.6	7.57	25.0	15.0	17.9
SVOC	2	October 2, 2015	7:40 - 11:57	135	16.4	16.1	-2.69	99.4	11.6	7.59	23.8	14.2	17.0
SVOC	3	October 2, 2015	12:26 - 16:41	139	16.4	16.4	-2.69	99.4	11.7	7.52	24.2	14.4	17.2

* Dry basis, measured by the DYEC CEMS
** At 25°C and 1 atmosphere

Covanta - Durham York Energy Centre
Boiler No. 2 BH Outlet
Stack Gas Physical Parameters and Volumetric Flowrates

Test Train	Test No.	Sample Date	Sampling Period	Gas Temp. °C	Moisture by Volume %	Gas Velocity m/s	Static Pressure kPa	Absolute Pressure kPa	Carbon Dioxide by Volume % *	Oxygen by Volume % *	Actual Flowrate m^3/s	Dry Reference Flowrate Rm^3/s **	Wet Reference Flowrate Rm^3/s**
Velocity	1	September 28, 2015	14:00 - 14:06	136	15.4	18.2	-2.74	98.7	10.3	8.82	26.8	16.1	19.1
Velocity	2	September 28, 2015	14:07 - 14:14	136	15.4	18.0	-2.74	98.7	11.0	8.20	26.6	16.0	18.9
Velocity	3	September 28, 2015	14:33 - 14:40	136	15.4	18.1	-2.74	98.7	11.0	8.29	26.7	16.0	19.0
Velocity	4	September 28, 2015	14:41 - 14:47	135	15.4	18.1	-2.74	98.7	10.7	8.65	26.7	16.1	19.0
Velocity	5	September 28, 2015	16:16 - 16:24	136	17.9	18.9	-2.74	98.5	10.4	8.87	28.0	16.3	19.9
Velocity	6	September 28, 2015	16:25 - 16:31	137	17.9	19.1	-2.74	98.5	11.5	7.69	28.2	16.4	20.0
Velocity	7	September 28, 2015	16:33 - 16:38	137	17.9	18.9	-2.74	98.5	11.4	8.04	27.9	16.2	19.8
Velocity	8	September 28, 2015	16:39 - 16:46	137	17.9	19.1	-2.74	98.5	11.7	7.72	28.2	16.4	20.0
Velocity	9	September 28, 2015	18:00 - 18:05	140	18.3	19.6	-2.91	98.3	10.9	8.31	28.9	16.6	20.3
Velocity	10	September 28, 2015	18:06 - 18:11	140	18.3	19.6	-2.91	98.3	11.0	8.35	28.9	16.5	20.2
Velocity	11	September 28, 2015	18:12 - 18:15	140	18.3	19.7	-2.84	98.4	11.5	7.87	29.1	16.6	20.4
Velocity	12	September 28, 2015	18:16 - 18:21	140	18.3	19.4	-2.84	98.4	11.2	8.18	28.7	16.4	20.1
Velocity	13	September 28, 2015	18:22 - 18:26	140	18.3	18.9	-2.76	98.4	11.3	7.95	27.9	16.0	19.6
Velocity	14	September 28, 2015	18:27 - 18:31	140	18.3	19.0	-2.76	98.4	11.0	8.11	28.0	16.1	19.7
M26A	1	September 30, 2015	8:13 - 14:34	136	15.9	18.7	-2.79	98.1	10.9	8.38	27.6	16.4	19.5
M26A	2	September 30, 2015	16:02 - 19:14	134	16.3	18.3	-2.79	98.4	11.0	8.28	27.1	16.1	19.3
M26A	3	October 1, 2015	7:42 - 11:01	133	16.4	17.3	-2.79	98.5	11.9	7.62	25.5	15.2	18.2
M29	1	September 29, 2015	9:15 - 12:32	135	16.6	17.4	-2.61	97.8	11.0	8.18	25.7	15.1	18.1
M29	2	September 29, 2015	13:41 - 15:53	136	15.7	17.2	-2.61	97.7	10.8	8.25	25.4	15.1	17.9
M29	3	September 29, 2015	16:49 - 19:02	136	15.9	17.4	-2.61	97.8	10.8	8.41	25.7	15.2	18.0
SVOC	1	October 1, 2015	12:14 - 16:31	131	17.0	16.0	-2.79	98.9	12.4	7.16	23.6	14.1	17.0
SVOC	2	October 2, 2015	7:42 - 11:57	131	16.7	16.0	-2.49	99.6	12.0	7.36	23.6	14.3	17.1
SVOC	3	October 2, 2015	12:26 - 16:40	133	16.8	15.6	-2.52	99.6	12.0	7.28	23.1	13.8	16.6

* Dry basis, measured by the DYEC CEMS

** At 25°C and 1 atmosphere

APPENDIX 2

Velocity Profile Field Data Sheets and
Velocity and Volumetric Flowrate Determination Calculations
Boiler No. 1 BH Outlet
(26 pages)

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.97 in. Hg	101.5 kPa
Client	Covanta	**Pstatic**	-11.30 in. H_2O	-2.81 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	1	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1346-1356	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.14					
CO_2 (%)	11.07					
CO (ppm)	20.7	**N_2 (%)**	79.8	**MW (dry)**	30.21	lb/lb mole
H_2O (%)	15.83	**Ar (%)**	1.0	**MW (wet)**	28.28	lb/lb mole

	Imperial	Metric
Average Velocity	57 ft/s	17.3 m/s
Average Temperature	283 °F	139 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	54089 cfm	25.5 m^3/s
Dry Reference Volumetric Flow Rate	32059 cfm	15.13 Rm^3/s
Wet Reference Volumetric Flow Rate	38090 cfm	17.98 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.760	189	279	137	410	59.7	18.2
2	0.780	194	282	139	412	60.6	18.5
3	0.790	197	282	139	412	61.0	18.6
4	0.750	187	283	139	413	59.4	18.1
5	0.700	174	284	140	413	57.5	17.5
6	0.590	147	286	141	414	52.8	16.1
7	0.680	169	285	141	414	56.7	17.3
8	0.700	174	286	141	414	57.5	17.5
9	0.720	179	284	140	413	58.3	17.8
10	0.700	174	284	140	413	57.5	17.5
11	0.520	130	284	140	413	49.5	15.1
12	0.400	100	282	139	412	43.4	13.2
13	0.780	194	280	138	411	60.5	18.4
14	0.830	207	282	139	412	62.5	19.0
15	0.830	207	282	139	412	62.5	19.0
16	0.790	197	283	139	413	61.0	18.6
17	0.740	184	284	140	413	59.1	18.0
18	0.680	169	285	141	414	56.7	17.3
19	0.630	157	284	140	413	54.5	16.6
20	0.640	159	284	140	413	54.9	16.7
21	0.680	169	284	140	413	56.6	17.3
22	0.710	177	283	139	413	57.8	17.6
23	0.670	167	280	138	411	56.1	17.1
24	0.420	105	279	137	410	44.4	13.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.30 in. H_2O	-2.81 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	2	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1416-1423	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.39					
CO_2 (%)	11.61					
CO (ppm)	23.0	**N_2 (%)**	80.0	**MW (dry)**	30.27	lb/lb mole
H_2O (%)	15.85	**Ar (%)**	1.0	**MW (wet)**	28.32	lb/lb mole

	Imperial	Metric
Average Velocity	57 ft/s	17.4 m/s
Average Temperature	281 °F	138 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	54385 cfm	25.7 m^3/s
Dry Reference Volumetric Flow Rate	32284 cfm	15.24 Rm^3/s
Wet Reference Volumetric Flow Rate	38364 cfm	18.11 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.730	182	277	136	409	58.4	17.8
2	0.790	197	277	136	409	60.7	18.5
3	0.800	199	277	136	409	61.1	18.6
4	0.770	192	280	138	411	60.1	18.3
5	0.720	179	281	138	411	58.1	17.7
6	0.660	164	281	138	411	55.7	17.0
7	0.610	152	282	139	412	53.6	16.3
8	0.630	157	282	139	412	54.4	16.6
9	0.670	167	282	139	412	56.1	17.1
10	0.680	169	282	139	412	56.5	17.2
11	0.650	162	281	138	411	55.2	16.8
12	0.510	127	280	138	411	48.9	14.9
13	0.740	184	279	137	410	58.9	17.9
14	0.820	204	281	138	411	62.0	18.9
15	0.800	199	282	139	412	61.3	18.7
16	0.770	192	282	139	412	60.2	18.3
17	0.710	177	282	139	412	57.8	17.6
18	0.630	157	283	139	413	54.5	16.6
19	0.660	164	283	139	413	55.7	17.0
20	0.690	172	283	139	413	57.0	17.4
21	0.750	187	283	139	413	59.4	18.1
22	0.730	182	281	138	411	58.5	17.8
23	0.670	167	281	138	411	56.1	17.1
24	0.480	120	280	138	411	47.4	14.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.30 in. H_2O	-2.81 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	3	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1424-1431	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	6.85					
CO_2 (%)	12.16					
CO (ppm)	39.9	**N_2 (%)**	80.0	**MW (dry)**	30.33	lb/lb mole
H_2O (%)	15.85	**Ar (%)**	1.0	**MW (wet)**	28.38	lb/lb mole

	Imperial	Metric
Average Velocity	59 ft/s	17.9 m/s
Average Temperature	283 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	56045 cfm	26.5 m^3/s
Dry Reference Volumetric Flow Rate	33158 cfm	15.65 Rm^3/s
Wet Reference Volumetric Flow Rate	39402 cfm	18.60 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.810	202	282	139	412	61.6	18.8
2	0.820	204	283	139	413	62.1	18.9
3	0.810	202	283	139	413	61.7	18.8
4	0.760	189	284	140	413	59.8	18.2
5	0.710	177	284	140	413	57.8	17.6
6	0.620	154	284	140	413	54.0	16.5
7	0.670	167	284	140	413	56.1	17.1
8	0.730	182	284	140	413	58.6	17.9
9	0.730	182	284	140	413	58.6	17.9
10	0.760	189	284	140	413	59.8	18.2
11	0.660	164	284	140	413	55.7	17.0
12	0.530	132	280	138	411	49.8	15.2
13	0.860	214	280	138	411	63.4	19.3
14	0.890	222	282	139	412	64.6	19.7
15	0.850	212	283	139	413	63.2	19.3
16	0.840	209	284	140	413	62.9	19.2
17	0.780	194	285	141	414	60.6	18.5
18	0.720	179	285	141	414	58.2	17.8
19	0.650	162	285	141	414	55.3	16.9
20	0.680	169	285	141	414	56.6	17.3
21	0.710	177	285	141	414	57.8	17.6
22	0.740	184	285	141	414	59.0	18.0
23	0.710	177	283	139	413	57.8	17.6
24	0.630	157	280	138	411	54.3	16.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.30 in. H_2O	-2.81 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	4	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1449-1456	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.14					
CO_2 (%)	10.98					
CO (ppm)	20.0	**N_2 (%)**	79.9	**MW (dry)**	30.20	lb/lb mole
H_2O (%)	15.85	**Ar (%)**	1.0	**MW (wet)**	28.26	lb/lb mole

	Imperial	Metric
Average Velocity	56 ft/s	17.1 m/s
Average Temperature	283 °F	139 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	53509 cfm	25.3 m^3/s
Dry Reference Volumetric Flow Rate	31691 cfm	14.96 Rm^3/s
Wet Reference Volumetric Flow Rate	37659 cfm	17.77 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.720	179	279	137	410	58.1	17.7
2	0.790	197	280	138	411	60.9	18.6
3	0.800	199	282	139	412	61.4	18.7
4	0.740	184	283	139	413	59.1	18.0
5	0.720	179	284	140	413	58.3	17.8
6	0.640	159	284	140	413	55.0	16.8
7	0.600	149	284	140	413	53.2	16.2
8	0.610	152	284	140	413	53.7	16.4
9	0.640	159	284	140	413	55.0	16.8
10	0.660	164	283	139	413	55.8	17.0
11	0.600	149	282	139	412	53.2	16.2
12	0.500	125	280	138	411	48.5	14.8
13	0.720	179	281	138	411	58.2	17.7
14	0.770	192	281	138	411	60.2	18.3
15	0.780	194	281	138	411	60.6	18.5
16	0.730	182	283	139	413	58.7	17.9
17	0.680	169	284	140	413	56.7	17.3
18	0.620	154	284	140	413	54.1	16.5
19	0.660	164	284	140	413	55.8	17.0
20	0.680	169	284	140	413	56.7	17.3
21	0.710	177	285	141	414	58.0	17.7
22	0.650	162	284	140	413	55.4	16.9
23	0.590	147	283	139	413	52.8	16.1
24	0.460	115	280	138	411	46.5	14.2

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.90 in. H_2O	-2.96 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	5	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1719-1726	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.09					
CO_2 (%)	11.12					
CO (ppm)	14.6	**N_2 (%)**	79.8	**MW (dry)**	30.22	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.76	lb/lb mole

	Imperial	Metric
Average Velocity	62 ft/s	18.8 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	58861 cfm	27.8 m^3/s
Dry Reference Volumetric Flow Rate	32903 cfm	15.53 Rm^3/s
Wet Reference Volumetric Flow Rate	41181 cfm	19.44 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.840	209	282	139	412	63.6	19.4
2	0.880	219	285	141	414	65.2	19.9
3	0.860	214	285	141	414	64.5	19.7
4	0.850	212	285	141	414	64.1	19.5
5	0.820	204	286	141	414	63.0	19.2
6	0.720	179	286	141	414	59.0	18.0
7	0.770	192	286	141	414	61.0	18.6
8	0.810	202	286	141	414	62.6	19.1
9	0.790	197	284	140	413	61.8	18.8
10	0.730	182	284	140	413	59.4	18.1
11	0.540	135	283	139	413	51.0	15.6
12	0.540	135	280	138	411	50.9	15.5
13	0.890	222	284	140	413	65.5	20.0
14	0.960	239	285	141	414	68.1	20.8
15	0.960	239	285	141	414	68.1	20.8
16	0.920	229	284	140	413	66.6	20.3
17	0.850	212	285	141	414	64.1	19.5
18	0.790	197	285	141	414	61.8	18.8
19	0.730	182	285	141	414	59.4	18.1
20	0.760	189	285	141	414	60.6	18.5
21	0.810	202	285	141	414	62.6	19.1
22	0.820	204	285	141	414	63.0	19.2
23	0.720	179	284	140	413	59.0	18.0
24	0.640	159	281	138	411	55.5	16.9

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.90 in. H_2O	-2.96 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	6	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1727-1732	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.21					
CO_2 (%)	10.94					
CO (ppm)	16.6	**N_2 (%)**	79.9	**MW (dry)**	30.19	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.74	lb/lb mole

	Imperial	Metric
Average Velocity	63 ft/s	19.2 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	60088 cfm	28.4 m^3/s
Dry Reference Volumetric Flow Rate	33604 cfm	15.86 Rm^3/s
Wet Reference Volumetric Flow Rate	42058 cfm	19.85 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.890	222	283	139	413	65.5	20.0
2	0.940	234	284	140	413	67.4	20.5
3	0.990	247	284	140	413	69.2	21.1
4	0.940	234	284	140	413	67.4	20.5
5	0.890	222	284	140	413	65.6	20.0
6	0.810	202	285	141	414	62.6	19.1
7	0.750	187	285	141	414	60.2	18.4
8	0.770	192	285	141	414	61.0	18.6
9	0.790	197	285	141	414	61.8	18.8
10	0.820	204	285	141	414	63.0	19.2
11	0.810	202	283	139	413	62.5	19.1
12	0.710	177	280	138	411	58.4	17.8
13	0.870	217	283	139	413	64.8	19.7
14	0.920	229	284	140	413	66.7	20.3
15	0.930	232	284	140	413	67.0	20.4
16	0.870	217	285	141	414	64.9	19.8
17	0.840	209	284	140	413	63.7	19.4
18	0.760	189	285	141	414	60.6	18.5
19	0.800	199	285	141	414	62.2	19.0
20	0.830	207	285	141	414	63.4	19.3
21	0.830	207	285	141	414	63.4	19.3
22	0.790	197	285	141	414	61.8	18.8
23	0.680	169	284	140	413	57.3	17.5
24	0.540	135	281	138	411	51.0	15.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.70 in. H_2O	-3.16 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	7	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1733-1738	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.21					
CO_2 (%)	10.94					
CO (ppm)	16.6	**N_2 (%)**	79.9	**MW (dry)**	30.19	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.74	lb/lb mole

	Imperial	Metric
Average Velocity	65 ft/s	19.8 m/s
Average Temperature	285 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	62142 cfm	29.3 m^3/s
Dry Reference Volumetric Flow Rate	34661 cfm	16.36 Rm^3/s
Wet Reference Volumetric Flow Rate	43381 cfm	20.47 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.870	217	284	140	413	64.9	19.8
2	0.920	229	284	140	413	66.7	20.3
3	0.910	227	284	140	413	66.4	20.2
4	0.890	222	284	140	413	65.6	20.0
5	0.790	197	284	140	413	61.8	18.8
6	0.760	189	284	140	413	60.6	18.5
7	0.820	204	284	140	413	63.0	19.2
8	0.830	207	284	140	413	63.4	19.3
9	0.860	214	284	140	413	64.5	19.7
10	0.810	202	283	139	413	62.6	19.1
11	0.650	162	282	139	412	56.0	17.1
12	0.550	137	281	138	411	51.5	15.7
13	0.930	232	283	139	413	67.0	20.4
14	1.000	249	284	140	413	69.6	21.2
15	1.100	274	283	139	413	72.9	22.2
16	1.000	249	286	141	414	69.7	21.2
17	0.980	244	287	142	415	69.0	21.0
18	0.870	217	287	142	415	65.0	19.8
19	0.870	217	287	142	415	65.0	19.8
20	0.870	217	287	142	415	65.0	19.8
21	0.930	232	287	142	415	67.2	20.5
22	0.960	239	287	142	415	68.3	20.8
23	0.990	247	285	141	414	69.3	21.1
24	0.950	237	283	139	413	67.8	20.7

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.70 in. H_2O	-3.16 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	8	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1739-1746	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.72					
CO_2 (%)	11.33					
CO (ppm)	13.7	**N_2 (%)**	80.0	**MW (dry)**	30.24	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.78	lb/lb mole

	Imperial	Metric
Average Velocity	69 ft/s	21.0 m/s
Average Temperature	289 °F	143 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	65822 cfm	31.1 m^3/s
Dry Reference Volumetric Flow Rate	36517 cfm	17.23 Rm^3/s
Wet Reference Volumetric Flow Rate	45704 cfm	21.57 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	1.100	274	283	139	413	72.9	22.2
2	1.100	274	287	142	415	73.1	22.3
3	1.100	274	287	142	415	73.1	22.3
4	1.100	274	287	142	415	73.1	22.3
5	1.100	274	288	142	415	73.1	22.3
6	0.940	234	288	142	415	67.6	20.6
7	0.870	217	288	142	415	65.0	19.8
8	0.910	227	289	143	416	66.5	20.3
9	0.970	242	288	142	415	68.7	20.9
10	1.050	262	288	142	415	71.4	21.8
11	0.960	239	288	142	415	68.3	20.8
12	0.870	217	285	141	414	64.9	19.8
13	1.000	249	290	143	416	69.8	21.3
14	1.100	274	290	143	416	73.2	22.3
15	1.100	274	290	143	416	73.2	22.3
16	1.100	274	290	143	416	73.2	22.3
17	0.880	219	290	143	416	65.5	20.0
18	0.810	202	291	144	417	62.9	19.2
19	0.860	214	291	144	417	64.8	19.7
20	0.970	242	291	144	417	68.8	21.0
21	1.000	249	291	144	417	69.9	21.3
22	1.000	249	290	143	416	69.8	21.3
23	0.920	229	289	143	416	66.9	20.4
24	0.740	184	285	141	414	59.8	18.2

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.70 in. H_2O	-3.16 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	9	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1747-1752	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.57					
CO_2 (%)	11.68					
CO (ppm)	16.7	**N_2 (%)**	79.8	**MW (dry)**	30.29	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	0.9	**MW (wet)**	27.82	lb/lb mole

	Imperial	Metric
Average Velocity	68 ft/s	20.7 m/s
Average Temperature	290 °F	143 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	64694 cfm	30.5 m^3/s
Dry Reference Volumetric Flow Rate	35810 cfm	16.90 Rm^3/s
Wet Reference Volumetric Flow Rate	44819 cfm	21.15 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	1.050	262	290	143	416	71.5	21.8
2	1.100	274	289	143	416	73.1	22.3
3	1.100	274	290	143	416	73.2	22.3
4	1.100	274	291	144	417	73.2	22.3
5	0.980	244	290	143	416	69.1	21.0
6	0.860	214	291	144	417	64.7	19.7
7	0.920	229	291	144	417	67.0	20.4
8	0.960	239	291	144	417	68.4	20.8
9	0.910	227	292	144	418	66.6	20.3
10	0.930	232	291	144	417	67.3	20.5
11	0.830	207	289	143	416	63.5	19.4
12	0.530	132	285	141	414	50.6	15.4
13	1.050	262	289	143	416	71.4	21.8
14	1.100	274	289	143	416	73.1	22.3
15	1.100	274	289	143	416	73.1	22.3
16	1.100	274	289	143	416	73.1	22.3
17	1.020	254	290	143	416	70.5	21.5
18	0.900	224	292	144	418	66.3	20.2
19	0.910	227	292	144	418	66.6	20.3
20	0.960	239	292	144	418	68.4	20.9
21	0.970	242	292	144	418	68.8	21.0
22	0.990	247	291	144	417	69.5	21.2
23	0.880	219	290	143	416	65.4	19.9
24	0.570	142	290	143	416	52.7	16.1

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.70 in. H_2O	-3.16 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	10	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1753-1800	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.11					
CO_2 (%)	11.12					
CO (ppm)	28.9	**N_2 (%)**	79.8	**MW (dry)**	30.22	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	0.9	**MW (wet)**	27.76	lb/lb mole

	Imperial	Metric
Average Velocity	68 ft/s	20.8 m/s
Average Temperature	291 °F	144 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	65081 cfm	30.7 m^3/s
Dry Reference Volumetric Flow Rate	35970 cfm	16.98 Rm^3/s
Wet Reference Volumetric Flow Rate	45020 cfm	21.25 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	1.050	262	291	144	417	71.6	21.8
2	1.100	274	291	144	417	73.3	22.3
3	1.100	274	291	144	417	73.3	22.3
4	1.100	274	292	144	418	73.3	22.4
5	1.100	274	292	144	418	73.3	22.4
6	0.940	234	293	145	418	67.8	20.7
7	0.950	237	293	145	418	68.2	20.8
8	0.940	234	294	146	419	67.9	20.7
9	1.020	254	293	145	418	70.7	21.5
10	0.980	244	293	145	418	69.3	21.1
11	0.930	232	292	144	418	67.4	20.6
12	0.860	214	290	143	416	64.8	19.7
13	0.980	244	290	143	416	69.1	21.1
14	1.100	274	291	144	417	73.3	22.3
15	1.100	274	291	144	417	73.3	22.3
16	1.000	249	292	144	418	69.9	21.3
17	0.940	234	292	144	418	67.8	20.7
18	0.880	219	292	144	418	65.6	20.0
19	0.880	219	292	144	418	65.6	20.0
20	0.860	214	292	144	418	64.8	19.8
21	0.890	222	292	144	418	66.0	20.1
22	0.900	224	291	144	417	66.3	20.2
23	0.810	202	287	142	415	62.7	19.1
24	0.550	137	285	141	414	51.6	15.7

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.60 in. H_2O	-3.14 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	11	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1804-1811	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.25					
CO_2 (%)	10.91					
CO (ppm)	12.8	**N_2 (%)**	79.9	**MW (dry)**	30.19	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.74	lb/lb mole

	Imperial	Metric
Average Velocity	65 ft/s	19.7 m/s
Average Temperature	288 °F	142 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	61660 cfm	29.1 m^3/s
Dry Reference Volumetric Flow Rate	34255 cfm	16.17 Rm^3/s
Wet Reference Volumetric Flow Rate	42873 cfm	20.23 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.950	237	289	143	416	68.0	20.7
2	1.020	254	289	143	416	70.5	21.5
3	1.000	249	289	143	416	69.8	21.3
4	0.960	239	289	143	416	68.4	20.8
5	0.930	232	289	143	416	67.3	20.5
6	0.800	199	289	143	416	62.4	19.0
7	0.800	199	289	143	416	62.4	19.0
8	0.810	202	289	143	416	62.8	19.1
9	0.880	219	288	142	415	65.4	19.9
10	0.860	214	288	142	415	64.7	19.7
11	0.650	162	287	142	415	56.2	17.1
12	0.470	117	285	141	414	47.7	14.5
13	0.900	224	288	142	415	66.2	20.2
14	1.000	249	288	142	415	69.8	21.3
15	1.050	262	288	142	415	71.5	21.8
16	0.980	244	288	142	415	69.1	21.0
17	0.900	224	288	142	415	66.2	20.2
18	0.860	214	287	142	415	64.6	19.7
19	0.870	217	287	142	415	65.0	19.8
20	0.890	222	287	142	415	65.8	20.0
21	0.920	229	287	142	415	66.9	20.4
22	0.930	232	287	142	415	67.2	20.5
23	0.730	182	286	141	414	59.5	18.1
24	0.590	147	283	139	413	53.4	16.3

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.60 in. H_2O	-3.14 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	12	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1812-1816	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.03					
CO_2 (%)	11.12					
CO (ppm)	12.9	**N_2 (%)**	79.9	**MW (dry)**	30.21	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	1.0	**MW (wet)**	27.76	lb/lb mole

	Imperial	Metric
Average Velocity	67 ft/s	20.5 m/s
Average Temperature	286 °F	141 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	64286 cfm	30.3 m^3/s
Dry Reference Volumetric Flow Rate	35793 cfm	16.89 Rm^3/s
Wet Reference Volumetric Flow Rate	44799 cfm	21.14 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.990	247	286	141	414	69.3	21.1
2	1.050	262	286	141	414	71.4	21.7
3	1.100	274	286	141	414	73.0	22.3
4	0.980	244	286	141	414	68.9	21.0
5	0.940	234	287	142	415	67.6	20.6
6	0.890	222	287	142	415	65.7	20.0
7	0.870	217	287	142	415	65.0	19.8
8	0.900	224	287	142	415	66.1	20.1
9	0.940	234	287	142	415	67.6	20.6
10	0.910	227	287	142	415	66.5	20.3
11	0.770	192	286	141	414	61.1	18.6
12	0.500	125	284	140	413	49.2	15.0
13	0.980	244	286	141	414	68.9	21.0
14	1.100	274	286	141	414	73.0	22.3
15	1.100	274	286	141	414	73.0	22.3
16	1.050	262	286	141	414	71.4	21.7
17	0.960	239	286	141	414	68.2	20.8
18	0.860	214	286	141	414	64.6	19.7
19	0.910	227	287	142	415	66.5	20.3
20	0.940	234	286	141	414	67.5	20.6
21	0.950	237	286	141	414	67.9	20.7
22	1.100	274	285	141	414	73.0	22.2
23	0.940	234	285	141	414	67.5	20.6
24	0.850	212	283	139	413	64.1	19.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-12.60 in. H_2O	-3.14 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.1	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	13	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1817-1824	**Pitot Coefficient**	0.847	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.62					
CO_2 (%)	11.61					
CO (ppm)	12.7	**N_2 (%)**	79.8	**MW (dry)**	30.28	lb/lb mole
H_2O (%)	20.10	**Ar (%)**	0.9	**MW (wet)**	27.81	lb/lb mole

	Imperial	Metric
Average Velocity	68 ft/s	20.6 m/s
Average Temperature	286 °F	141 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	64522 cfm	30.5 m^3/s
Dry Reference Volumetric Flow Rate	35905 cfm	16.95 Rm^3/s
Wet Reference Volumetric Flow Rate	44938 cfm	21.21 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.980	244	287	142	415	68.9	21.0
2	1.050	262	287	142	415	71.3	21.7
3	1.100	274	287	142	415	73.0	22.3
4	0.990	247	287	142	415	69.3	21.1
5	0.960	239	287	142	415	68.2	20.8
6	0.840	209	287	142	415	63.8	19.4
7	0.880	219	287	142	415	65.3	19.9
8	0.930	232	287	142	415	67.1	20.5
9	1.050	262	287	142	415	71.3	21.7
10	1.050	262	287	142	415	71.3	21.7
11	0.970	242	286	141	414	68.5	20.9
12	0.670	167	284	140	413	56.9	17.3
13	1.000	249	286	141	414	69.6	21.2
14	1.100	274	286	141	414	73.0	22.2
15	1.100	274	286	141	414	73.0	22.2
16	1.100	274	286	141	414	73.0	22.2
17	1.050	262	286	141	414	71.3	21.7
18	0.950	237	287	142	415	67.9	20.7
19	0.960	239	287	142	415	68.2	20.8
20	0.870	217	287	142	415	64.9	19.8
21	0.920	229	287	142	415	66.8	20.4
22	0.890	222	287	142	415	65.7	20.0
23	0.750	187	286	141	414	60.3	18.4
24	0.610	152	283	139	413	54.2	16.5

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 1 | Time: 1346-1356 | Operator: DM | Signature: [signature]

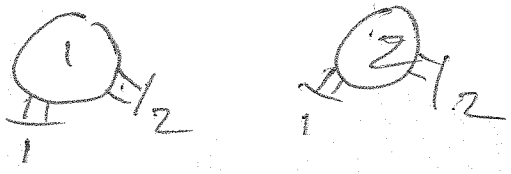
Measuring Devices	MII Number
Pitot Tube	S6
Pitot Factor	~~.846~~ .847
Manometer	COE 20093
Temp meter	
Barometer	ENV-CAN

Measured Parameters	
Barometric	~~29.92~~ 29.97
Static	-11.3" H_2O

O_2 - 8.14%
CO_2 - 11.07%
CO - 20.7ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.76	279	.78	280
2	.78	282	.83	282
3	.79	282	.83	282
4	.75	283	.79	283
5	.70	284	.74	284
6	.59	286	.68	285
7	.69	285	.63	284
8	.70	286	.64	284
9	.72	284	.68	284
10	.70	284	.71	283
11	.52	284	.67	280
12	.40	282	.42	279

ALL FLOWS START AT FAR WALL



Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA — Site Location: ARC OUTLET #1

Company Location: COURTICE — Test Date: SEPT 28/15

Test No.: 2 — Time: 1416 1423 — Operator: RM — Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.94
Static	-11.3

O_2 - 7.39%
CO_2 - 11.61%
CO - 23.0ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.73	277	.74	279
2	.79	277	.82	281
3	.80	277	.80	282
4	.77	280	.77	282
5	.72	281	.71	282
6	.66	281	.63	283
7	.61	282	.66	283
8	.63	282	.69	283
9	.67	282	.75	283
10	.68	282	.73	281
11	.65	281	.67	281
12	.57	280	.48	280

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: CANTICE, ON | Test Date: SEPT 29 '15

Test No.: 3 | Time: 1424-1431 | Operator: DW | Signature: D. Wilson

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.94
Static	-11.3

O_2 - 6.85%
CO_2 - 12.16%
CO - 39.9 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.91	282	.86	280
2	.82	283	.89	282
3	.81	283	.85	283
4	.76	284	.84	284
5	.71	284	.78	285
6	.62	284	.72	285
7	.67	284	.65	285
8	.73	284	.68	285
9	.73	284	.71	285
10	.76	284	.74	285
11	.66	284	.71	283
12	.53	280	.63	280

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21456

Company: QUANTA | Site Location: APC OUTLET #1

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 4 | Time: 1449 1450 | Operator: KR | Signature: KR

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	1

Measured Parameters	
Barometric	29.94
Static	-11.3

O_2 - 8.14%
CO_2 - 10.98%
CO - 20.0ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.72	279	.72	281
2	.79	280	.77	281
3	.80	282	.78	281
4	.74	283	.73	283
5	.72	284	.68	284
6	.64	284	.62	284
7	.60	284	.66	284
8	.61	284	.68	284
9	.64	284	.71	285
10	.66	283	.65	284
11	.60	282	.59	283
12	.50	280	.46	280

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: ARC OUTLET #1

Company Location: CAMBRIDGE, ON | Test Date: SEPT. 28/15

Test No.: 5 | Time: 1719 - 1126 | Operator: RM | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	1
Temp meter	
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.9

O_2 - 8.09%
CO_2 - 11.12%
CO - 14.6 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.84	282	.89	284
2	.98	285	.96	285
3	.86	285	.96	285
4	.85	285	.92	284
5	.82	286	.85	285
6	.72	286	.79	285
7	.77	286	.73	285
8	.81	286	.76	285
9	.79	284	.81	285
10	.73	284	.82	285
11	.54	283	.72	284
12	.54	280	.64	281

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: CORNWALL, ON | Test Date: SEPT 28/15

Test No.: 6 | Time: 1727-1732 | Operator: RM | Signature:

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	1

Measured Parameters	
Barometric	29.88
Static	-11.9

O_2 - 8.2%
CO_2 - 10.9%
CO - 16.6 ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.89	283	.87	283
2	.94	284	.92	284
3	.99	284	.93	284
4	.94	284	.87	285
5	.89	284	.84	284
6	.81	285	.76	286 285
7	.75	285	.80	285
8	.77	285	.83	285
9	.79	285	.83	285
10	.82	285	.79	285
11	.81	283	.66	284
12	.71	280	.54	281

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: QUANTA | Site Location: APC OUTLET #1

Company Location: COBOURG, ON | Test Date: SEPT, 28 2015

Test No.: 7 | Time: 1733-1738 | Operator: DM | Signature: D. M.

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	1

Measured Parameters	
Barometric	29.88
Static	-12.7

O_2 - 8.21%
CO_2 - 10.94%
CO - 16.6 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.87	284	.93	283
2	.92	284	1.0	284
3	.91	284	1.1	283
4	.89	284	1.0	286
5	.79	284	.96	287
6	.76	284	.89	287
7	.82	284	.87	287
8	.83	284	.87	287
9	.86	284	.93	287
10	.81	283	.96	287
11	.65	282	.99	285
12	.55	281	.95	283

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: COURTICE | Test Date: SEPT 29/15

Test No.: 8 | Time: 1739-1746 | Operator: DM | Signature: D Mc

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-12.7

O_2 - 7.72%
CO_2 - 11.33%
CO - 13.7 ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	1.1	283	1.0	290
2	1.1	287	1.1	290
3	1.1	287	1.1	290
4	1.1	287	1.1	290
5	1.1	288	~~0.188~~	290
6	.94	288	.81	291
7	.87	288	.86	291
8	.91	289	.97	291
9	.97	288	1.0	291
10	1.05	288	1.0	290
11	.96	288	.92	289
12	.87	285	.74	285

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company COVANTA **Site Location** APC OUTLET #1

Company Location COURTICE, ON **Test Date** SEPT 28/15

Test No.: 9 **Time** 1747-1752 **Operator** RW **Signature** RW

Measuring Devices	MII Number
Pitot Tube	SEE TEST
Pitot Factor	
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-12.7

O_2 - 7.57 %
CO_2 - 11.68 %
CO - 16.7 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	1.05	290	1.05	289
2	1.1	289	1.1	289
3	1.1	290	1.1	289
4	1.1	291	1.1	289
5	.98	290	1.02	290
6	.86	291	.90	292
7	.92	291	.91	292
8	.96	291	.96	292
9	.91	292	.97	292
10	.93	291	.99	291
11	.83	289	.88	290
12	.53	285	.57	290

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: ENANTA | Site Location: APC OUTLET # 1

Company Location: COURTICE, ON | Test Date:

Test No.: 10 | Time: 1753 - 1800 | Operator: [signature] | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	

Measured Parameters	
Barometric	29.88
Static	-12.7

O_2 - 8.11%
CO_2 - 11.12%
CO - 28.9 ppm

Port	1		2		
Point #	Delta P	Temp	Delta P	Temp	
1	1.05	291	.98	~~289~~	290
2	1.1	291	1.1	291	
3	1.1	291	1.1	291	
4	1.1	292	1.0	292	
5	1.1	292	.94	292	
6	.94	293	.88	292	
7	.95	293	.88	292	
8	.94	294	.86	292	
9	1.02	293	.89	292	
10	.98	293	.90	291	
11	.93	292	.81	287	
12	.86	290	.55	285	

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: COURTICE, ON | Test Date: SEPT 25/15

Test No.: 11 | Time: 1804-1811 | Operator: RM | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	355
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	1

Measured Parameters	
Barometric	29.88
Static	-12.6

O_2 - 8.25%
CO_2 - 10.9%
CO - 12.8 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.95	289	.90	288
2	1.02	289	1.0	288
3	1.0	289	1.05	288
4	.96	289	.98	288
5	.93	289	.90	288
6	.80	289	.86	287
7	.80	289	.87	287
8	.81	289	.89	287
9	.86	288	.92	287
10	.86	286	.93	287
11	.65	287	.73	286
12	.47	285	.59	283

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET # 1

Company Location: COURTICE, ON | Test Date: SEPT-29/15

Test No.: 12 | Time: 1812-1916 | Operator: RM | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	
Manometer	TEST
Temp meter	
Barometer	1

Measured Parameters	
Barometric	29.88
Static	-12.6

O2 - 8.03%
CO2 - 11.12%
CO - 10.9 ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.99	286	.98	286
2	1.05	286	1.1	286
3	1.1	286	1.1	286
4	.98	286	1.05	286
5	.94	287	.96	286
6	.89	287	.86	286
7	.87	287	.91	287
8	.90	287	.94	286
9	.94	287	.95	286
10	.91	287	1.1	285
11	.77	286	.94	285
12	.50	284	.85	283

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #1

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 13 | Time: 1817-1824 | Operator: DM | Signature: D DeLong

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-12.6

O_2 - 7.62%
CO_2 - 11.61%
CO - 12.7 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.98	287	1.0	286
2	1.05	287	1.1	286
3	1.1	287	1.1	286
4	.99	287	1.1	286
5	.96	287	1.05	286
6	.84	287	.95	287
7	.88	287	.96	287
8	.93	287	.87	287
9	1.05	287	.92	287
10	1.05	287	.89	287
11	.97	286	.75	286
12	.67	284	.61	283

APPENDIX 3

Velocity Profile Field Data Sheets and
Velocity and Volumetric Flowrate Determination Calculations
Boiler No. 2 BH Outlet
(28 pages)

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	1	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1400-1406	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.82					
CO_2 (%)	10.33					
CO (ppm)	18.6	**N_2 (%)**	79.9	**MW (dry)**	30.12	lb/lb mole
H_2O (%)	15.44	**Ar (%)**	1.0	**MW (wet)**	28.25	lb/lb mole

	Imperial	Metric
Average Velocity	60 ft/s	18.2 m/s
Average Temperature	277 °F	136 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	56859 cfm	26.8 m^3/s
Dry Reference Volumetric Flow Rate	34137 cfm	16.11 Rm^3/s
Wet Reference Volumetric Flow Rate	40372 cfm	19.05 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.860	214	277	136	409	63.6	19.4
2	0.890	222	278	137	410	64.7	19.7
3	0.870	217	278	137	410	64.0	19.5
4	0.830	207	278	137	410	62.5	19.1
5	0.770	192	278	137	410	60.2	18.4
6	0.730	182	278	137	410	58.6	17.9
7	0.760	189	278	137	410	59.8	18.2
8	0.760	189	277	136	409	59.8	18.2
9	0.780	194	277	136	409	60.6	18.5
10	0.810	202	277	136	409	61.7	18.8
11	0.810	202	276	136	409	61.7	18.8
12	0.740	184	271	133	406	58.7	17.9
13	0.870	217	277	136	409	64.0	19.5
14	0.890	222	277	136	409	64.7	19.7
15	0.880	219	277	136	409	64.3	19.6
16	0.820	204	277	136	409	62.1	18.9
17	0.740	184	277	136	409	59.0	18.0
18	0.720	179	277	136	409	58.2	17.7
19	0.680	169	277	136	409	56.5	17.2
20	0.700	174	277	136	409	57.4	17.5
21	0.720	179	276	136	409	58.1	17.7
22	0.640	159	275	135	408	54.8	16.7
23	0.550	137	275	135	408	50.8	15.5
24	0.420	105	275	135	408	44.4	13.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	2	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1407-1414	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.20					
CO_2 (%)	10.98					
CO (ppm)	25.3	**N_2 (%)**	79.9	**MW (dry)**	30.20	lb/lb mole
H_2O (%)	15.44	**Ar (%)**	1.0	**MW (wet)**	28.31	lb/lb mole

	Imperial	Metric
Average Velocity	59 ft/s	18.0 m/s
Average Temperature	276 °F	136 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	56366 cfm	26.6 m^3/s
Dry Reference Volumetric Flow Rate	33858 cfm	15.98 Rm^3/s
Wet Reference Volumetric Flow Rate	40042 cfm	18.90 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.850	212	277	136	409	63.1	19.2
2	0.880	219	277	136	409	64.2	19.6
3	0.860	214	277	136	409	63.5	19.4
4	0.830	207	277	136	409	62.4	19.0
5	0.770	192	277	136	409	60.1	18.3
6	0.750	187	277	136	409	59.3	18.1
7	0.690	172	277	136	409	56.9	17.3
8	0.690	172	277	136	409	56.9	17.3
9	0.740	184	277	136	409	58.9	18.0
10	0.720	179	276	136	409	58.1	17.7
11	0.640	159	274	134	408	54.7	16.7
12	0.560	139	270	132	405	51.0	15.5
13	0.830	207	277	136	409	62.4	19.0
14	0.880	219	277	136	409	64.2	19.6
15	0.880	219	277	136	409	64.2	19.6
16	0.830	207	277	136	409	62.4	19.0
17	0.780	194	277	136	409	60.5	18.4
18	0.720	179	277	136	409	58.1	17.7
19	0.740	184	277	136	409	58.9	18.0
20	0.740	184	277	136	409	58.9	18.0
21	0.760	189	277	136	409	59.7	18.2
22	0.690	172	277	136	409	56.9	17.3
23	0.580	144	277	136	409	52.2	15.9
24	0.540	135	271	133	406	50.1	15.3

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	3	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1433-1440	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.29					
CO_2 (%)	10.98					
CO (ppm)	20.2	**N_2 (%)**	79.8	**MW (dry)**	30.20	lb/lb mole
H_2O (%)	15.44	**Ar (%)**	0.9	**MW (wet)**	28.32	lb/lb mole

	Imperial	Metric
Average Velocity	59 ft/s	18.1 m/s
Average Temperature	277 °F	136 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	56609 cfm	26.7 m^3/s
Dry Reference Volumetric Flow Rate	33986 cfm	16.04 Rm^3/s
Wet Reference Volumetric Flow Rate	40194 cfm	18.97 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.870	217	278	137	410	63.9	19.5
2	0.900	224	277	136	409	65.0	19.8
3	0.870	217	277	136	409	63.9	19.5
4	0.810	202	277	136	409	61.6	18.8
5	0.760	189	277	136	409	59.7	18.2
6	0.700	174	277	136	409	57.3	17.5
7	0.640	159	277	136	409	54.8	16.7
8	0.680	169	277	136	409	56.5	17.2
9	0.720	179	277	136	409	58.1	17.7
10	0.730	182	277	136	409	58.5	17.8
11	0.670	167	276	136	409	56.0	17.1
12	0.510	127	274	134	408	48.8	14.9
13	0.860	214	277	136	409	63.5	19.4
14	0.890	222	277	136	409	64.6	19.7
15	0.900	224	277	136	409	65.0	19.8
16	0.860	214	277	136	409	63.5	19.4
17	0.800	199	277	136	409	61.2	18.7
18	0.730	182	277	136	409	58.5	17.8
19	0.730	182	277	136	409	58.5	17.8
20	0.750	187	277	136	409	59.3	18.1
21	0.760	189	277	136	409	59.7	18.2
22	0.760	189	277	136	409	59.7	18.2
23	0.680	169	276	136	409	56.4	17.2
24	0.530	132	273	134	407	49.7	15.2

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.94 in. Hg	101.4 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	4	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1441-1447	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.65					
CO_2 (%)	10.72					
CO (ppm)	24.4	**N_2 (%)**	79.7	**MW (dry)**	30.17	lb/lb mole
H_2O (%)	15.44	**Ar (%)**	0.9	**MW (wet)**	28.29	lb/lb mole

	Imperial	Metric
Average Velocity	59 ft/s	18.1 m/s
Average Temperature	276 °F	135 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	56598 cfm	26.7 m^3/s
Dry Reference Volumetric Flow Rate	34024 cfm	16.06 Rm^3/s
Wet Reference Volumetric Flow Rate	40239 cfm	18.99 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.820	204	276	136	409	62.0	18.9
2	0.830	207	276	136	409	62.4	19.0
3	0.840	209	276	136	409	62.7	19.1
4	0.810	202	276	136	409	61.6	18.8
5	0.760	189	277	136	409	59.7	18.2
6	0.720	179	277	136	409	58.1	17.7
7	0.730	182	276	136	409	58.5	17.8
8	0.730	182	276	136	409	58.5	17.8
9	0.750	187	276	136	409	59.3	18.1
10	0.750	187	276	136	409	59.3	18.1
11	0.650	162	274	134	408	55.1	16.8
12	0.630	157	273	134	407	54.2	16.5
13	0.890	222	275	135	408	64.5	19.7
14	0.910	227	276	136	409	65.3	19.9
15	0.880	219	276	136	409	64.2	19.6
16	0.830	207	276	136	409	62.4	19.0
17	0.750	187	276	136	409	59.3	18.1
18	0.730	182	276	136	409	58.5	17.8
19	0.670	167	276	136	409	56.0	17.1
20	0.710	177	276	136	409	57.7	17.6
21	0.760	189	276	136	409	59.7	18.2
22	0.710	177	276	136	409	57.7	17.6
23	0.670	167	275	135	408	56.0	17.1
24	0.550	137	274	134	408	50.7	15.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.90 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	5	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1616-1624	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.87					
CO_2 (%)	10.44					
CO (ppm)	26.0	**N_2 (%)**	79.7	**MW (dry)**	30.14	lb/lb mole
H_2O (%)	17.87	**Ar (%)**	0.9	**MW (wet)**	27.97	lb/lb mole

	Imperial	Metric
Average Velocity	62 ft/s	18.9 m/s
Average Temperature	277 °F	136 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59325 cfm	28.0 m^3/s
Dry Reference Volumetric Flow Rate	34555 cfm	16.31 Rm^3/s
Wet Reference Volumetric Flow Rate	42072 cfm	19.86 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.920	229	276	136	409	66.1	20.1
2	0.980	244	276	136	409	68.2	20.8
3	0.930	232	276	136	409	66.4	20.3
4	0.870	217	277	136	409	64.3	19.6
5	0.840	209	277	136	409	63.2	19.3
6	0.770	192	277	136	409	60.5	18.4
7	0.710	177	277	136	409	58.1	17.7
8	0.760	189	277	136	409	60.1	18.3
9	0.790	197	277	136	409	61.3	18.7
10	0.820	204	277	136	409	62.4	19.0
11	0.710	177	275	135	408	58.0	17.7
12	0.620	154	271	133	406	54.1	16.5
13	0.900	224	276	136	409	65.4	19.9
14	0.930	232	277	136	409	66.5	20.3
15	0.930	232	277	136	409	66.5	20.3
16	0.870	217	278	137	410	64.4	19.6
17	0.840	209	278	137	410	63.2	19.3
18	0.740	184	278	137	410	59.4	18.1
19	0.830	207	278	137	410	62.9	19.2
20	0.830	207	278	137	410	62.9	19.2
21	0.850	212	278	137	410	63.6	19.4
22	0.840	209	278	137	410	63.2	19.3
23	0.770	192	276	136	409	60.5	18.4
24	0.550	137	272	133	406	51.0	15.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.90 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	6	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1625-1631	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.69					
CO_2 (%)	11.52					
CO (ppm)	8.9	**N_2 (%)**	79.8	**MW (dry)**	30.26	lb/lb mole
H_2O (%)	17.87	**Ar (%)**	1.0	**MW (wet)**	28.07	lb/lb mole

	Imperial	Metric
Average Velocity	63 ft/s	19.1 m/s
Average Temperature	278 °F	137 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59772 cfm	28.2 m^3/s
Dry Reference Volumetric Flow Rate	34756 cfm	16.40 Rm^3/s
Wet Reference Volumetric Flow Rate	42317 cfm	19.97 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.910	227	278	137	410	65.7	20.0
2	0.980	244	278	137	410	68.2	20.8
3	0.990	247	278	137	410	68.5	20.9
4	0.940	234	278	137	410	66.8	20.4
5	0.860	214	278	137	410	63.9	19.5
6	0.810	202	278	137	410	62.0	18.9
7	0.810	202	278	137	410	62.0	18.9
8	0.810	202	278	137	410	62.0	18.9
9	0.840	209	278	137	410	63.1	19.2
10	0.840	209	278	137	410	63.1	19.2
11	0.750	187	277	136	409	59.6	18.2
12	0.580	144	272	133	406	52.2	15.9
13	0.920	229	278	137	410	66.1	20.1
14	0.970	242	278	137	410	67.8	20.7
15	0.940	234	278	137	410	66.8	20.4
16	0.910	227	278	137	410	65.7	20.0
17	0.810	202	278	137	410	62.0	18.9
18	0.780	194	278	137	410	60.8	18.5
19	0.730	182	279	137	410	58.9	17.9
20	0.750	187	279	137	410	59.7	18.2
21	0.790	197	279	137	410	61.3	18.7
22	0.770	192	279	137	410	60.5	18.4
23	0.710	177	279	137	410	58.1	17.7
24	0.730	182	275	135	408	58.7	17.9

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.90 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	7	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1633-1638	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.04					
CO_2 (%)	11.40					
CO (ppm)	14.4	**N_2 (%)**	79.6	**MW (dry)**	30.26	lb/lb mole
H_2O (%)	17.87	**Ar (%)**	0.9	**MW (wet)**	28.07	lb/lb mole

	Imperial	Metric
Average Velocity	62 ft/s	18.9 m/s
Average Temperature	278 °F	137 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59128 cfm	27.9 m^3/s
Dry Reference Volumetric Flow Rate	34363 cfm	16.22 Rm^3/s
Wet Reference Volumetric Flow Rate	41838 cfm	19.75 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.910	227	278	137	410	65.7	20.0
2	0.940	234	278	137	410	66.8	20.4
3	0.930	232	278	137	410	66.4	20.2
4	0.890	222	278	137	410	65.0	19.8
5	0.830	207	278	137	410	62.7	19.1
6	0.770	192	279	137	410	60.5	18.4
7	0.730	182	279	137	410	58.9	17.9
8	0.740	184	279	137	410	59.3	18.1
9	0.770	192	279	137	410	60.5	18.4
10	0.770	192	279	137	410	60.5	18.4
11	0.730	182	278	137	410	58.8	17.9
12	0.710	177	275	135	408	57.9	17.7
13	0.900	224	278	137	410	65.3	19.9
14	0.940	234	278	137	410	66.8	20.4
15	0.920	229	279	137	410	66.1	20.1
16	0.890	222	279	137	410	65.0	19.8
17	0.840	209	279	137	410	63.2	19.3
18	0.770	192	279	137	410	60.5	18.4
19	0.800	199	279	137	410	61.6	18.8
20	0.790	197	279	137	410	61.3	18.7
21	0.840	209	279	137	410	63.2	19.3
22	0.810	202	279	137	410	62.0	18.9
23	0.660	164	276	136	409	55.9	17.0
24	0.600	149	275	135	408	53.2	16.2

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.90 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.00 in. H_2O	-2.74 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	8	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1639-1646	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.72					
CO_2 (%)	11.68					
CO (ppm)	11.9	**N_2 (%)**	79.7	**MW (dry)**	30.29	lb/lb mole
H_2O (%)	17.87	**Ar (%)**	0.9	**MW (wet)**	28.10	lb/lb mole

	Imperial	Metric
Average Velocity	63 ft/s	19.1 m/s
Average Temperature	278 °F	137 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59842 cfm	28.2 m^3/s
Dry Reference Volumetric Flow Rate	34777 cfm	16.41 Rm^3/s
Wet Reference Volumetric Flow Rate	42343 cfm	19.98 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.940	234	278	137	410	66.7	20.3
2	0.960	239	278	137	410	67.5	20.6
3	0.930	232	278	137	410	66.4	20.2
4	0.890	222	278	137	410	64.9	19.8
5	0.850	212	279	137	410	63.5	19.4
6	0.770	192	279	137	410	60.4	18.4
7	0.780	194	279	137	410	60.8	18.5
8	0.810	202	279	137	410	62.0	18.9
9	0.840	209	279	137	410	63.1	19.2
10	0.850	212	279	137	410	63.5	19.4
11	0.750	187	278	137	410	59.6	18.2
12	0.620	154	270	132	405	53.9	16.4
13	0.960	239	279	137	410	67.5	20.6
14	1.000	249	279	137	410	68.9	21.0
15	0.970	242	279	137	410	67.8	20.7
16	0.910	227	279	137	410	65.7	20.0
17	0.850	212	279	137	410	63.5	19.4
18	0.800	199	279	137	410	61.6	18.8
19	0.730	182	279	137	410	58.9	17.9
20	0.750	187	279	137	410	59.7	18.2
21	0.820	204	279	137	410	62.4	19.0
22	0.840	209	279	137	410	63.1	19.2
23	0.690	172	278	137	410	57.2	17.4
24	0.670	167	275	135	408	56.2	17.1

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.70 in. H_2O	-2.91 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	9	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1800-1805	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.31					
CO_2 (%)	10.94					
CO (ppm)	15.8	**N_2 (%)**	79.8	**MW (dry)**	30.20	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	0.9	**MW (wet)**	27.96	lb/lb mole

	Imperial	Metric
Average Velocity	64 ft/s	19.6 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	61333 cfm	28.9 m^3/s
Dry Reference Volumetric Flow Rate	35082 cfm	16.56 Rm^3/s
Wet Reference Volumetric Flow Rate	42954 cfm	20.27 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	1.050	262	284	140	413	71.1	21.7
2	1.050	262	284	140	413	71.1	21.7
3	0.990	247	284	140	413	69.0	21.0
4	0.950	237	284	140	413	67.6	20.6
5	0.860	214	284	140	413	64.3	19.6
6	0.800	199	284	140	413	62.0	18.9
7	0.750	187	284	140	413	60.1	18.3
8	0.760	189	284	140	413	60.5	18.4
9	0.830	207	284	140	413	63.2	19.3
10	0.790	197	284	140	413	61.7	18.8
11	0.500	125	284	140	413	49.1	15.0
12	0.480	120	284	140	413	48.1	14.6
13	1.050	262	284	140	413	71.1	21.7
14	0.960	239	284	140	413	68.0	20.7
15	0.940	234	284	140	413	67.3	20.5
16	0.900	224	284	140	413	65.8	20.1
17	0.840	209	284	140	413	63.6	19.4
18	0.860	214	284	140	413	64.3	19.6
19	0.890	222	284	140	413	65.4	19.9
20	0.840	209	284	140	413	63.6	19.4
21	0.880	219	284	140	413	65.1	19.8
22	0.900	224	284	140	413	65.8	20.1
23	0.940	234	284	140	413	67.3	20.5
24	0.950	237	284	140	413	67.6	20.6

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.70 in. H_2O	-2.91 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	10	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	18:06-1811	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.35					
CO_2 (%)	11.03					
CO (ppm)	13.7	**N_2 (%)**	79.7	**MW (dry)**	30.21	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	0.9	**MW (wet)**	27.97	lb/lb mole

	Imperial	Metric
Average Velocity	64 ft/s	19.6 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	61220 cfm	28.9 m^3/s
Dry Reference Volumetric Flow Rate	35017 cfm	16.53 Rm^3/s
Wet Reference Volumetric Flow Rate	42874 cfm	20.23 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.950	237	284	140	413	67.6	20.6
2	0.960	239	284	140	413	68.0	20.7
3	0.920	229	284	140	413	66.5	20.3
4	0.890	222	284	140	413	65.4	19.9
5	0.820	204	284	140	413	62.8	19.1
6	0.790	197	284	140	413	61.6	18.8
7	0.790	197	284	140	413	61.6	18.8
8	0.850	212	284	140	413	63.9	19.5
9	0.870	217	284	140	413	64.7	19.7
10	0.850	212	284	140	413	63.9	19.5
11	0.730	182	284	140	413	59.3	18.1
12	0.700	174	284	140	413	58.0	17.7
13	1.100	274	284	140	413	72.7	22.2
14	1.050	262	284	140	413	71.1	21.7
15	1.000	249	284	140	413	69.4	21.1
16	0.920	229	284	140	413	66.5	20.3
17	0.870	217	284	140	413	64.7	19.7
18	0.850	212	284	140	413	63.9	19.5
19	0.800	199	284	140	413	62.0	18.9
20	0.800	199	284	140	413	62.0	18.9
21	0.860	214	284	140	413	64.3	19.6
22	0.850	212	284	140	413	63.9	19.5
23	0.740	184	284	140	413	59.7	18.2
24	0.650	162	284	140	413	55.9	17.0

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.40 in. H_2O	-2.84 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	11	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1812-1815	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.87					
CO_2 (%)	11.54					
CO (ppm)	11.0	**N_2 (%)**	79.6	**MW (dry)**	30.27	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	0.9	**MW (wet)**	28.03	lb/lb mole

	Imperial	Metric
Average Velocity	65 ft/s	19.7 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	61567 cfm	29.1 m^3/s
Dry Reference Volumetric Flow Rate	35242 cfm	16.63 Rm^3/s
Wet Reference Volumetric Flow Rate	43150 cfm	20.36 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	in. H_2O	Pa	°F	°C	K	ft/s	m/s
1	0.970	242	284	140	413	68.2	20.8
2	0.990	247	284	140	413	68.9	21.0
3	0.970	242	284	140	413	68.2	20.8
4	0.920	229	284	140	413	66.4	20.3
5	0.870	217	284	140	413	64.6	19.7
6	0.830	207	284	140	413	63.1	19.2
7	0.790	197	284	140	413	61.6	18.8
8	0.810	202	284	140	413	62.3	19.0
9	0.870	217	284	140	413	64.6	19.7
10	0.860	214	284	140	413	64.2	19.6
11	0.780	194	284	140	413	61.2	18.6
12	0.740	184	284	140	413	59.6	18.2
13	0.990	247	284	140	413	68.9	21.0
14	0.980	244	284	140	413	68.6	20.9
15	0.920	229	284	140	413	66.4	20.3
16	0.880	219	284	140	413	65.0	19.8
17	0.850	212	284	140	413	63.9	19.5
18	0.830	207	284	140	413	63.1	19.2
19	0.850	212	284	140	413	63.9	19.5
20	0.910	227	284	140	413	66.1	20.1
21	0.920	229	284	140	413	66.4	20.3
22	0.920	229	284	140	413	66.4	20.3
23	0.710	177	284	140	413	58.4	17.8
24	0.710	177	284	140	413	58.4	17.8

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.40 in. H_2O	-2.84 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	12	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1816-1821	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.18					
CO_2 (%)	11.21					
CO (ppm)	14.8	**N_2 (%)**	79.7	**MW (dry)**	30.23	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	0.9	**MW (wet)**	27.99	lb/lb mole

	Imperial	Metric
Average Velocity	64 ft/s	19.4 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	60851 cfm	28.7 m^3/s
Dry Reference Volumetric Flow Rate	34833 cfm	16.44 Rm^3/s
Wet Reference Volumetric Flow Rate	42649 cfm	20.13 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	1.100	274	284	140	413	72.7	22.2
2	1.000	249	284	140	413	69.3	21.1
3	0.950	237	284	140	413	67.6	20.6
4	0.920	229	284	140	413	66.5	20.3
5	0.850	212	284	140	413	63.9	19.5
6	0.790	197	284	140	413	61.6	18.8
7	0.830	207	284	140	413	63.1	19.2
8	0.850	212	284	140	413	63.9	19.5
9	0.900	224	284	140	413	65.8	20.0
10	0.890	222	284	140	413	65.4	19.9
11	0.700	174	284	140	413	58.0	17.7
12	0.720	179	284	140	413	58.8	17.9
13	1.100	274	284	140	413	72.7	22.2
14	1.100	274	284	140	413	72.7	22.2
15	1.050	262	284	140	413	71.0	21.6
16	0.910	227	284	140	413	66.1	20.2
17	0.850	212	284	140	413	63.9	19.5
18	0.810	202	284	140	413	62.4	19.0
19	0.740	184	284	140	413	59.6	18.2
20	0.760	189	284	140	413	60.4	18.4
21	0.730	182	284	140	413	59.2	18.0
22	0.660	164	284	140	413	56.3	17.2
23	0.640	159	284	140	413	55.4	16.9
24	0.610	152	284	140	413	54.1	16.5

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.10 in. H_2O	-2.76 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	13	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1822-1826	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	7.95					
CO_2 (%)	11.34					
CO (ppm)	10.4	**N_2 (%)**	79.8	**MW (dry)**	30.25	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	0.9	**MW (wet)**	28.00	lb/lb mole

	Imperial	Metric
Average Velocity	62 ft/s	18.9 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59170 cfm	27.9 m^3/s
Dry Reference Volumetric Flow Rate	33896 cfm	16.00 Rm^3/s
Wet Reference Volumetric Flow Rate	41502 cfm	19.59 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	1.000	249	284	140	413	69.3	21.1
2	0.980	244	284	140	413	68.6	20.9
3	0.940	234	284	140	413	67.2	20.5
4	0.880	219	284	140	413	65.0	19.8
5	0.850	212	284	140	413	63.9	19.5
6	0.820	204	284	140	413	62.7	19.1
7	0.720	179	284	140	413	58.8	17.9
8	0.770	192	284	140	413	60.8	18.5
9	0.700	174	284	140	413	58.0	17.7
10	0.550	137	284	140	413	51.4	15.7
11	0.530	132	284	140	413	50.4	15.4
12	0.510	127	284	140	413	49.5	15.1
13	0.950	237	284	140	413	67.5	20.6
14	0.940	234	284	140	413	67.2	20.5
15	0.910	227	284	140	413	66.1	20.1
16	0.810	202	284	140	413	62.3	19.0
17	0.790	197	284	140	413	61.6	18.8
18	0.770	192	284	140	413	60.8	18.5
19	0.810	202	284	140	413	62.3	19.0
20	0.840	209	284	140	413	63.5	19.4
21	0.880	219	284	140	413	65.0	19.8
22	0.860	214	284	140	413	64.2	19.6
23	0.820	204	284	140	413	62.7	19.1
24	0.740	184	284	140	413	59.6	18.2

ORTECH Environmental

Velocity and Volume Flowrate Determination

Covanta

Project No.	21546	**Pbar**	29.88 in. Hg	101.2 kPa
Client	Covanta	**Pstatic**	-11.10 in. H_2O	-2.76 kPa
Location	Courtice, Ontario	**Stack Diameter**	4.500 ft	1.37 m
Test Location	APC Outlet No.2	**Stack Width**	0.00 ft	0.00 m
Date	September 28, 2015	**Stack Length**	0.00 ft	0.00 m
Test Number	14	**Stack Area**	15.90 ft^2	1.48 m^2
Test Time	1827-1831	**Pitot Coefficient**	0.849	
Operator	DU	**Number of Points**	24	

O_2 (%)	8.11					
CO_2 (%)	11.01					
CO (ppm)	21.8	**N_2 (%)**	79.9	**MW (dry)**	30.20	lb/lb mole
H_2O (%)	18.33	**Ar (%)**	1.0	**MW (wet)**	27.96	lb/lb mole

	Imperial	Metric
Average Velocity	62 ft/s	19.0 m/s
Average Temperature	284 °F	140 °C
Duct Cross-sectional Area	15.90 ft^2	1.48 m^2
Actual Volumetric Flow Rate	59386 cfm	28.0 m^3/s
Dry Reference Volumetric Flow Rate	34020 cfm	16.06 Rm^3/s
Wet Reference Volumetric Flow Rate	41654 cfm	19.66 Rm^3/s

Reference conditions: 25°C, 101.3 kPa (77°F, 29.92 in. Hg)

Point	Velocity Pressure		Stack Temp.			Velocity	
No.	**in. H_2O**	**Pa**	**°F**	**°C**	**K**	**ft/s**	**m/s**
1	0.930	232	284	140	413	66.8	20.4
2	0.910	227	284	140	413	66.1	20.2
3	0.940	234	284	140	413	67.2	20.5
4	0.840	209	284	140	413	63.5	19.4
5	0.820	204	284	140	413	62.8	19.1
6	0.820	204	284	140	413	62.8	19.1
7	0.800	199	284	140	413	62.0	18.9
8	0.840	209	284	140	413	63.5	19.4
9	0.900	224	284	140	413	65.8	20.0
10	0.840	209	284	140	413	63.5	19.4
11	0.640	159	284	140	413	55.5	16.9
12	0.600	149	284	140	413	53.7	16.4
13	0.990	247	284	140	413	69.0	21.0
14	0.960	239	284	140	413	67.9	20.7
15	0.940	234	284	140	413	67.2	20.5
16	0.890	222	284	140	413	65.4	19.9
17	0.830	207	284	140	413	63.1	19.2
18	0.780	194	284	140	413	61.2	18.7
19	0.730	182	284	140	413	59.2	18.1
20	0.750	187	284	140	413	60.0	18.3
21	0.720	179	284	140	413	58.8	17.9
22	0.690	172	284	140	413	57.6	17.5
23	0.660	164	284	140	413	56.3	17.2
24	0.620	154	284	140	413	54.6	16.6

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #2

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 1 | Time: 1402 - 1406 | Operator: DM | Signature: DM

Measuring Devices	MII Number
Pitot Tube	D2
Pitot Factor	.849
Manometer	GOE 20190
Temp meter	
Barometer	ENV. CAN

Measured Parameters	
Barometric	29.94
Static	-11.0

O_2 - 8.82%
CO_2 - 10.33%
CO - 18.6 ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.86	277	.87	277
2	.89	278	.89	277
3	.87	278	.86	277
4	.83	278	.87	277
5	.77	278	.74	277
6	.73	278	.72	277
7	.76	278	.68	277
8	.76	277	.70	277
9	.78	277	.72	276
10	.81	277	.64	275
11	.81	276	.55	275
12	.74	271	.42	275

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: QUANTA | Site Location: APC OUTLET #2

Company Location: CANTICE | Test Date: SEPT 29 '15

Test No.: 2 | Time: 1407-1414 | Operator: RM | Signature: RM

Measuring Devices	MII Number
Pitot Tube	SSE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.94
Static	-11.0

O_2 - 8.20%
CO_2 - 10.98%
CO - 25.3ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.85	277	.83	277
2	.88	277	.88	277
3	.86	277	.88	277
4	.83	277	.83	277
5	.77	277	.78	277
6	.75	277	.72	277
7	.69	277	.74	277
8	.69	277	.74	277
9	.74	277	.76	277
10	.72	276	.69	277
11	.64	274	.58	277
12	.56	270	.54	271

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: CONANTA | Site Location: APC outlet #2

Company Location: CANTICE | Test Date: SEPT 28/15

Test No.: 3 | Time: 1433-1440 | Operator: DM | Signature: D. Mc

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.94
Static	-11.0

O_2 - 8.2%
CO_2 - 10.9%
CO - 20.2 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.87	278	.86	277
2	.90	277	.89	277
3	.87	277	.90	277
4	.81	277	.86	277
5	.76	277	.80	277
6	.70	277	.73	277
7	.64	277	.73	277
8	.68	277	.75	277
9	.72	277	.76	277
10	.73	277	.76	277
11	.67	276	.68	276
12	.51	274	.53	273

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #2

Company Location: CANTICO | Test Date: SEPT 28/15

Test No.: 4 | Time: 1441-1445 | Operator: DM | Signature: DM

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.94
Static	-1.0

O_2 - 8.65%
CO_2 - 10.72%
CO - 24.4ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.82	276	.89	275
2	.83	276	.91	276
3	.84	276	.88	276
4	.81	276	.83	276
5	.76	277	.75	276
6	.72	277	.73	276
7	.73	276	.67	276
8	.73	276	.71	276
9	.75	276	.76	276
10	.75	276	.71	276
11	.65	274	.67	275
12	.63	273	.55	274

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #2

Company Location: CANTICO | Test Date: SEPT 29/15

Test No.: 5 | Time: 1616-1624 | Operator: RM | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SET
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.90
Static	71.0

O_2 - 8.87%
CO_2 - 10.44%
CO - 26.0 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.92	276	.90	276
2	.98	276	.93	277
3	.93	276	.93	277
4	.87	277	.87	278
5	.84	277	.84	278
6	.77	277	.74	278
7	.71	277	.83	278
8	.76	277	.83	278
9	.79	277	.85	278
10	.82	277	.84	278
11	.71	275	.77	276
12	.62	271	.55	272

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #2

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 6 | Time: 1625 - 1631 | Operator: DL | Signature: DL

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.90
Static	-11.0

O_2 - 7.69%
CO_2 - 11.52%.
CO - 8.9ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.91	278	.92	278
2	.98	278	.97	278
3	.99	278	.94	278
4	.94	278	.91	278
5	.86	278	.81	278
6	.81	278	.78	278
7	.81	278	.73	279
8	.81	278	.75	279
9	.84	278	.79	279
10	.84	278	.77	279
11	.75	277	.71	279
12	.58	272	.73	275

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: ARC OUTLET #2

Company Location: COURTICE, ON | Test Date: SEPT 28/15

Test No.: 7 | Time: 1633 – 1638 | Operator: DM | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	T57
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.90
Static	-11.0

O2 - 8.04%.
CO2 - 11.40%.
CO - 14.4ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.91	278	.90	278
2	.94	278	.94	278
3	.93	278	.97	279
4	.89	278	.89	279
5	.83	278	.84	279
6	.77	279	.77	279
7	.73	279	.80	279
8	.74	279	.79	279
9	.77	279	.84	279
10	.77	279	.81	279
11	.73	278	.66	276
12	.71	275	.60	275

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: COVANTA | Site Location: APC OUTLET #2

Company Location: COURTICE, ON | Test Date: SEPT 29/15

Test No.: 8 | Time: 1639 - 1646 | Operator: DW | Signature: [signature]

Measuring Devices	MII Number
Pitot Tube	SEE
Pitot Factor	TEST
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.90
Static	-11.0

O_2 - 7.72%
CO_2 - 11.68%
CO - 11.9 ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.94	278	.96	279
2	.96	278	1.00	279
3	.93	278	.97	279
4	.89	278	.91	279
5	.85	279	.85	279
6	.77	279	.80	279
7	.78	279	.73	279
8	.81	279	.75	279
9	.84	279	.82	279
10	.85	279	.84	279
11	.75	279	.69	278
12	.62	270	.67	275

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: Covanta | Site Location: Unit 2 Outlet

Company Location: Courtice ON | Test Date: Sept. 28/15

Test No.: 4 | Time: 18:00 - 18:05 | Operator: RL | Signature:

Measuring Devices	MII Number
Pitot Tube	D2
Pitot Factor	
Manometer	Team 4
Temp meter	Team 4
Barometer	Env. Can.

Measured Parameters	
Barometric	99.88
Static	-11.7

O_2 - 8.31%
CO_2 - 10.94%.
CO - 15.8ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	1.05	284	1.05	284
2	1.05	284	.96	284
3	.99	284	.94	284
4	.95	284	.90	284
5	.86	284	.84	284
6	.80	284	.86	284
7	.75	284	.89	284
8	.76	284	.84	284
9	.83	284	.88	284
10	.79	284	.90	284
11	.50	284	.94	284
12	.48	284	.95	284

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: Counts | Site Location: Unit 2 Outlet

Company Location: | Test Date: Sept. 28/15

Test No.: #10 | Time: 18:06 - 18:41 | Operator: RW | Signature:

Measuring Devices	MII Number
Pitot Tube	
Pitot Factor	See Test
Manometer	
Temp meter	
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.7

O_2 - 8.35%
CO_2 - 11.03%
CO - 13.7 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.95	284	1.10	284
2	.96	284	1.05	284
3	.92	284	1.00	284
4	.89	284	.92	284
5	.82	284	.87	284
6	.79	284	.85	284
7	.79	284	.80	284
8	.85	284	.80	284
9	.87	284	.86	284
10	.85	284	.85	284
11	.73	284	.74	284
12	.70	284	.65	284

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: Covanta | Site Location: Unit 2 outlet

Company Location: | Test Date: Sept. 28/15

Test No.: 11 | Time: 18:12 - 18:15 | Operator: RW | Signature:

Measuring Devices	MII Number
Pitot Tube	
Pitot Factor	See
Manometer	Test
Temp meter	
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.4

O_2 - 7.87%.
CO_2 - 11.54%.
CO - 11.0ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	.97	284	.99	284
2	.99	284	.98	284
3	.97	284	.92	284
4	.92	284	.88	284
5	.87	284	.85	284
6	.83	284	.83	284
7	.79	284	.85	284
8	.81	284	.91	284
9	.87	284	.92	284
10	.86	284	.92	284
11	.78	284	.71	284
12	.74	284	.71	284

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: Covanta | Site Location: Unit 2 Outlet

Company Location: | Test Date: Sept 28/15

Test No.: 12 | Time: 18:16 - 18:21 | Operator: RV | Signature:

Measuring Devices	MII Number
Pitot Tube	
Pitot Factor	See Test
Manometer	
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.4

O_2 - 8.18%.
CO_2 - 11.21%.
CO - 14.8 ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	1.1	284	1.1	284
2	1.0	284	1.1	284
3	0.95	284	1.05	284
4	.92	284	.91	284
5	.85	284	.85	284
6	.79	284	.81	284
7	.83	284	.74	284
8	.85	284	.76	284
9	.90	284	.73	284
10	.89	284	.66	284
11	.70	284	.64	284
12	.72	284	.61	284

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: 21546

Company: Covanta | Site Location: Unit 2 Outlet

Company Location: | Test Date: Sept. 28/15

Test No.: #13 | Time: 18:22 - 18:26 | Operator: RV | Signature:

Measuring Devices	MII Number
Pitot Tube	
Pitot Factor	See
Manometer	Test
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.1

O_2 - 7.95%
CO_2 - 11.34%
CO - 10.4ppm

Port	1		2	
Point #	Delta P	Temp	Delta P	Temp
1	1.0	284	.95	284
2	.98	284	.94	284
3	.94	284	.91	284
4	.88	284	.81	284
5	.85	284	.79	284
6	.82	284	.77	284
7	.72	284	.81	284
8	.77	284	.84	284
9	.70	284	.88	284
10	.55	284	.86	284
11	.53	284	.82	284
12	.51	284	.74	284

Stack Gas Velocity and Volumetric Flow Rate Data Sheet

Method 2: S.O.P. Number 93 - T62 - SP - 002

Project No.: ~~6000~~ 21546

Company: Covanta | Site Location: Unit 2 Outlet

Company Location: | Test Date: Sept 28/15

Test No.: #14 | Time: 18:27 - 18:31 | Operator: RL | Signature:

Measuring Devices	MII Number
Pitot Tube	
Pitot Factor	See
Manometer	Tech
Temp meter	1
Barometer	

Measured Parameters	
Barometric	29.88
Static	-11.1

O_2 - 8.11%
CO_2 - 11.01%
CO - 21.8ppm

Port	2		1	
Point #	Delta P	Temp	Delta P	Temp
1	.93	284	.99	284
2	.91	284	.96	284
3	.94	284	.94	284
4	.84	284	.89	284
5	.82	284	.83	284
6	.82	284	.78	284
7	.80	284	.73	284
8	.84	284	.75	284
9	.80	284	.72	284
10	.84	284	.69	284
11	.64	284	.66	284
12	.60	284	.62	284

APPENDIX 4

Moisture Field Data Sheets
(5 pages)

Moisture Train Recovery Sheet

Client:	**Covanta**
Project No.:	**21546**
Test :	1-4
Test Location:	UNIT 2 outlet
Test Date:	SEPT. 28, 2015
Test Condition:	

DGM MII:	CE20090
DGMCF:	1.004

Volume of Stack Gas Sampled				
		Meter Temperature		Meter Pressure
Time	Dry Gas Meter Volume	Inlet	Outlet	"H_2O
On: 1340	92.65	77	78	1.9
Off: 1445	142.99	77	78	1.9
Total:	50.34	Average:	77.5	1.9

Initial Leak Check:	.002 @ 15" Hg
Final Leak Check:	.002 @ 11" Hg

Impinger 1 H_2O / glycol	
Initial Mass:	762.2
Final Mass:	893.3
1 **Gain:**	131.1

Impinger 3 (Empty)	
Initial Mass:	668.0
Final Mass:	678.9
3 **Gain:**	10.9

Impinger 2 H_2O / glycol	
Initial Mass:	763.5
Final Mass:	793.6
2 **Gain:**	30.1

Impinger 4 (Silica Gel)	
Initial Mass:	789.8
Final Mass:	811.0
4 **Gain:**	21.2

CWTR = 1+2+3:	172.1
WCBDA= 4:	21.2
Total:	193.3

Train Loaded By:	CB.
Train Recovered By:	
Date:	SEPT. 28, 15

I

Moisture Train Recovery Sheet

Client:	**Covanta**
Project No.:	**21546**
Test :	S-8 UNIT 2
Test Location:	UNIT #2 OUTLET
Test Date:	SEPT. 28, 2015
Test Condition:	

DGM MII:	COE 200090
DGMCF:	1.004

Volume of Stack Gas Sampled				
		Meter Temperature		Meter Pressure
Time	Dry Gas Meter Volume	Inlet	Outlet	"H_2O
On: 1615	42.24	78	78	1.9
Off: 1647	65.92	80	91	1.9
Total:	23.68	Average:	81.8	1.9

Initial Leak Check:	.003 @ 10
Final Leak Check:	.002 @ 11

Impinger 1 H_2O / glycol	
Initial Mass:	873.3
Final Mass:	966.6
1 **Gain:**	93.3

Impinger 3 (Empty)	
Initial Mass:	678.9
Final Mass:	680.4
3 **Gain:**	1.5

Impinger 2 H_2O / glycol	
Initial Mass:	793.6
Final Mass:	801.6
2 **Gain:**	8.0

Impinger 4 (Silica Gel)	
Initial Mass:	811.0
Final Mass:	815.5
4 **Gain:**	4.5

CWTR = 1+2+3:	102.8
WCBDA= 4:	4.5
Total:	107.3

✓

Train Loaded By:	CB
Train Recovered By:	CB
Date:	SEPT. 28 / 2015

Box I

Moisture Train Recovery Sheet

Client:	Covanta
Project No.:	21546
Test :	9-14
Test Location:	UNIT #2 OUTLET
Test Date:	SEPT. 28, 2015
Test Condition:	

DGM MII:	Team 4 COC 20090
DGMCF:	1.004

Volume of Stack Gas Sampled				
		Meter Temperature		Meter Pressure
Time	Dry Gas Meter Volume	Inlet	Outlet	"H_2O
On: 17:55	66.63	79	79	1.9
Off: 18:33	94.50	90	82	1.9
Total:	27.87	Average:	82.5	1.9

Initial Leak Check:	0.001 @ 12"
Final Leak Check:	

Impinger 1 H_2O / glycol	
Initial Mass:	966.6
Final Mass:	913.2
1 **Gain:**	-53.4

Impinger 3 (Empty)	
Initial Mass:	680.4
Final Mass:	712.0
3 **Gain:**	31.6

Impinger 2 H_2O / glycol	
Initial Mass:	801.6
Final Mass:	948.7
2 **Gain:**	147.1

Impinger 4 (Silica Gel)	
Initial Mass:	815.5
Final Mass:	820.2
4 **Gain:**	4.7

CWTR = 1+2+3:	125.3
WCBDA= 4:	4.7 ✓
Total:	130.0

Train Loaded By:	CB.
Train Recovered By:	CB
Date:	SEPT. 28, 2015

Moisture Train Recovery Sheet

Client:	**Covanta**
Project No.:	**21546**
Test :	1 - 4
Test Location:	UNIT 1 outlet
Test Date:	SEPT. 28 / 15
Test Condition:	

DGM MII:	CAE 20093
DGMCF:	.981

Volume of Stack Gas Sampled				
		Meter Temperature		Meter Pressure
Time	Dry Gas Meter Volume	Inlet	Outlet	"H_2O
On: 1344	96.09	77	77	1.8
Off: 1457	145.73	79	79	1.8
Total:	49.64	Average:	78.0	1.8

Initial Leak Check:	.003 @ 13
Final Leak Check:	.003 @ 13

Impinger 1 H_2O / glycol	
Initial Mass:	776.4
Final Mass:	897.1
1 **Gain:**	120.7

Impinger 3 (Empty)	
Initial Mass:	657.4
Final Mass:	671.5
3 **Gain:**	14.1

Impinger 2 H_2O / glycol	
Initial Mass:	775.0
Final Mass:	806.8
2 **Gain:**	31.8

Impinger 4 (Silica Gel)	
Initial Mass:	791.2
Final Mass:	816.5
4 **Gain:**	25.2

CWTR = 1+2+3:	166.6
WCBDA= 4:	25.2 ✓
Total:	191.8

Train Loaded By:	CB
Train Recovered By:	
Date:	SEPT 28 / 15

Box D

Moisture Train Recovery Sheet

Client:	**Covanta**
Project No.:	**21546**
Test :	RETEST 5-13
Test Location:	UNIT 1 OUTLET
Test Date:	SEPT. 28, 2015
Test Condition:	

DGM MII:	COE 20093
DGMCF:	0.981

Volume of Stack Gas Sampled				
		Meter Temperature		Meter Pressure
Time	Dry Gas Meter Volume	Inlet	Outlet	"H_2O
On: 1710	45.90	79	79	1.8
Off: 1626	96.30	83	83	1.8
Total:	50.4	Average:	81.0	1.8

Initial Leak Check:	.004@17
Final Leak Check:	

Impinger 1 H_2O / glycol	
Initial Mass:	897.1
Final Mass:	1004.3
1 **Gain:**	107.2

Impinger 3 (Empty)	
Initial Mass:	671.5
Final Mass:	681.0
3 **Gain:**	9.5

Impinger 2 H_2O / glycol	
Initial Mass:	806.8
Final Mass:	931.0
2 **Gain:**	124.2

Impinger 4 (Silica Gel)	
Initial Mass:	816.5
Final Mass:	833.8
4 **Gain:**	17.3

CWTR = 1+2+3:	240.9
WCBDA= 4:	17.3 ✓
Total:	WRONG
	258.2

Train Loaded By:	CB
Train Recovered By:	CB
Date:	SEPT. 28 / 2015

Box D

APPENDIX 5

Isokinetic Output Summary Sheets
Boiler No. 1 BH Outlet
(9 pages)

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	1 - Particulate & Acid Gases
Date:	September 29, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	0.981
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	3.796 m^3
AVGERGE ISOKINETICITY	100.9 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	130.4 °C
AVERAGE GAS MOISTURE BY VOLUME	16.4 %
AVERAGE GAS VELOCITY	17.64 m/s
BAROMETRIC PRESSURE (Station)	100.406 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	97.618 Kpa
OXYGEN CONCENTRATION	7.67 %
CARBON DIOXIDE CONCENTRATION	11.33 %
CARBON MONOXIDE CONCENTRATION	16.9 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	26.07 m^3/s
DRY REF GAS FLOWRATE	15.51 Rm^3/s
DRY ADJ GAS FLOWRATE	20.73 Rm^3/s
WET REF GAS FLOWRATE	18.56 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.796 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	2 - Particulate & Acid Gases
Date:	September 29, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	0.981
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	3.734 m^3
AVGERGE ISOKINETICITY	101.2 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	129.7 °C
AVERAGE GAS MOISTURE BY VOLUME	16.1 %
AVERAGE GAS VELOCITY	17.20 m/s
BAROMETRIC PRESSURE (Station)	100.373 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	97.584 Kpa
OXYGEN CONCENTRATION	7.69 %
CARBON DIOXIDE CONCENTRATION	11.39 %
CARBON MONOXIDE CONCENTRATION	22.4 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.41 m^3/s
DRY REF GAS FLOWRATE	15.20 Rm^3/s
DRY ADJ GAS FLOWRATE	20.28 Rm^3/s
WET REF GAS FLOWRATE	18.11 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.734 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	3 - Particulate & Acid Gases
Date:	October 1, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	1.017
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	3.668 m^3
AVGERGE ISOKINETICITY	102.0 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	135.3 °C
AVERAGE GAS MOISTURE BY VOLUME	17.5 %
AVERAGE GAS VELOCITY	17.21 m/s
BAROMETRIC PRESSURE (Station)	101.795 Kpa
STATIC PRESSURE	-2.714 Kpa
ABSOLUTE GAS PRESSURE	99.081 Kpa
OXYGEN CONCENTRATION	7.54 %
CARBON DIOXIDE CONCENTRATION	11.62 %
CARBON MONOXIDE CONCENTRATION	16.0 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.43 m^3/s
DRY REF GAS FLOWRATE	14.98 Rm^3/s
DRY ADJ GAS FLOWRATE	20.21 Rm^3/s
WET REF GAS FLOWRATE	18.16 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.668 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	1 - Metals
Date:	September 30, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT		0.847
DGM CORRECTION FACTOR		1.017
NOZZLE DIAMETER		6.46 mm
DRY REF GAS VOLUME SAMPLED		2.445 m^3
AVGERGE ISOKINETICITY		100.4 %
STACK DIAMETER		1.37 m
LENGTH		0.00 m
WIDTH		0.00 m
AREA OF STACK or DUCT		1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE		139.9 °C
AVERAGE GAS MOISTURE BY VOLUME		15.9 %
AVERAGE GAS VELOCITY		17.52 m/s
BAROMETRIC PRESSURE (Station)		100.914 Kpa
STATIC PRESSURE		-2.789 Kpa
ABSOLUTE GAS PRESSURE		98.126 Kpa
OXYGEN CONCENTRATION		7.91 %
CARBON DIOXIDE CONCENTRATION		11.23 %
CARBON MONOXIDE CONCENTRATION		15.5 ppm

FLOWRATE

ACTUAL GAS FLOWRATE		25.89 m^3/s
DRY REF GAS FLOWRATE		15.23 Rm^3/s
DRY ADJ GAS FLOWRATE		19.98 Rm^3/s
WET REF GAS FLOWRATE		18.10 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.445 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	2 - Metals
Date:	September 30, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	1.017
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	2.524 m^3
AVGERGE ISOKINETICITY	100.6 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	140.1 °C
AVERAGE GAS MOISTURE BY VOLUME	16.4 %
AVERAGE GAS VELOCITY	18.14 m/s
BAROMETRIC PRESSURE (Station)	101.016 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	98.227 Kpa
OXYGEN CONCENTRATION	7.92 %
CARBON DIOXIDE CONCENTRATION	11.12 %
CARBON MONOXIDE CONCENTRATION	21.3 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	26.81 m^3/s
DRY REF GAS FLOWRATE	15.68 Rm^3/s
DRY ADJ GAS FLOWRATE	20.55 Rm^3/s
WET REF GAS FLOWRATE	18.75 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.524 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	3 - Metals
Date:	October 1, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT		0.847
DGM CORRECTION FACTOR		1.017
NOZZLE DIAMETER		6.46 mm
DRY REF GAS VOLUME SAMPLED		2.429 m^3
AVGERGE ISOKINETICITY		100.4 %
STACK DIAMETER		1.37 m
LENGTH		0.00 m
WIDTH		0.00 m
AREA OF STACK or DUCT		1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE		138.1 °C
AVERAGE GAS MOISTURE BY VOLUME		16.5 %
AVERAGE GAS VELOCITY		17.30 m/s
BAROMETRIC PRESSURE (Station)		101.761 Kpa
STATIC PRESSURE		-2.714 Kpa
ABSOLUTE GAS PRESSURE		99.047 Kpa
OXYGEN CONCENTRATION		7.62 %
CARBON DIOXIDE CONCENTRATION		11.58 %
CARBON MONOXIDE CONCENTRATION		18.3 ppm

FLOWRATE

ACTUAL GAS FLOWRATE		25.57 m^3/s
DRY REF GAS FLOWRATE		15.13 Rm^3/s
DRY ADJ GAS FLOWRATE		20.29 Rm^3/s
WET REF GAS FLOWRATE		18.12 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.429 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	1 - SVOC
Date:	October 1, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	1.017
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	4.811 m^3
AVGERGE ISOKINETICITY	100.4 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	135.5 °C
AVERAGE GAS MOISTURE BY VOLUME	16.1 %
AVERAGE GAS VELOCITY	16.94 m/s
BAROMETRIC PRESSURE (Station)	101.761 Kpa
STATIC PRESSURE	-2.714 Kpa
ABSOLUTE GAS PRESSURE	99.047 Kpa
OXYGEN CONCENTRATION	7.57 %
CARBON DIOXIDE CONCENTRATION	11.59 %
CARBON MONOXIDE CONCENTRATION	16.6 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.03 m^3/s
DRY REF GAS FLOWRATE	14.98 Rm^3/s
DRY ADJ GAS FLOWRATE	20.17 Rm^3/s
WET REF GAS FLOWRATE	17.85 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.811 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	2 - SVOC
Date:	October 2, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	1.017
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	4.599 m^3
AVGERGE ISOKINETICITY	101.0 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	134.7 °C
AVERAGE GAS MOISTURE BY VOLUME	16.4 %
AVERAGE GAS VELOCITY	16.08 m/s
BAROMETRIC PRESSURE (Station)	102.133 Kpa
STATIC PRESSURE	-2.689 Kpa
ABSOLUTE GAS PRESSURE	99.444 Kpa
OXYGEN CONCENTRATION	7.59 %
CARBON DIOXIDE CONCENTRATION	11.61 %
CARBON MONOXIDE CONCENTRATION	19.6 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	23.75 m^3/s
DRY REF GAS FLOWRATE	14.24 Rm^3/s
DRY ADJ GAS FLOWRATE	19.14 Rm^3/s
WET REF GAS FLOWRATE	17.04 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.599 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 1 BH Outlet
Test No.:	3 - SVOC
Date:	October 2, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	1.017
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	4.644 m^3
AVGERGE ISOKINETICITY	100.9 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	138.7 °C
AVERAGE GAS MOISTURE BY VOLUME	16.4 %
AVERAGE GAS VELOCITY	16.41 m/s
BAROMETRIC PRESSURE (Station)	102.066 Kpa
STATIC PRESSURE	-2.689 Kpa
ABSOLUTE GAS PRESSURE	99.377 Kpa
OXYGEN CONCENTRATION	7.52 %
CARBON DIOXIDE CONCENTRATION	11.69 %
CARBON MONOXIDE CONCENTRATION	20.9 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	24.24 m^3/s
DRY REF GAS FLOWRATE	14.39 Rm^3/s
DRY ADJ GAS FLOWRATE	19.45 Rm^3/s
WET REF GAS FLOWRATE	17.22 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.644 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

APPENDIX 6

Isokinetic Output Summary Sheets
Boiler No. 2 BH Outlet
(9 pages)

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	1 - Particulate & Acid Gases
Date:	September 30, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	1.004
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	3.995 m^3
AVGERGE ISOKINETICITY	100.7 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	135.6 °C
AVERAGE GAS MOISTURE BY VOLUME	15.9 %
AVERAGE GAS VELOCITY	18.65 m/s
BAROMETRIC PRESSURE (Station)	100.914 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	98.126 Kpa
OXYGEN CONCENTRATION	8.38 %
CARBON DIOXIDE CONCENTRATION	10.89 %
CARBON MONOXIDE CONCENTRATION	13.5 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	27.55 m^3/s
DRY REF GAS FLOWRATE	16.37 Rm^3/s
DRY ADJ GAS FLOWRATE	20.70 Rm^3/s
WET REF GAS FLOWRATE	19.47 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.995 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	2 - Particulate & Acid Gases
Date:	September 30, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	1.004
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	3.949 m^3
AVGERGE ISOKINETICITY	101.1 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	133.8 °C
AVERAGE GAS MOISTURE BY VOLUME	16.3 %
AVERAGE GAS VELOCITY	18.31 m/s
BAROMETRIC PRESSURE (Station)	101.185 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	98.396 Kpa
OXYGEN CONCENTRATION	8.28 %
CARBON DIOXIDE CONCENTRATION	10.98 %
CARBON MONOXIDE CONCENTRATION	14.1 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	27.05 m^3/s
DRY REF GAS FLOWRATE	16.11 Rm^3/s
DRY ADJ GAS FLOWRATE	20.54 Rm^3/s
WET REF GAS FLOWRATE	19.25 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.949 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	3 - Particulate & Acid Gases
Date:	October 1, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	1.004
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	3.769 m^3
AVGERGE ISOKINETICITY	102.2 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	132.5 °C
AVERAGE GAS MOISTURE BY VOLUME	16.4 %
AVERAGE GAS VELOCITY	17.25 m/s
BAROMETRIC PRESSURE (Station)	101.321 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	98.532 Kpa
OXYGEN CONCENTRATION	7.62 %
CARBON DIOXIDE CONCENTRATION	11.85 %
CARBON MONOXIDE CONCENTRATION	16.8 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.49 m^3/s
DRY REF GAS FLOWRATE	15.22 Rm^3/s
DRY ADJ GAS FLOWRATE	20.42 Rm^3/s
WET REF GAS FLOWRATE	18.22 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		3.769 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	1 - Metals
Date:	September 29, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	0.985
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	2.454 m^3
AVGERGE ISOKINETICITY	101.7 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	134.9 °C
AVERAGE GAS MOISTURE BY VOLUME	16.6 %
AVERAGE GAS VELOCITY	17.36 m/s
BAROMETRIC PRESSURE (Station)	100.406 Kpa
STATIC PRESSURE	-2.614 Kpa
ABSOLUTE GAS PRESSURE	97.792 Kpa
OXYGEN CONCENTRATION	8.18 %
CARBON DIOXIDE CONCENTRATION	10.99 %
CARBON MONOXIDE CONCENTRATION	21.0 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.65 m^3/s
DRY REF GAS FLOWRATE	15.08 Rm^3/s
DRY ADJ GAS FLOWRATE	19.38 Rm^3/s
WET REF GAS FLOWRATE	18.09 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.454 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	2 - Metals
Date:	September 29, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	0.985
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	2.406 m^3
AVGERGE ISOKINETICITY	99.7 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	135.6 °C
AVERAGE GAS MOISTURE BY VOLUME	15.7 %
AVERAGE GAS VELOCITY	17.22 m/s
BAROMETRIC PRESSURE (Station)	100.339 Kpa
STATIC PRESSURE	-2.614 Kpa
ABSOLUTE GAS PRESSURE	97.724 Kpa
OXYGEN CONCENTRATION	8.25 %
CARBON DIOXIDE CONCENTRATION	10.81 %
CARBON MONOXIDE CONCENTRATION	22.2 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.44 m^3/s
DRY REF GAS FLOWRATE	15.09 Rm^3/s
DRY ADJ GAS FLOWRATE	19.28 Rm^3/s
WET REF GAS FLOWRATE	17.90 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.406 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	3 - Metals
Date:	September 29, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.847
DGM CORRECTION FACTOR	0.985
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	2.435 m^3
AVGERGE ISOKINETICITY	100.4 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	136.3 °C
AVERAGE GAS MOISTURE BY VOLUME	15.9 %
AVERAGE GAS VELOCITY	17.36 m/s
BAROMETRIC PRESSURE (Station)	100.406 Kpa
STATIC PRESSURE	-2.614 Kpa
ABSOLUTE GAS PRESSURE	97.792 Kpa
OXYGEN CONCENTRATION	8.41 %
CARBON DIOXIDE CONCENTRATION	10.78 %
CARBON MONOXIDE CONCENTRATION	18.9 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	25.66 m^3/s
DRY REF GAS FLOWRATE	15.16 Rm^3/s
DRY ADJ GAS FLOWRATE	19.13 Rm^3/s
WET REF GAS FLOWRATE	18.04 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		2.435 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	1 - SVOC
Date:	October 1, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	1.004
NOZZLE DIAMETER	6.50 mm
DRY REF GAS VOLUME SAMPLED	4.661 m^3
AVGERGE ISOKINETICITY	102.2 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	131.2 °C
AVERAGE GAS MOISTURE BY VOLUME	17.0 %
AVERAGE GAS VELOCITY	15.99 m/s
BAROMETRIC PRESSURE (Station)	101.727 Kpa
STATIC PRESSURE	-2.789 Kpa
ABSOLUTE GAS PRESSURE	98.938 Kpa
OXYGEN CONCENTRATION	7.16 %
CARBON DIOXIDE CONCENTRATION	12.43 %
CARBON MONOXIDE CONCENTRATION	29.1 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	23.62 m^3/s
DRY REF GAS FLOWRATE	14.11 Rm^3/s
DRY ADJ GAS FLOWRATE	19.59 Rm^3/s
WET REF GAS FLOWRATE	17.01 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.661 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	2 - SVOC
Date:	October 2, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT	0.845
DGM CORRECTION FACTOR	1.004
NOZZLE DIAMETER	6.46 mm
DRY REF GAS VOLUME SAMPLED	4.685 m^3
AVGERGE ISOKINETICITY	102.9 %
STACK DIAMETER	1.37 m
LENGTH	0.00 m
WIDTH	0.00 m
AREA OF STACK or DUCT	1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	130.9 °C
AVERAGE GAS MOISTURE BY VOLUME	16.7 %
AVERAGE GAS VELOCITY	15.97 m/s
BAROMETRIC PRESSURE (Station)	102.133 Kpa
STATIC PRESSURE	-2.490 Kpa
ABSOLUTE GAS PRESSURE	99.643 Kpa
OXYGEN CONCENTRATION	7.36 %
CARBON DIOXIDE CONCENTRATION	12.03 %
CARBON MONOXIDE CONCENTRATION	14.0 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	23.59 m^3/s
DRY REF GAS FLOWRATE	14.27 Rm^3/s
DRY ADJ GAS FLOWRATE	19.51 Rm^3/s
WET REF GAS FLOWRATE	17.12 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.685 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

ORTECH Environmental

Plant:	Covanta - DYEC
Plant Location:	Courtice, ON
Test Location:	Unit No. 2 BH Outlet
Test No.:	3 - SVOC
Date:	October 2, 2015

STACK GAS SAMPLING PARAMETERS

PITOT TUBE COEFFICIENT		0.845
DGM CORRECTION FACTOR		1.004
NOZZLE DIAMETER		6.46 mm
DRY REF GAS VOLUME SAMPLED		4.538 m^3
AVGERGE ISOKINETICITY		102.7 %
STACK DIAMETER		1.37 m
LENGTH		0.00 m
WIDTH		0.00 m
AREA OF STACK or DUCT		1.48 m^3

STACK GAS PHYSICAL PARAMETERS

AVERAGE GAS TEMPERATURE	133.4 °C
AVERAGE GAS MOISTURE BY VOLUME	16.8 %
AVERAGE GAS VELOCITY	15.63 m/s
BAROMETRIC PRESSURE (Station)	102.066 Kpa
STATIC PRESSURE	-2.515 Kpa
ABSOLUTE GAS PRESSURE	99.551 Kpa
OXYGEN CONCENTRATION	7.28 %
CARBON DIOXIDE CONCENTRATION	12.04 %
CARBON MONOXIDE CONCENTRATION	11.8 ppm

FLOWRATE

ACTUAL GAS FLOWRATE	23.09 m^3/s
DRY REF GAS FLOWRATE	13.84 Rm^3/s
DRY ADJ GAS FLOWRATE	19.04 Rm^3/s
WET REF GAS FLOWRATE	16.64 Rm^3/s

PARTICULATE EMISSION DATA

PARTICULATE COLLECTED	-PROBE	0 mg
	-FILTER	0 mg
	-TOTAL	0 mg
DRY REF GAS VOLUME SAMPLED		4.538 m^3
PARTICULATE CONC. - ACTUAL		0.000 mg/m^3
PARTICULATE CONC. - DRY REF		0.000 mg/m^3
PARTICULATE CONC. - DRY ADJ		0.000 mg/m^4
PARTICULATE CONC. - WET REF		0.000 mg/m^3
PARTICULATE EMISSION RATE		0.00000 g/s

Note: * Reference conditions refers to 25 deg C (77 deg F) and 101.325 kPa (29.92 in. Hg)

Note: Dry Adj condition refers to 25 deg C (77 deg F)and 1 atmosphere, adjusted to 11% oxygen by volume

APPENDIX 7

ORTECH Equipment Calibrations
(8 pages)

ORTECH Environmental
Pitot Tube Calibration

Date	January 19, 2015
Probe/Pitot ID	S6
MII Number	B03767
Calibrated Against	B02911
Cp standard	0.99948
Calibration Procedure	93-T62-SP-012

Calibration Facility	ORTECH Environmental
Calibrated By	David Utley
Signature	
Reviewed/Accepted By	

$$Cp = Cpstd * \sqrt{\frac{Pstd}{Ps}}$$

Configuration	Wind Tunnel Velocity m/s	Velocity Head Standard Pitot in. H_2O Pstd	Velocity Head S-Type Pitot in. H_2O Ps	S-Type Pitot Coefficient Cp_s	Deviation From The Mean
With Nozzle	7.88	0.150	0.210	0.845	0.0048
(0.25")	10.13	0.248	0.340	0.854	0.0041
	12.03	0.350	0.490	0.845	0.0048
	14.45	0.505	0.700	0.849	0.0006
	15.73	0.598	0.816	0.856	0.0061
			Mean	0.850	0.0041
Without Nozzle	7.98	0.154	0.215	0.846	0.0013
	10.21	0.252	0.348	0.851	0.0033
	12.10	0.354	0.486	0.853	0.0058
	14.23	0.490	0.690	0.842	0.0049
	15.73	0.598	0.838	0.844	0.0029
			Mean	0.847	0.0037

Note: Pitots must always be used in the orientation that they are calibrated in (marked F for front and B for back).

Acceptance Criteria:
The Cp of Standard Pitots must be in the range of 0.99 ±0.01.
For Stausscheibe (S-Type) Pitots refer to the measurement criteria as specified in Method 2 of the MOE Source Testing Code. If the pitot meets these measurement requirements it is assigned a Cp of 0.84. Otherwise, calculate the absolute differences between the average pitot tube coefficient and the coefficient obtained for each of the wind tunnel settings. The average of these differences must not exceed 0.01. Otherwise, the calibration must be repeated. (Environment Canada Reference Method EPS 1/RM/8, Section 6).

ORTECH Environmental

Dry Gas Meter Calibration Data

Calibration Procedure	03 - J004
Meter Number	Team 4
Date	August 21, 2015
Barometric Pressure	29.60
System Leak Check	<.001 cfm @ 22 "Hg

MII NUMBERS	
DGM	COE 20090
Gasometer	A01463
Barometer	COE20028

Calibrated By	Devin Golub
signature	
Reviewed and Accepted By	CHRIS BELORE

ft^3= cm* 1.332 litres per cm/28.3168 litres per ft^3

$$DGMCF = \frac{Vstd\ ft^3}{Vdgm\ ft^3} \quad \frac{Tdgm\ ^\circ F+460}{Tstd\ ^\circ F+460} \quad \frac{Pbar\ (in.\ Hg)}{(Pbar\ in.\ Hg+DGMPressure/13.6)}$$

Gasometer Reading cm			Gasometer Volume	Gasometer Temperature	DGM Reading ft^3		DGM Volume	DGM Average Temperature	DGM Pressure	DGM Outlet	DGM Calibration	Time
Initial	Final	cm	ft^3	°C	Initial	Final	ft^3	°F	in. H_2O	°F	Factor	min.
87.80	23.90	63.90	3.006	23.0	175.285	178.325	3.040	80	0.8	77	0.999	6
88.30	24.60	63.70	2.996	23.0	143.240	146.265	3.025	79.5	0.8	75	1.000	6
88.30	24.70	63.60	2.992	23.0	146.265	149.280	3.015	80.5	0.8	76	1.003	6
88.10	23.80	64.30	3.025	23.0	153.035	156.070	3.035	81	1.9	76	1.006	4
88.00	23.70	64.30	3.025	23.0	156.070	159.120	3.050	82	1.9	77	1.003	4
88.00	23.50	64.50	3.034	23.0	159.120	162.175	3.055	81.5	1.9	77	1.003	4
87.80	21.00	66.80	3.142	23.0	171.950	175.080	3.130	80.5	3.5	77	1.008	3
87.90	21.00	66.90	3.147	23.0	165.675	168.820	3.145	79.5	3.5	77	1.003	3
88.00	21.30	66.70	3.138	23.0	168.820	171.950	3.130	79.5	3.5	77	1.005	3

DGMCF AVERAGE 1.004

BEFORE 0.976

Acceptance Criteria:
Individual values of DGM calibration factor must be within ± 1.5% of the average value.
If not the calibration must be repeated. Also, the DGMCF average value must be 1.00 ± 0.05,
otherwise the meter must be repaired and/or adjusted as necessary and recalibrated prior to use.
(Environment Canada Reference Method EPS 1/RM/8, Section 6)

ORTECH Environmental

Trendicator Calibration

Calibration Procedure	03 - J005
Trendicator Type	Omega DP116
MII	COE 20090
Date	August 21, 2015
Calibrated By	Devin Golub
Signature	
Reviewed and Accepted By	

Fluke Calibrator Output (COE 20024) (°F)	Tredicator Display Value		Percent Difference
	Before Adjustment (°F)	After Adjustment (°F)	(%)
32	32	N/A	0.0
70	70		0.0
100	100		0.0
200	201		-0.5
250	251		-0.4
300	301		-0.3
400	400		0.0
500	499		0.2
600	600		0.0
700	701		-0.1
800	800		0.0
900	900		0.0
1000	1001		-0.1
1100	1101		-0.1
1200	1201		-0.1
1250	1250		0.0

$$\% \text{ Difference} = \frac{(\text{micromite} - \text{after adjustment reading})}{\text{micromite}} \times 100$$

Acceptance Criteria:
Trendicator display must read within ± 1.5% of the micromite value at each output. Otherwise, the Trendicator must be repaired and/or adjusted as necessary, and recalibrated prior to use. (MOE Source Testing Code, Version #2, Method 5)

ORTECH Environmental

Manometer Calibration Data

Date	August 21, 2015	Calibrated By	Devin Golub
Manometer Number	Team 4	Signature	
Manometer MII Number	COE 20090	Reviewed/Accepted By	
Calibrated Against	Omega HHP		
MII Number	B02679		
Calibration Procedure	03 - J010		

Front Leg

Manometer Scale "H_2O	Manometer Reading "H_2O		Reference Manometer Reading "H_2O	Percent Difference %
	Before Adjustment	After Adjustment		
	0.850	NA	0.840	-1.2
0-1.0	0.505		0.500	-1.0
	0.240		0.233	-3.0
	8.50		8.500	0.0
1.0-10.0	4.85		4.870	0.4
	2.00		1.950	-2.6

$$\text{Percent Difference} = \frac{(\text{Ref. Manometer} - \text{Instrument Reading})}{\text{Ref. Manometer}} \times 100$$

Acceptance Criteria:
The manometer being calibrated must be within ± 5.0% of the Standard value at each reading. Otherwise, the manometer must be repaired and/or adjusted as necessary and recalibrated prior to use. Manometers must be capable of measuring velocity pressure to within 0.005 "H_2O on the 0 to 1 inch scale, and 0.05 "H_2O on the 1 to 10 inch scales.
(Environment Canada Reference Method 1/RM/8, Section 2)

ORTECH Environmental
Pitot Tube Calibration

Date	January 19, 2015
Probe/Pitot ID	(D2)
MII Number	COE20108
Calibrated Against	B02911
Cp standard	0.99948
Calibration Procedure	93-T62-SP-012

Calibration Facility	ORTECH Environmental
Calibrated By	David Utley
Signature	
Reviewed/Accepted By	

$$Cp = Cpstd * \sqrt{\frac{Pstd}{Ps}}$$

Configuration	Wind Tunnel Velocity m/s	Velocity Head Standard Pitot in. H_2O Pstd	Velocity Head S-Type Pitot in. H_2O Ps	S-Type Pitot Coefficient Cp_s	Deviation From The Mean
With Nozzle	8.06	0.157	0.218	0.848	0.0018
(0.25")	9.96	0.240	0.337	0.843	0.0029
	12.29	0.365	0.510	0.846	0.0008
	14.79	0.529	0.723	0.855	0.0086
	15.78	0.602	0.853	0.840	0.0067
			Mean	0.846	0.0042
Without Nozzle	7.88	0.150	0.206	0.853	0.0043
	9.71	0.228	0.310	0.857	0.0086
	12.45	0.375	0.519	0.850	0.0011
	14.66	0.520	0.733	0.842	0.0067
	15.75	0.600	0.847	0.841	0.0073
			Mean	0.849	0.0056

Note: Pitots must always be used in the orientation that they are calibrated in (marked F for front and B for back).

Acceptance Criteria:
The Cp of Standard Pitots must be in the range of 0.99 ±0.01.
For Stausscheibe (S-Type) Pitots refer to the measurement criteria as specified in Method 2 of the MOE Source Testing Code. If the pitot meets these measurement requirements it is assigned a Cp of 0.84. Otherwise, calculate the absolute differences between the average pitot tube coefficient and the coefficient obtained for each of the wind tunnel settings. The average of these differences must not exceed 0.01. Otherwise, the calibration must be repeated. (Environment Canada Reference Method EPS 1/RM/8, Section 6).

ORTECH Environmental

Dry Gas Meter Calibration Data

Calibration Procedure	03 - J004
Meter Number	Team 3
Date	August 20, 2015
Barometric Pressure	29.50
System Leak Check	<.001 cfm @ 24 "Hg

MII NUMBERS	
DGM	COE 20093
Gasometer	A01463
Barometer	COE 20028

Calibrated By	Devin Golub
signature	
Reviewed and Accepted By	

ft^3= cm* 1.332 litres per cm/28.3168 litres per ft^3

$$DGMCF = \frac{Vstd\ ft^3}{Vdgm\ ft^3} \quad \frac{Tdgm\ ^\circ F+460}{Tstd\ ^\circ F+460} \quad \frac{Pbar\ (in.\ Hg)}{(Pbar\ in.\ Hg+DGMPressure/13.6)}$$

Gasometer Reading cm			Gasometer Volume	Gasometer Temperature	DGM Reading ft^3		DGM Volume	DGM Average Temperature	DGM Pressure	DGM Outlet	DGM Calibration	Time
Initial	Final	cm	ft^3	°C	Initial	Final	ft^3	°F	in. H_2O	°F	Factor	min.
88.50	26.20	62.30	2.931	23.0	89.970	92.985	3.015	76	0.83	76	0.975	6
88.40	26.20	62.20	2.926	23.0	92.985	95.985	3.000	76.5	0.83	76	0.979	6
88.60	26.50	62.10	2.921	23.0	95.985	98.970	2.985	77	0.83	76	0.983	6
88.60	28.50	60.10	2.827	23.0	99.250	102.160	2.910	77	1.8	77	0.974	4
88.60	28.00	60.60	2.851	23.0	102.160	105.050	2.890	77.5	1.8	77	0.990	4
88.00	27.30	60.70	2.855	23.0	105.050	107.970	2.920	77.5	1.8	77	0.981	4
88.60	25.00	63.60	2.992	23.0	108.300	111.355	3.055	77.5	3.4	77	0.979	3
88.50	24.90	63.60	2.992	23.0	111.355	114.395	3.040	78.5	3.4	77	0.985	3
88.50	24.90	63.60	2.992	23.0	114.395	117.425	3.030	77.5	3.4	77	0.987	3

DGMCF AVERAGE	0.981
BEFORE	0.970

Acceptance Criteria:
Individual values of DGM calibration factor must be within ± 1.5% of the average value.
If not the calibration must be repeated. Also, the DGMCF average value must be 1.00 ± 0.05,
otherwise the meter must be repaired and/or adjusted as necessary and recalibrated prior to use.
(Environment Canada Reference Method EPS 1/RM/8, Section 6)

ORTECH Environmental

Trendicator Calibration

Calibration Procedure	03 - J005
Trendicator Type	Team 3
MII	COE 20093
Date	August 20, 2015
Calibrated By	Devin Golub
Signature	
Reviewed and Accepted By	

Fluke Calibrator Output (COE 20024) (°F)	Tredicator Display Value		Percent Difference
	Before Adjustment (°F)	After Adjustment (°F)	(%)
32	32	N/A	0.0
70	70		0.0
100	100		0.0
200	201		-0.5
250	251		-0.4
300	301		-0.3
400	400		0.0
500	499		0.2
600	600		0.0
700	702		-0.3
800	801		-0.1
900	901		-0.1
1000	1002		-0.2
1100	1102		-0.2
1200	1202		-0.2
1250	1252		-0.2

$$\% \text{ Difference} = \frac{(\text{micromite} - \text{after adjustment reading}) \times 100}{\text{micromite}}$$

Acceptance Criteria:
Trendicator display must read within ± 1.5% of the micromite value at each output. Otherwise, the Trendicator must be repaired and/or adjusted as necessary, and recalibrated prior to use. (MOE Source Testing Code, Version #2, Method 5)

ORTECH Environmental

Manometer Calibration Data

Date	August 20, 2015	Calibrated By	Devin Golub
Manometer Number	Team 3	Signature	
Manometer MII Number	COE 20093	Reviewed/Accepted By	
Calibrated Against	Omega HHP		
MII Number	B02679		
Calibration Procedure	03 - J010		

Front Leg

Manometer Scale "H_2O	Manometer Reading "H_2O		Reference Manometer Reading "H_2O	Percent Difference %
	Before Adjustment	After Adjustment		
	0.930	NA	0.925	-0.5
0-1.0	0.525		0.524	-0.2
	0.200		0.198	-1.0
	7.70		7.66	-0.5
1.0-10.0	5.20		5.17	-0.6
	2.25		2.22	-1.4

Percent Difference = (Ref. Manometer - Instrument Reading) x 100
Ref. Manometer

Acceptance Criteria:
The manometer being calibrated must be within ± 5.0% of the Standard value at each reading. Otherwise, the manometer must be repaired and/or adjusted as necessary and recalibrated prior to use. Manometers must be capable of measuring velocity pressure to within 0.005 "H_2O on the 0 to 1 inch scale, and 0.05 "H_2O on the 1 to 10 inch scales.
(Environment Canada Reference Method 1/RM/8, Section 2)