Wheelabrator North Broward Inc.
A Waste Management Company

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April 23, 2009

UPS # 1Z26X1500191677200

Mr. Lennon Anderson
Air Program Administrator
Florida Department of Environmental Protection
Southeast District
400 North Congress Ave., Suite 200
West Palm Beach, FL 33401

Re: Wheelabrator North Broward
2009 Annual Compliance Stack Test and RATA Reports

Dear Mr. Anderson:

Please find enclosed a copy of the final compliance stack test report and the continuous emissions monitoring system certification RATA report for testing conducted on March 10-12 of this year by Clean Air Engineering, Inc.

I, the undersigned, am a responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this submittal. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements and information in this document are true, accurate and complete.

If there are any questions, please contact this office at (954) 971-8701.

Sincerely,

Scott McIlvaine
Plant Manager

cc: USEPA, Region IV, Pesticides and Toxics Management Division, Air & EPCRA Enforcement Branch, Air Enforcement Section (with) UPS# 1Z26X1500191930417

FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, (with) UPS# 1Z26X1500193275024

Broward County Department of Planning and Environmental Protection, Air Quality Division (with) UPS# 1Z26X1500191787038

Chuck Faller (with)
Ram Tewari – BCWRS (without)
Tim Porter (without)
Rob French – MPI (with)

WM WASTE MANAGEMENT

CleanAir.

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Wheelabrator North Broward, Inc.
2600 NW 48th Street
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REPORT ON COMPLIANCE TESTING

Performed for:

WHEELABRATOR NORTH BROWARD, INC.
ASH HANDLING SYSTEM, LIME SILO VENTS,
UNITS 1, 2 AND 3 SDA INLETS, FF OUTLETS AND STACKS
POMPANO BEACH, FL
VOLUME I OF II

CleanAir Project No: 10735-2
Revision 0: April 22, 2009

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program.

Submitted by,

Scott Brown
Project Manager
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Reviewed by,

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REVISION HISTORY

REPORT ON COMPLIANCE TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	04/15/09	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	04/22/09	All	Final version of original document.

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PROJECT OVERVIEW

INTRODUCTION

Wheelabrator North Broward, Inc. operates a Refuse to Energy facility, located in Pompano Beach, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (FDEP). Wheelabrator North Broward, Inc. contracted Clean Air Engineering (CleanAir) to perform a compliance test program. The lime silo fabric filter vent was observed for visual emissions (VEs) and the ash handling system was observed for fugitive emissions.

The VEs were determined by the facility's continuous opacity monitor system (COMS) data, as allowed under Title V Conditions A.36 (6), A.53 and A.54. The lime silo fabric filter vent was observed for VEs and the ash handling system was observed for fugitive emissions. Testing was conducted in accordance with the Wheelabrator North and South Broward Protocol on Compliance, dated February 5, 2009, 40 CFR 60 Subpart Cb, and applicable sections of the facility's Title V Permit number 0112120-009-AV.

All testing was conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (EPA) and the FDEP.

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

C. Faller – Wheelabrator North Broward
S. Brown – CleanAir

Patty Tampas of the FDEP was present for portions of the test program.

The CleanAir test crew consisted of the following individuals:

B. Wiltse
R. Vicere
P. Bihun
C. Slimp
P. Collins
S. Joint

PROJECT OVERVIEW

Test Program Parameters

The sampling was conducted at the Units 1, 2 and 3 Spray Dry Absorption (SDA) Inlet and Fabric Filter (FF) Outlets from March 10 through 12, 2009, and included the following emissions measurements:

- beryllium;
- cadmium;
- lead;
- mercury;
- PCDDs and PCDFs (Unit 1 only);
- total suspended particulate (TSP);
- hydrogen chloride;
- fluoride;
- visual emissions;
- fugitive emissions.

TEST PROGRAM SYNOPSIS

Test Schedule

The on-site schedule followed during the test program is outlined in Table 1-1.

Table 1-1:
Schedule of Activities

Run	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/10/09	06:48	09:03
1	Unit 2 SDA Inlet/FF Outlet	USEPA Mod. Method 26A	HCl	03/10/09	06:51	08:03
1	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/10/09	08:17	10:32
2	Unit 2 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/10/09	08:38	09:38
2	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/10/09	09:25	11:37
3	Unit 2 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/10/09	10:04	11:04
1	Unit 1 FF Outlet	USEPA Method 23	PCDD/F	03/10/09	10:08	14:30
2	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/10/09	11:31	12:49
3	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/10/09	11:59	14:13
3	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/10/09	13:16	14:30
2	Unit 1 FF Outlet	USEPA Method 23	PCDD/F	03/11/09	06:26	11:05
1	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/11/09	06:46	08:58
1	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/11/09	06:57	07:57
1	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/11/09	07:30	08:48
2	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/11/09	08:29	09:29
2	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/11/09	09:24	11:38
3	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/11/09	10:02	11:02
3	Unit 1 FF Outlet	USEPA Method 23	PCDD/F	03/11/09	11:26	15:45
2	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/11/09	11:28	12:46
3	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/11/09	11:58	14:10
3	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/11/09	13:12	14:24
1	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/12/09	06:29	08:40
1	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/12/09	06:36	07:36
4	Unit 1 FF Outlet	USEPA Method 23	PCDD/F	03/12/09	06:42	11:13
1	Lime Silo FF Outlet	USEPA Method 9	Opacity	03/12/09	08:16	10:12
2	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/12/09	08:25	09:25
2	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/12/09	08:58	11:20
3	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/12/09	10:10	11:10
3	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/12/09	11:39	13:49
1	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/12/09	11:47	12:59
1	Ash handling System	USEPA Method 22	Fugitive Emissions	03/12/09	12:48	16:28
2	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/12/09	13:09	14:19
3	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/12/09	14:33	15:43

TEST PROGRAM SYNOPSIS (CONTINUED)

Results Summary

Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 through 2-20 on pages 2-1 through 2-18. Subpart Cb required operating data is summarized in Table 1-3, and opacity and fugitive emission results are presented in Table 1-4, both on page 1-5.

Table 1-2:
Summary of Test Results

Source	Average Unit 1	Average Unit 2	Average Unit 3	Permit Limit[1]
Constituent				
Particulate (mg/dscm @7% O_2)	<0.63	0.63	1.1	27/25
Visual Emissions (%, by COMS)[2]	0	0	0	10
Fluoride (lb/MMBtu as HF)[3]	<0.000024	<0.000023	<0.000027	0.0040
Total PCCD/PCDF (ng/dscm @ 7% O_2)	0.62	NA	NA	30
Hydrogen Chloride (ppmdv @ 7% O_2) or	17	16	8	29
Hydrogen Chloride Removal (%)[4]	97%	96%	98%	>95
Beryllium (mg/dscm @ 7% O_2)	<0.000028	<0.000030	<0.000028	0.001
Cadmium (mg/dscm @ 7% O_2)	<0.00020	<0.00012	<0.00013	0.040/0.035
Lead (mg/dscm @ 7% O_2)	0.00047	0.00039	0.00045	0.44/0.40
Mercury (µg/dscm @ 7% O_2)	8.0	12	5.0	70/50
Average Steam Flow (Klbs/hr)[5]	183.9	184.1	184.0	186
Average FF Inlet Temperature (^{O}F)[5]	320	321	320	NA

[1] Limits obtained from facilities Title V Permit 0112119-009-AV. If a second limit is shown that limit is being implemented by the EPA as of April 28, 2009.

[2] Visual Emissions (opacity) was obtained from the facilities COMS data as allowed under Title V Conditions B.53(6), B.76 and B.81.

[3] lb/MMBtu calculations used Fd of 9,570 for MSW as per Method 19.

[4] Removal for hydrogen chloride calculated in the unit of its standard (ppmdv @ 7% O_2). The hydrogen chloride limit is 29 ppmdv @ 7% O2 or 95% removal, whichever is less stringent.

[5] From all compliance test runs.

Table 1-3:
Subpart Cb Required Operating Data

Process Condition	
Unit 1 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.5
Unit 2 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	183.9 [2]
Unit 3 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.1 [3]
Unit 1 Maximum Particulate Control Device Inlet Temperature (°F)[4]	322
Unit 2 Maximum Particulate Control Device Inlet Temperature (°F)[4]	325 [2]
Unit 3 Maximum Particulate Control Device Inlet Temperature (°F)[4]	325 [3]

[1] From 40CFR60.58b (i) (8) the maximum demonstrated load during PCDD/PCDF testing, four hour average.

[2] From CleanAir Cb test report dated April 19, 2007.

[3] From CleanAir Cb test report dated April 30, 2008.

[4] From 40CFR60.58b (i) (9) the highest four hour average during PCDD/PCDF testing.

Table 1-4:
Opacity and Fugitive Emission Test Results

Source / Constituent	Sampling Method	Results	Permit Limit[1]
Ash Handling System[2]			
Fugitive Emissions (% of obseravtion time)	EPA M22	0	5%
Fugitive Emissions (minutes)		0	9 minutes
Lime Silo[3]			
Visual Emisssions (%)	EPA M9	0	5%

[1] Limits obtained from 40 Code of Federal Register part 60 Subpart Cb - Emission Guidelines and Compliance Times for Large Municipal Waste Combustors That Are Constructed on or Before September 20, 1994 published in Federal Register as 62 FR 45123 on December 19, 1995 as modifed on August 25, 1997, Florida's Rule 62-296.416, F.A.C. and PSD-FL-105.

[2] The Ash Handling System was observed at various locations for a total of 3 hours.

[3] The Lime Silo was observed for one complete truck unloading.

Discussion of Test Program

All test methods were done in triplicate. All data that is reported in the units of lb/MMBTU utilized the Fd of 9,570 as per EPA Method 19.

All equipment utilized for compliance testing was manufactured by Clean Air Engineering, except for the Servomex O_2/CO_2 analyzer utilized for all of the integrated gas sample bag analysis.

PROJECT OVERVIEW

During compliance testing, all three (3) boilers were operated within 10% of the 186,000 lb/hr maximum steam flow rating. The result tables present each boiler's steam output for every test run.

Shawn Joint performed the fugitive emission readings (per EPA Method 22) on the ash handling system. Ben Wiltse conducted the VE readings (per EPA Method 9) on the Lime Silo during one (1) entire truck unloading. Mr. Wiltse's VE evaluation certificate is presented in Appendix I.

Any fractions of the mercury analysis that were reported as not detected were summed as zero, if there was at least one (1) fraction detected in that run. The beryllium, cadmium and lead front- and back-half fractions were combined proportionately for analysis per EPA Method 29, Section 5.4.

Field blanks were collected for the Method 23 and 29 testing by assembling a used set of glassware, taking the complete train to the outlet location and performing a leak check. These samples were treated exactly as the other samples. The results for the Method and Field Blanks are presented in Table 2-19 on page 2-17, as well as Appendix H. The results of the Method 29 reagent blank analysis were used to correct any data, as outlined in Method 29.

All Method 23 samples were analyzed with the DB-5S column with modified calibration and additional quality assurance procedures as a direct substitute for the DB-5 and DB-225 columns. Confirmation of the 2,3,7,8 TCDF and TCDD 2,3,7,8 isomers was performed on the DB-5S column. The DB-5S column and modified calibration procedures meets the column separation requirement and can be used as a direct substitute for the DB-5 and DB-225 columns, in accordance with Method 23 as approved by the EPA. All QA/QC data (spikes and recoveries) for Method 23, as well as the EPA Audit Sample results, are presented in Appendix H.

The Method 23 results for Runs 3 and 4 each contained at least one (1) estimated maximum possible concentration (EMPC) value. EMPC results do not meet all the identification criteria required by Method 23 to be positively identified as a dioxin or furan. Specifically, the integrated ion abundance ratios were not within 15% of the theoretical value limits specified in Method 23 Section 5.3.2.5, Table 4. The laboratory reports EMPC results as zero and, for this reason, all EMPC results are enclosed in brackets and are considered zero when calculating total dioxin/furans.

PROJECT OVERVIEW

Chuck Faller of Wheelabrator North Broward, Inc. provided the process (operating) data. This data is presented in its entirety in Appendix C. All process data and CleanAir run times are based on facility CEM and Bailey Computer Time, which is 60 minutes earlier than actual Eastern Standard Time (EST). The Lime Silo opacity start and stop times are based on EST, since the initial and final truck weights were recorded using "real" time.

Integrated gas samples (IGS) were collected in a vinyl sample bag from every sample train. The contents of the bag were then analyzed for O_2 and CO_2 concentrations using an O_2/CO_2 continuous monitoring analyzer calibrated with EPA Protocol gases. A linearity and bias check was performed on the analyzers before each set of bags was analyzed, and then a post bias check was performed after each set of bags was analyzed. All data was recorded using CleanAir's data acquisition system. The results of the IGS bag analyses are presented in Appendix G.

Metals and particulate matter sampling were combined during this test program per the Method 29 Section 1.2 Principle, "This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed".

Sixty-minute Method 26A sample trains at the SDA Inlets and FF Outlets were utilized to exhibit compliance with each unit's HCl limit(s). The Method 26A was modified to a single-point constant sampling rate at all test locations.

The FDEP supplied audit samples for PCDD/PCDF, metals, HF and HCl to CleanAir. The analytical results of these samples are presented in Appendix H, along with each respective lab report.

During recovery of Run 2 of the Method 23 (PCCD/PCDF) XAD, the sample trap accidentally broke and the XAD sorbent was compromised. The test run was invalidated and two (2) additional test runs, labeled Runs 3 and 4, were performed.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
Unit 1 FF Outlet – Particulate, Metals and Mercury

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.6	8.3	8.4	**8.1**
CO_2	Carbon dioxide (dry volume %)	11.7	11.4	11.3	**11.5**
T_s	Sample temperature (°F)	307	307	307	**307**
B_w	Actual water vapor in gas (% by volume)	22.7	22.3	21.3	**22.1**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.91	69.19	67.92	**67.68**
%I	Isokinetic sampling (%)	100.0	99.1	96.7	**98.6**
Particulate Laboratory Data					
m_n	Net matter collected (g)	0.0029	<0.00020	<0.00020	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.6	<0.10	<0.10	**<0.59**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	1.6	<0.11	<0.12	**<0.63**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	12.8947	13.9374	15.6810	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	6.9	7.1	8.2	**7.4**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.2	7.8	9.1	**8.0**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000027	<0.000026	<0.000026	**<0.000026**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000028	<0.000028	<0.000029	**<0.000028**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.6369	<0.2009	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00034	<0.00010	<0.00010	**<0.00018**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00036	<0.00011	<0.00012	**<0.00020**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.8752	0.9408	0.6833	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00047	0.00048	0.00036	**0.00043**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00049	0.00053	0.00039	**0.00047**

RESULTS

Table 2-2:
Unit 1 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		11:47	13:09	14:33	
Stop Time (approx.)		12:59	14:19	15:43	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.6	184.1	183.7	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	319	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.5	8.6	8.6	**8.6**
CO_2	Carbon dioxide (dry volume %)	11.4	11.5	11.2	**11.3**
T_s	Sample temperature (°F)	304	305	306	**305**
B_w	Actual water vapor in gas (% by volume)	21.3	21.4	21.0	**21.2**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	179,476	174,385	189,647	**181,169**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,200	93,195	101,746	**97,047**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.08	37.50	39.55	**38.38**
%I	Isokinetic sampling (%)	100.5	102.2	98.7	**100.5**
Laboratory Data					
m_n	Total HF collected (mg)	<0.02453	<0.02590	<0.02801	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.027	<0.029	<0.030	**<0.029**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.031	<0.033	<0.034	**<0.033**
C_{sd}	HF Concentration (mg/dscm)	<0.023	<0.024	<0.025	**<0.024**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.025	<0.027	<0.028	**<0.027**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0082	<0.0085	<0.0095	**<0.0087**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000023	<0.000025	<0.000025	**<0.000024**

RESULTS

Table 2-3:
Unit 1 FF Outlet - PCDDs/PCDFs

Run No.		1	2	3	4	Average
Date (2009)		Mar 10	Mar 11	Mar 11	Mar 12	
Start Time (approx.)		10:08	06:26	11:26	06:42	
Stop Time (approx.)		14:30	11:05	15:45	11:13	
Process Conditions						
R_P	Steam Production Rate (Klbs/hr)	184.0	184.5	183.6	183.9	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	320	322	320	319	**320**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.6	8.9	9.3	8.7	**8.9**
CO_2	Carbon dioxide (dry volume %)	11.3	11.0	10.6	11.2	**11.0**
T_s	Sample temperature (°F)	307	307	305	306	**306**
B_w	Actual water vapor in gas (% by volume)	21.6	20.7	21.0	20.1	**20.9**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	172,759	178,893	175,038	176,461	**175,788**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,098	96,002	93,905	95,725	**94,433**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	138.68	146.02	142.06	141.32	**142.02**
%I	Isokinetic sampling (%)	99.9	101.0	100.4	98.0	**99.8**
Results (ND and EMPC = 0)						
Laboratory Data from USEPA Method 23						
m_n	Total PCDDs & PCDFs (ng)	2.2000		2.4100	1.7600	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0236		0.0237	0.0184	
Total PCDD/F Results (TEF=1)						
C_{sd}	PCDD/F Concentration (ng/dscm)	0.56		0.60	0.44	**0.53**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	0.63		0.72	0.50	**0.62**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.933E-07		2.108E-07	1.577E-07	**1.873E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	5.665E-10		6.467E-10	4.484E-10	**5.538E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)						
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.0060		0.0059	0.0046	**0.0055**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.0068		0.0071	0.0052	**0.0064**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	2.074E-09		2.073E-09	1.649E-09	**1.932E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	6.077E-12		6.359E-12	4.688E-12	**5.708E-12**
Results (ND and EMPC = actual value)						
Laboratory Data from USEPA Method 23, including NDs and EMPCs						
m_n	Total PCDDs & PCDFs (ng)	2.2600		2.5500	1.8900	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0242		0.0272	0.0199	
Total PCDD/F Results (TEF=1)						
C_{sd}	PCDD/F Concentration (ng/dscm)	0.58		0.63	0.47	**0.56**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	0.65		0.76	0.54	**0.65**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.986E-07		2.230E-07	1.694E-07	**1.970E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	5.820E-10		6.842E-10	4.815E-10	**5.826E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)						
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.0062		0.0068	0.0050	**0.0060**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.0069		0.0081	0.0056	**0.0069**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	2.126E-09		2.379E-09	1.783E-09	**2.096E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	6.232E-12		7.298E-12	5.070E-12	**6.200E-12**

Run 2 XAD trap broke during recovery. Run 2 is not included in any averages.

RESULTS

Table 2-4:
Unit 1 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.0	183.6	183.8	**183.8**
P_1	Fabric Filter Inlet Temperature (°F)	320	317	320	**319**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.8	8.1	8.2	**8.0**
CO_2	Carbon dioxide (dry volume %)	11.7	11.4	11.6	**11.6**
T_s	Sample temperature (°F)	496	499	498	**498**
B_w	Actual water vapor in gas (% by volume)	16.9	16.5	16.6	**16.7**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	32.25	33.48	34.50	**33.41**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	711.8015	610.9163	602.0750	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	514	425	407	**449**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	545	463	445	**484**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.9	9.1	8.9	**9.0**
CO_2	Carbon dioxide (dry volume %)	10.7	10.5	11.0	**10.7**
T_s	Sample temperature (°F)	307	304	306	**306**
B_w	Actual water vapor in gas (% by volume)	20.9	20.9	20.6	**20.8**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.30	41.43	41.91	**41.21**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	33.4232	21.9550	19.7170	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	19	12	11	**14**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	22	15	13	**17**
RE	Reduction Efficiency (% Removal)	96%	97%	97%	**97%**

RESULTS

Table 2-5:
Unit 2 FF Outlet – Particulate, Metals and Mercury

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.0	10.0	8.3	**9.1**
CO_2	Carbon dioxide (dry volume %)	10.6	9.7	11.7	**10.7**
T_s	Sample temperature (°F)	311	311	311	**311**
B_w	Actual water vapor in gas (% by volume)	21.6	21.9	21.9	**21.8**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.57	67.68	68.02	**69.09**
%I	Isokinetic sampling (%)	100.9	98.8	98.6	**99.5**
Laboratory Data					
m_n	Net matter collected (g)	0.00099	0.00135	0.00075	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.49	0.70	0.39	**0.53**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.57	0.90	0.43	**0.63**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	22.3002	16.7306	18.6602	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	11	8.7	9.7	**9.8**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	13	11	11	**12**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000025	<0.000026	<0.000026	**<0.000026**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000029	<0.000033	<0.000029	**<0.000030**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	0.2028	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000099	0.00011	<0.00010	**<0.00010**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00012	0.00014	<0.00011	**<0.00012**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.5592	0.8264	0.5117	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00028	0.00043	0.00027	**0.00032**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00032	0.00055	0.00029	**0.00039**

RESULTS

Table 2-6:
Unit 2 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		07:30	11:28	13:12	
Stop Time (approx.)		08:48	12:46	14:24	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.4	184.0	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	330	320	320	**323**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.4	9.2	9.1	**8.9**
CO_2	Carbon dioxide (dry volume %)	10.8	10.7	10.8	**10.8**
T_s	Sample temperature (°F)	318	312	314	**314**
B_w	Actual water vapor in gas (% by volume)	22.7	22.0	22.5	**22.4**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	188,918	183,861	193,864	**188,881**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	97,759	96,793	101,143	**98,565**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.04	36.84	38.97	**37.95**
%I	Isokinetic sampling (%)	98.8	96.6	97.8	**97.8**
Laboratory Data					
m_n	Total HF collected (mg)	<0.02464	<0.02346	<0.02420	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.028	<0.027	<0.026	**<0.027**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.031	<0.032	<0.031	**<0.031**
C_{sd}	HF Concentration (mg/dscm)	<0.023	<0.022	<0.022	**<0.022**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.025	<0.027	<0.026	**<0.026**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0084	<0.0082	<0.0083	**<0.0083**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000023	<0.000024	<0.000023	**<0.000023**

RESULTS

Table 2-7:
Unit 2 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.6	183.8	184.1	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	319	322	320	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.2	9.2	8.4	**8.2**
CO_2	Carbon dioxide (dry volume %)	12.1	10.5	11.3	**11.3**
T_s	Sample temperature (°F)	503	508	508	**507**
B_w	Actual water vapor in gas (% by volume)	19.5	17.3	17.9	**18.2**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	34.56	33.65	32.35	**33.52**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	510.8082	510.6186	584.4054	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	345	354	421	**373**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	349	418	467	**412**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.8	9.6	9.0	**9.1**
CO_2	Carbon dioxide (dry volume %)	10.7	10.1	10.7	**10.5**
T_s	Sample temperature (°F)	312	313	313	**312**
B_w	Actual water vapor in gas (% by volume)	23.1	21.4	22.0	**22.2**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.20	39.64	39.47	**39.77**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	30.4028	20.3235	17.7085	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	17.6	12.0	10.5	**13.3**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	20.2	14.6	12.2	**15.7**
RE	Reduction Efficiency (% Removal)	94%	97%	97%	**96%**

RESULTS

Table 2-8:
Unit 3 FF Outlet – Particulate, Metals and Mercury

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.8	9.0	8.8	**8.8**
CO_2	Carbon dioxide (dry volume %)	10.6	10.9	11.1	**10.8**
T_s	Sample temperature (°F)	308	308	310	**309**
B_w	Actual water vapor in gas (% by volume)	20.0	20.0	20.6	**20.2**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.64	74.94	71.27	**72.62**
%I	Isokinetic sampling (%)	101.8	103.2	102.2	**102.4**
Particulate Laboratory Data					
m_n	Net matter collected (g)	0.0037	0.0012	0.0011	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.8	0.56	0.55	**1.0**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.1	0.66	0.63	**1.1**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	11.5809	8.1043	6.8887	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	5.7	3.8	3.4	**4.3**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	6.5	4.5	3.9	**5.0**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000025	<0.000024	<0.000025	**<0.000024**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000028	<0.000027	<0.000028	**<0.000028**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.2826	<0.2000	0.2161	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00014	<0.000094	0.00011	**<0.00011**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00016	<0.00011	0.00012	**<0.00013**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	1.4108	0.4894	0.4760	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00070	0.00023	0.00024	**0.00039**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00080	0.00027	0.00027	**0.00045**

RESULTS

Table 2-9:
Unit 3 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		08:17	11:31	13:16	
Stop Time (approx.)		10:32	12:49	14:30	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.8	184.6	183.9	**184.4**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9	8.8	8.9	**8.8**
CO_2	Carbon dioxide (dry volume %)	10.7	11.0	10.9	**10.9**
T_s	Sample temperature (°F)	310	309	313	**311**
B_w	Actual water vapor in gas (% by volume)	23.0	22.8	21.1	**22.3**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	183,084	172,115	164,821	**173,340**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	95,013	90,201	87,724	**90,980**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.01	35.74	33.65	**35.80**
%I	Isokinetic sampling (%)	101.6	100.6	97.4	**99.9**
Laboratory Data					
m_n	Total HF collected (mg)	<0.02798	<0.02675	<0.02341	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.031	<0.032	<0.030	**<0.031**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.036	<0.036	<0.034	**<0.036**
C_{sd}	HF Concentration (mg/dscm)	<0.026	<0.026	<0.025	**<0.026**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.030	<0.030	<0.029	**<0.030**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0093	<0.0089	<0.0081	**<0.0088**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000027	<0.000027	<0.000026	**<0.000027**

RESULTS

Table 2-10:
Unit 3 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184	183	184	**184**
P_1	Fabric Filter Inlet Temperature (°F)	321	321	320	**321**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.2	8.2	8.2	**8.2**
CO_2	Carbon dioxide (dry volume %)	11.1	11.3	11.6	**11.3**
T_s	Sample temperature (°F)	487	495	496	**493**
B_w	Actual water vapor in gas (% by volume)	16.3	16.4	15.8	**16.2**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	32.51	32.23	33.40	**32.71**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	698.7197	595.7498	572.4612	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	501	431	400	**444**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	549	472	438	**486**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.2	9.2	9.0	**9.1**
CO_2	Carbon dioxide (dry volume %)	10.0	10.3	10.8	**10.4**
T_s	Sample temperature (°F)	309	311	309	**310**
B_w	Actual water vapor in gas (% by volume)	19.9	20.7	20.1	**20.2**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	39.84	40.04	39.66	**39.85**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	7.9377	13.6807	13.2000	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	4.6	8.0	7.8	**6.8**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	5.5	9.4	9.1	**8.0**
RE	Reduction Efficiency (% Removal)	99%	98%	98%	**98%**

RESULTS

Table 2-11:
Units 1, 2 and 3 FF Outlets – Opacity by COMS

Run No.	1	2	3	Average
Unit 1				
Date (2009)	Mar 10	Mar 10	Mar 10	
Start Time (approx.)	06:48	09:25	11:59	
Stop Time (approx.)	09:03	11:37	14:13	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**
Unit 2				
Date (2009)	Mar 12	Mar 12	Mar 12	
Start Time (approx.)	06:29	08:58	11:39	
Stop Time (approx.)	08:40	11:20	13:49	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**
Unit 3				
Date (2009)	Mar 11	Mar 11	Mar 11	
Start Time (approx.)	06:46	09:24	11:58	
Stop Time (approx.)	08:58	11:38	14:10	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**

[1] Reading obtained from facility's continuous opacity monitoring system (COMS) as provided under 40 CFR 60.11(e) and Title V Conditions A.36(6), A.53 and A.54 and coincide with Method 5/29 test run

Table 2-12:
Ash Handling System - Fugitive Emissions

Source / Constituent	Date (2009)	Start Time (approx.)	Stop Time (approx.)	Observation Duration (minutes)	Accumulated Emission Duration (seconds)	
Ash Conveyor/Doors to Baghouse						
Visual Opacity (%)	March 12	12:48	13:58	60	0	
Ash Unloading/Conveyor						
Visual Opacity (%)	March 12	14:03	15:13	60	0	
Rolling Door/Door to Baghouse						
Visual Opacity (%)	March 12	15:18	16:28	60	0	Permit Limit
				Total (% of observation time) = 0		< 5% of observation Time
				Total (minutes) = 0		< 9 minutes

Table 2-13:
Lime Silo Fabric Filter Outlet - Visible Emissions

Run No.	**1**
Date (2009)	Mar 12
Start Time (approx.)	08:16
Stop Time (approx.)	10:12
Process Conditions	
Total lime unloaded (tons)	25.81
Rate of unloading (tons/hr)	13.5
Visible Emissions	
Average (percent opacity)	0
Maximum reading (percent opacity)	0

RESULTS

Table 2-14:
Air Flow Summary

Run Number	Run Date	Run Time	Steam Flow Klbs/hour	Flue Gas Temp Deg F	Air Flow ACFM	O_2 %	CO_2 %	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/10/2009	06:48-09:03	185.4	307	164,030	7.6	11.7	86,185	82,526
1-O-M5/29-2	3/10/2009	09:25-11:37	183.9	307	172,929	8.3	11.4	91,330	82,789
1-O-M5/29-3	3/10/2009	11:59-14:13	183.7	307	171,587	8.4	11.3	91,825	82,576
1-O-M13B-1	3/12/2009	11:47-12:59	184.6	304	179,476	8.5	11.4	96,200	85,888
1-O-M13B-2	3/12/2009	13:09-14:19	184.1	305	174,385	8.6	11.5	93,195	82,669
1-O-M13B-3	3/12/2009	14:33-15:43	183.7	306	189,647	8.6	11.2	101,746	89,961
1-O-M23-1	3/10/2009	10:08-14:30	184.0	307	172,759	8.6	11.3	92,098	81,828
1-O-M23-2	3/11/2009	06:26-11:05	184.5	307	178,893	8.9	11.0	96,002	83,017
1-O-M23-3	3/11/2009	11:26-15:45	183.6	305	175,038	9.3	10.6	93,905	78,164
1-O-M23-4	3/12/2009	06:42-11:13	183.9	306	176,461	8.7	11.2	95,725	84,362
		Average	**184.1**	**306**	**175,520**	**8.5**	**11.2**	**93,821**	**83,378**
2-O-M5/29-1	3/12/2009	06:29-0840	184.6	311	175,746	9.0	10.6	92,746	79,468
2-O-M5/29-2	3/12/2009	0858:-11:20	183.7	311	170,351	10.0	9.7	89,558	70,164
2-O-M5/29-3	3/12/2009	11:39-13:49	184.3	311	171,635	8.3	11.7	90,177	82,003
2-O-M13B-1	3/11/2009	07:30-08:48	184.4	318	188,918	8.4	10.8	97,759	87,983
2-O-M13B-2	3/11/2009	11:28-12:46	184.0	312	183,861	9.2	10.7	96,793	81,473
2-O-M13B-3	3/11/2009	13:12-14:24	183.5	314	193,864	9.1	10.8	101,143	86,227
		Average	**184.1**	**313**	**180,729**	**9.0**	**10.7**	**94,696**	**81,220**
3-O-M5/29-1	3/11/2009	06:46-08:58	184.0	308	170,082	8.8	10.6	92,068	80,410
3-O-M5/29-2	3/11/2009	09:24-11:38	184.1	308	175,333	9.0	10.9	94,920	81,331
3-O-M5/29-3	3/11/2009	11:58-14:10	184.0	310	170,440	8.8	11.1	91,224	79,739
3-O-M13B-1	3/10/2009	08:17-09:32	184.8	310	183,084	8.9	10.7	95,013	82,368
3-O-M13B-2	3/10/2009	11:31-12:49	184.6	309	172,115	8.8	11.0	90,201	78,845
3-O-M13B-3	3/10/2009	13:16-14:30	183.9	313	164,821	8.9	10.9	87,724	75,480
		Average	**184.2**	**310**	**172,646**	**8.8**	**10.9**	**91,859**	**79,696**
Facility Average			**184.2**	**309**	**176,298**	**8.8**	**10.9**	**93,459**	**81,431**

Table 2-15:
Quality Control and Quality Assurance
PCDD/PCDF - Extraction Standard Percent Recoveries

Sample Number	Extraction Standard Percent Recoveries, %						
	^{13}C-TCDD	^{13}C-PeCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HpCDD	^{13}C-OCDD
0_6673_MB001	83.1	77.2	94.6	86.1	92.1	82.7	74.4
Field Blank	89.7	85.1	86.4	84.1	87.7	83.5	72.4
Run 1-Unit 1 FF Outlet	89.1	84.4	84.2	81.8	85.3	82.1	73.5
Run 3-Unit 1 FF Outlet	88.2	83.5	87.9	82.1	90	84	72.4
Run 4-Unit 1 FF Outlet	87.3	82.3	87.1	83.9	86.3	79.5	66.8
Average	87	83	88	84	88	82	72
SD	3	3	4	2	3	2	3
Min	83.1	77.2	84.2	81.8	85.3	79.5	66.8
Max	89.7	85.1	94.6	86.1	92.1	84	74.4
Within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Sample Number	Extraction Standard Percent Recoveries, %									
	^{13}C-TCDF	^{13}C-PeCDF	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HpCDF	^{13}C-HpCDF	^{13}C-OCDF
0_6673_MB001	87.9	81.6	78.2	93.1	93.6	90.9	77.7	86.2	84.1	75.4
Field Blank	92.5	83.5	86.6	86.8	85.4	86.4	76	83.6	82.2	73.9
Run 1-Unit 1 FF Outlet	87.9	83.2	80.8	85.9	82.8	84.3	74.6	79.8	80.6	74.4
Run 3-Unit 1 FF Outlet	89.2	83.4	82.4	87.8	83.3	87.3	76.3	82.4	83.6	75.2
Run 4-Unit 1 FF Outlet	87.2	81.4	81.6	91.7	90.6	92.2	76.8	81.8	80.6	68.7
Average	89	83	82	89	87	88	76	83	82	74
SD	2	1	3	3	5	3	1	2	2	3
Min	87.2	81.4	78.2	85.9	82.8	84.3	74.6	79.8	80.6	68.7
Max	92.5	83.5	86.6	93.1	93.6	92.2	77.7	86.2	84.1	75.4
Within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Table 2-16:
Quality Control and Quality Assurance
PCDD/PCDF – CS/SS Percent Recoveries

Sample Number	CS/SS Percent Recoveries, %				
	^{37}Cl-TCDD	^{13}C-PeCDD	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HpCDF
0_6673_MB001	97.6	106	96.2	93.5	95.9
Field Blank	96.3	95.4	95.6	98.2	96.6
Run 1-Unit 1 FF Outlet	95.8	94.4	91	96.7	96.5
Run 3-Unit 1 FF Outlet	95.6	95.7	89.4	98.7	95.9
Run 4-Unit 1 FF Outlet	99.5	96.8	94.2	97.7	98
Average	97	98	93	97	97
SD	2	5	3	2	1
Min	95.6	94.4	89.4	93.5	95.9
Max	99.5	106	96.2	98.7	98
Min within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE

Table 2-17:
Quality Control and Quality Assurance - Metals

RPD RESULTS

Run Number	FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
U1 FF Outlet R1	NA	0.1%	5.9%	NA	NA
U1 FF Outlet R2	NA	0.2%	NA	NA	NA
U1 FF Outlet R3	NA	0.4%	NA	NA	NA
U2 FF Outlet R1	NA	0.2%	0.7%	NA	NA
U2 FF Outlet R2	NA	0.2%	NA	NA	NA
U2 FF Outlet R3	NA	0.4%	0.6%	NA	NA
U3 FF Outlet R1	NA	1.1%	NA	NA	NA
U3 FF Outlet R2	NA	0.0%	NA	NA	NA
U3 FF Outlet R3	NA	0.7%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Duplicate Analysis RPD

Element	U1 FF O R2 RPD	U2 FF O R2 RPD	U3 FF O R2 RPD
	12198-2	12198-5	12198-8
Beryllium	NA	NA	NA
Cadmium	NA	2.2%	NA
Lead	2.1%	2.3%	3.7%

Table 2-18:
Quality Control and Quality Assurance - Metals (Continued)
Sample Spike and Recovery

Run Number		FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
U1 FF Outlet R3	#1	102%	100%	101%	103%	94%
	#2	105%	100%	100%	102%	94%
U2 FF Outlet R3	#1	101%	90%	101%	103%	91%
	#2	103%	89%	102%	104%	92%
U3 FF Outlet R3	#1	98%	94%	102%	93%	93%
	#2	100%	97%	100%	93%	94%

Element	U1 FF O R3 Recovery	U2 FF O R3 Recovery	U3 FF O R3 Recovery
	12198-3	12198-6	12198-9
Beryllium	95%	90%	97%
Cadmium	106%	105%	108%
Lead	114%	116%	113%

Second Source Calibration Verification

Element	.25 ppb	1 ppb	50 ppb	100 ppb	250 ppb
	QC Std 8	QC Std 2	QC Std 5	QC Std 4	QC Std 3
Beryllium	119%	107%	106%	95%	101%
Cadmium		108%	101%	94%	99%
Lead		115%	116%	99%	98%

RESULTS

Table 2-19:
Quality Control and Quality Assurance - Method and Field Blanks

Method 29		Average Total Catch ug	FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
Field Blank	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Element	Field Blank Total µg	Reagent Blank Total µg
	12198-10	12198-11
Beryllium	< 0.05	< 0.05
Cadmium	< 0.2	< 0.2
Lead	0.900	0.364

Method 23	0_6673_MB001 pg	Field Blank pg
Totals		
TCDDs	0	3.34
PeCDDs	0	0
HxCDDs	0	8.23
HpCDDs	0	5.05
OCDD	0	10.5
TCDFs	0	0.955
PeCDFs	0	0
HxCDFs	0	4.23
HpCDFs	0	2.17
OCDF	0	1.12
Total PCDD/Fs (ND=0; EMPC=0)	0.00	35.6
Total PCDD/Fs (ND=0; EMPC=EMPC)	0.00	51.4
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	38.2	64.6
Total 2378s (ND=0; EMPC=0)	0.00	10.5
Total 2378s (ND=0.5; EMPC=0)	19.1	34.6
Total 2378s (ND=1; EMPC=0)	38.2	58.7
Total 2378s (ND=0; EMPC=1)	0.00	10.5
Total 2378s (ND=0.5; EMPC=1)	19.1	34.6
Total 2378s (ND=1; EMPC=1)	38.2	58.7

Table 2-20:
Quality Control and Quality Assurance - Miscellaneous

Blanks	Result	
Acetone (g)	<0.0001	
HCl DI H_2O (mg/l)	<0.008	
HCl 0.1 N H_2SO_4 (mg/l)	<0.008	
HF DI H_2O (mg/l)	<0.026	
Meters - Post Cal	**Result**	**Limit**
61-6	-0.9%	≤ ± 5%
61-7	3.6%	≤ ± 5%
61-8	-3.4%	≤ ± 5%
66-6	-1.7%	≤ ± 5%
66-7	2.3%	≤ ± 5%
66-11	-0.9%	≤ ± 5%
66-22	-1.1%	≤ ± 5%

End of Section 2 – Results

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION

The North Broward Resource Recovery facility operates three (3) 750-tons-per-day municipal refuse-fired, water-wall boiler trains. The trains were manufactured by Babcock and Wilcox to produce electricity for sale to a local utility company. The boilers are rated at a maximum steam flow of 186,000 lbs/hr. Each boiler is equipped with an SDA for acid gas removal, followed by an FF baghouse for the control of particulate emissions and selective non-catalytic reduction for NO_X control. The control equipment is manufactured by Wheelabrator Air Pollution Control, Inc. Each FF baghouse is followed by an induced draft fan that directs the flue gas to a dedicated flue in a common stack.

Figure 3-1 shows a general schematic of the facility. The general sampling locations for the Units 1, 2 and 3 SDA Inlets and FF Outlets are shown in Figure 3-2 on page 3-2.

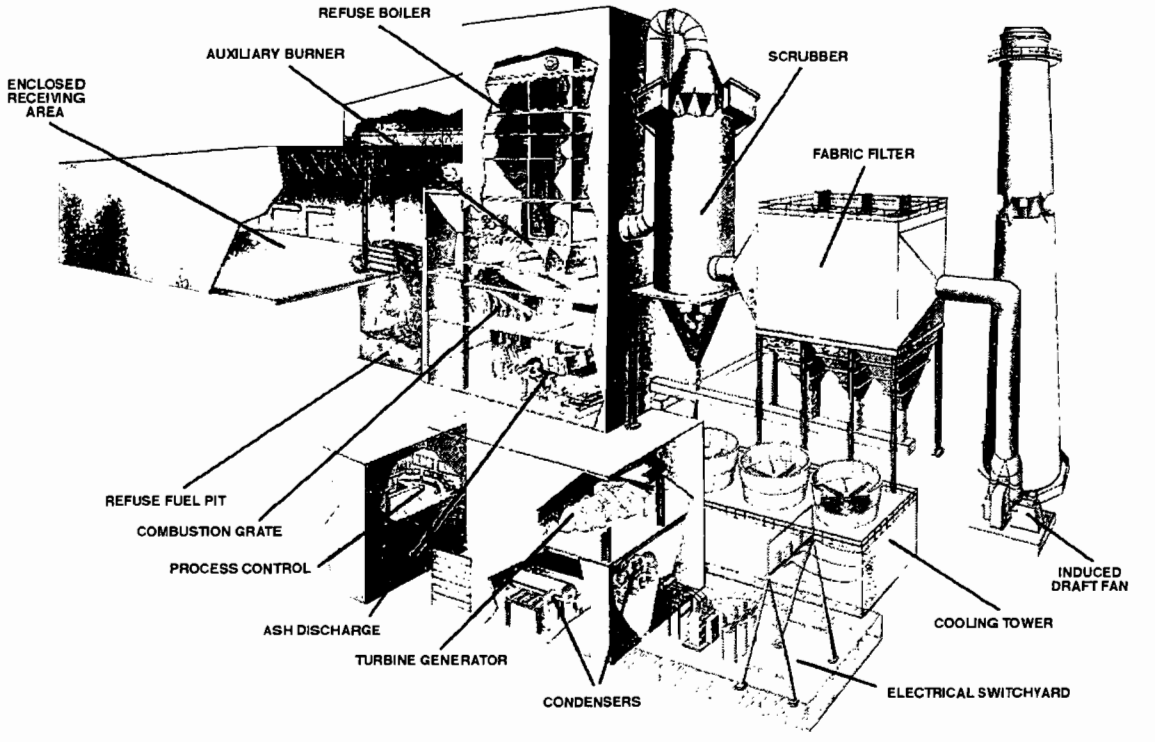


Figure 3-1: General Process Schematic

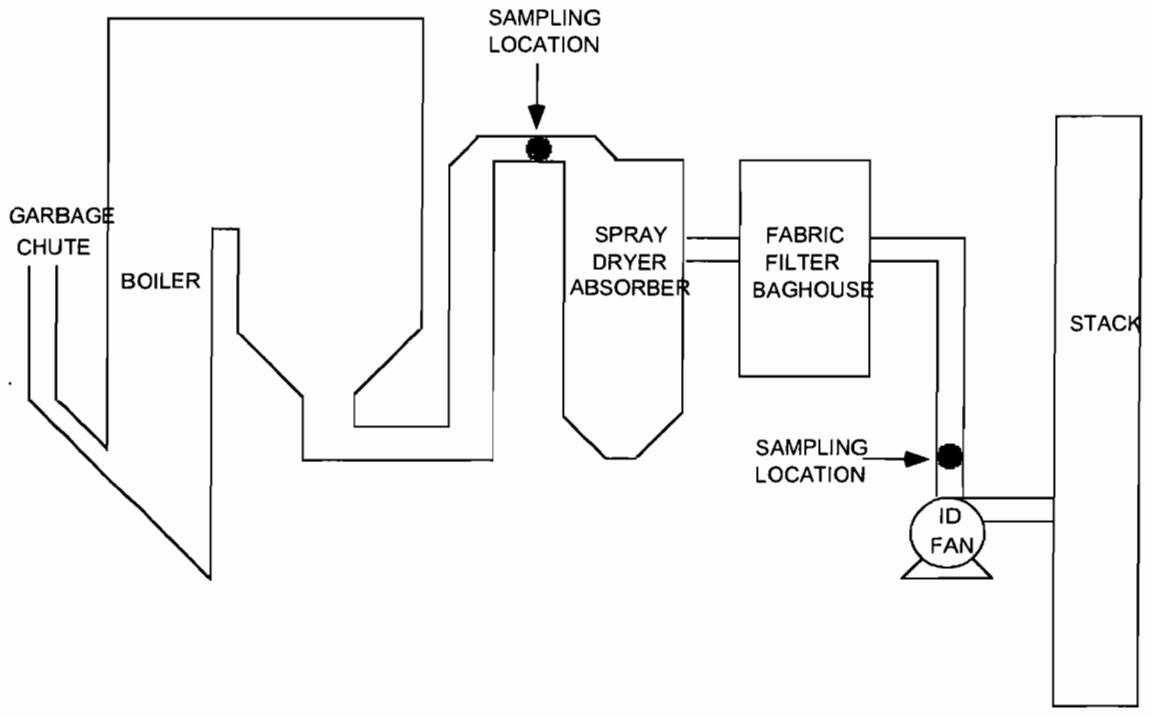


Figure 3-2: Process Schematic

DESCRIPTION OF INSTALLATION

Table 3-1:
Unit 1 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data from DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	1	1	3/12/2009	0636	0736	184.0	319.9	6.3	522.9	38.7	31.9	6.8	15.8	1.098	1.028	420.7	All times based on CEMS time
HCl		2	3/12/2009	0825	0925	183.6	317.0	6.2	525.7	39.8	33.0	6.8	23.2	1.098	1.028	422.0	Bailey time = CEMS time
		3	3/12/2009	1010	1110	183.8	320.1	6.3	527.3	40.1	31.4	8.7	25.0	1.098	1.028	538.0	
					Avg	183.8	319.0	6.3	525.3	39.5	32.1	7.5	21.3	1.098	1.028	460.2	
M-29/5	1	1	3/10/2009	0648	0903	185.4	319.6	6.3	521.2	36.5	29.3	7.2	16.3	1.102	1.070	461.6	All times based on CEMS time
Metals		2	3/10/2009	0925	1137	183.9	320.1	6.3	527.7	38.7	31.7	7.0	15.5	1.102	1.070	448.8	Bailey time = CEMS time
PM		3	3/10/2009	1159	1413	183.7	320.1	6.2	531.4	39.4	32.0	7.4	15.4	1.101	1.060	470.6	
					Avg	184.3	319.9	6.3	526.8	38.2	31.0	7.2	15.7	1.102	1.067	460.3	
M-23	1	1	3/10/2009	1008	1430	184.0	319.9	6.2	530.3	39.0	31.8	7.3	15.5	1.101	1.060	461.7	All times based on CEMS time
dioxins		2	3/11/2009	0626	1105	184.5	321.7	6.3	521.9	38.5	29.6	8.9	16.1	1.098	1.028	547.8	Bailey time = CEMS time
		3	3/11/2009	1126	1545	183.6	320.1	6.3	528.9	40.5	32.6	7.9	15.4	1.097	1.017	481.6	Run 2 excluded due to broken XAD-trap during
		4	3/12/2009	0642	1113	183.9	319.0	6.3	525.3	39.4	32.2	7.2	20.9	1.098	1.028	442.3	sample recovery
					Avg	184.0	320.2	6.3	526.6	39.4	31.6	7.8	16.9	1.099	1.033	483.4	
M-13B	1	1	3/12/2009	1147	1259	184.6	319.4	6.2	522.6	37.2	31.2	6.0	15.7	1.099	1.039	374.7	All times based on CEMS time
HF		2	3/12/2009	1309	1419	184.1	320.4	6.4	523.4	37.2	30.5	6.7	15.8	1.099	1.039	418.3	Bailey time = CEMS time
		3	3/12/2009	1433	1543	183.7	320.4	6.3	530.0	39.6	32.8	6.8	15.0	1.097	1.017	418.1	
					Avg	184.1	320.1	6.3	525.3	38.0	31.5	6.5	15.5	1.098	1.032	403.7	

DESCRIPTION OF INSTALLATION

Table 3-2:
Unit 2 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	2	1	3/10/2009	0651	0803	184.6	319.4	6.4	498.8	35.6	32.4	3.2	16.9	1.102	1.070	202.2	All times based on CEMS time
HCl		2	3/10/2009	0838	0938	183.8	321.5	6.5	511.2	40.0	34.4	5.6	16.3	1.102	1.070	361.4	Bailey time = CEMS time
		3	3/10/2009	1004	1104	184.1	319.6	6.4	511.4	38.9	34.3	4.7	18.5	1.102	1.070	299.8	
					Avg	184.2	320.1	6.4	507.2	38.2	33.7	4.5	17.2	1.102	1.070	287.8	
M-29/5	2	1	3/12/2009	0629	0840	184.6	320.0	6.5	501.8	36.6	32.2	4.4	20.1	1.098	1.028	269.6	All times based on CEMS time
Metals		2	3/12/2009	0858	1120	183.7	319.8	6.5	503.3	35.7	31.6	4.1	18.0	1.098	1.028	252.3	Bailey time = CEMS time
PM		3	3/12/2009	1139	1349	184.3	320.1	6.5	508.5	36.8	32.9	3.9	17.0	1.099	1.039	241.9	
					Avg	184.2	320.0	6.5	504.5	36.4	32.3	4.1	18.4	1.098	1.032	254.6	
M-13B	2	1	3/11/2009	0730	0848	184.4	329.8	6.5	500.0	34.6	24.9	9.8	24.7	1.098	1.028	602.1	All times based on CEMS time
HF		2	3/11/2009	1128	1246	184.0	319.8	6.4	512.4	38.8	32.8	6.0	19.0	1.097	1.017	366.8	Bailey time = CEMS time
		3	3/11/2009	1312	1424	183.5	320.2	6.6	516.9	40.6	32.9	7.7	18.4	1.097	1.017	468.8	
					Avg	184.0	323.3	6.5	509.8	38.0	30.2	7.8	20.7	1.097	1.021	479.2	

DESCRIPTION OF INSTALLATION

Table 3-3:
Unit 3 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	3	1	3/11/2009	0657	0757	184.2	321.4	6.3	510.0	33.0	23.1	10.0	20.1	1.098	1.028	614.5	All times based on CEMS time
HCl		2	3/11/2009	0829	0929	182.9	320.6	6.0	518.1	36.1	30.1	6.0	15.6	1.098	1.028	371.4	Bailey time = CEMS time
		3	3/11/2009	1002	1102	183.9	319.7	5.7	520.3	36.7	32.1	4.6	15.6	1.098	1.028	284.4	
					Avg	183.7	320.6	6.0	516.1	35.3	28.4	6.9	17.1	1.098	1.028	423.4	
M-29/5	3	1	3/11/2009	0646	0858	184.0	320.9	6.2	511.5	33.9	25.6	8.3	18.6	1.098	1.028	510.8	All times based on CEMS time
Metals		2	3/11/2009	0924	1138	184.1	319.8	6.0	520.4	36.6	31.9	4.7	15.9	1.098	1.028	288.7	Bailey time = CEMS time
PM		3	3/11/2009	1158	1410	184.0	320.2	6.1	515.1	34.4	28.6	5.8	18.1	1.097	1.017	354.0	
					Avg	184.0	320.3	6.1	515.7	34.9	28.7	6.3	17.5	1.098	1.025	384.5	
M-13B	3	1	3/10/2009	0817	0932	184.8	319.9	6.0	524.1	37.2	31.6	5.6	16.5	1.102	1.070	361.4	All times based on CEMS time
HF		2	3/10/2009	1131	1249	184.6	319.8	6.0	518.6	34.5	28.6	5.9	17.4	1.101	1.060	377.8	Bailey time = CEMS time
		3	3/10/2009	1316	1430	183.9	320.1	6.1	518.2	34.0	26.5	7.5	17.5	1.101	1.060	477.0	
					Avg	184.4	319.9	6.0	520.3	35.2	28.9	6.4	17.1	1.101	1.063	405.4	

DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Method 1.

Table 3-4 outlines the sampling point configurations. Figures 3-3 and 3-4 on pages 3-7 and 3-8 illustrate the sampling points and orientation of sampling ports for each of the sources that were tested in the program.

Table 3-4:
Sampling Points

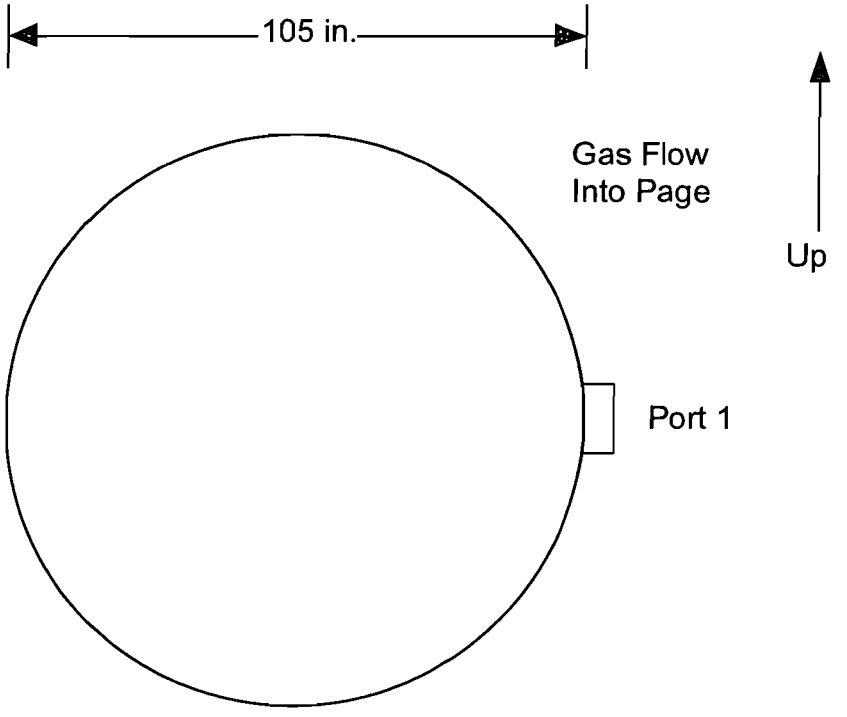
Location / Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Units 1,2 and 3 SDA Inlets							
Hydrogen Chloride	26A[1]	1-3	1	1	60	60	3-3
Units 1,2 and 3 FF Outlets							
Particulate, Be, Cd, Pb and Hg	5/29[2]	1-3	5	5	5	125	3-4
Hydrogen Chloride	26A[1]	1-3	1	1	60	60	NA
Fluorides	13B	1-3	5	5	2.5	62.5	3-4
PCDDs/PCDFs (Unit 3 only)	23	1-3	5	5	10	250	3-4

[1] Hydrogen chloride inlet testing utilized a modification of EPA Method 26A (single point constant sampling rate).

[2] Metals testing was done in conjunction with EPA Method 5 particulate sampling.

DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)



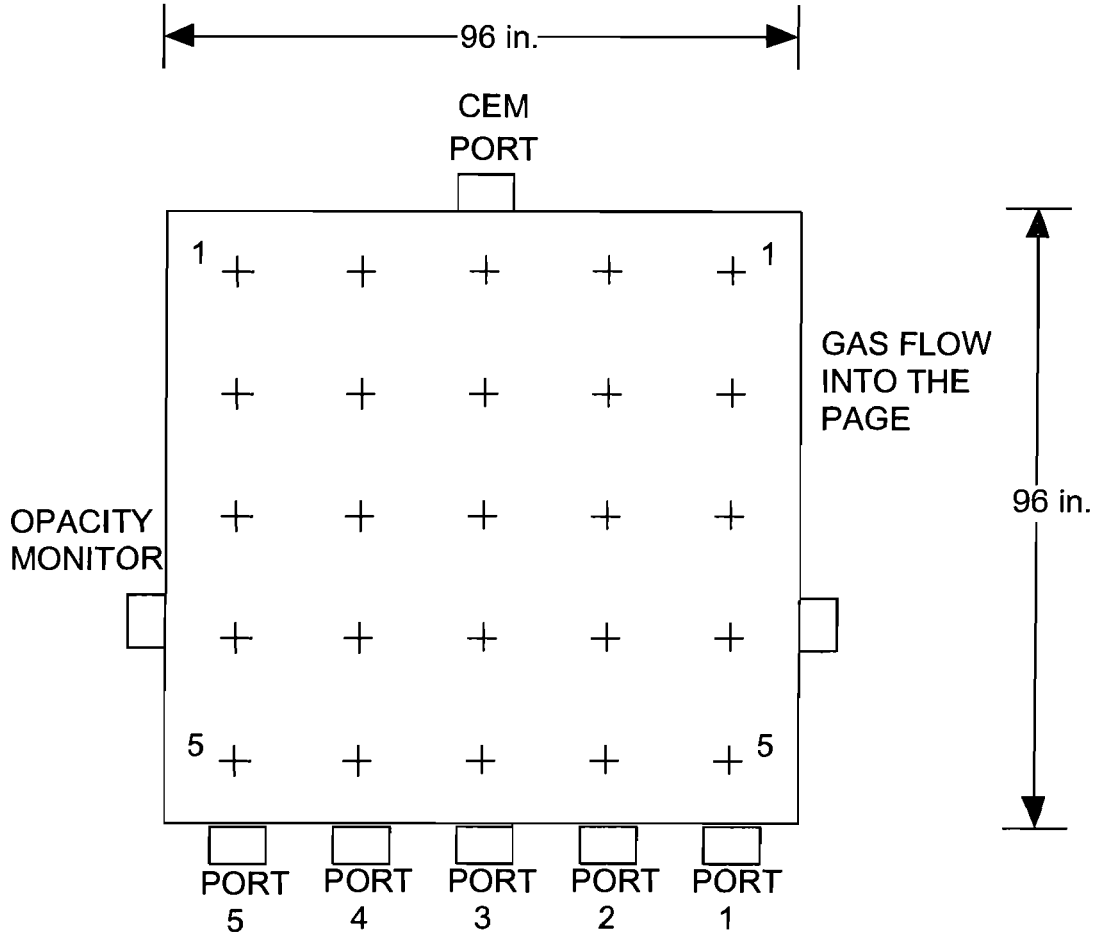
Sampling Point	Port to Point Distance (in.)
1	approximate center

Equivalent diameters to upstream disturbance: 2.0 Limit: 2.0
Equivalent diameters to downstream disturbance: 0.5 Limit: 0.5

Figure 3-3: SDA Inlets - Sampling Point Determination (HCl Sampling)
(Units 1, 2 and 3 are identical)

DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)



Sampling Point	Port to Point Distance (in.)
1	86.4
2	67.2
3	48.0
4	28.8
5	9.6

Equivalent diameters to upstream disturbance: 2.0 Limit: 2.0
Equivalent diameters to downstream disturbance: 0.5 Limit: 0.5

Figure 3-4: FF Outlets - Sampling Point Determination (Units 1, 2 and 3 are identical)

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in EPA Methods 1, 2, 3, 3A, 3B, 4, 5, 9, 13B, 22, 23, mod. 26A and 29. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 3B	"Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air"
Method 5	"Determination of Particulate Matter Emissions from Stationary Sources"
Method 9	"Visual Determination of the Opacity of Emissions from Stationary Sources"
Method 13B	"Determination of Total Fluoride Emissions from Stationary Sources (Specific Ion Electrode Method)"
Method 23	"Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from Municipal Waste Conductors"
Method 22	"Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares"
Mod.Method 26A[1]	"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Isokinetic Method"
Method 29	"Determination of Metals Emissions from Stationary Sources"

[1] Method 26A was modified at the inlet using single point constant sampling rate and at the outlet it was done in conjunction with Method 5.

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at http://www.cleanair.com.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and in EPA "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source-Specific Methods", EPA/600/R-94/038C. Additional QA/QC methods, as prescribed in CleanAir's internal Quality Manual, were also followed. Results of all QA/QC activities performed by CleanAir are summarized in Appendix E.

End of Section 4 – Methodology

APPENDIX

TEST METHOD SPECIFICATIONS

A

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Specification Sheet for EPA Method 5/29

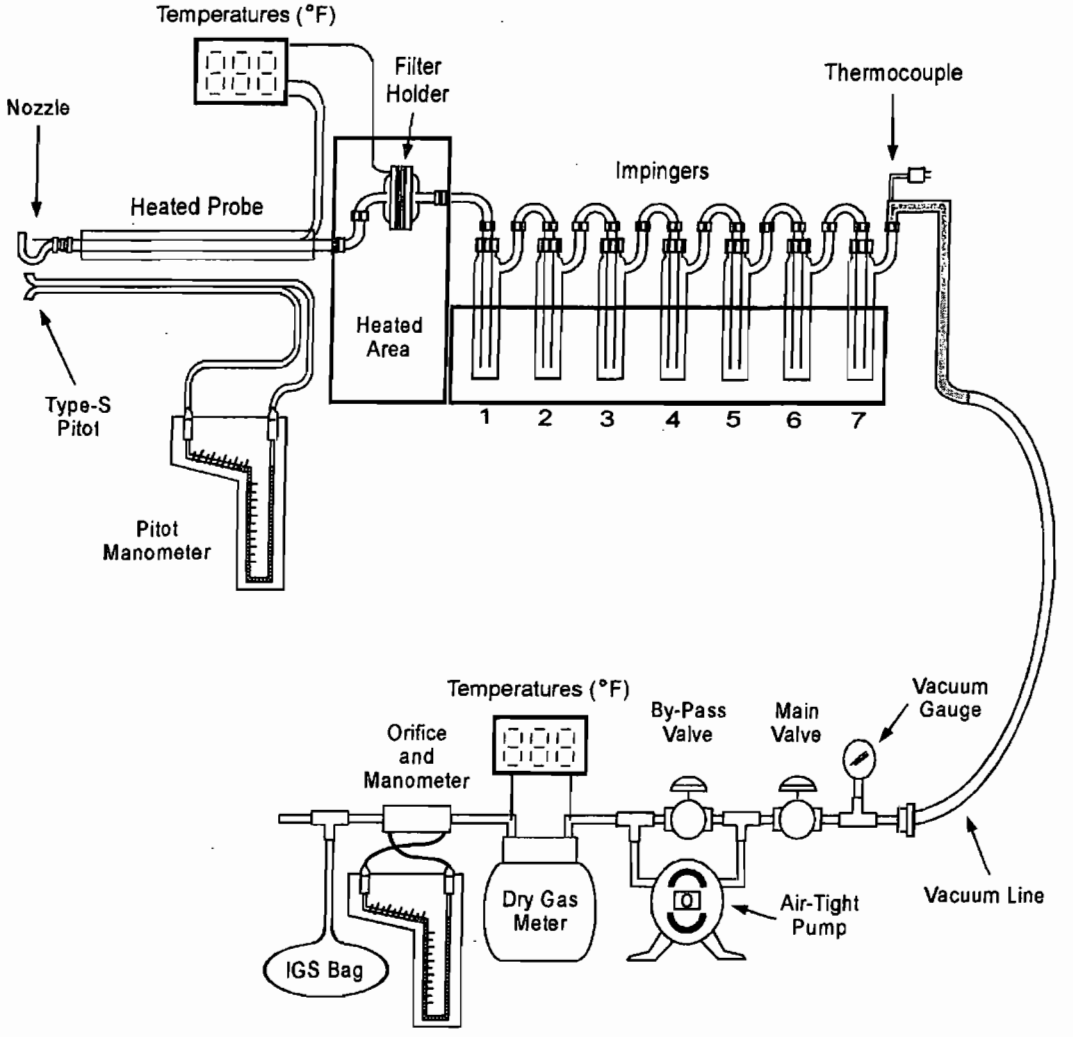
Source Location Name(s)	Units 1, 2 and 3 FF Outlets
Pollutant(s) to be Determined	Particulate Matter (PM) and Trace Metals (including Mercury)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	125 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.812
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Teflon (or other non-metallic material)	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F	248°F±25°F
Filter Material	Quartz or Fiberglass Fiber	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 5/29

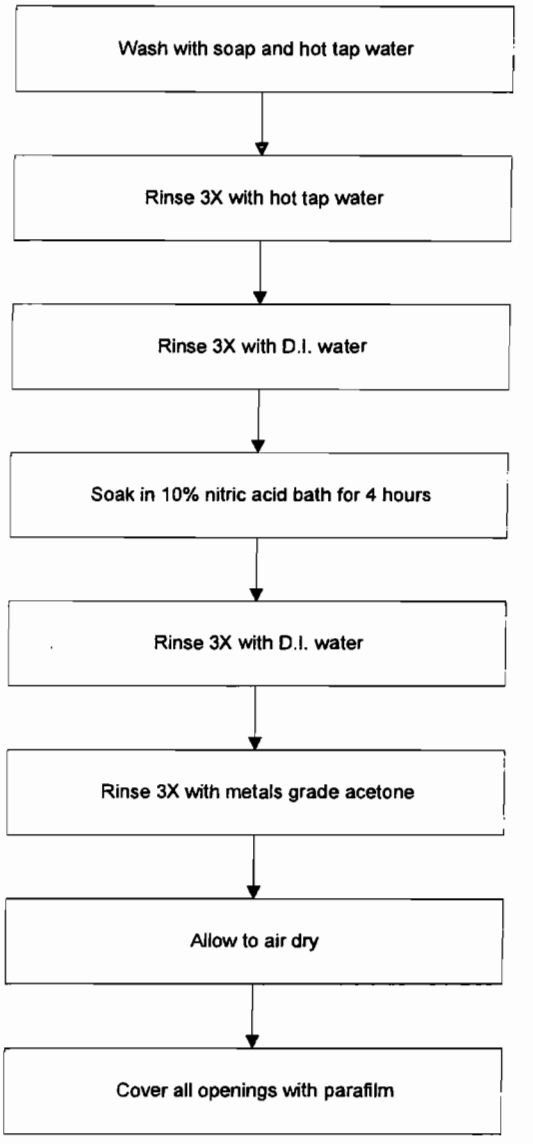
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 7	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Non-metallic swab or bristle	Teflon Mat
Probe Rinse Reagent	Acetone/0.1N Nitric Acid	Acetone/0.1N. Nitric Acid
Probe Rinse Wash Bottle Material	Glass or Teflon	Teflon
Probe Rinse Storage Container	See Method 29 Recovery Flow Chart	See Recovery Flow Chart
Filter Recovered?	Yes	Yes
Filter Storage Container	Petri Dish - Glass or Polystyrene	Glass
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	See Method 29 Recovery Flow Chart	See Recovery Flow Chart
Impinger Wash Bottle	Glass or Teflon	Teflon
Impinger Storage Container	See Recovery Flow Chart	See Recovery Flow Chart
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	See Method 29 Analytical Flow Chart	For Metals Analysis
Front-Half Rinse Preparation	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Back-Half Analysis	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Additional Analysis	Gravimetric (EPA Method 5)	Gravimetric (EPA Method 5)

EPA Method 5/29
Sampling Train Configuration



	Impinger Contents
Impinger 1	Empty
Impinger 2	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 3	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 4	Empty
Impinger 5	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 6	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 7	Silica Gel

EPA Method 29
Glassware Preparation Procedures



EPA Method 29
Sample Recovery Flowchart
(includes Mercury and Particulate Matter)

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
- Collect one complete blank set per field test

Container 1
Tared Quartz Filter
Petri Dish

Remove with acid washed polypropylene or Teflon tweezers to plastic container.

Remove any particulate or filter fiber to sample container

If necessary, fold the filter and transfer to the container.

Container 2
Acetone Rinse
250 ml Glass

Probe liner, nozzle, cyclone bypass and front half (FH) filter housing

Brush/rinse 3X with a total of 100 ml acetone

Visual Inspection

Label container and measure volume by weight

Container 3
Probe Rinse
250 ml Polyethylene

Probe liner, nozzle, cyclone bypass and front half (FH) filter housing

Rinse 3X with a total of 100 ml 0.1N HNO_3

Visual Inspection

Label container and measure volume by weight

Container 7
Acetone Blank
250 ml Glass

100 ml of acetone

Container 8A
Nitric Acid Blank
1000 ml Plastic

300 ml of 0.1N HNO_3

Container 8B
Water Blank
250 ml Plastic

100 ml of water

Container 4
1000 ml Polyethylene

Back half (BH) filter housing, Z-piece, impingers 1, 2, 3 and U-bends

Measure impinger volume by weight

Transfer to sample container

Rinse each piece 3X with a total of 100 ml 0.1N HNO_3

Visual Inspection

Label container and measure volume by weight

Container 9
5%HNO_3/10%H_2O_2 Blank
500 ml Plastic

200 ml of absorbing solution

Container 5A
250 ml Polyethylene

Impinger 4 and U-bend

Measure impinger volume by weight

Transfer to sample container

Rinse with 100 ml of 0.1N HNO_3

Visual Inspection

Label container and measure volume by weight

Container 10
Permanganate Blank
500 ml Glass

100 ml $KMnO_4$ solution

Container 5B
950 ml Glass

Impingers 5, 6 and U-bends

Measure impinger volume by weight

Transfer to sample container

Rinse each piece 3X with 100 ml of acidic permanganate solution

Rinse 3X with 100 ml of water

Visual Inspection

Label container and measure volume by weight

Container 5C
250 ml Glass

If brown spots remain in impingers, remove residue with 25 ml of 8N HCl total for both impingers

Pour HCl rinse into bottle containing 200 ml of water

Label container and measure volume by weight

Container 6
Silica Gel

Measure and record impinger, volume by weight, record condition of indicating gel

Recycle silica gel

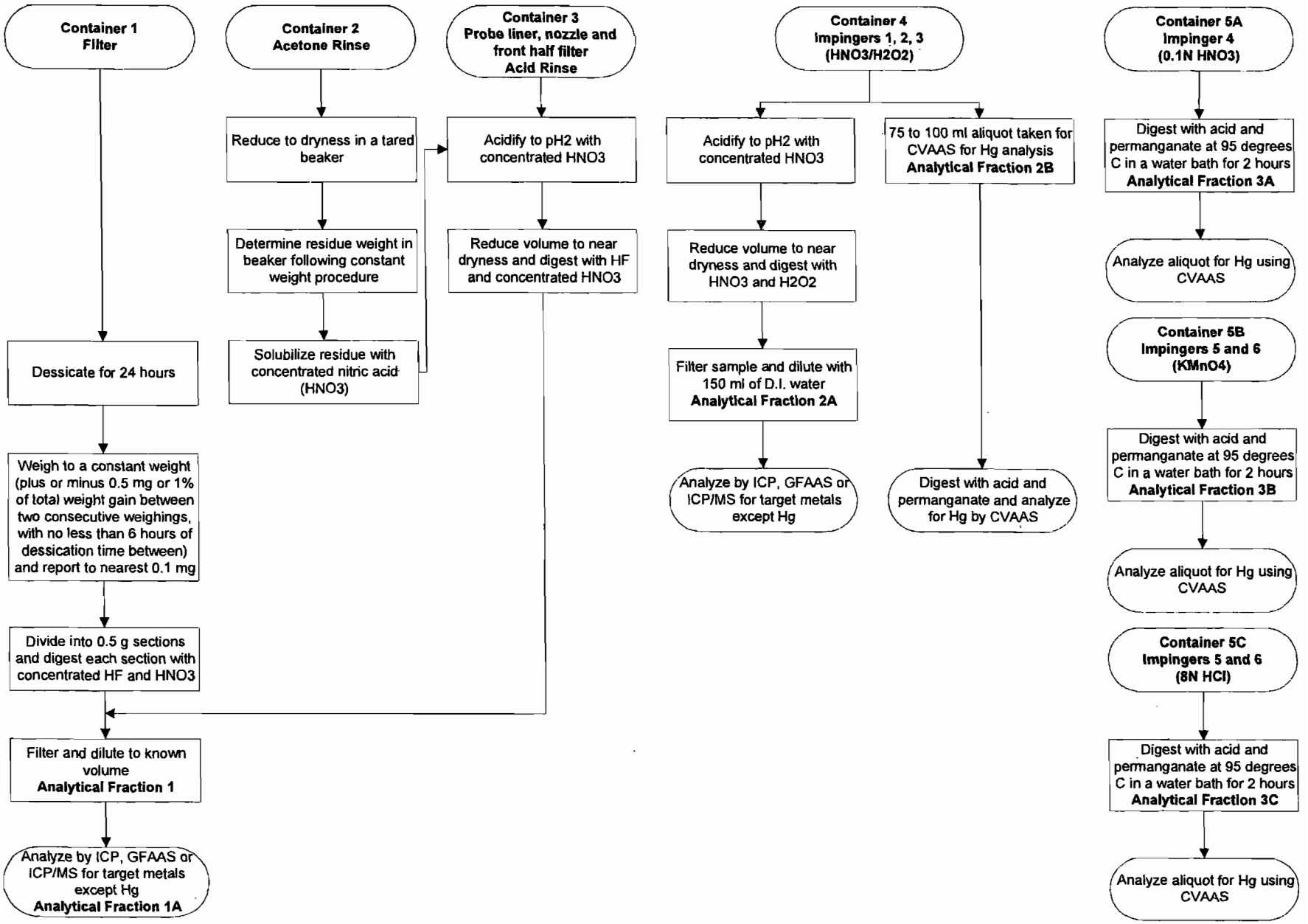
Container 11
HCl Rinse Blank
250 ml Glass

200 ml water, add 25 ml of 8N HCl. Mix well and seal

Container 12
Filter Blanks
Petri Dish

3 clean, unused filters

EPA Method 29
Analytical Flowchart
(includes Mercury and Particulate Matter)



Specification Sheet for EPA Method 13B

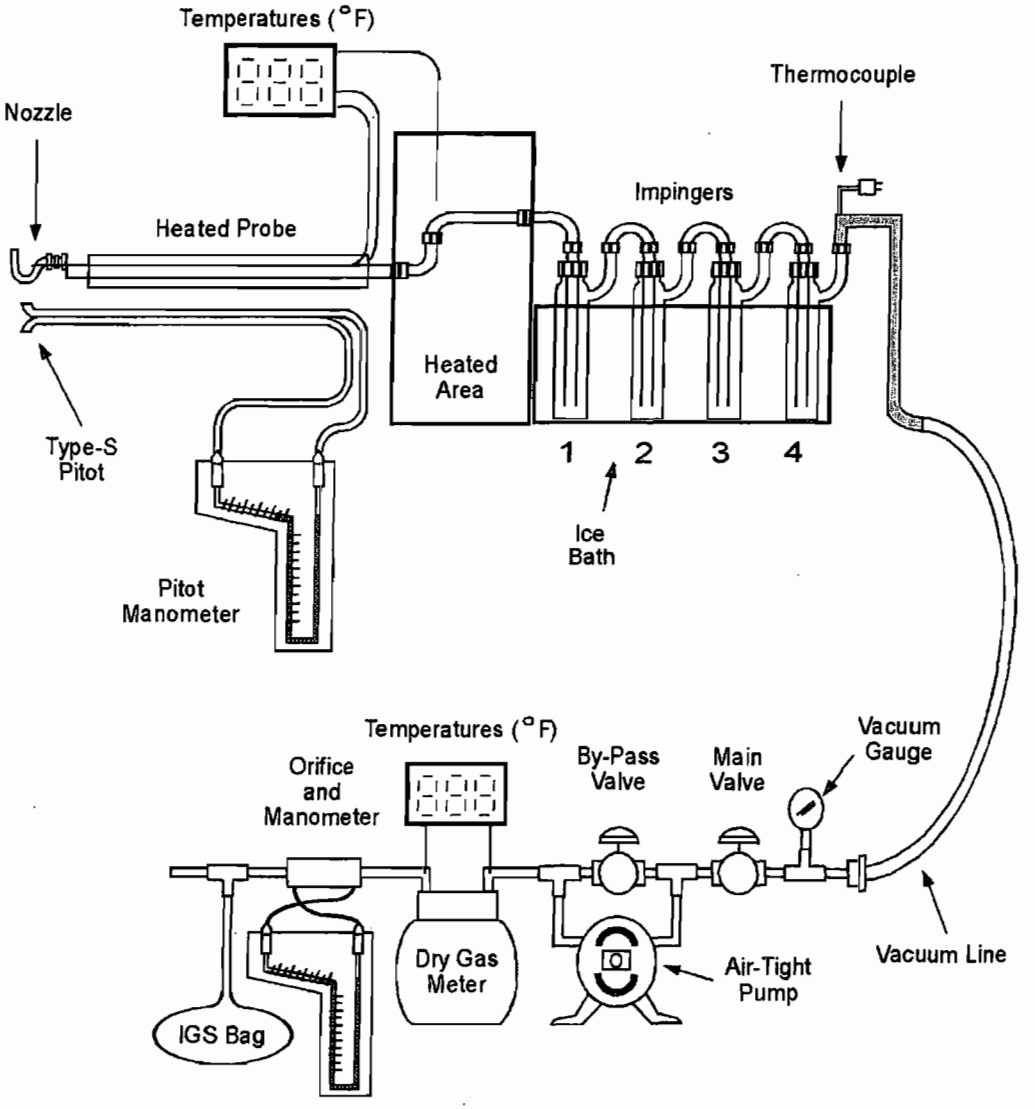
Source Location Name(s)	Units 1 ,2 and 3 FF Outlets
Pollutant(s) to be Determined	Total Fluoride (F)
Other Parameters to be Determined from Trai	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	62.5 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	2.5 minutes
Sampling Rate	Isokinetic (90-110%) 1 cfm maximum	Isokinetic (90-110%) 1 cfm maximum
Sampling Probe		
Nozzle Material	Stainless Steel or Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Stainless Steel or Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F (optional)	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.825
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	Exit of Probe or Between 3rd and 4th impingers	Exit of Probe
Filter Holder Material	Borosilicate Glass or Stainless Steel	Borosilicate Glass
Filter Support Material	Stainless Steel if filter at probe exit; Glass Frit if filter after 3rd impinger	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F if after probe, unheated if after 3rd imp.	248°F±25°F
Filter Material	Low F Quartz or Fiberglass if after probe, Whatman No. 1 if after 3rd impinger	Whatman No. 1 (Ashless)
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 13B

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	4	4
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Greenburg-Smith	Greenburg-Smith
Impinger 3	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5		
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Nylon Bristle	Nylon Bristle
Probe Rinse Reagent	Deionized distilled water	Deionized Distilled Water
Probe Rinse Wash Bottle Material	Glass or Polyethylene	Teflon
Probe Rinse Storage Container	Polyethylene	Polyethylene
Filter Recovered?	Yes	Yes
Filter Storage Container	Polyethylene	Polyethylene
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Impinger Wash Bottle	Glass or Polyethylene	Teflon
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	See analytical flow chart	See Analytical Flow Chart
Front-Half Rinse Preparation	See analytical flow chart	See Analytical Flow Chart
Back-Half Analysis	Ion Specific Electrode	Ion Chromatography
Additional Analysis	N/A	None

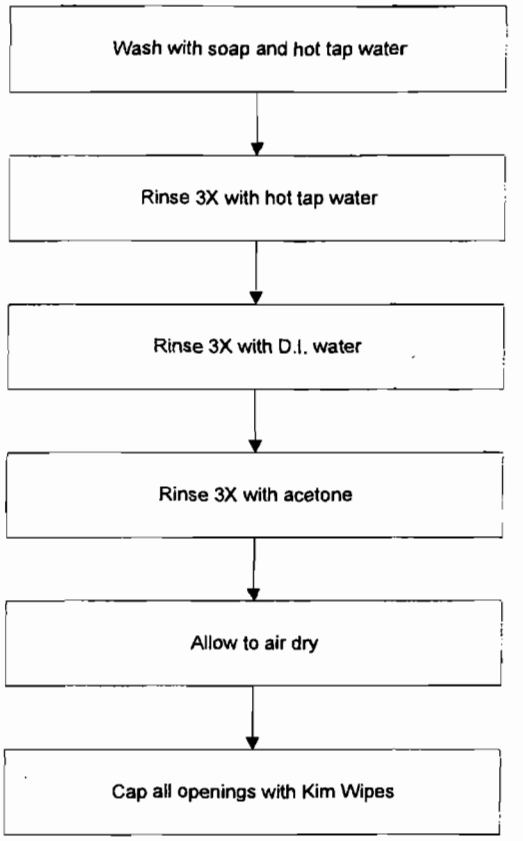
EPA Method 13B
Sampling Train Configuration



Impinger Contents

Impinger 1	100 ml DI H_2O
Impinger 2	100 ml DI H_2O
Impinger 3	Empty
Impinger 4	Silica Gel

EPA Method 13B
Glassware Preparation Procedures



EPA Method 13B
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)

Container 1
Polyethylene

Filter, probe nozzle, probe fitting, probe liner, impingers 1, 2, 3, connecting glassware, filter holder

Measure and record volume of impingers 1, 2, 3

Transfer into polyethylene container

Add filter to sample container

Brush/rinse each piece 3X with D.I. water. Use less than 500 ml for entire wash. Add to sample container

Label container, seal, mark liquid level

Container 2
Sample Blank
Polyethylene

Place unused filter in sample container

Add volume of water equal to total volume in Container 1

Visual Inspection

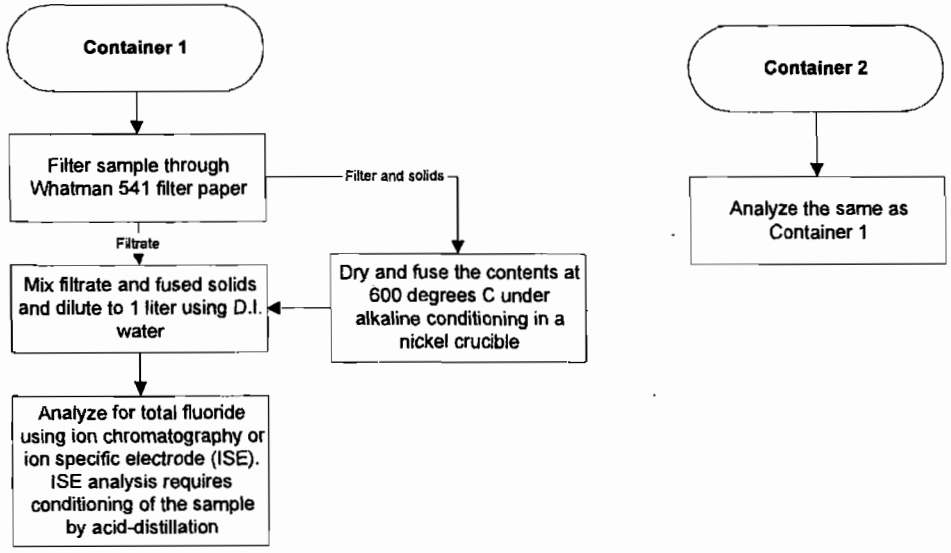
Label container and measure volume by weight

Container 3
Silica Gel

Measure volume by weight, note any color change

Recycle silica gel

EPA Method 13B
Analytical Flowchart



Specification Sheet for EPA Method 23

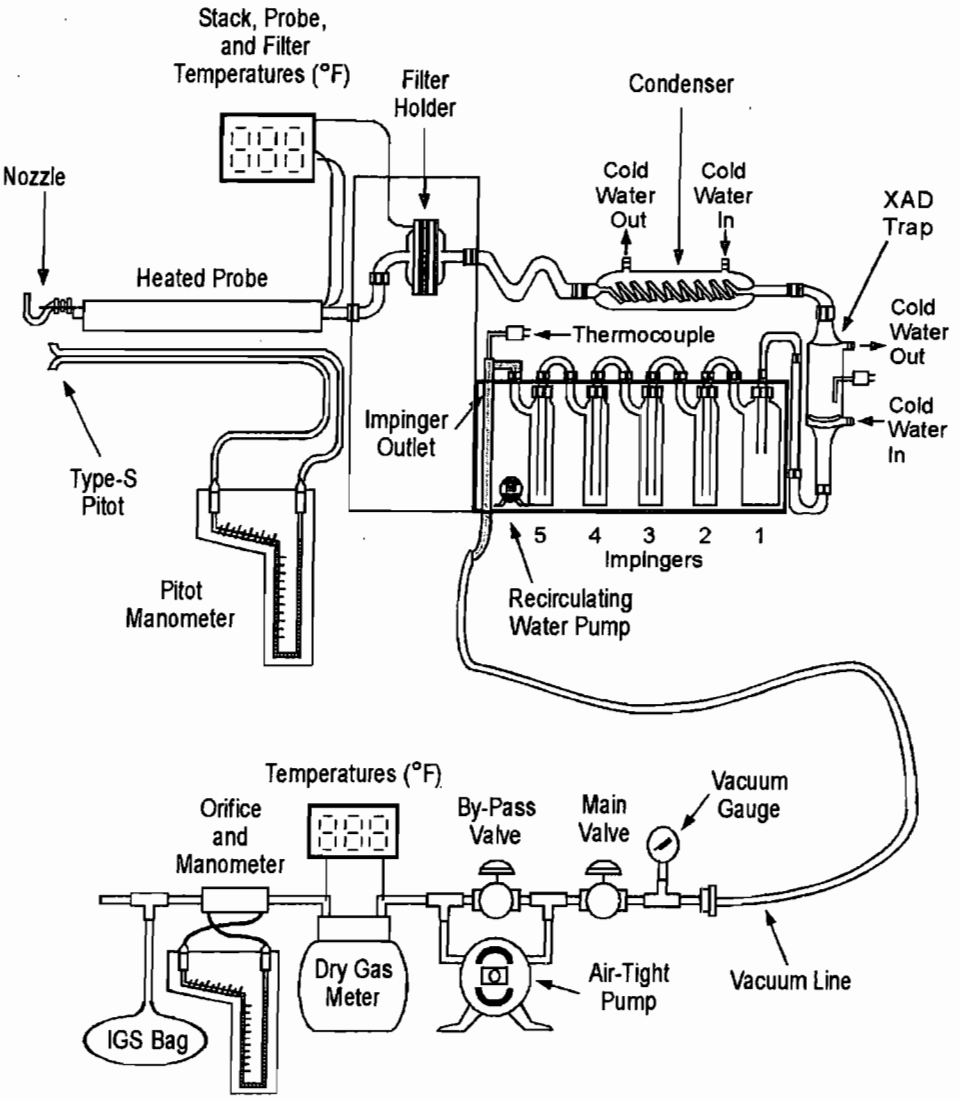
Source Location Name(s)	Unit 1 FF Outlet
Pollutant(s) to be Determined	Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans (PCDD/PCDF)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	250 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	10 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Nickel, Quartz, Stainless Steel or Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.833
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Glass Frit	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F	248°F±25°F
Filter Material	Glass Fiber - Toluene Extracted	Glass Fiber - Toluene Extracted
Other Components		
Adsorbent Module	XAD-2 Trap	XAD-II Adsorbent Trap
Location	After filter and condenser	After filter and condenser
Operating Temperature	< 68°F	<68°F

Specification Sheet for EPA Method 23

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	5	5
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Shortened Stem (open tip)
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Inert Bristle	Teflon Mat
Probe Rinse Reagent	Acetone/Methylene Chloride/Toluene	Acetone/Toluene (see Appendix J)
Probe Rinse Wash Bottle Material	Glass or Teflon	Teflon
Probe Rinse Storage Container	Glass	Glass
Filter Recovered?	Yes	Yes
Filter Storage Container	Petri Dish - Glass or Polystyrene	Glass
Impinger Contents Recovered?	No	Archived
Impinger Rinse Reagent	N/A	HPLC Water
Impinger Wash Bottle	N/A	Teflon
Impinger Storage Container	N/A	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric
Filter Preparation Conditions	See Method 23 Analytical Flow Chart	For Organic Analysis
Front-Half Rinse Preparation	See Method 23 Analytical Flow Chart	Organic Analysis
Back-Half Analysis	N/A	Archive
Additional Analysis	None	None

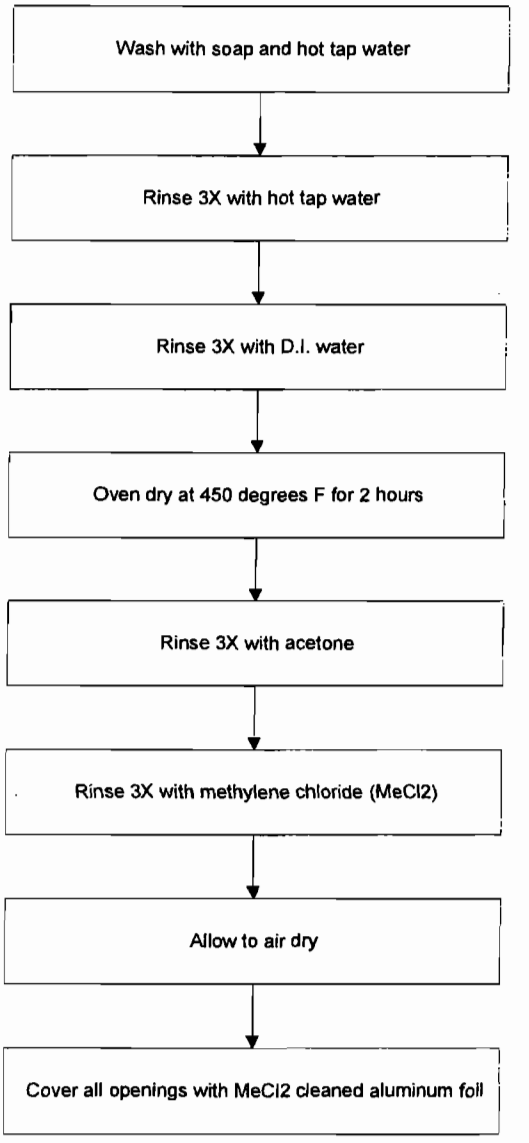
EPA Method 23
Sampling Train Configuration



Impinger Contents

Impinger 1	Empty
Impinger 2	100 ml HPLC H_2O
Impinger 3	100 ml HPLC H_2O
Impinger 4	Empty
Impinger 5	Silica Gel

EPA Method 23
Glassware Preparation Procedures



EPA Method 23
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)

Container 1
Glass fiber MeCl2 extracted filter
250 ml Glass

Remove with tweezers to plastic container. Remove any particulate or filter fiber into sample container.

Visual Inspection

Container 4
Impinger water
1000 ml Glass

Measure and record weight

Transfer to sample container, label, mark liquid volume and seal

Archive

XAD-II Resin Adsorbent Module

Measure and record weight

Tightly cap both ends, label and cover with aluminum foil

Store at ice temperature. Transport to laboratory with ice packs

Container 2
500 ml Glass

Probe liner, nozzle, cyclone bypass and filter holder

Brush/rinse each piece 3X with acetone

Z-piece, condenser and any other connecting lines to adsorbent module

Rinse each piece 3X with acetone

Visual Inspection

Label container and measure volume by weight

Container 3
250 ml Glass

Probe liner, nozzle, cyclone bypass and filter holder

Rinse each piece 3X with toluene

Z-piece, condenser and any other connecting lines to adsorbent module

Soak with 3 separate portions of toluene for 5 minutes each

Visual Inspection

Label container and measure volume by weight

Container 5
Filter Blank
250 ml Glass

Clean, unused filter

Container 6
Acetone Blank
250 ml Glass

200 ml of acetone from rinse bottle

Container 7
Toluene
250 ml Glass

100 ml of toluene from rinse bottle

Silica Gel

Measure volume by weight, note any change in color

Recycle silica gel

EPA Method 23
Analytical Flowchart

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition
- All samples must be extracted within 30 days of collection
- All samples must be analyzed within 45 days of extraction
- All laboratory glassware must be cleaned as described in Section 3A of the "Manual of Analytical Methods for the Analysis of Pesticides"

Container 1
Glass fiber filter

Transfer to extraction thimble

XAD-II Resin Absorbent Module

Transfer to extraction thimble

Container 2
acetone/methylene chloride (MeCl2 - if used)

Concentrate sample to volume of 1 to 5 ml and add to extraction thimble

Container 3
Toluene

Add internal standard solution and concentrate to 1 - 5 ml

Dissolve sample in 5 ml of hexane and analyze by GC/MS

Containers 5, 6, 7, 8
Reagent blanks

Glass fiber filter
acetone
MeCl2 (if used)
toluene
XAD-II Resin

Analysis by GC/MS, DB-5 or DB-5S capillary column

If tetra-chlorinated dibenzofurans are detected, analyze separate aliquot using DB-225 capillary column [Only if DB-5 is used for initial analysis]

Add internal standard solution

Place thimble in extractor and extract for 16 hours

Concentrate to approximately 10 ml (split sample into two 5 ml portions for future use, optional)

Dissolve sample in 5 ml of hexane and analyze by gas chromatography coupled to a mass spectrometer (GC/MS)
DB-5 or DB-5S capillary column

If tetra-chlorinated dibenzofurans are detected, analyze separate aliquot using DB-225 capillary column
[Only if DB-5 is used for initial analysis]

Audit Sample

Audit samples must be analyzed subject to availability

Specification Sheet for EPA Method 26A (modified)

Note: Modification includes the use of full-size impingers instead of midget impingers.

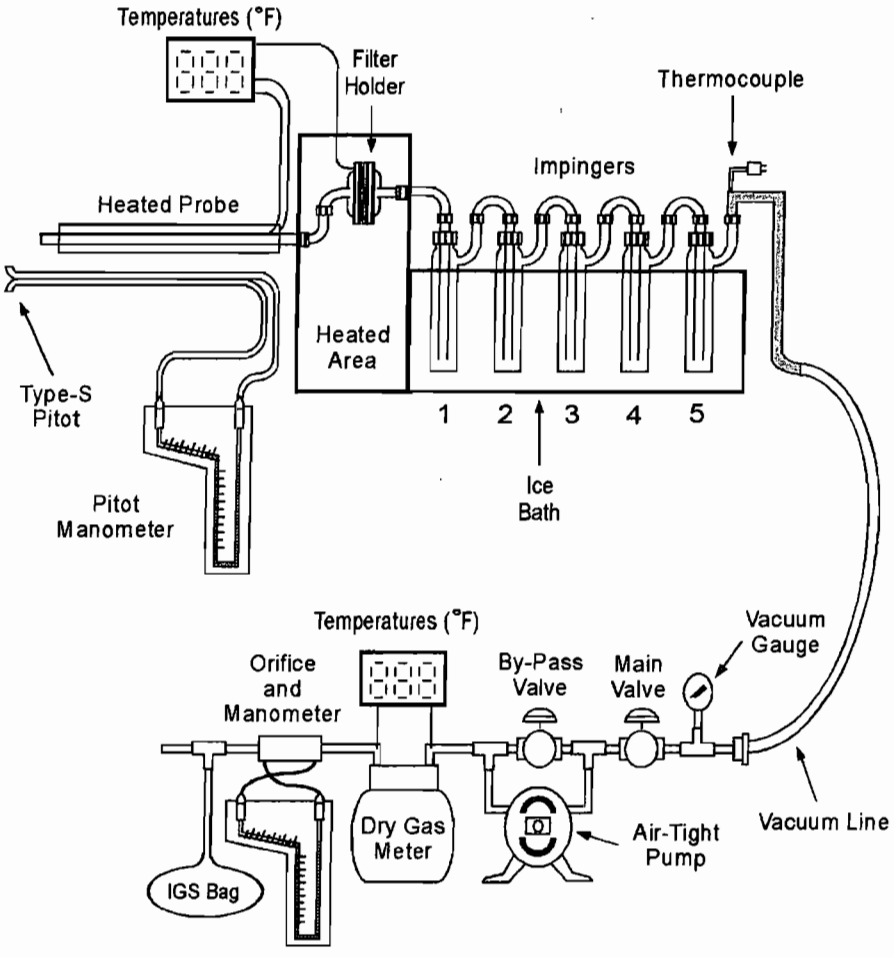
Source Location Name(s)	Units 1-3 SDA Inlets and Units 1-3 FF Outlets
Pollutant(s) to be Determined	Hydrogen Chloride (HCl)
Other Parameters to be Determined from Train	Gas Density, Moisture

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	60 minutes
Sampling Rate	Constant Rate (±10%)	Constant Rate (±10%)
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Borosilicate Glass	Borosilicate Glass
Effective Probe Length	N/A	5 feet
Probe Temperature Set-Point	>248°F	350°F @ Inlet, Stack Temp @ FF Outlet
Velocity Measuring Equipment		
Pitot Tube Design	None	None
Pitot Tube Coefficient	N/A	N/A
Pitot Tube Calibration by	N/A	N/A
Pitot Tube Attachment	N/A	N/A
Metering System Console		
Meter Type	Dry Gas Meter or Critical Orifice	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	2 liters/minute	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter	Wet Test Meter
Pump Type	Diaphragm or equivalent	Rotary Vane
Temperature Measurements	Dial Thermometer or equivalent	Type K Thermocouple/Pyrometer
Temperature Resolution	2°F-5.4°F	1.0°F
ΔP Differential Pressure Gauge	N/A	N/A
ΔH Differential Pressure Gauge	N/A	Inclined Manometer
Barometer	Mercury, aneroid or other.	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Teflon or Quartz	Borosilicate Glass
Filter Support Material	Teflon Frit	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	>248°F	350°F @ Inlet, Stack Temp @ FF Outlet
Filter Material	Teflon/Glass Mat (Quartz, Optional High Temp>410F)	Quartz Fiber @ Inlet, Teflon on Glass @ Outlet
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 26A (modified)

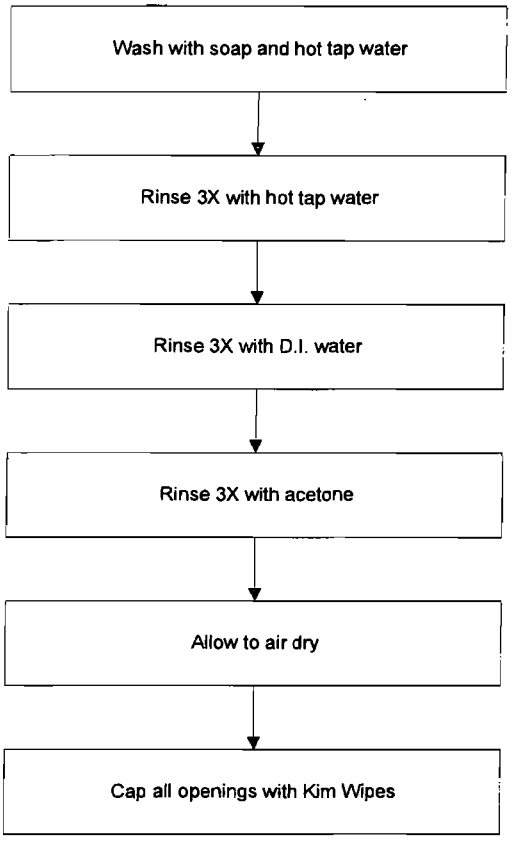
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	5 or 6 (Midget Impingers)	5
Impinger Stem Types		
Impinger 1	Midget Shortened Stem	Shortened Stem (open tip)
Impinger 2	Midget Bubbler	Greenburg-Smith
Impinger 3	Midget Bubbler	Greenburg-Smith
Impinger 4	Midget Bubbler	Modified Greenburg-Smith
Impinger 5	Midget Bubbler	Modified Greenburg-Smith
Impinger 6	Mae West	
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	N/A	Single Point Integrated
Sample Collection Medium	N/A	Vinyl Bag
Sample Analysis	N/A	CEM
Sample Recovery Information		
Probe Brush Material	N/A	N/A
Probe Rinse Reagent	N/A	N/A
Probe Rinse Wash Bottle Material	N/A	N/A
Probe Rinse Storage Container	N/A	N/A
Filter Recovered?	No	No
Filter Storage Container	N/A	N/A
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Impinger Wash Bottle	Polyethylene or glass	Polyethylene
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	N/A	Gravimetric
Filter Preparation Conditions	N/A	N/A
Front-Half Rinse Preparation	N/A	N/A
Back-Half Analysis	Ion Chromatography	Ion Chromatography
Additional Analysis	None	None

Modified EPA Method 26A
Sampling Train Configuration



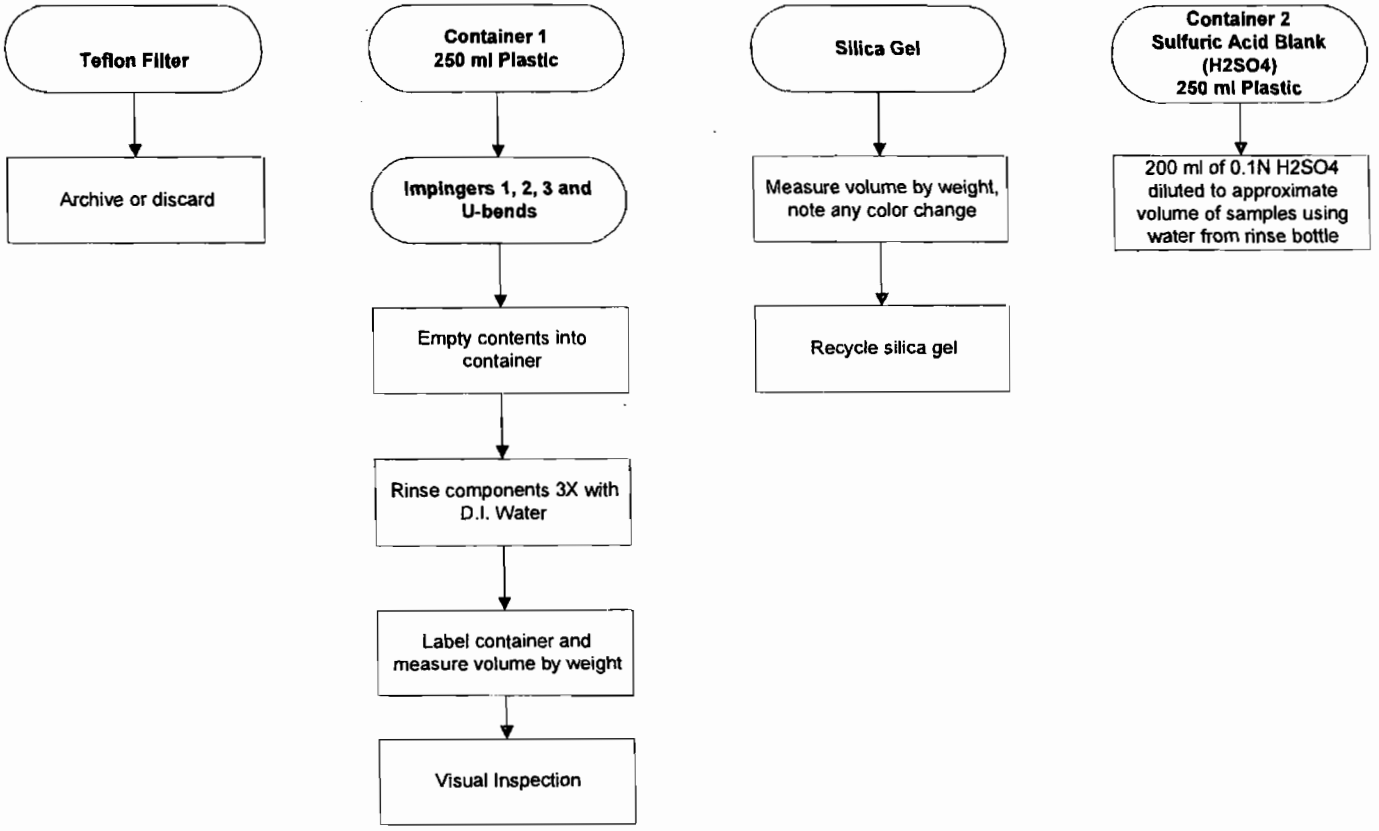
Impinger Contents	
Impinger 1	50 ml 0.1 N H_2SO_4
Impinger 2	100 ml 0.1 N H_2SO_4
Impinger 3	100 ml 0.1 N H_2SO_4
Impinger 4	Empty
Impinger 5	Silica Gel

EPA Method 26A
Glassware Preparation Procedures



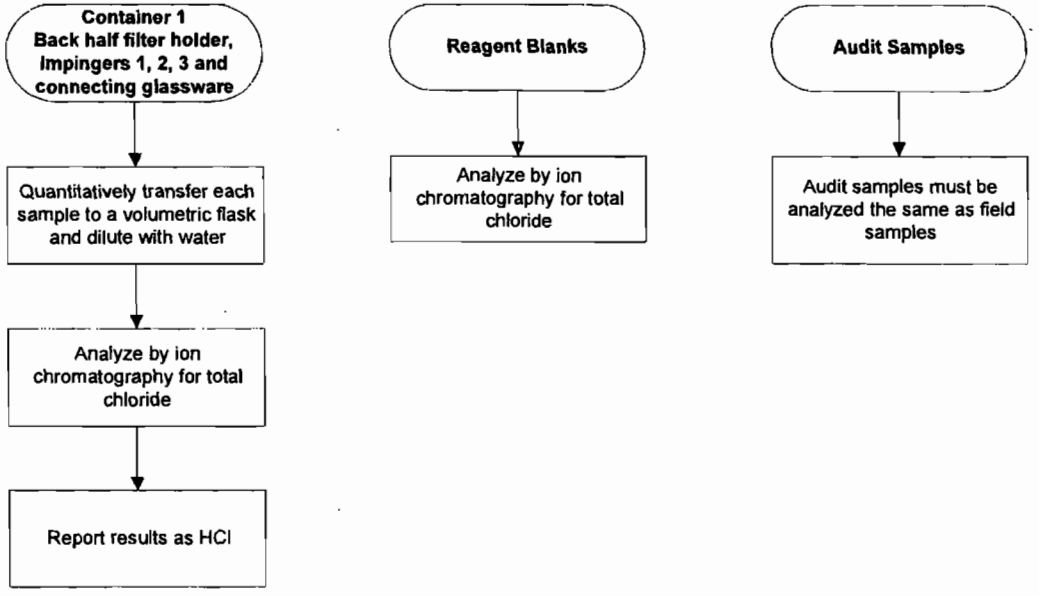
EPA Method 26
Sample Recovery Flowchart
(without Cl2)
(Modified)

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)



EPA Method 26
Analytical Flowchart
(without Cl2)
(Modified)

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition



SAMPLE CALCULATIONS

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	412.4	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	19.41	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
T_m	= average dry gas meter temperature (°F)	=	68.40	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	65.67	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9916	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	0.97	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	65.915	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-9.40	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	306.96	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.56	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.56	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	65.915	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	19.41	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2275	
		=	22.75	%

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Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.56	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2275	
B_w	= actual water vapor in gas	=	0.2275	
		=	22.75	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.72	%

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.7	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.17	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2275	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.17	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.40	lb/lb·mole

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)\left(\sqrt{\Delta P}\right)\left(\sqrt{\frac{(\overline{T_s}+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.40	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
T_s	= average sample gas temperature (°F)	=	306.96	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.632	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	42.72	ft/sec

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	42.72	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	307.0	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	111,560	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2275	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	111,560	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std\,7} = (Q_{std})\left(\frac{20.9-O_2}{20.9-7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	82,526	dscfm

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Clean Air Project No: 10735
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17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft^3/min)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	5,171,079	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std-english}$	= volumetric flow rate, english units (ft^3/min)	=	86,185	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	= volumetric flow rate, metric units (m^3/hr)	=	146,448	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32+460}{68+460}\right)$$

Where:

$Q_{std-metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	146,448	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	136,463	dry Nm^3/hr

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

20. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s}+460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1-B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.268	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2275	
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
T_s	= average sample gas temperature (°F)	=	307.0	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	65.915	dscf
V_s	= sample gas velocity (ft/sec)	=	42.72	ft/sec
θ	= total sampling time (min)	=	125	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	100.02	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m+460)(28.96)}{(\Delta H_@)(P_{bar}+\frac{\Delta H}{13.6})(M_d)}}(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	125	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	65.67	dcf
T_m	= average dry gas meter temperature (°F)	=	68.40	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.8053	
P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	0.967	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.17	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	0.979	√in. H_2O
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	1.0130	

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USEPA Method 5/29
Filterable Particulate Gravimetric Analysis Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Total residue from gravimetric analysis of filters (g)

$$m_{fr} = \sum_{i=1}^{n} m_{fi}$$

Where:

m_{f1}	= residual mass of filter "1" from gravimetric analysis (g)	=	0.00090	g
m_{f2}	= residual mass of filter "2" from gravimetric analysis (g)	=	0.00000	g
m_{f3}	= residual mass of filter "3" from gravimetric analysis (g)	=	0.00000	g
m_{f4}	= residual mass of filter "4" from gravimetric analysis (g)	=	0.00000	g
m_{fr}	= total filter residue from gravimetric analysis (g)	=	0.00090	g

2. Total particulate collected on filters (g)

$$m_{filter} = m_{fr} \text{ if } m_{fr} \geq 0$$
$$m_{filter} = 0 \quad \text{if } m_{fr} < 0$$

Where:

m_{fr}	= total filter residue from gravimetric analysis (g)	=	0.00090	g
m_{filter}	= total particulate collected on filters (g)	=	0.00090	g

3. Solvent rinse - sample residue mass (g)

$$r_{si} = (r_{ai})\left(\frac{v_{si}}{v_{ai}}\right)$$

Where:

			Acetone	
r_{ai}	= aliquot residue mass for solvent "i" (g)	=	0.00280	g
v_{si}	= sample liquid volume for solvent rinse "i" (ml)	=	96.0	ml
v_{ai}	= aliquot liquid volume for solvent rinse "i" (ml)	=	96.0	ml
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00280	g

4. Solvent rinse - blank residue (g)

$$m_{i-blank} = r_{ai-blank} \text{ if } r_{ai-blank} \geq 0$$
$$m_{i-blank} = 0 \quad \text{if } r_{ai-blank} < 0$$

Where:

			Acetone	
$r_{ai\text{-}blank}$	= blank residue for solvent "i" from gravimetric analysis (g)	=	0.00120	g
$m_{i\text{-}blank}$	= solvent rinse - blank residue (g)	=	0.00120	g

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Date _____

5. Solvent rinse - maximum allowable blank correction (g)

$$m_{bi} = MINIMUM\left[\left(\frac{(m_{i-blank})(v_{si})}{v_{ai-blank}}\right) \; or \; (0.00001)(\rho_i)(v_{si}) \; or \; (r_{si})\right] \text{ if } r_{si} \geq 0$$

$$m_{bi} = 0 \quad \text{if } r_{si} < 0$$

Where:			Acetone	
$m_{i\text{-blank}}$	= solvent rinse - blank residue (g)	=	0.00120	g
v_{si}	= sample liquid volume for solvent rinse "i" (ml)	=	96.0	ml
$v_{ai\text{-blank}}$	= blank liquid volume for solvent rinse "i" (ml)	=	100.0	ml
0.00001	= EPA M5 fraction of total rinse that can be subtracted (g)	=	0.00001	g
ρ_i	= density of solvent rinse "i" (g/ml)	=	0.7845	g/ml
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00280	g
m_{bi}	= solvent rinse "i" - maximum allowable blank correction (g)	=	0.00075	g

6. Solvent rinse - net residue (g)

$$m_i = (r_{si} - m_{bi}) \text{ if } r_{si} \geq m_{bi}$$

$$m_i = 0 \quad \text{if } r_{si} < m_{bi}$$

Where:			Acetone	
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00280	g
m_{bi}	= solvent rinse "i" - maximum allowable blank correction (g)	=	0.00075	g
m_i	= solvent rinse "i" - net residue (g)	=	0.00205	g

7. Total solvent residue - (g)

$$m_s = \sum_{i=1}^{n} m_i$$

Where:				
m_1	= solvent rinse "1" - net residue (g)	=	0.00205	g
m_2	= solvent rinse "2" - net residue (g)	=	N/A	g
m_3	= solvent rinse "3" - net residue (g)	=	N/A	g
m_s	= total solvent residue (g)	=	0.00205	g

8. Total gravimetric result (g)

$$m_T = m_{filter} + m_s$$

Where:				
m_{filter}	= total particulate collected on filters (g)	=	0.00090	g
m_s	= total solvent residue (g)	=	0.00205	g
m_T	= total gravimetric result (g)	=	0.00295	g

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9. Total gravimetric detection limit (g)

$$m_D = (MDL_{filter})(n_f) + (MDL_{rinse})(n_r)$$

Where:

MDL_{filter}	= minimum detection limit for single filter analysis (g)	=	0.00010	g
n_f	= number of filters in analysis	=	1	
MDL_{rinse}	= minimum detection limit for single rinse analysis (g)	=	0.00010	g
n_r	= number of rinses in analysis	=	1	
m_D	= total gravimetric detection limit (g)	=	0.00020	g

10. Total particulate matter (g)

$$m_n = MAXIMUM[m_T \quad or \quad < m_D]$$

Where:

m_T	= total gravimetric result (g)	=	0.00295	g
m_D	= total gravimetric detection limit (g)	=	0.00020	g
m_n	= total particulate matter (g)	=	0.00295	g

QA/QC _____
Date _____

USEPA Method 5/29
Filterable Particulate Sample Calculations

Sample data taken from Run 1

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1. Particulate concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
C_{sd}	= particulate concentration (lb/dscf)	=	9.8580E-08	lb/dscf

2. Particulate concentration (gr/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(15.43\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
15.43	= conversion factor (gr/g)	=	15.43	gr/g
C_{sd}	= particulate concentration (gr/dscf)	=	0.00069	gr/dscf

3. Particulate concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(1000\right)\left(35.31\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
1,000	= conversion factor (mg/g)	=	1,000	mg/g
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= particulate concentration (mg/dscm)	=	1.57861	mg/dscm

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4. Particulate concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(1000)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
1,000	= conversion factor (mg/g)	=	1,000	mg/g
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= particulate concentration (mg/Nm^3 dry)	=	1.69412	mg/Nm^3 dry

5. Particulate concentration corrected to x% O_2 (gr/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00069	gr/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= particulate concentration corrected to x%O_2 (gr/dscf)	=	0.00072	gr/dscf @ x%O_2

6. Particulate concentration corrected to y% CO_2 (gr/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00069	gr/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= particulate concentration corrected to y%CO_2 (gr/dscf)	=	0.00071	gr/dscf @ y%CO_2

7. Particulate concentration at actual gas conditions (gr/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00069	gr/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
C_a	= particulate concentration at actual gas conditions (gr/acf)	=	0.00036	gr/acf

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8. Particulate rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)(2.205 \times 10^{-3})(Q_{std})(60)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= particulate rate (lb/hr)	=	0.5098	lb/hr

9. Particulate rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{(Q_{std})(60)}{1000}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
1,000	= conversion factor (g/kg)	=	1,000	g/kg
$E_{kg/hr}$	= particulate rate (kg/hr)	=	0.2312	kg/hr

10. Particulate rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)(2.205 \times 10^{-3})(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2,000	= conversion factor (lb/Ton)	=	2,000	lb/Ton
$E_{T/yr}$	= particulate rate (Ton/yr)	=	2.2328	Ton/yr

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11. Particulate rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(F_d\right)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= particulate rate - F_d - based (lb/MMBtu)	=	0.00148	lb/MMBtu

12. Particulate rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(F_c\right)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= particulate rate - F_c - based (lb/MMBtu)	=	0.00153	lb/MMBtu

13. Particulate rate - Heat Input-based (lb/MMBtu)

$$E_{Hi} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(\frac{(Q_{std})(60)}{H_i}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00295	g
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
H_i	= actual heat input (MMBtu/hr)	=		MMBtu/hr
E_{Hi}	= particulate rate - Heat based (lb/MMBtu)	=	N/A	lb/MMBtu

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LOGIC FOR TREATING DETECTION LIMITS

(mercury only)

1. Logic for Determining Total Blank ($m_{Total-B}$) from 5 Fractions

	CASE 1 All 5 fractions are D.	CASE 2 1 to 4 fractions are ND	CASE 3 All 5 fractions are ND
Rule			
ND = 0	$m_{Total-B}$ = Sum D, 1-5	$m_{Total-B}$ = Sum D	$m_{Total-B}$ = < Sum ND
ND=1x	$m_{Total-B}$ = Sum D, 1-5	$m_{Total-B}$ = Sum D	$m_{Total-B}$ = < Sum ND
ND=0.5x	$m_{Total-B}$ = Sum D, 1-5	$m_{Total-B}$ = Sum D	$m_{Total-B}$ = < 0.5 Sum ND

2. Logic for Determining Total Sample ($m_{Total-S}$) from 5 Fractions

	CASE 1 All 5 fractions are D.	CASE 2 1 to 4 fractions are ND	CASE 3 All 5 fractions are ND
Rule			
ND = 0	$m_{Total-S}$ = Sum D, 1-5	$m_{Total-S}$ = Sum D	$m_{Total-S}$ = < Sum ND
ND=1x	$m_{Total-S}$ = Sum D, 1-5	$m_{Total-S}$ = < [Sum D + Sum ND]	$m_{Total-S}$ = < Sum ND
ND=0.5x	$m_{Total-S}$ = Sum D, 1-5	$m_{Total-S}$ = < [SumD+0.5 SumND]	$m_{Total-S}$ = < 0.5 Sum ND

3. Logic for Determining Maximum Allowable Blank Correction ($m_{T-B-allow}$)

	CASE 1 All 5 fractions are D. $m_{Total-B}$ = D	CASE 2 1 to 4 sample fractions are ND $m_{Total-B}$ = D	CASE 3 All 5 fractions are ND $m_{Total-B}$ = D	CASE 4 Any type of fractions $m_{Total-B}$ = ND
Rule				
ND = 0	$m_{T-B-allow}$ = M29 Rule	$m_{T-B-allow}$ = M29 Rule*	$m_{T-B-allow}$ = 0	$m_{T-B-allow}$ = 0
ND=1x	$m_{T-B-allow}$ = M29 Rule	$m_{T-B-allow}$ = M29 Rule*	$m_{T-B-allow}$ = 0	$m_{T-B-allow}$ = 0
ND=0.5x	$m_{T-B-allow}$ = M29 Rule	$m_{T-B-allow}$ = M29 Rule*	$m_{T-B-allow}$ = 0	$m_{T-B-allow}$ = 0

* M29 rule using only detected sample quantities for logical comparisons.

4. Logic for Determining Blank-Corrected Sample Amount (m_n)

	CASE 1 All 5 fractions are D. $m_{Total-S}$ - $m_{T-B-allow}$ ≥ MIN(MDL)	CASE 2 1 to 4 sample fractions are ND $m_{Total-S}$ - $m_{T-B-allow}$ ≥ MIN(MDL)	CASE 3 All 5 fractions are ND $m_{Total-S}$ and $m_{T-B-allow}$ anything	CASE 4 Any type of fractions $m_{Total-S}$ - $m_{T-B-allow}$ < MIN(MDL)
Rule				
ND = 0	$m_n = m_{Total-S} - m_{T-B-allow}$	$m_n = m_{Total-S} - m_{T-B-allow}$	m_n = < $m_{Total-S}$	m_n = < MIN[MDL]
ND=1x	$m_n = m_{Total-S} - m_{T-B-allow}$	m_n = < [$m_{Total-S} - m_{T-B-allow}$]	m_n = < $m_{Total-S}$	m_n = < MIN[MDL]
ND=0.5x	$m_n = m_{Total-S} - m_{T-B-allow}$	m_n = < [$m_{Total-S} - m_{T-B-allow}$]	m_n = < $m_{Total-S}$	m_n = < MIN[MDL]

Definitions and Notes

The term "Rule" refers to the rule being implemented for handling non-detectable quantities in summations.
MDL = minimum detection limit.
D = Detectable quantity reported as D.
ND = Non-Detectable quantity reported at a value of ND.
MIN[MDL] = lowest quantity of all detection limits for 5 fractions.

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LOGIC FOR TREATING DETECTION LIMITS

(all metals except mercury)

1. Logic for Determining Maximum Allowable Front-Half Blank Correction ($m_{FB\text{-}allow}$)

	CASE 1 m_{FB} = D	CASE 2 m_{FB} = ND
Rule		
ND = 0	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0
ND=1x	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0
ND=0.5x	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0

2. Logic for Determining Blank-Corrected Front-Half Sample Amount (m_F)

	CASE 1 $m_{FS} - m_{FB\text{-}allow} \geq$ MDL	CASE 2 $m_{FS} - m_{FB\text{-}allow} <$ MDL
Rule		
ND = 0	$m_F = m_{FS} - m_{FB\text{-}allow}$	$m_F = <$ MDL
ND=1x	$m_F = m_{FS} - m_{FB\text{-}allow}$	$m_F = <$ MDL
ND=0.5x	$m_F = m_{FS} - m_{FB\text{-}allow}$	$m_F = <$ MDL

3. Logic for Determining Maximum Allowable Back-Half Blank Correction ($m_{BB\text{-}allow}$)

	CASE 1 m_{BB} = D	CASE 2 m_{BB} = ND
Rule		
ND = 0	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0
ND=1x	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0
ND=0.5x	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0

4. Logic for Determining Blank-Corrected Back-Half Sample Amount (m_B)

	CASE 1 $m_{BS} - m_{BB\text{-}allow} \geq$ MDL	CASE 2 $m_{BS} - m_{BB\text{-}allow} <$ MDL
Rule		
ND = 0	$m_B = m_{BS} - m_{BB\text{-}allow}$	$m_B = <$ MDL
ND=1x	$m_B = m_{BS} - m_{BB\text{-}allow}$	$m_B = <$ MDL
ND=0.5x	$m_B = m_{BS} - m_{BB\text{-}allow}$	$m_B = <$ MDL

5. Logic for Adding Front and Back-Half Corrected Samples (m_n)

	CASE 1 Both are D	CASE 2 One is D, other is ND	CASE 3 Both are ND
Rule			
ND = 0	$m_n = m_F + m_B$	m_n = D	$m_n = <$ Sum ND
ND=1x	$m_n = m_F + m_B$	$m_n = <$ [D + ND]	$m_n = <$ Sum ND
ND=0.5x	$m_n = m_F + m_B$	$m_n = <$[D + 0.5ND]	$m_n = <$ 0.5 Sum ND

Definitions and Notes

The term "Rule" refers to the rule being implemented for hanMDLing non-detectable quantities in summations
MDL = minimum detection limit.
D = Detectable quantity reported as D.
ND = Non-Detectable quantity reported at a value of ND.
If Front and Back-Half fractions are combined, then only Items 1 and 2 are used.

USEPA Method 5/29
Mercury Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

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G

1. Total blank amount (µg)

$$m_{total-B} = \sum_{i=1}^{n} m_{i-B}$$

Where:

m_{1b-B}	= mercury amount in blank for Fraction 1b	=	<0.1000	µg
m_{2b-B}	= mercury amount in blank for Fraction 2b	=	<0.2000	µg
m_{3a-B}	= mercury amount in blank for Fraction 3a	=	<0.2000	µg
m_{3b-B}	= mercury amount in blank for Fraction 3b	=	<0.5000	µg
m_{3c-B}	= mercury amount in blank for Fraction 3c	=	<0.4000	µg
$m_{total-B}$	= total amount of mercury in blank	=	<1.4000	µg

2. Total sample amount (µg)

$$m_{total-S} = \sum_{i=1}^{n} m_{i-S}$$

Where:

m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	18.9954	µg
m_{3a-S}	= mercury amount in sample for Fraction 3a	=	0.2294	µg
m_{3b-S}	= mercury amount in sample for Fraction 3b	=	<0.5000	µg
m_{3c-S}	= mercury amount in sample for Fraction 3c	=	<0.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	19.2248	µg

3. Allowable blank correction (µg)

$$m_{T-B-allow} = m_{total-B} \text{ if } m_{total-B} \le 0.6$$

$$m_{T-B-allow} = MAX\left[0.6,\ MIN\left(m_{total-B},\ 0.05 \times m_{total-S}\right)\right] \text{ if } m_{total-B} > 0.6$$

Where:

$m_{total-B}$	= total amount of mercury in blank	=	<1.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	19.2248	µg
0.05 x $m_{total-S}$	= 5% of $m_{total-S}$	=	0.9612	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg

NOTE: In this case, the second criteria applies.

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4. Sample corrected for allowable blank - Total (µg)

$$m_n = m_{total-S} - m_{T-B-allow}$$

Where:

$m_{total-S}$	= total amount of mercury in sample	=	19.2248	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	19.2248	µg

5. Sample corrected for allowable blank - Prorated for each fraction (µg)

$$m_{n-i} = \left(\frac{m_{i-S}}{m_{total-S}}\right)(m_n)$$

Where:

m_n	= total mercury in sample corrected for allowable blank	=	19.2248	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	18.9954	µg
m_{3a-S}	= mercury amount in sample for Fraction 3a	=	0.2294	µg
m_{3b-S}	= mercury amount in sample for Fraction 3b	=	<0.5000	µg
m_{3c-S}	= mercury amount in sample for Fraction 3c	=	<0.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	19.2248	µg
m_{n-1b}	= mercury corrected for blank - prorated for Fraction 1b	=	<0.1000	µg
m_{n-2b}	= mercury corrected for blank - prorated for Fraction 2b	=	18.9954	µg
m_{n-3a}	= mercury corrected for blank - prorated for Fraction 3a	=	0.2294	µg
m_{n-3b}	= mercury corrected for blank - prorated for Fraction 3b	=	<0.5000	µg
m_{n-3c}	= mercury corrected for blank - prorated for Fraction 3c	=	<0.4000	µg

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USEPA Method 5/29
Mercury Sample Calculations

Sample data taken from Run 1

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N_G

1. Mercury concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{6}}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^{6}	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= mercury concentration (lb/dscf)	=	6.4311E-10	lb/dscf

2. Mercury concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	1.0299E+01	µg/dscm

3. Mercury concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= mercury concentration (mg/dscm)	=	1.0299E-02	mg/dscm

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4. Mercury concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= mercury concentration (µg/Nm3 dry)	=	1.1052E+01	µg/Nm^3 dry

5. Mercury concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	6.4311E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	6.7162E-10	lb/dscf @ x%O_2

6. Mercury concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	6.4311E-10	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	6.6017E-10	lb/dscf @ y%CO_2

7. Mercury concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	6.4311E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	3.3790E-10	lb/acf

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8. Mercury emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	3.3256E-03	lb/hr

9. Mercury emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= mercury emission rate (g/s)	=	4.1894E-04	g/s

10. Mercury emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{T/yr}$	= mercury emission rate (Ton/yr)	=	1.4566E-02	Ton/yr

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11. Mercury emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	9.6642E-06	lb/MMBtu

12. Mercury emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	19.2248	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	1.0013E-05	lb/MMBtu

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USEPA Method 5/29
Beryllium Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

041409 111627
K

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \le A + 1$$

$$m_{FB-allow} = MAX\left[A + 1,\ MIN\left(m_{FB},\ 0.05 \times m_{FS}\right)\right] \text{ if } m_{FB} > A + 1$$

Where:

m_{FB}	= beryllium amount in combined front- and back-half blank	=	<0.0500	µg
m_{FS}	= beryllium amount in combined front- and back-half sample	=	<0.0500	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	<0.0025	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB-allow}$	= allowable combined Beryllium blank correction	=	0.0000	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= beryllium amount in combined front- and back-half sample	=	<0.0500	µg
$m_{FB-allow}$	= allowable combined beryllium blank correction	=	0.0000	µg
m_n	= blank-corrected beryllium in combined sample	=	<0.0500	µg

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USEPA Method 5/29
Beryllium Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

041409 111627
N_K

1. Beryllium concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{6}}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= beryllium concentration (lb/dscf)	=	<1.6726E-12	lb/dscf

2. Beryllium concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= beryllium concentration (µg/dscm)	=	<2.6785E-02	µg/dscm

3. Beryllium concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= beryllium concentration (mg/dscm)	=	<2.6785E-05	mg/dscm

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4. Beryllium concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	≤	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= beryllium concentration (µg/Nm3 dry)	=	<2.8744E-02	µg/Nm^3 dry

5. Beryllium concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.6726E-12	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= beryllium concentration corrected to x% oxygen (lb/dscf)	=	<1.7468E-12	lb/dscf @ x%O_2

6. Beryllium concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.6726E-12	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= beryllium conc. corrected to y% carbon dioxide (lb/dscf)	=	<1.7170E-12	lb/dscf @ y%CO_2

7. Beryllium concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.6726E-12	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
C_a	= beryllium concentration at actual gas conditions (lb/acf)	=	<8.7882E-13	lb/acf

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Date _____

8. Beryllium emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= beryllium emission rate (lb/hr)	=	<8.6492E-06	lb/hr

9. Beryllium emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= beryllium emission rate (g/s)	=	<1.0896E-06	g/s

10. Beryllium emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= beryllium emission rate (Ton/yr)	=	<3.7883E-05	Ton/yr

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11. Beryllium emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= beryllium emission rate - Fd-based (lb/MMBtu)	=	<2.5135E-08	lb/MMBtu

12. Beryllium emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= beryllium emission rate - Fc-based (lb/MMBtu)	=	<2.6041E-08	lb/MMBtu

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USEPA Method 5/29
Cadmium Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

041509 091402
K

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \le A + 1$$

$$m_{FB-allow} = MAX\left[A + 1,\ MIN\left(m_{FB},\ 0.05 \times m_{FS}\right)\right] \text{ if } m_{FB} > A + 1$$

Where:

m_{FB}	= cadmium amount in combined front- and back-half blank	=	<0.2000	µg
m_{FS}	= cadmium amount in combined front- and back-half sample	=	0.6369	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	0.0318	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB-allow}$	= allowable combined Cadmium blank correction	=	0.0000	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= cadmium amount in combined front- and back-half sample	=	0.6369	µg
$m_{FB-allow}$	= allowable combined cadmium blank correction	=	0.0000	µg
m_n	= blank-corrected cadmium in combined sample	=	0.6369	µg

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USEPA Method 5/29
Cadmium Sample Calculations

Sample data taken from Run 1

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041509 091402
N_K

1. Cadmium concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{6}}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= cadmium concentration (lb/dscf)	=	2.1304E-11	lb/dscf

2. Cadmium concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= cadmium concentration (µg/dscm)	=	3.4116E-01	µg/dscm

3. Cadmium concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= cadmium concentration (mg/dscm)	=	3.4116E-04	mg/dscm

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4. Cadmium concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= cadmium concentration (µg/Nm3 dry)	=	3.6612E-01	µg/Nm^3 dry

5. Cadmium concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	2.1304E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= cadmium concentration corrected to x% oxygen (lb/dscf)	=	2.2249E-11	lb/dscf @ x%O_2

6. Cadmium concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	2.1304E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= cadmium conc. corrected to y% carbon dioxide (lb/dscf)	=	2.1869E-11	lb/dscf @ y%CO_2

7. Cadmium concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	2.1304E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
C_a	= cadmium concentration at actual gas conditions (lb/acf)	=	1.1194E-11	lb/acf

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8. Cadmium emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= cadmium emission rate (lb/hr)	=	1.1017E-04	lb/hr

9. Cadmium emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= cadmium emission rate (g/s)	=	1.3878E-05	g/s

10. Cadmium emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= cadmium emission rate (Ton/yr)	=	4.8252E-04	Ton/yr

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11. Cadmium emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= cadmium emission rate - Fd-based (lb/MMBtu)	=	3.2014E-07	lb/MMBtu

12. Cadmium emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.6369	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= cadmium emission rate - Fc-based (lb/MMBtu)	=	3.3168E-07	lb/MMBtu

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USEPA Method 5/29
Lead Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

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K

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \le A + 1$$

$$m_{FB-allow} = MAX\left[A + 1,\ MIN\left(m_{FB},\ 0.05 \times m_{FS}\right)\right] \text{ if } m_{FB} > A + 1$$

Where:

m_{FB}	= lead amount in combined front- and back-half blank	=	0.3640	µg
m_{FS}	= lead amount in combined front- and back-half sample	=	1.2392	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	0.0620	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB-allow}$	= allowable combined Lead blank correction	=	0.3640	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= lead amount in combined front- and back-half sample	=	1.2392	µg
$m_{FB-allow}$	= allowable combined lead blank correction	=	0.3640	µg
m_n	= blank-corrected lead in combined sample	=	0.8752	µg

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USEPA Method 5/29
Lead Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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N_K

1. Lead concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= lead concentration (lb/dscf)	=	2.9277E-11	lb/dscf

2. Lead concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= lead concentration (µg/dscm)	=	4.6884E-01	µg/dscm

3. Lead concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= lead concentration (mg/dscm)	=	4.6884E-04	mg/dscm

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4. Lead concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= lead concentration (µg/Nm3 dry)	=	5.0314E-01	µg/Nm^3 dry

5. Lead concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	2.9277E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= lead concentration corrected to x% oxygen (lb/dscf)	=	3.0575E-11	lb/dscf @ x%O_2

6. Lead concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	2.9277E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= lead conc. corrected to y% carbon dioxide (lb/dscf)	=	3.0054E-11	lb/dscf @ y%CO_2

7. Lead concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	2.9277E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	164,030	acfm
C_a	= lead concentration at actual gas conditions (lb/acf)	=	1.5383E-11	lb/acf

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8. Lead emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= lead emission rate (lb/hr)	=	1.5140E-04	lb/hr

9. Lead emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= lead emission rate (g/s)	=	1.9072E-05	g/s

10. Lead emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	86,185	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= lead emission rate (Ton/yr)	=	6.6311E-04	Ton/yr

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11. Lead emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= lead emission rate - Fd-based (lb/MMBtu)	=	4.3996E-07	lb/MMBtu

12. Lead emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.8752	µg
V_{mstd}	= volume metered, standard (dscf)	=	65.9150	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= lead emission rate - Fc-based (lb/MMBtu)	=	4.5582E-07	lb/MMBtu

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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K

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	219.1	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	10.31	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
T_m	= average dry gas meter temperature (°F)	=	79.60	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	38.78	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9916	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.28	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	38.083	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-9.70	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg

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Wheelabrator North Broward, Inc.
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4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	303.96	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.49	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.49	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	38.083	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	10.31	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2131	
		=	21.31	%

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7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.49	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000 100.00	 %

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2131	
B_w	= actual water vapor in gas	=	0.2131	
		=	21.31	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.4	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.5	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.14	%

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10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.4	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.5	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.1	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.16	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2131	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.16	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.57	lb/lb·mole

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)(\sqrt{\Delta P})\left(\sqrt{\frac{(T_s+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.83	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.57	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
T_s	= average sample gas temperature (°F)	=	303.96	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.684	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	46.74	ft/sec

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13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	46.74	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	179,476	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	179,476	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	304.0	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	122,246	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2131	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	122,246	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std\,7} = (Q_{std})\left(\frac{20.9-O_2}{20.9-7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.5	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	85,888	dscfm

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17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft^3/min)	=	96,200	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	5,771,996	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std-english}$	= volumetric flow rate, english units (ft^3/min)	=	96,200	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	= volumetric flow rate, metric units (m^3/hr)	=	163,466	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32 + 460}{68 + 460}\right)$$

Where:

$Q_{std-metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	163,466	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	152,321	dry Nm^3/hr

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20. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s} + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.272	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2131	
P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
T_s	= average sample gas temperature (°F)	=	304.0	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	38.083	dscf
V_s	= sample gas velocity (ft/sec)	=	46.74	ft/sec
θ	= total sampling time (min)	=	63	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	100.52	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_@)(P_{bar} + \frac{\Delta H}{13.6})(M_d)}}(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	63	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	38.78	dcf
T_m	= average dry gas meter temperature (°F)	=	79.60	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.8053	
P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.280	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.16	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.129	√in. H_2O
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	1.0006	

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USEPA Method 13B
HF Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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J

1. Fluoride to HF conversion factor

$$K_{HF} = \frac{MW_{HF}}{n \times MW_{F^-}}$$

Where:

MW_{HF}	= molecular weight of HF (mg/mg-mole)	=	20.006	mg/mg-mole
MW_{F-}	= molecular weight of fluoride ion (mg/mg-mole)	=	18.998	mg/mg-mole
n	= molar ratio of fluoride to HF	=	1.0	mole F/mole HF
K_{HF}	= conversion factor to convert mass F⁻ to mass HF	=	1.053	

2. Total HF collected (mg)

$$m_{HF} = K_{HF} \times \frac{(S_{F-1} v_1 + S_{F-2} v_2)}{1000}$$

Where:

K_{HF}	= conversion factor to convert mass F⁻ to mass HF	=	1.053	
S_{F-1}	= fluoride concentration of sample fraction 1 (mg/liter)	=	<0.0260	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	896.0	ml
S_{F-2}	= fluoride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HF}	= total HF collected in sample (mg)	=	<0.0245	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HF} \times B_F \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_F < MDL$$

Where:

K_{HF}	= conversion factor to convert mass F⁻ to mass HF	=	1.053	
B_F	= fluoride concentration of blank (mg/liter)	=	<0.0260	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	896.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_b	= allowable blank subtraction (mg)	=	0.0000	mg

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4. Total HF collected, corrected for blank (mg)

$$m_{nb} = m_{HF} - m_b$$

Where:

m_{HF}	= total HF collected in sample (mg)	=	<0.0245	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0245	mg

5. Minimum detectable HF (mg)

$$m_{MDL} = K_{HF} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
MDL	= minimum detectable fluoride concentration	=	0.005	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	896.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HF (mg)	=	0.0047	mg

6. Total HF value used in emission calculations (mg)

$$m_n = MAXIMUM \left[m_{nb} \quad or \quad < m_{MDL} \right]$$

Where:

m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0245	mg
m_{MDL}	= minimum detectable HF (mg)	=	0.0047	mg
m_n	= total HF value used in emission calculations (mg)	=	<0.0245	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HF} \times S_{F-2} \times \frac{v_2}{1000}}{m_{HF}}$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
S_{F-2}	= fluoride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
m_{HF}	= total HF collected in sample (mg)	=	<0.0245	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= Collection QC check (% mass collected in second fraction)	=	0.00	%

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USEPA Method 13B
HF Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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K_J

1. HF concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HF concentration (lb/dscf)	=	<1.4203E-09	lb/dscf

2. HF concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
MW	= molecular weight of HF (g/g-mole)	=	20.006	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HF concentration (ppmdv)	=	<0.0274	ppmdv

3. HF concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0274	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	21.3062	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HF concentration (ppmwv)	=	<0.0215	ppmwv

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4. HF concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HF concentration (mg/dscm)	=	<0.0227	mg/dscm

5. HF concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HF concentration (mg/Nm^3 dry)	=	<0.0244	mg/Nm^3 dry

6. HF concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0274	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.5	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HF concentration corrected to x%O_2 (ppmdv)	=	<0.0307	ppmdv @ x%O_2

7. HF concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0274	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.4	%
C_{sdy}	= HF concentration corrected to y%CO_2 (ppmdv)	=	<0.0289	ppmdv @ y%CO_2

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8. HF concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= HF concentration (lb/dscf)	=	<1.4203E-09	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	179,476	acfm
C_a	= HF concentration at actual gas conditions (lb/acf)	=	<7.6130E-10	lb/acf

9. HF rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= HF rate (lb/hr)	=	<0.0082	lb/hr

10. HF rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{(Q_{std})(60)}{10^6}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
10^6	= conversion factor (mg/kg)	=	10^6	g/kg
$E_{kg/hr}$	= HF rate (kg/hr)	=	<0.0037	kg/hr

11. HF rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,200	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2,000	lb/Ton
$E_{T/yr}$	= HF rate (Ton/yr)	=	<0.0359	Ton/yr

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12. HF rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.5	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HF rate (lb/MMBtu)	=	<2.2892E-05	lb/MMBtu

13. HF rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0245	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.0828	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.4	%
100	= conversion factor	=	100	
E_{Fc}	= HF rate (lb/MMBtu)	=	<2.2735E-05	lb/MMBtu

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 23 (PCDD/F)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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J

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	812.3	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	38.23	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
T_m	= average dry gas meter temperature (°F)	=	87.88	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	142.94	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9937	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.01	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	138.679	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-9.40	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg

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Clean Air Project No: 10735
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4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	307.04	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.56	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.56	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	138.679	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	38.23	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2161	
		=	21.61	%

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.56	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000 100.00	 %

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2161	
B_w	= actual water vapor in gas	=	0.2161	
		=	21.61	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.6	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.15	%

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.6	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.2	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.15	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2161	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.15	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.52	lb/lb·mole

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_p)(\sqrt{\Delta P})\left(\sqrt{\frac{(T_s+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.83	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.52	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
T_s	= average sample gas temperature (°F)	=	307.04	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.651	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	44.99	ft/sec

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	44.99	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	172,759	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	172,759	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	307.0	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	117,485	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2161	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	117,485	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	92,098	dscfm

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std\,7} = (Q_{std})\left(\frac{20.9-O_2}{20.9-7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	92,098	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	81,828	dscfm

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17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft^3/min)	=	92,098	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	5,525,886	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std-english}$	= volumetric flow rate, english units (ft^3/min)	=	92,098	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	= volumetric flow rate, metric units (m^3/hr)	=	156,496	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32+460}{68+460}\right)$$

Where:

$Q_{std-metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	156,496	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	145,826	dry Nm^3/hr

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20. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s}+460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1-B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.266	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2161	
P_s	= absolute sample gas pressure (in. Hg)	=	29.56	in. Hg
T_s	= average sample gas temperature (°F)	=	307.0	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	138.679	dscf
V_s	= sample gas velocity (ft/sec)	=	44.99	ft/sec
θ	= total sampling time (min)	=	250	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	99.95	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m+460)(28.96)}{(\Delta H_@)(P_{bar}+\frac{\Delta H}{13.6})(M_d)}}\,(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	250	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	142.94	dcf
T_m	= average dry gas meter temperature (°F)	=	87.88	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7498	
P_{bar}	= barometric pressure (in. Hg)	=	30.25	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.008	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.15	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.000	√in. H_2O
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9836	

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USEPA Method 23
PCDD/PCDF Emissions Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: PCDD/F results may be presented in two formats - normally expected levels and the maximum possible levels. In the normal case, data classified as ND (non-detect) or EMPC (estimated maximum possible concentration) are not counted. In the maximum possible emissions case, NDs and EMPCs are fully counted.

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			Normal Case (ND & EMPC = 0)		Maximum Case (ND & EMPC fully counted)	
1. TEQ concentration (ng/dscm)						
$C_{sd} = \left(\frac{m_{n\_TEQ}}{V_{msid}}\right) \times 35.31$						
Where:						
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{msid}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm	35.31	dscf/dscm
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	6.0090E-03	ng/dscm	6.1617E-03	ng/dscm
2. TEQ concentration (ng/Nm3 dry)						
$C_{sd} = \left(\frac{m_{n\_TEQ}}{V_{msid}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$						
Where:						
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{msid}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F	68	°F
32	= normal temperature (°F)	=	32	°F	32	°F
460	= °F to °R conversion constant	=	460		460	
C_{sd}	= PCDD/F TEQ concentration (ng/Nm3 dry)	=	6.4486E-03	ng/Nm^3 dry	6.6128E-03	ng/Nm^3 dry
3. TEQ concentration at actual gas conditions (ng/acm example)						
$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$						
Where:						
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	6.0090E-03	ng/dscm	6.1617E-03	ng/dscm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscm/h)	=	156,496	dry std m^3/hr	156,496	dry std m^3/hr
Q_a	= volumetric flow rate at actual conditions (acm/h)	=	293,558	actual m^3/hr	293,558	actual m^3/hr
C_a	= PCDD/F TEQ concentration at actual gas conditions (ng/acm)	=	3.2034E-03	ng/acm	3.2848E-03	ng/acm

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4. TEQ concentration corrected to x% O2 (ng/dscm example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	6.0090E-03	ng/dscm	6.1617E-03	ng/dscm
x	= oxygen content of corrected gas (%)	=	7.0	%	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.6	%	8.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%	20.9	%
C_{sdx}	= PCDD/F TEQ concentration (ng/dscm corrected to x% O_2)	=	6.7631E-03	ng/dscm @ x% O_2	6.9351E-03	ng/dscm @ x% O_2

5. TEQ concentration corrected to y% CO2 (ng/dscm example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	6.0090E-03	ng/dscm	6.1617E-03	ng/dscm
y	= carbon dioxide content of corrected gas (%)	=	12.0	%	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.3	%	11.3	%
C_{sdy}	= PCDD/F TEQ concentration (ng/dscm corrected to y% CO_2)	=	6.3812E-03	ng/dscm @ y% CO_2	6.5434E-03	ng/dscm @ y% CO_2

6. TEQ Emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)(2.205 \times 10^{-3})(Q_{std})\frac{(60)}{(10^9)}$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	92,098	dscfm	92,098	dscfm
60	= conversion factor (min/hr)	=	60	min/hr	60	min/hr
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{lb/hr}$	= PCDDF TEQ Emission rate (lb/hr)	=	2.0735E-09	lb/hr	2.1263E-09	lb/hr

7. TEQ Emission rate (g/sec)

$$E_{g/sec} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{Q_{std}}{60 \times 10^9}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	92,098	dscfm	92,098	dscfm
60	= conversion factor (sec/min)	=	60	sec/min	60	sec/min
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{g/sec}$	= PCDDF TEQ Emission rate (g/sec)	=	2.6122E-10	g/sec	2.6786E-10	g/sec

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8. TEQ emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{9}}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
2.205 x 10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	92,098	dscfm	92,098	dscfm
60	= conversion factor (min/hr)	=	60	min/hr	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2,000	lb/Ton	2,000	lb/Ton
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{T/yr}$	= PCDDF TEQ Emission rate (Ton/yr)	=	9.0821E-09	Ton/yr	9.3130E-09	Ton/yr

9. TEQ emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{9}}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
2.205 x 10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.6	%	8.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%	20.9	%
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
E_{Fd}	= PCDDF TEQ Emission rate (lb/MMBtu)	=	6.0772E-12	lb/MMBtu	6.2317E-12	lb/MMBtu

10. TEQ emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^{9}}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	2.3600E-02	ng	2.4200E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	138.6788	dscf	138.6788	dscf
2.205 x 10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu	1,820	dscf/MMBtu
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.3	%	11.3	%
100	= conversion factor	=	100		100	
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
E_{Fc}	= PCDDF TEQ Emission rate (lb/MMBtu)	=	6.0437E-12	lb/MMBtu	6.1974E-12	lb/MMBtu

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	139.5	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	6.56	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
T_m	= average dry gas meter temperature (°F)	=	73.50	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	32.13	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0028	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.02	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	32.253	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-2.20	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	30.04	in. Hg

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4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	495.67	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	30.04	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	30.04	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	30.04	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	32.253	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	6.56	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.1691	
		=	16.91	%

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7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	30.04	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	30.04	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000 100.00	 %

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.1691	
B_w	= actual water vapor in gas	=	0.1691	
		=	16.91	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.8	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.53	%

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Clean Air Project No: 10735
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10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.8	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.5	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.18	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.1691	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.18	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	28.12	lb/lb·mole

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USEPA Method 26A
HCl Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Chloride to HCl conversion factor

$$K_{HCl} = \frac{MW_{HCl}}{n \times MW_{Cl^-}}$$

Where:

MW_{HCl}	= molecular weight of HCl (mg/mg-mole)	=	36.461	mg/mg-mole
MW_{Cl^-}	= molecular weight of chloride ion (mg/mg-mole)	=	35.453	mg/mg-mole
n	= molar ratio of chloride to HCl	=	1.0	mole Cl/mole HCl
K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	

2. Total HCl collected (mg)

$$m_{HCl} = K_{HCl} \times \frac{(S_{Cl\text{-}1} v_1 + S_{Cl\text{-}2} v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
$S_{Cl\text{-}1}$	= chloride concentration of sample fraction 1 (mg/liter)	=	874.2600	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	792.0	ml
$S_{Cl\text{-}2}$	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HCl}	= total HCl collected in sample (mg)	=	711.8015	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HCl} \times B_{Cl} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_{Cl} < MDL$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
B_{Cl}	= chloride concentration of blank (mg/liter)	=	<0.0	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	792.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000.0000	ml/liter
m_b	= *allowable blank subtraction (mg)*	=	0.0000	mg

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4. Total HCl collected, corrected for blank (mg)

$$m_{nb} = m_{HCl} - m_b$$

Where:

m_{HCl}	= total HCl collected in sample (mg)	=	711.8015	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= *total HCl collected, corrected for blank (mg)*	=	711.8015098	mg

5. Minimum detectable HCl (mg)

$$m_{MDL} = K_{HCl} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
MDL	= *minimum* detectable chloride concentration	=	0.0	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	792.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HCl (mg)	=	0.001628352	mg

6. Total HCl value used in emission calculations (mg)

$$m_n = MAXIMUM \left[m_{nb} \quad or \quad < m_{MDL} \right]$$

Where:

m_{nb}	= total HCl collected, corrected for blank (mg)	=	711.8015	mg
m_{MDL}	= minimum detectable HCl (mg)	=	0.001628352	mg
m_n	= total HCl value used in emission calculations (mg)	=	711.8015098	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HCl} \times S_{Cl-2} \times \frac{v_2}{1000}}{m_{HCl}}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0000	ml
m_{HCl}	= total HCl collected in sample (mg)	=	712	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= *Collection QC check (% mass collected in second fraction)*	=	0	%

QA/QC _____
Date _____

USEPA Method 26A
HCl Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. HCl concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HCl concentration (lb/dscf)	=	4.8663E-05	lb/dscf

2. HCl concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
MW	= molecular weight of HCl (g/g-mole)	=	36.461	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HCl concentration (ppmdv)	=	514.4898	ppmdv

3. HCl concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	514.4898	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	16.9119	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HCl concentration (ppmwv)	=	427.4798	ppmwv

QA/QC _____
Date _____

4. HCl concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HCl concentration (mg/dscm)	=	779.2632	mg/dscm

5. HCl concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HCl concentration (mg/Nm^3 dry)	=	836.2824	mg/Nm^3 dry

6. HCl concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	514.4898	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.8	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HCl concentration corrected to x%O_2 (ppmdv)	=	545.4926	ppmdv @ x%O_2

7. HCl concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	514.4898	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	11.7	%
C_{sdy}	= HCl concentration corrected to y%CO2 (ppmdv)	=	528.5854	ppmdv @ y%CO_2

QA/QC _____
Date _____

8. HCl rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	7.8	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HCl rate (lb/MMBtu)	=	7.4242E-01	lb/MMBtu

9. HCl rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	711.8015	mg
V_{mstd}	= volume metered, standard (dscf)	=	32.2532	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	11.7	%
100	= conversion factor	=	100	
E_{Fc}	= HCl rate (lb/MMBtu)	=	7.5827E-01	lb/MMBtu

QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Modified Method 26A (HCl)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	226.9	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	10.68	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
T_m	= average dry gas meter temperature (°F)	=	72.33	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	40.47	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9916	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.50	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	40.301	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.20	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-9.70	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg

QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	307.25	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.49	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.49	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	40.301	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	10.68	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2095	
		=	20.95	%

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Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.49	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.49	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000 100.00	 %

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2095	
B_w	= actual water vapor in gas	=	0.2095	
		=	20.95	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.9	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.37	%

QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.9	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.4	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.07	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2095	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.07	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.54	lb/lb·mole

QA/QC _____
Date _____

USEPA Modified Method 26A
HCl Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Chloride to HCl conversion factor

$$K_{HCl} = \frac{MW_{HCl}}{n \times MW_{Cl^-}}$$

Where:

MW_{HCl}	= molecular weight of HCl (mg/mg-mole)	=	36.461	mg/mg-mole
MW_{Cl-}	= molecular weight of chloride ion (mg/mg-mole)	=	35.453	mg/mg-mole
n	= molar ratio of chloride to HCl	=	1.0	mole Cl/mole HCl
K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	

2. Total HCl collected (mg)

$$m_{HCl} = K_{HCl} \times \frac{(S_{Cl\text{-}1} v_1 + S_{Cl\text{-}2} v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
S_{Cl-1}	= chloride concentration of sample fraction 1 (mg/liter)	=	37.2000	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	874.0	ml
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HCl}	= total HCl collected in sample (mg)	=	33.4232	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HCl} \times B_{Cl} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_{Cl} < MDL$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
B_{Cl}	= chloride concentration of blank (mg/liter)	=	<0.0	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	874.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000.0000	ml/liter
m_b	= *allowable blank subtraction (mg)*	=	0.0000	mg

QA/QC _____
Date _____

4. Total HCl collected, corrected for blank (mg)

$$m_{nb} = m_{HCl} - m_b$$

Where:

m_{HCl}	= total HCl collected in sample (mg)	=	33.4232	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= *total HCl collected, corrected for blank (mg)*	=	33.4231584	mg

5. Minimum detectable HCl (mg)

$$m_{MDL} = K_{HCl} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
MDL	= minimum detectable chloride concentration	=	0.0	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	874.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HCl (mg)	=	0.001796944	mg

6. Total HCl value used in emission calculations (mg)

$$m_n = MAXIMUM \left[m_{nb} \quad or \quad < m_{MDL} \right]$$

Where:

m_{nb}	= total HCl collected, corrected for blank (mg)	=	33.4232	mg
m_{MDL}	= minimum detectable HCl (mg)	=	0.001796944	mg
m_n	= total HCl value used in emission calculations (mg)	=	33.4231584	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HCl} \times S_{Cl-2} \times \frac{v_2}{1000}}{m_{HCl}}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0000	ml
m_{HCl}	= total HCl collected in sample (mg)	=	33	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= *Collection QC check (% mass collected in second fraction)*	=	0	%

QA/QC _____
Date _____

USEPA Modified Method 26A
HCl Sample Calculations

Sample data taken from Run 1

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1. HCl concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HCl concentration (lb/dscf)	=	1.8287E-06	lb/dscf

2. HCl concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
MW	= molecular weight of HCl (g/g-mole)	=	36.461	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HCl concentration (ppmdv)	=	19.3338	ppmdv

3. HCl concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	19.3338	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	20.9455	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HCl concentration (ppmwv)	=	15.2842	ppmwv

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Date _____

4. HCl concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HCl concentration (mg/dscm)	=	29.2836	mg/dscm

5. HCl concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HCl concentration (mg/Nm^3 dry)	=	31.4263	mg/Nm^3 dry

6. HCl concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	19.3338	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.9	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HCl concentration corrected to x%O_2 (ppmdv)	=	22.3950	ppmdv @ x%O_2

7. HCl concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	19.3338	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.7	%
C_{sdy}	= HCl concentration corrected to y%CO2 (ppmdv)	=	21.6221	ppmdv @ y%CO_2

QA/QC _____
Date _____

8. HCl rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.9	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HCl rate (lb/MMBtu)	=	3.0480E-02	lb/MMBtu

9. HCl rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	33.4232	mg
V_{mstd}	= volume metered, standard (dscf)	=	40.3015	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	10.7	%
100	= conversion factor	=	100	
E_{Fc}	= HCl rate (lb/MMBtu)	=	3.1017E-02	lb/MMBtu

QA/QC _____
Date _____

PLANT DATA

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WHEELABRATOR NORTH BROWARD
TONS OF REFUSE PROCESSED PER STACK TEST RUN LOG (2009)

UNIT #1

Date	Pollutant Tested	Method #	Run #	Steam Rate (klb/hr)	Run Length (hrs)	Trash Processed (tons)
3/12/2009	HCl	26A	1	184.0	1.00	32.9
3/12/2009	HCl	26A	2	183.6	1.00	32.8
3/12/2009	HCl	26A	3	183.8	1.00	32.8
3/10/2009	Particulate/Metals	5/29	1	185.4	2.25	74.5
3/10/2009	Particulate/Metals	5/29	2	183.9	2.20	72.2
3/10/2009	Particulate/Metals	5/29	3	183.7	2.23	73.1
3/12/2009	Fluorides	13B	1	184.6	1.20	39.6
3/12/2009	Fluorides	13B	2	184.1	1.17	38.5
3/12/2009	Fluorides	13B	3	183.7	1.17	38.4
3/10/2009	Dioxins/Furans	23	1	184.0	4.37	143.6
3/11/2009	Dioxins/Furans	23	2	184.5	4.48	147.6
3/11/2009	Dioxins/Furans	23	3	183.6	4.32	141.7
3/12/2009	Dioxins/Furans	23	4	183.9	4.52	148.4

UNIT #2

Date	Pollutant Tested	Method #	Run #	Steam Rate (klb/hr)	Run Length (hrs)	Trash Processed (tons)
3/10/2009	HCl	26A	1	184.6	1.20	39.6
3/10/2009	HCl	26A	2	183.8	1.00	32.8
3/10/2009	HCl	26A	3	184.1	1.00	32.9
3/12/2009	Particulate/Metals	5/29	1	184.6	2.18	71.8
3/12/2009	Particulate/Metals	5/29	2	183.7	2.37	77.7
3/12/2009	Particulate/Metals	5/29	3	184.3	2.17	71.4
3/11/2009	Fluorides	13B	1	184.4	1.20	39.5
3/11/2009	Fluorides	13B	2	184.0	1.30	42.7
3/11/2009	Fluorides	13B	3	183.5	1.20	39.3
n/a	Dioxins/Furans	23	1	n/a	n/a	n/a
n/a	Dioxins/Furans	23	2	n/a	n/a	n/a
n/a	Dioxins/Furans	23	3	n/a	n/a	n/a

UNIT #3

Date	Pollutant Tested	Method #	Run #	Steam Rate (klb/hr)	Run Length (hrs)	Trash Processed (tons)
3/11/2009	HCl	26A	1	184.2	1.00	32.9
3/11/2009	HCl	26A	2	182.9	1.00	32.7
3/11/2009	HCl	26A	3	183.9	1.00	32.8
3/11/2009	Particulate/Metals	5/29	1	184.0	2.20	72.3
3/11/2009	Particulate/Metals	5/29	2	184.1	2.23	73.3
3/11/2009	Particulate/Metals	5/29	3	184.0	2.20	72.3
3/10/2009	Fluorides	13B	1	184.8	1.25	41.3
3/10/2009	Fluorides	13B	2	184.6	1.30	42.9
3/10/2009	Fluorides	13B	3	183.9	1.23	40.4
n/a	Dioxins/Furans	23	1	n/a	n/a	n/a
n/a	Dioxins/Furans	23	2	n/a	n/a	n/a
n/a	Dioxins/Furans	23	3	n/a	n/a	n/a

Metals: Cd (cadmium) Hg (mercury) Be (beryllium) Pb (lead)

Stack Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data from DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	1	1	3/12/2009	0636	0736	184.0	319.9	6.3	522.9	38.7	31.9	6.8	15.8	1.098	1.028	420.7	All times based on CEMS time
HCl		2	3/12/2009	0825	0925	183.6	317.0	6.2	525.7	39.8	33.0	6.8	23.2	1.098	1.028	422.0	Bailey time = CEMS time
		3	3/12/2009	1010	1110	183.8	320.1	6.3	527.3	40.1	31.4	8.7	25.0	1.098	1.028	538.0	
					Avg	183.8	319.0	6.3	525.3	39.5	32.1	7.5	21.3	1.098	1.028	460.2	
M-29/5	1	1	3/10/2009	0648	0903	185.4	319.6	6.3	521.2	36.5	29.3	7.2	16.3	1.102	1.070	461.6	All times based on CEMS time
Metals		2	3/10/2009	0925	1137	183.9	320.1	6.3	527.7	38.7	31.7	7.0	15.5	1.102	1.070	448.8	Bailey time = CEMS time
PM		3	3/10/2009	1159	1413	183.7	320.1	6.2	531.4	39.4	32.0	7.4	15.4	1.101	1.060	470.6	
					Avg	184.3	319.9	6.3	526.8	38.2	31.0	7.2	15.7	1.102	1.067	460.3	
M-23	1	1	3/10/2009	1008	1430	184.0	319.9	6.2	530.3	39.0	31.8	7.3	15.5	1.101	1.060	461.7	All times based on CEMS time
dioxins		2	3/11/2009	0626	1105	184.5	321.7	6.3	521.9	38.5	29.6	8.9	16.1	1.098	1.028	547.8	Bailey time = CEMS time
		3	3/11/2009	1126	1545	183.6	320.1	6.3	528.9	40.5	32.6	7.9	15.4	1.097	1.017	481.6	Run 2 excluded due to broken XAD-trap during
		4	3/12/2009	0642	1113	183.9	319.0	6.3	525.3	39.4	32.2	7.2	20.9	1.098	1.028	442.3	sample recovery
					Avg	184.0	320.2	6.3	526.6	39.4	31.6	7.8	16.9	1.099	1.033	483.4	
M-13B	1	1	3/12/2009	1147	1259	184.6	319.4	6.2	522.6	37.2	31.2	6.0	15.7	1.099	1.039	374.7	All times based on CEMS time
HF		2	3/12/2009	1309	1419	184.1	320.4	6.4	523.4	37.2	30.5	6.7	15.8	1.099	1.039	418.3	Bailey time = CEMS time
		3	3/12/2009	1433	1543	183.7	320.4	6.3	530.0	39.6	32.8	6.8	15.0	1.097	1.017	418.1	
					Avg	184.1	320.1	6.3	525.3	38.0	31.5	6.5	15.5	1.098	1.032	403.7	

Stack Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	2	1	3/10/2009	0651	0803	184.6	319.4	6.4	498.8	35.6	32.4	3.2	16.9	1.102	1.070	202.2	All times based on CEMS time
HCl		2	3/10/2009	0838	0938	183.8	321.5	6.5	511.2	40.0	34.4	5.6	16.3	1.102	1.070	361.4	Bailey time = CEMS time
		3	3/10/2009	1004	1104	184.1	319.6	6.4	511.4	38.9	34.3	4.7	18.5	1.102	1.070	299.8	
					Avg	184.2	320.1	6.4	507.2	38.2	33.7	4.5	17.2	1.102	1.070	287.8	
M-29/5	2	1	3/12/2009	0629	0840	184.6	320.0	6.5	501.8	36.6	32.2	4.4	20.1	1.098	1.028	269.6	All times based on CEMS time
Metals		2	3/12/2009	0858	1120	183.7	319.8	6.5	503.3	35.7	31.6	4.1	18.0	1.098	1.028	252.3	Bailey time = CEMS time
PM		3	3/12/2009	1139	1349	184.3	320.1	6.5	508.5	36.8	32.9	3.9	17.0	1.099	1.039	241.9	
					Avg	184.2	320.0	6.5	504.5	36.4	32.3	4.1	18.4	1.098	1.032	254.6	
M-13B	2	1	3/11/2009	0730	0848	184.4	329.8	6.5	500.0	34.6	24.9	9.8	24.7	1.098	1.028	602.1	All times based on CEMS time
HF		2	3/11/2009	1128	1246	184.0	319.8	6.4	512.4	38.8	32.8	6.0	19.0	1.097	1.017	366.8	Bailey time = CEMS time
		3	3/11/2009	1312	1424	183.5	320.2	6.6	516.9	40.6	32.9	7.7	18.4	1.097	1.017	468.8	
					Avg	184.0	323.3	6.5	509.8	38.0	30.2	7.8	20.7	1.097	1.021	479.2	

Stack Test Process Data

PLANT NAME: NORTH BROWARD 2009						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	3	1	3/11/2009	0657	0757	184.2	321.4	6.3	510.0	33.0	23.1	10.0	20.1	1.098	1.028	614.5	All times based on CEMS time
HCl		2	3/11/2009	0829	0929	182.9	320.6	6.0	518.1	36.1	30.1	6.0	15.6	1.098	1.028	371.4	Bailey time = CEMS time
		3	3/11/2009	1002	1102	183.9	319.7	5.7	520.3	36.7	32.1	4.6	15.6	1.098	1.028	284.4	
					Avg	183.7	320.6	6.0	516.1	35.3	28.4	6.9	17.1	1.098	1.028	423.4	
M-29/5	3	1	3/11/2009	0646	0858	184.0	320.9	6.2	511.5	33.9	25.6	8.3	18.6	1.098	1.028	510.8	All times based on CEMS time
Metals		2	3/11/2009	0924	1138	184.1	319.8	6.0	520.4	36.6	31.9	4.7	15.9	1.098	1.028	288.7	Bailey time = CEMS time
PM		3	3/11/2009	1158	1410	184.0	320.2	6.1	515.1	34.4	28.6	5.8	18.1	1.097	1.017	354.0	
					Avg	184.0	320.3	6.1	515.7	34.9	28.7	6.3	17.5	1.098	1.025	384.5	
M-13B	3	1	3/10/2009	0817	0932	184.8	319.9	6.0	524.1	37.2	31.6	5.6	16.5	1.102	1.070	361.4	All times based on CEMS time
HF		2	3/10/2009	1131	1249	184.6	319.8	6.0	518.6	34.5	28.6	5.9	17.4	1.101	1.060	377.8	Bailey time = CEMS time
		3	3/10/2009	1316	1430	183.9	320.1	6.1	518.2	34.0	26.5	7.5	17.5	1.101	1.060	477.0	
					Avg	184.4	319.9	6.0	520.3	35.2	28.9	6.4	17.1	1.101	1.063	405.4	

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 6:48
End Time: 9:03

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	5/29 run 1	521.16	319.59	36.49	29.30	7.19	16.29	306.07	6.26	-9.41
Unit 2		501.61	320.12	36.69	32.51	4.18	17.55	0.00	6.42	-11.31
Unit 3		523.03	320.18	36.48	31.51	4.97	16.28	309.02	6.13	-8.27

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		187.31	896.13	831.99	79.02	-0.09	273.32	1211.89	2.85	185.38
Unit 2		186.77	893.27	829.24	78.24	-0.10	273.72	1207.92	4.44	184.60
Unit 3		189.70	897.60	825.68	80.48	-0.09	280.03	1093.80	8.26	184.17

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 9:25
End Time: 11:37

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	5/29 run 2	527.74	320.11	38.69	31.70	6.99	15.53	306.33	6.26	-9.43
Unit 2		512.08	319.97	39.41	34.58	4.83	17.38	0.00	6.39	-11.37
Unit 3		521.88	319.90	35.48	28.40	7.08	16.85	308.08	6.02	-7.96

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		186.02	894.37	831.61	80.87	-0.10	273.27	1208.11	2.54	183.89
Unit 2		185.06	891.72	829.77	81.68	-0.10	273.67	1201.04	5.39	182.62
Unit 3		191.05	896.83	832.92	80.12	-0.09	279.97	1096.62	7.83	184.21

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 11:59
End Time: 14:13

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	5/29 run 3	531.36	320.08	39.39	31.99	7.40	15.36	306.24	6.23	-9.36
Unit 2		507.83	319.95	35.84	30.74	5.10	20.08	0.00	6.43	-11.04
Unit 3		517.87	319.93	33.99	27.48	6.51	17.59	308.16	6.03	-7.69

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.19	894.32	829.03	83.29	-0.10	273.50	1216.49	2.53	183.68
Unit 2		186.66	891.37	828.95	76.80	-0.11	273.89	1212.81	3.24	184.45
Unit 3		190.30	896.04	828.34	78.30	-0.08	280.15	1095.99	8.94	184.17

C-9

General Average Report

Reporting Period: 03/10/2009 to 03/10/2009

Site Name: UNIT1
Time of Report: 03/10/09 15:03

Data Averaging Type: 6m
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/10/09	06:48	0
	06:54	0
	07:00	0
	07:06	0
	07:12	0
	07:18	0
	07:24	0
	07:30	0
	07:36	0
	07:42	0
	07:48	0
	07:54	0
	08:00	0
	08:06	0
	08:12	0
	08:18	0
	08:24	0
	08:30	0
	08:36	0
	08:42	0
	08:48	0
	08:54	0
	09:00	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: NBWD
General Average Report
Reporting Period: 03/10/2009 to 03/10/2009

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/10/09 15:03
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/10/09	09:24	0
	09:30	0
	09:36	0
	09:42	0
	09:48	0
	09:54	0
	10:00	0
	10:06	0
	10:12	0
	10:18	0
	10:24	0
	10:30	0
	10:36	0
	10:42	0
	10:48	0
	10:54	0
	11:00	0
	11:06	0
	11:12	0
	11:18	0
	11:24	0
	11:30	0
	11:36	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: NBWD
General Average Report
Reporting Period: 03/10/2009 to 03/10/2009

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/10/09 15:03
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/10/09	11:54	0
	12:00	0
	12:06	0
	12:12	0
	12:18	0
	12:24	0
	12:30	0
	12:36	0
	12:42	0
	12:48	0
	12:54	0
	13:00	0
	13:06	0
	13:12	0
	13:18	0
	13:24	0
	13:30	0
	13:36	0
	13:42	0
	13:48	0
	13:54	0
	14:00	0
	14:06	0
	14:12	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	24
Included Values =	24
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 11:47
End Time: 12:59

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	13B run 1	522.56	319.39	37.17	31.16	6.00	15.67	303.68	6.22	-9.33
Unit 2		508.79	320.27	37.32	33.62	3.71	16.72	0.00	6.50	-11.18
Unit 3		524.38	319.92	37.63	28.69	8.95	16.58	308.54	6.04	-8.46

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	186.13	894.52	828.20	78.21	-0.10	273.20	1237.49	2.54	184.62
Unit 2	186.12	891.35	827.90	78.18	-0.10	273.66	1209.83	5.08	183.92
Unit 3	190.27	895.92	823.86	84.40	-0.11	279.83	1155.80	3.07	183.54

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 13:09
End Time: 14:19

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	13B run 2	523.37	320.41	37.21	30.50	6.71	15.81	304.35	6.40	-9.45
Unit 2		512.23	320.75	38.17	33.13	5.03	16.54	0.00	6.51	-11.24
Unit 3		531.05	320.16	39.71	34.56	5.15	15.84	309.21	6.15	-8.64

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.77	894.09	827.63	79.68	-0.10	273.31	1244.23	2.53	184.11
Unit 2		186.99	891.24	827.61	75.94	-0.08	273.67	1212.46	6.81	184.34
Unit 3		189.70	895.54	820.70	86.29	-0.10	279.84	1163.02	4.88	183.41

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 14:33
End Time: 15:43

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	13B run 3	530.02	320.36	39.62	32.77	6.85	14.96	305.53	6.27	-9.48
Unit 2		519.82	320.61	41.45	35.05	6.40	14.93	0.00	6.57	-11.51
Unit 3		525.48	319.66	37.03	31.31	5.72	16.71	308.60	5.97	-8.24

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.98	894.44	828.40	82.75	-0.09	273.57	1248.14	2.53	183.69
Unit 2		186.53	891.09	827.53	77.44	-0.09	273.91	1214.52	3.53	183.53
Unit 3		192.94	896.13	825.66	81.80	-0.09	280.04	1173.57	6.40	185.10

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 10:08
End Time: 14:30

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	23 run 1	530.28	319.85	39.04	31.78	7.26	15.46	306.11	6.23	-9.35
Unit 2		510.00	319.82	37.24	32.23	5.01	19.36	0.00	6.42	-11.17
Unit 3		519.80	319.95	34.62	28.15	6.48	17.27	308.22	6.02	-7.77

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.63	894.42	829.20	82.30	-0.10	273.47	1215.35	2.53	183.98
Unit 2		187.31	891.72	830.74	78.54	-0.10	273.86	1211.30	4.31	184.39
Unit 3		190.53	896.38	830.23	78.98	-0.09	280.14	1095.97	8.75	184.20

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 6:26
End Time: 11:05

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	23 run 2	521.92	321.72	38.52	29.64	8.88	16.06	307.50	6.29	-9.64
Unit 2		501.19	323.53	35.90	27.71	8.19	21.63	0.00	6.48	-11.09
Unit 3		515.97	320.45	35.43	28.65	6.78	17.07	307.64	6.02	-9.23

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.48	895.08	828.11	83.13	-0.10	272.95	1174.83	2.55	184.48
Unit 2		186.88	892.26	829.02	78.49	-0.09	273.44	1199.69	3.90	183.93
Unit 3		190.23	897.22	830.13	79.93	-0.10	279.59	1126.33	3.49	183.80

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 11:26
End Time: 15:45

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DI WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	23 run 3	528.89	320.12	40.52	32.63	7.89	15.38	305.52	6.30	-9.62
Unit 2		514.40	319.93	39.32	32.26	7.06	19.04	0.00	6.49	-11.19
Unit 3		515.56	320.00	34.66	28.68	5.98	17.98	307.39	6.05	-8.90

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.07	893.98	828.94	85.69	-0.10	273.11	1189.12	2.52	183.64
Unit 2		187.05	890.92	828.91	80.09	-0.10	273.55	1210.10	4.62	183.89
Unit 3		190.89	895.87	828.07	77.14	-0.10	279.75	1135.27	5.63	184.24

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 6:42
End Time: 11:13

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	23 run 4	525.32	319.04	39.38	32.21	7.18	20.86	304.31	6.29	-9.78
Unit 2		502.93	319.99	36.32	32.10	4.22	18.98	0.00	6.46	-11.13
Unit 3		515.37	320.23	34.09	27.82	6.26	18.04	307.72	6.11	-8.43

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.41	894.35	829.16	81.82	-0.10	273.14	1221.07	2.52	183.90
Unit 2		186.62	891.76	830.09	77.53	-0.10	273.61	1204.56	3.94	184.09
Unit 3		190.19	896.28	825.49	79.46	-0.10	279.75	1129.39	3.47	183.62

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 6:36
End Time: 7:36

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	26A run 1	522.89	319.94	38.70	31.88	6.81	15.80	305.28	6.29	-9.84
Unit 2		502.43	319.49	37.06	32.71	4.35	19.76	0.00	6.46	-11.28
Unit 3		507.49	320.21	31.99	25.92	6.07	19.16	307.26	6.16	-8.42

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.44	894.72	827.79	81.48	-0.09	273.25	1222.09	2.51	184.02
Unit 2		186.64	892.02	827.62	80.29	-0.08	273.81	1196.15	5.06	184.25
Unit 3		190.58	896.92	829.21	75.84	-0.11	279.84	1116.49	3.49	183.78

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 8:25
End Time: 9:25

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	26A run 2	525.67	317.00	39.84	33.00	6.84	23.16	302.81	6.19	-9.71
Unit 2		505.26	319.99	37.61	33.32	4.30	19.63	0.00	6.41	-11.18
Unit 3		516.41	320.22	34.39	29.61	4.78	17.81	307.97	6.05	-8.41

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		184.53	893.89	826.54	82.03	-0.11	273.08	1222.96	2.53	183.62
Unit 2		187.26	891.55	831.41	75.74	-0.10	273.54	1198.73	3.68	184.39
Unit 3		189.34	896.00	825.91	79.89	-0.10	279.69	1124.10	4.07	183.43

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 10:10
End Time: 11:10

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	26A run 3	527.28	320.10	40.07	31.35	8.72	25.04	304.66	6.31	-9.78
Unit 2		503.90	320.34	35.66	31.76	3.90	17.27	0.00	6.55	-11.14
Unit 3		522.79	320.55	36.26	27.84	8.42	16.98	307.84	5.99	-8.40

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.41	894.12	829.11	82.45	-0.10	273.14	1221.75	2.52	183.78
Unit 2		185.92	891.36	829.60	77.96	-0.09	273.56	1205.72	3.71	183.53
Unit 3		189.26	895.66	821.39	83.32	-0.10	279.80	1142.41	2.70	183.03

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 6:29
End Time: 8:40

	SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	522.97	318.99	38.78	32.59	6.19	17.11	304.81	6.27	-9.78
Unit 2 5/29 run 1	501.82	320.02	36.60	32.23	4.37	20.08	0.00	6.45	-11.20
Unit 3	509.35	320.10	32.44	26.95	5.49	18.89	307.29	6.20	-8.44

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.48	894.77	829.53	81.21	-0.10	273.27	1221.67	2.52	184.10
Unit 2	186.72	892.12	828.99	78.60	-0.09	273.79	1204.19	4.29	184.56
Unit 3	190.81	896.80	826.90	76.63	-0.10	279.85	1123.56	3.85	184.01

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 8:58
End Time: 11:20

	SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	527.58	319.71	39.88	31.91	7.98	23.27	304.27	6.31	-9.79
Unit 2 5/29 run 2	503.31	319.80	35.72	31.63	4.09	17.98	0.00	6.45	-11.02
Unit 3	520.08	320.23	35.41	27.73	7.68	17.40	307.98	6.10	-8.45

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.27	894.14	829.38	82.49	-0.10	272.99	1218.68	2.52	183.71
Unit 2	186.46	891.53	831.48	77.13	-0.10	273.42	1202.98	3.75	183.70
Unit 3	190.09	895.93	823.29	81.53	-0.10	279.62	1137.34	3.11	183.56

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/12/09
Start Time: 11:39
End Time: 13:49

		SDA INLET TEMP	SDA OUTLET 0:00	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1		522.60	319.54	36.96	31.08	5.88	15.80	303.78	6.27	-9.34
Unit 2	5/29 run 3	508.46	320.07	36.81	32.93	3.88	17.02	0.00	6.46	-11.08
Unit 3		526.98	320.13	38.52	30.76	7.76	16.26	308.82	6.11	-8.58

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	186.22	894.45	828.76	78.02	-0.10	273.23	1238.89	2.54	184.59
Unit 2	186.97	891.47	829.03	77.02	-0.10	273.64	1210.42	5.51	184.26
Unit 3	189.80	895.75	822.09	85.33	-0.10	279.83	1156.31	3.51	183.28

General Average Report

Reporting Period: 03/12/2009 to 03/12/2009

Site Name: UNIT2
Time of Report: 03/12/09 14:28

Data Averaging Type: 6m
Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/12/09	06:24	0
	06:30	0
	06:36	0
	06:42	0
	06:48	0
	06:54	0
	07:00	0
	07:06	0
	07:12	0
	07:18	0
	07:24	0
	07:30	0
	07:36	0
	07:42	0
	07:48	0
	07:54	0
	08:00	0
	08:06	0
	08:12	0
	08:18	0
	08:24	0
	08:30	0
	08:36	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: NBWD
General Average Report
Reporting Period: 03/12/2009 to 03/12/2009

Site Name: UNIT2
Data Averaging Type: 6m

Time of Report: 03/12/09 14:28
Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/12/09	08:54	0
	09:00	0
	09:06	0
	09:12	0
	09:18	0
	09:24	0
	09:30	0
	09:36	0
	09:42	0
	09:48	0
	09:54	0
	10:00	0
	10:06	0
	10:12	0
	10:18	0
	10:24	0
	10:30	0
	10:36	0
	10:42	0
	10:48	0
	10:54	0
	11:00	0
	11:06	0
	11:12	0
	11:18	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	25
Included Values =	25
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

General Average Report

Reporting Period: 03/12/2009 to 03/12/2009

Site Name: UNIT2
Time of Report: 03/12/09 14:29

Data Averaging Type: 6m
Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/12/09	11:36	0
	11:42	0
	11:48	0
	11:54	0
	12:00	0
	12:06	0
	12:12	0
	12:18	0
	12:24	0
	12:30	0
	12:36	0
	12:42	0
	12:48	0
	12:54	0
	13:00	0
	13:06	0
	13:12	0
	13:18	0
	13:24	0
	13:30	0
	13:36	0
	13:42	0
	13:48	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 7:30
End Time: 8:48

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1		520.47	319.86	38.22	29.29	8.93	15.81	306.98	6.25	-9.58
Unit 2	13B run 1	499.97	329.77	34.64	24.88	9.76	24.72	0.00	6.52	-11.22
Unit 3		511.76	320.14	34.13	27.36	6.77	17.41	307.46	6.11	-9.23

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		186.42	896.10	833.40	82.20	-0.10	273.21	1168.80	2.56	184.84
Unit 2		187.69	893.23	833.00	78.17	-0.10	273.72	1204.68	3.52	184.37
Unit 3		190.08	897.87	829.41	78.01	-0.10	279.79	1123.72	3.17	183.97

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 11:28
End Time: 12:46

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	524.51	320.11	39.00	30.28	8.71	15.75	304.83	6.40	-9.62
Unit 2 13B run 2	512.42	319.80	38.82	32.81	6.01	19.02	0.00	6.40	-10.85
Unit 3	512.39	319.69	33.08	27.64	5.45	18.59	307.16	6.06	-8.91

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	186.02	894.68	832.61	84.53	-0.09	273.55	1176.27	2.53	184.21
Unit 2	187.34	891.83	830.67	79.90	-0.10	273.99	1205.64	5.26	184.02
Unit 3	191.82	896.92	829.77	75.45	-0.10	280.25	1139.91	6.96	185.33

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 13:12
End Time: 14:24

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	529.05	319.94	40.37	33.00	7.37	15.44	305.54	6.29	-9.60
Unit 2 13B run 3	516.91	320.22	40.62	32.94	7.68	18.39	0.00	6.58	-11.50
Unit 3	517.35	320.11	35.52	29.93	5.60	17.54	307.52	6.06	-8.92

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	184.84	893.42	828.18	85.43	-0.09	272.37	1192.83	2.52	183.48
Unit 2	186.62	890.25	828.91	81.35	-0.10	272.82	1202.93	4.54	183.51
Unit 3	190.13	895.34	829.42	78.17	-0.10	278.96	1127.78	5.30	183.53

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 6:51
End Time: 8:03

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	521.32	319.54	37.11	29.60	7.52	15.98	306.32	6.20	-9.40
Unit 2 26A run 1	498.83	319.37	35.59	32.44	3.15	16.93	0.00	6.38	-11.17
Unit 3	521.25	320.30	35.65	30.37	5.29	16.65	309.14	6.12	-8.20

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	187.14	896.36	832.60	81.43	-0.08	273.21	1216.71	2.92	185.26
Unit 2	187.32	893.53	832.63	76.21	-0.09	273.58	1211.54	4.72	184.58
Unit 3	189.45	897.73	826.31	80.20	-0.09	279.90	1088.42	7.52	183.98

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 8:38
End Time: 9:38

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	522.01	320.25	36.26	29.41	6.85	16.40	305.80	6.42	-9.52
Unit 2 26A run 2	511.24	321.46	40.01	34.38	5.63	16.25	0.00	6.45	-11.54
Unit 3	522.78	319.50	36.64	30.42	6.23	16.22	308.20	6.00	-8.11

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	186.74	895.39	831.52	77.12	-0.10	273.47	1205.27	2.59	184.76
Unit 2	186.27	892.86	829.41	83.23	-0.11	273.93	1207.63	4.06	183.81
Unit 3	190.94	897.60	827.77	79.87	-0.10	280.18	1103.43	9.36	185.13

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 10:04
End Time: 11:04

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1		529.06	319.58	39.08	32.02	7.05	15.39	306.29	6.16	-9.32
Unit 2	26A run 3	511.40	319.60	38.93	34.26	4.67	18.47	0.00	6.40	-11.33
Unit 3		522.49	319.76	35.54	28.72	6.82	16.84	308.10	5.88	-7.82

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		186.73	894.39	829.52	80.04	-0.10	273.36	1211.30	2.56	184.36
Unit 2		187.24	892.08	830.28	80.69	-0.10	273.72	1201.32	5.67	184.11
Unit 3		190.57	896.82	831.46	80.20	-0.09	280.03	1091.70	7.32	184.25

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 6:46
End Time: 8:58

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1		520.77	321.90	38.17	29.21	8.96	16.19	308.61	6.32	-9.70
Unit 2		498.63	327.32	34.79	25.79	9.00	23.66	0.00	6.46	-11.16
Unit 3	5/29 run 1	511.50	320.91	33.89	25.61	8.28	18.60	307.50	6.15	-9.26

		FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
		KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1		185.90	895.75	832.18	82.96	-0.10	272.90	1166.75	2.56	184.43
Unit 2		186.93	892.63	829.44	78.30	-0.09	273.42	1200.05	3.48	184.26
Unit 3		190.19	897.57	829.00	77.94	-0.10	279.52	1122.81	3.26	184.00

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 9:24
End Time: 11:38

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	523.65	319.98	39.14	31.12	8.02	15.52	305.38	6.26	-9.55
Unit 2	507.43	320.27	38.14	30.97	7.16	19.16	0.00	6.61	-11.07
Unit 3 5/29 run 2	520.38	319.79	36.56	31.88	4.68	15.90	307.65	6.03	-9.20

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	ZSH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	184.52	894.23	825.56	84.25	-0.10	273.01	1192.00	2.54	183.98
Unit 2	186.56	891.83	829.81	79.67	-0.09	273.40	1200.73	4.90	183.51
Unit 3	190.67	896.82	830.14	81.27	-0.10	279.66	1134.36	4.42	184.10

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 11:58
End Time: 14:10

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	527.42	320.09	39.94	31.29	8.65	15.59	305.27	6.34	-9.62
Unit 2	514.64	320.22	39.70	33.23	6.48	18.83	0.00	6.51	-11.32
Unit 3 5/29 run 3	515.08	320.15	34.37	28.57	5.80	18.13	307.42	6.05	-8.86

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.29	893.70	828.91	85.20	-0.10	272.90	1183.75	2.52	183.81
Unit 2	186.69	890.66	828.02	80.53	-0.09	273.37	1203.83	5.03	183.72
Unit 3	190.41	895.66	827.78	77.25	-0.10	279.56	1136.47	5.05	183.95

Site Name: UNIT3
Data Averaging Type: 6m

Time of Report: 03/12/09 05:34
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/11/09	06:42	0
	06:48	0
	06:54	0
	07:00	0
	07:06	0
	07:12	0
	07:18	0
	07:24	0
	07:30	0
	07:36	0
	07:42	0
	07:48	0
	07:54	0
	08:00	0
	08:06	0
	08:12	0
	08:18	0
	08:24	0
	08:30	0
	08:36	0
	08:42	0
	08:48	0
	08:54	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

General Average Report

Reporting Period: 03/11/2009 to 03/11/2009

Site Name: UNIT3
Time of Report: 03/12/09 05:34

Data Averaging Type: 6m
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/11/09	09:24	0
	09:30	0
	09:36	0
	09:42	0
	09:48	0
	09:54	0
	10:00	0
	10:06	0
	10:12	0
	10:18	0
	10:24	0
	10:30	0
	10:36	0
	10:42	0
	10:48	0
	10:54	0
	11:00	0
	11:06	0
	11:12	0
	11:18	0
	11:24	0
	11:30	0
	11:36	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: NBWD
General Average Report
Reporting Period: 03/11/2009 to 03/11/2009

Site Name: UNIT3
Data Averaging Type: 6m

Time of Report: 03/12/09 05:35
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/11/09	11:54	0
	12:00	0
	12:06	0
	12:12	0
	12:18	0
	12:24	0
	12:30	0
	12:36	0
	12:42	0
	12:48	0
	12:54	0
	13:00	0
	13:06	0
	13:12	0
	13:18	0
	13:24	0
	13:30	0
	13:36	0
	13:42	0
	13:48	0
	13:54	0
	14:00	0
	14:06	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 8:17
End Time: 9:32

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	521.50	320.10	36.00	29.21	6.78	16.51	305.76	6.37	-9.46
Unit 2	509.50	321.90	39.40	33.87	5.53	17.02	0.00	6.46	-11.56
Unit 3 13B run 1	524.10	319.85	37.20	31.57	5.64	15.96	308.56	6.03	-8.19

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	186.92	895.54	830.41	76.60	-0.10	273.45	1206.21	2.66	185.13
Unit 2	185.96	892.96	827.86	82.73	-0.11	273.90	1205.64	4.11	184.36
Unit 3	190.51	897.54	826.56	80.42	-0.10	280.17	1102.14	9.27	184.80

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 11:31
End Time: 12:49

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	529.43	320.04	38.90	31.38	7.51	15.56	306.08	6.20	-9.31
Unit 2	509.61	319.23	36.97	31.92	5.05	19.54	0.00	6.46	-11.16
Unit 3 13B run 2	518.57	319.81	34.50	28.56	5.94	17.38	308.40	5.96	-7.65

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.86	894.46	827.72	82.31	-0.11	273.59	1211.57	2.54	184.11
Unit 2	187.60	891.91	831.69	77.75	-0.11	273.98	1214.43	4.19	184.70
Unit 3	191.10	896.59	830.80	78.44	-0.09	280.24	1098.08	10.16	184.60

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/10/09
Start Time: 13:16
End Time: 14:30

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	532.91	319.77	39.57	32.68	6.89	15.23	306.10	6.21	-9.33
Unit 2	509.99	320.72	36.68	31.54	5.14	19.52	0.00	6.47	-11.20
Unit 3 13B run 3	518.24	320.06	33.97	26.47	7.50	17.51	308.18	6.13	-7.80

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	184.83	894.42	831.34	83.55	-0.11	273.30	1222.37	2.53	183.69
Unit 2	185.40	890.95	827.77	78.76	-0.09	273.68	1209.06	3.15	183.86
Unit 3	189.43	895.58	825.01	78.38	-0.08	279.95	1098.40	8.26	183.91

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 6:57
End Time: 7:57

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	520.73	321.57	38.82	28.44	10.39	15.80	309.79	6.33	-9.76
Unit 2	496.70	330.94	32.27	25.31	6.96	28.26	0.00	6.42	-11.22
Unit 3 26A run 1	510.01	321.36	33.01	23.05	9.96	20.14	307.43	6.29	-9.37

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.64	895.67	833.92	84.33	-0.10	272.56	1168.46	2.55	183.99
Unit 2	186.27	892.24	828.81	78.82	-0.11	273.05	1196.72	3.34	183.61
Unit 3	189.98	897.34	827.07	77.57	-0.10	279.17	1116.67	3.23	184.19

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 8:29
End Time: 9:29

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	522.35	320.23	38.91	31.81	7.10	15.41	306.09	6.27	-9.63
Unit 2	501.27	320.34	36.43	25.74	10.69	19.78	0.00	6.56	-10.89
Unit 3 26A run 2	518.10	320.63	36.07	30.05	6.02	15.59	308.03	6.03	-9.33

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	185.44	895.08	826.17	81.92	-0.10	273.35	1167.32	2.58	184.59
Unit 2	187.26	892.74	829.65	77.01	-0.10	273.90	1205.37	3.18	184.52
Unit 3	189.54	897.50	834.06	80.90	-0.10	279.97	1128.27	3.76	182.94

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/11/09
Start Time: 10:02
End Time: 11:02

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	523.00	319.84	38.81	30.52	8.29	15.69	305.32	6.31	-9.56
Unit 2	506.27	319.95	37.05	32.44	4.61	19.74	0.00	6.50	-11.01
Unit 3 26A run 3	520.27	319.68	36.74	32.13	4.61	15.61	307.66	5.69	-8.85

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	184.08	894.05	822.27	84.10	-0.11	273.14	1197.10	2.54	184.13
Unit 2	186.87	891.78	828.57	78.81	-0.10	273.47	1198.77	4.32	183.66
Unit 3	189.80	896.61	828.11	81.82	-0.10	279.78	1136.22	3.34	183.92

Wheelabrator - N. Broward

2600 N.W. 48th Street
Pompano Beach, FL 33073
Tel: (954) 971-8701 Fax: (954) 971-8703

Ticket 274039

3/12/2009

In 7:43:59AM
Out 10:08:56AM

Account	623030
Customer	Chemical Lime Chemical Lime PO Box 7247-8945 Philadelphia. PA
Decal #	LIME1
Vehicle #	LIME1
Auto ID	0
Other	2357416
Product	9020 Lime
Qty	**25.81 Ton**
Origin	Wheelabrator No
Operator	Olivia Smith

Price/Ton	0.00
Fees	0.00
Other	0.00
Total	0.00

	Pounds	Tons
Gross	78840	39.42
Tare	27220	13.61
Net	51620	25.81

Wheelabrator - N. Broward

2600 N.W. 48th Street
Pompano Beach, FL 33073
Tel: (954) 971-8701 Fax: (954) 971-8703

Ticket 274039

3/12/2009

In 7:43:59AM
Out 10:08:56AM

Account	623030
Customer	Chemical Lime Chemical Lime PO Box 7247-8945 Philadelphia. PA
Decal #	LIME1
Vehicle #	LIME1
Auto ID	0
Other	2357416
Product	9020
Qty	**25.81 Ton**
Origin	Wheelabrator No
Operator	Olivia Smith

Price/Ton	0.00
Fees	0.00
Other	0.00
Total	0.00

	Pounds	Tons
Gross	78840	39.42
Tare	27220	13.61
Net	51620	25.81

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PARAMETERS

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9916	0.9916	0.9916	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-9.4000	-9.4000	-9.4000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.25	30.25	30.25	**30.2500**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7200	80.3000	80.3200	**80.4467**
V_{lc}	Total Liquid collected (ml)	412.40	421.90	390.80	
V_m	Volume metered, meter conditions (ft^3)	65.6700	70.3650	70.0350	
T_m	Dry gas meter temperature (°F)	68.4000	79.5000	86.9600	
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
ΔH	Meter box orifice pressure drop (in. H_2O)	0.9668	1.0440	1.0388	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	19.4075	19.8546	18.3910	**19.2177**
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
P_s	Sample gas pressure, absolute (in. Hg)	29.5588	29.5588	29.5588	**29.5588**
P_v	Vapor pressure, actual (in. Hg)	29.5588	29.5588	29.5588	**29.5588**
B_{wo}	Moisture measured in sample (% by volume)	22.7461	22.2981	21.3072	**22.1171**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6324	0.6670	0.6633	**0.6542**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1740	30.1560	30.1408	**30.1569**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4049	27.4454	27.5539	**27.4681**
V_s	Velocity of sample (ft/sec)	42.7161	45.0336	44.6840	**44.1446**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00090	0.00010	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00205	0.00003	0.00006	
m_n	Total particulate matter collected (g)	0.00295	<0.00020	<0.00020	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	9.8580E-08	<6.3740E-09	<6.4927E-09	**<3.7149E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	1.0295E-07	<7.0316E-09	<7.2198E-09	**<3.9067E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	1.0119E-07	<6.7095E-09	<6.9071E-09	**<3.8270E-08**
C_a	Particulate Concentration (lb/acf)	5.1796E-08	<3.3663E-09	<3.4746E-09	**<1.9546E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0007	<0.0000	<0.0000	**<0.0003**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0007	<0.0000	<0.0001	**<0.0003**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0007	<0.0000	<0.0000	**<0.0003**
C_a	Particulate Concentration (gr/acf)	0.0004	<0.0000	<0.0000	**<0.0001**
C_{sd}	Particulate Concentration (mg/dscm)	1.5786	<0.1021	<0.1040	**<0.5949**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	1.6486	<0.1126	<0.1156	**<0.6256**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	1.6205	<0.1074	<0.1106	**<0.6128**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.8294	<0.0539	<0.0556	**<0.3130**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	1.6941	<0.1095	<0.1116	**<0.6384**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	1.7692	<0.1208	<0.1241	**<0.6714**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	1.7390	<0.1153	<0.1187	**<0.6577**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.5098	<0.0349	<0.0358	**<0.1935**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.2312	<0.0158	<0.0162	**<0.0877**
$E_{T/yr}$	Particulate Rate (Ton/yr)	2.2328	<0.1530	<0.1567	**<0.8475**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0015	<0.00010	<0.00010	**<0.00056**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0015	<0.00010	<0.00010	**<0.00058**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_a	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	12.6653	13.9374	15.6810	
m_{n-3a}	Fraction 3A (µg)	0.2294	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
m_{n-3c}	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	12.8947	13.9374	15.6810	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	4.3136E-10	4.4418E-10	5.0906E-10	**4.6153E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.5048E-10	4.9001E-10	5.6607E-10	**5.0219E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.4279E-10	4.6756E-10	5.4155E-10	**4.8397E-10**
C_a	Concentration (lb/acf)	2.2664E-10	2.3459E-10	2.7242E-10	**2.4455E-10**
C_{sd}	Concentration (µg/dscm)	6.9076E+00	7.1130E+00	8.1518E+00	**7.3908E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.2138E+00	7.8469E+00	9.0649E+00	**8.0418E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	7.0907E+00	7.4874E+00	8.6722E+00	**7.7501E+00**
C_{sd}	Concentration (mg/dscm)	6.9076E-03	7.1130E-03	8.1518E-03	**7.3908E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	7.2138E-03	7.8469E-03	9.0649E-03	**8.0418E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	7.0907E-03	7.4874E-03	8.6722E-03	**7.7501E-03**
C_a	Concentration (µg/m^3 (actual,wet))	3.6294E+00	3.7566E+00	4.3625E+00	**3.9162E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	7.4130E+00	7.6335E+00	8.7483E+00	**7.9316E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.7416E+00	8.4210E+00	9.7281E+00	**8.6303E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	7.6096E+00	8.0352E+00	9.3067E+00	**8.3172E+00**
$E_{lb/hr}$	Rate (lb/hr)	2.2306E-03	2.4340E-03	2.8046E-03	**2.4898E-03**
$E_{g/s}$	Rate (g/s)	2.8100E-04	3.0663E-04	3.5332E-04	**3.1365E-04**
$E_{T/yr}$	Rate (Ton/yr)	9.7699E-03	1.0661E-02	1.2284E-02	**1.0905E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.4821E-06	7.0510E-06	8.1455E-06	**7.2262E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.7157E-06	7.0914E-06	8.2135E-06	**7.3402E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Front Half Results

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Mercury Results - Front Half					
C_{sd}	Concentration (lb/dscf)	<3.3452E-12	<3.1870E-12	<3.2463E-12	**<3.2595E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.4935E-12	<3.5158E-12	<3.6099E-12	**<3.5397E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.4339E-12	<3.3547E-12	<3.4535E-12	**<3.4141E-12**
C_a	Concentration (lb/acf)	<1.7576E-12	<1.6832E-12	<1.7373E-12	**<1.7260E-12**
C_{sd}	Concentration (µg/dscm)	<5.3569E-02	<5.1035E-02	<5.1986E-02	**<5.2197E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.5944E-02	<5.6301E-02	<5.7808E-02	**<5.6684E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.4990E-02	<5.3721E-02	<5.5304E-02	**<5.4672E-02**
C_{sd}	Concentration (mg/dscm)	<5.3569E-05	<5.1035E-05	<5.1986E-05	**<5.2197E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.5944E-05	<5.6301E-05	<5.7808E-05	**<5.6684E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.4990E-05	<5.3721E-05	<5.5304E-05	**<5.4672E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.8146E-02	<2.6954E-02	<2.7820E-02	**<2.7640E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<5.7489E-02	<5.4770E-02	<5.5789E-02	**<5.6016E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<6.0037E-02	<6.0421E-02	<6.2038E-02	**<6.0832E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<5.9013E-02	<5.7652E-02	<5.9350E-02	**<5.8672E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.7298E-05	<1.7464E-05	<1.7886E-05	**<1.7549E-05**
$E_{g/s}$	Rate (g/s)	<2.1792E-06	<2.2001E-06	<2.2532E-06	**<2.2108E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.5767E-05	<7.6493E-05	<7.8339E-05	**<7.6866E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<5.0270E-08	<5.0591E-08	<5.1945E-08	**<5.0935E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.2081E-08	<5.0880E-08	<5.2379E-08	**<5.1780E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 1-3 Results

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Mercury Results - Impingers 1-3 Solution					
C_{sd}	Concentration (lb/dscf)	4.2368E-10	4.4418E-10	5.0906E-10	**4.5898E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.4246E-10	4.9001E-10	5.6607E-10	**4.9952E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.3492E-10	4.6756E-10	5.4155E-10	**4.8134E-10**
C_a	Concentration (lb/acf)	2.2261E-10	2.3459E-10	2.7242E-10	**2.4321E-10**
C_{sd}	Concentration (µg/dscm)	6.7847E+00	7.1130E+00	8.1518E+00	**7.3498E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.0854E+00	7.8469E+00	9.0649E+00	**7.9991E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.9646E+00	7.4874E+00	8.6722E+00	**7.7081E+00**
C_{sd}	Concentration (mg/dscm)	6.7847E-03	7.1130E-03	8.1518E-03	**7.3498E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	7.0854E-03	7.8469E-03	9.0649E-03	**7.9991E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.9646E-03	7.4874E-03	8.6722E-03	**7.7081E-03**
C_a	Concentration (µg/m^3 (actual,wet))	3.5648E+00	3.7566E+00	4.3625E+00	**3.8946E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	7.2811E+00	7.6335E+00	8.7483E+00	**7.8876E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.6039E+00	8.4210E+00	9.7281E+00	**8.5844E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	7.4742E+00	8.0352E+00	9.3067E+00	**8.2721E+00**
$E_{lb/hr}$	Rate (lb/hr)	2.1909E-03	2.4340E-03	2.8046E-03	**2.4765E-03**
$E_{g/s}$	Rate (g/s)	2.7600E-04	3.0663E-04	3.5332E-04	**3.1198E-04**
$E_{T/yr}$	Rate (Ton/yr)	9.5961E-03	1.0661E-02	1.2284E-02	**1.0847E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.3668E-06	7.0510E-06	8.1455E-06	**7.1878E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.5963E-06	7.0914E-06	8.2135E-06	**7.3004E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 4 Results

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Mercury Results - Impinger 4 Solution					
C_{ad}	Concentration (lb/dscf)	7.6724E-12	<6.3740E-12	<6.4927E-12	**<6.8464E-12**
C_{ad7}	Concentration @7% O_2 (lb/dscf)	8.0125E-12	<7.0316E-12	<7.2198E-12	**<7.4213E-12**
C_{ad12}	Concentration @12% CO_2 (lb/dscf)	7.8759E-12	<6.7095E-12	<6.9071E-12	**<7.1642E-12**
C_a	Concentration (lb/acf)	4.0313E-12	<3.3663E-12	<3.4746E-12	**<3.6241E-12**
C_{sd}	Concentration (µg/dscm)	1.2286E-01	<1.0207E-01	<1.0397E-01	**<1.0964E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.2831E-01	<1.1260E-01	<1.1562E-01	**<1.1884E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.2612E-01	<1.0744E-01	<1.1061E-01	**<1.1472E-01**
C_{sd}	Concentration (mg/dscm)	1.2286E-04	<1.0207E-04	<1.0397E-04	**<1.0964E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.2831E-04	<1.1260E-04	<1.1562E-04	**<1.1884E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.2612E-04	<1.0744E-04	<1.1061E-04	**<1.1472E-04**
C_a	Concentration (µg/m^3 (actual,wet))	6.4555E-02	<5.3907E-02	<5.5640E-02	**<5.8034E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	1.3185E-01	<1.0954E-01	<1.1158E-01	**<1.1766E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.3770E-01	<1.2084E-01	<1.2408E-01	**<1.2754E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.3535E-01	<1.1530E-01	<1.1870E-01	**<1.2312E-01**
$E_{lb/hr}$	Rate (lb/hr)	3.9675E-05	<3.4928E-05	<3.5771E-05	**<3.6791E-05**
$E_{g/s}$	Rate (g/s)	4.9981E-06	<4.4001E-06	<4.5063E-06	**<4.6349E-06**
$E_{T/yr}$	Rate (Ton/yr)	1.7378E-04	<1.5299E-04	<1.5668E-04	**<1.6115E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1530E-07	<1.0118E-07	<1.0389E-07	**<1.0679E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.1945E-07	<1.0176E-07	<1.0476E-07	**<1.0866E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 5-6 Results

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Mercury Results - Filtered Permanganate Solution					
C_{sd}	Concentration (lb/dscf)	<1.6726E-11	<1.5935E-11	<1.6232E-11	**<1.6298E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7468E-11	<1.7579E-11	<1.8050E-11	**<1.7699E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7170E-11	<1.6774E-11	<1.7268E-11	**<1.7070E-11**
C_a	Concentration (lb/acf)	<8.7882E-12	<8.4159E-12	<8.6864E-12	**<8.6302E-12**
C_{sd}	Concentration (µg/dscm)	<2.6785E-01	<2.5518E-01	<2.5993E-01	**<2.6098E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.7972E-01	<2.8150E-01	<2.8904E-01	**<2.8342E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7495E-01	<2.6861E-01	<2.7652E-01	**<2.7336E-01**
C_{sd}	Concentration (mg/dscm)	<2.6785E-04	<2.5518E-04	<2.5993E-04	**<2.6098E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.7972E-04	<2.8150E-04	<2.8904E-04	**<2.8342E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7495E-04	<2.6861E-04	<2.7652E-04	**<2.7336E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.4073E-01	<1.3477E-01	<1.3910E-01	**<1.3820E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.8744E-01	<2.7385E-01	<2.7895E-01	**<2.8008E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0019E-01	<3.0210E-01	<3.1019E-01	**<3.0416E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9507E-01	<2.8826E-01	<2.9675E-01	**<2.9336E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.6492E-05	<8.7321E-05	<8.9428E-05	**<8.7747E-05**
$E_{g/s}$	Rate (g/s)	<1.0896E-05	<1.1000E-05	<1.1266E-05	**<1.1054E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.7883E-04	<3.8247E-04	<3.9170E-04	**<3.8433E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5135E-07	<2.5295E-07	<2.5972E-07	**<2.5467E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6041E-07	<2.5440E-07	<2.6189E-07	**<2.5890E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate					
C_{sd}	Concentration (lb/dscf)	<1.3381E-11	<1.2748E-11	<1.2985E-11	**<1.3038E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.3974E-11	<1.4063E-11	<1.4440E-11	**<1.4159E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.3736E-11	<1.3419E-11	<1.3814E-11	**<1.3656E-11**
C_a	Concentration (lb/acf)	<7.0306E-12	<6.7327E-12	<6.9491E-12	**<6.9041E-12**
C_{sd}	Concentration (µg/dscm)	<2.1428E-01	<2.0414E-01	<2.0794E-01	**<2.0879E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.2377E-01	<2.2520E-01	<2.3123E-01	**<2.2674E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.1996E-01	<2.1489E-01	<2.2122E-01	**<2.1869E-01**
C_{sd}	Concentration (mg/dscm)	<2.1428E-04	<2.0414E-04	<2.0794E-04	**<2.0879E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.2377E-04	<2.2520E-04	<2.3123E-04	**<2.2674E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.1996E-04	<2.1489E-04	<2.2122E-04	**<2.1869E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.1259E-01	<1.0781E-01	<1.1128E-01	**<1.1056E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.2995E-01	<2.1908E-01	<2.2316E-01	**<2.2406E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.4015E-01	<2.4168E-01	<2.4815E-01	**<2.4333E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.3605E-01	<2.3061E-01	<2.3740E-01	**<2.3469E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.9194E-05	<6.9857E-05	<7.1543E-05	**<7.0198E-05**
$E_{g/s}$	Rate (g/s)	<8.7168E-06	<8.8003E-06	<9.0127E-06	**<8.8432E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.0307E-04	<3.0597E-04	<3.1336E-04	**<3.0747E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.0108E-07	<2.0236E-07	<2.0778E-07	**<2.0374E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.0832E-07	<2.0352E-07	<2.0952E-07	**<2.0712E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_a	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.6726E-12	<1.5935E-12	<1.6232E-12	**<1.6298E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7468E-12	<1.7579E-12	<1.8050E-12	**<1.7699E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7170E-12	<1.6774E-12	<1.7268E-12	**<1.7070E-12**
C_a	Concentration (lb/acf)	<8.7882E-13	<8.4159E-13	<8.6864E-13	**<8.6302E-13**
C_{sd}	Concentration (µg/dscm)	<2.6785E-02	<2.5518E-02	<2.5993E-02	**<2.6098E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.7972E-02	<2.8150E-02	<2.8904E-02	**<2.8342E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7495E-02	<2.6861E-02	<2.7652E-02	**<2.7336E-02**
C_{sd}	Concentration (mg/dscm)	<2.6785E-05	<2.5518E-05	<2.5993E-05	**<2.6098E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.7972E-05	<2.8150E-05	<2.8904E-05	**<2.8342E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7495E-05	<2.6861E-05	<2.7652E-05	**<2.7336E-05**
C_s	Concentration (µg/m^3 (actual,wet))	<1.4073E-02	<1.3477E-02	<1.3910E-02	**<1.3820E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.8744E-02	<2.7385E-02	<2.7895E-02	**<2.8008E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0019E-02	<3.0210E-02	<3.1019E-02	**<3.0416E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9507E-02	<2.8826E-02	<2.9675E-02	**<2.9336E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.6492E-06	<8.7321E-06	<8.9428E-06	**<8.7747E-06**
$E_{g/s}$	Rate (g/s)	<1.0896E-06	<1.1000E-06	<1.1266E-06	**<1.1054E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7883E-05	<3.8247E-05	<3.9170E-05	**<3.8433E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5135E-08	<2.5295E-08	<2.5972E-08	**<2.5467E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6041E-08	<2.5440E-08	<2.6189E-08	**<2.5890E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.6369	<0.2009	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	2.1304E-11	<6.4041E-12	<6.4927E-12	**<1.1400E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.2249E-11	<7.0649E-12	<7.2198E-12	**<1.2178E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.1869E-11	<6.7412E-12	<6.9071E-12	**<1.1839E-11**
C_a	Concentration (lb/acf)	1.1194E-11	<3.3823E-12	<3.4746E-12	**<6.0168E-12**
C_{sd}	Concentration (µg/dscm)	3.4116E-01	<1.0255E-01	<1.0397E-01	**<1.8256E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.5628E-01	<1.1313E-01	<1.1562E-01	**<1.9501E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.5020E-01	<1.0795E-01	<1.1061E-01	**<1.8959E-01**
C_{sd}	Concentration (mg/dscm)	3.4116E-04	<1.0255E-04	<1.0397E-04	**<1.8256E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.5628E-04	<1.1313E-04	<1.1562E-04	**<1.9501E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.5020E-04	<1.0795E-04	<1.1061E-04	**<1.8959E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.7925E-01	<5.4162E-02	<5.5640E-02	**<9.6351E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	3.6612E-01	<1.1006E-01	<1.1158E-01	**<1.9592E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.8235E-01	<1.2141E-01	<1.2408E-01	**<2.0928E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.7583E-01	<1.1585E-01	<1.1870E-01	**<2.0346E-01**
$E_{lb/hr}$	Rate (lb/hr)	1.1017E-04	<3.5093E-05	<3.5771E-05	**<6.0343E-05**
$E_{g/s}$	Rate (g/s)	1.3878E-05	<4.4209E-06	<4.5063E-06	**<7.6018E-06**
$E_{T/yr}$	Rate (Ton/yr)	4.8252E-04	<1.5371E-04	<1.5668E-04	**<2.6430E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.2014E-07	<1.0166E-07	<1.0389E-07	**<1.7523E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.3168E-07	<1.0224E-07	<1.0476E-07	**<1.7956E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:48	09:25	11:59	
Stop Time (approx.)		09:03	11:37	14:13	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.4	183.9	183.7	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.5900	8.3000	8.4000	**8.0967**
CO_2	Carbon dioxide (dry volume %)	11.6900	11.4000	11.2800	**11.4567**
T_s	Sample temperature (°F)	306.9600	307.4400	307.0400	**307.1467**
B_w	Actual water vapor in gas (% by volume)	22.7461	22.2981	21.3072	**22.1171**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	164,030	172,929	171,587	**169,515**
Q_s	Volumetric flow rate, standard (scfm)	111,560	117,539	116,688	**115,262**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,185	91,330	91,825	**89,780**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,526	82,789	82,576	**82,630**
Q_a	Volumetric flow rate, actual (acf/hr)	9,841,788	10,375,743	10,295,196	**10,170,909**
Q_s	Volumetric flow rate, standard (scf/hr)	6,693,616	7,052,357	7,001,258	**6,915,744**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,171,079	5,479,818	5,509,487	**5,386,795**
Q_a	Volumetric flow rate, actual (m^3/hr)	278,725	293,847	291,566	**288,046**
Q_s	Volumetric flow rate, standard (m^3/hr)	189,567	199,727	198,280	**195,858**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	146,448	155,192	156,032	**152,557**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,232	140,677	140,316	**140,409**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	176,642	186,109	184,761	**182,504**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	136,463	144,610	145,393	**142,156**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,671	131,086	130,749	**130,835**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.9150	69.1873	67.9228	**67.6750**
%I	Isokinetic sampling (%)	100.0190	99.0695	96.7350	**98.6078**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.8752	0.9408	0.6833	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	2.9277E-11	2.9982E-11	2.2181E-11	**2.7147E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.0575E-11	3.3076E-11	2.4665E-11	**2.9439E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.0054E-11	3.1560E-11	2.3597E-11	**2.8404E-11**
C_a	Concentration (lb/acf)	1.5383E-11	1.5835E-11	1.1870E-11	**1.4363E-11**
C_{sd}	Concentration (µg/dscm)	4.6884E-01	4.8012E-01	3.5520E-01	**4.3472E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.8962E-01	5.2966E-01	3.9498E-01	**4.7142E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.8127E-01	5.0539E-01	3.7787E-01	**4.5484E-01**
C_{sd}	Concentration (mg/dscm)	4.6884E-04	4.8012E-04	3.5520E-04	**4.3472E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.8962E-04	5.2966E-04	3.9498E-04	**4.7142E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.8127E-04	5.0539E-04	3.7787E-04	**4.5484E-04**
C_a	Concentration (µg/m^3 (actual,wet))	2.4634E-01	2.5357E-01	1.9008E-01	**2.3000E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	5.0314E-01	5.1525E-01	3.8119E-01	**4.6653E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	5.2545E-01	5.6842E-01	4.2388E-01	**5.0591E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	5.1648E-01	5.4237E-01	4.0552E-01	**4.8813E-01**
$E_{lb/hr}$	Rate (lb/hr)	1.5140E-04	1.6430E-04	1.2221E-04	**1.4597E-04**
$E_{g/s}$	Rate (g/s)	1.9072E-05	2.0698E-05	1.5395E-05	**1.8388E-05**
$E_{T/yr}$	Rate (Ton/yr)	6.6311E-04	7.1962E-04	5.3526E-04	**6.3933E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.3996E-07	4.7594E-07	3.5492E-07	**4.2361E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.5582E-07	4.7866E-07	3.5788E-07	**4.3079E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		11:47	13:09	14:33	
Stop Time (approx.)		12:59	14:19	15:43	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9916	0.9916	0.9916	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-9.7000	-9.7000	-9.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
D_n	Nozzle diameter (in.)	0.2720	0.2720	0.2720	
O_2	Oxygen (dry volume %)	8.4900	8.5700	8.6100	**8.5567**
CO_2	Carbon dioxide (dry volume %)	11.3700	11.4700	11.1800	**11.3400**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.1400	79.9600	80.2100	**80.1033**
V_{lc}	Total Liquid collected (ml)	219.10	216.90	223.80	
V_m	Volume metered, meter conditions (ft^3)	38.7800	38.5250	40.5050	
T_m	Dry gas meter temperature (°F)	79.6000	84.2000	82.7800	
T_s	Sample temperature (°F)	303.9600	305.3600	305.9600	**305.0933**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2800	1.1576	1.3960	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.3108	10.2073	10.5320	**10.3501**
V_{mstd}	Volume metered, standard (dscf)	38.0828	37.5015	39.5549	**38.3797**
P_s	Sample gas pressure, absolute (in. Hg)	29.4868	29.4868	29.4868	**29.4868**
P_v	Vapor pressure, actual (in. Hg)	29.4868	29.4868	29.4868	**29.4868**
B_{wo}	Moisture measured in sample (% by volume)	21.3062	21.3950	21.0275	**21.2429**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.3062	21.3950	21.0275	**21.2429**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6836	0.6636	0.7216	**0.6896**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1588	30.1780	30.1332	**30.1567**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5682	27.5725	27.5819	**27.5742**
V_s	Velocity of sample (ft/sec)	46.7384	45.4129	49.3873	**47.1795**
%I	Isokinetic sampling (%)	100.5182	102.1751	98.7132	**100.4688**
Q_a	Volumetric flow rate, actual (acfm)	179,476	174,385	189,647	**181,169**
Q_s	Volumetric flow rate, standard (scfm)	122,246	118,562	128,837	**123,215**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,200	93,195	101,746	**97,047**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,888	82,669	89,961	**86,172**
Q_a	Volumetric flow rate, actual (acf/hr)	10,768,533	10,463,122	11,378,824	**10,870,160**
Q_s	Volumetric flow rate, standard (scf/hr)	7,334,751	7,113,691	7,730,200	**7,392,881**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,771,996	5,591,714	6,104,733	**5,822,814**
Q_a	Volumetric flow rate, actual (m^3/hr)	304,971	296,322	322,255	**307,849**
Q_s	Volumetric flow rate, standard (m^3/hr)	207,724	201,464	218,924	**209,371**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	163,466	158,361	172,890	**164,906**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	145,944	140,474	152,864	**146,427**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	193,561	187,728	203,997	**195,095**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	152,321	147,563	161,102	**153,662**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	135,993	130,896	142,442	**136,444**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		11:47	13:09	14:33	
Stop Time (approx.)		12:59	14:19	15:43	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	184.1	183.7	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	319	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.4900	8.5700	8.6100	**8.5567**
CO_2	Carbon dioxide (dry volume %)	11.3700	11.4700	11.1800	**11.3400**
T_s	Sample temperature (°F)	303.9600	305.3600	305.9600	**305.0933**
B_w	Actual water vapor in gas (% by volume)	21.3062	21.3950	21.0275	**21.2429**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	179,476	174,385	189,647	**181,169**
Q_s	Volumetric flow rate, standard (scfm)	122,246	118,562	128,837	**123,215**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,200	93,195	101,746	**97,047**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,888	82,669	89,961	**86,172**
Q_a	Volumetric flow rate, actual (acf/hr)	10,768,533	10,463,122	11,378,824	**10,870,160**
Q_s	Volumetric flow rate, standard (scf/hr)	7,334,751	7,113,691	7,730,200	**7,392,881**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,771,996	5,591,714	6,104,733	**5,822,814**
Q_a	Volumetric flow rate, actual (m^3/hr)	304,971	296,322	322,255	**307,849**
Q_s	Volumetric flow rate, standard (m^3/hr)	207,724	201,464	218,924	**209,371**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	163,466	158,361	172,890	**164,906**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	145,944	140,474	152,864	**146,427**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	193,561	187,728	203,997	**195,095**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	152,321	147,563	161,102	**153,662**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	135,993	130,896	142,442	**136,444**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.0828	37.5015	39.5549	**38.3797**
%I	Isokinetic sampling (%)	100.5182	102.1751	98.7132	**100.4688**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0245	<0.0259	<0.0280	
Hydrogen Fluoride (HF) Results					
C_{ad}	HF Concentration (lb/dscf)	<1.4203E-09	<1.5228E-09	<1.5613E-09	**<1.5015E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<1.5909E-09	<1.7167E-09	<1.7658E-09	**<1.6911E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<1.4990E-09	<1.5932E-09	<1.6758E-09	**<1.5893E-09**
C_a	HF Concentration (lb/acf)	<7.6130E-10	<8.1384E-10	<8.3763E-10	**<8.0426E-10**
C_{sd}	HF Concentration (ppmdv)	<0.0274	<0.0293	<0.0301	**<0.0289**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0307	<0.0331	<0.0340	**<0.0326**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0289	<0.0307	<0.0323	**<0.0306**
C_w	HF Concentration (ppmwv)	<0.0215	<0.0231	<0.0238	**<0.0228**
C_{sd}	HF Concentration (mg/dscm)	<0.0227	<0.0244	<0.0250	**<0.0240**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0255	<0.0275	<0.0283	**<0.0271**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0240	<0.0255	<0.0268	**<0.0255**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0122	<0.0130	<0.0134	**<0.0129**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0244	<0.0262	<0.0268	**<0.0258**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0273	<0.0295	<0.0303	**<0.0291**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0258	<0.0274	<0.0288	**<0.0273**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0082	<0.0085	<0.0095	**<0.0087**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0037	<0.0039	<0.0043	**<0.0040**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0359	<0.0373	<0.0417	**<0.0383**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000023	<0.000025	<0.000025	**<0.000024**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000023	<0.000024	<0.000025	**<0.000024**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 23 (PCDD/F)
Sampling, Velocity and Moisture Parameters

Run No.		1	2*	3	4	Average
Date (2009)		Mar 10	Mar 11	Mar 11	Mar 12	
Start Time (approx.)		10:08	06:26	11:26	06:42	
Stop Time (approx.)		14:30	11:05	15:45	11:13	
Sampling Conditions						
Y_d	Dry gas meter correction factor	0.9937	0.9937	0.9937	0.9875	
C_p	Pitot tube coefficient	0.8330	0.8330	0.8330	0.8330	
P_g	Static pressure (in. H_2O)	-9.4000	-10.5000	-10.4000	-9.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.25	30.20	30.20	30.20	**30.2167**
D_n	Nozzle diameter (in.)	0.2660	0.2660	0.2660	0.2660	
O_2	Oxygen (dry volume %)	8.5500	8.8800	9.3300	8.6500	**8.8433**
CO_2	Carbon dioxide (dry volume %)	11.3000	10.9700	10.5500	11.1500	**11.0000**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.1500	80.1500	80.1200	80.2000	**80.1567**
V_{lc}	Total Liquid collected (ml)	812.30	811.90	800.60	757.70	
V_m	Volume metered, meter conditions (ft^3)	142.9400	146.9950	146.2800	146.3950	
T_m	Dry gas meter temperature (°F)	87.8800	74.3000	86.4800	86.3500	
T_s	Sample temperature (°F)	307.0400	307.0200	305.2800	305.9600	**306.0933**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0076	1.0856	1.0458	1.0452	
θ	Total sampling time (min)	250.0	250.0	250.0	250.0	
Flow Results						
V_{wstd}	Volume of water collected (ft^3)	38.2268	38.2080	37.6762	35.6574	**37.1868**
V_{mstd}	Volume metered, standard (dscf)	138.6788	146.0241	142.0613	141.3194	**140.6865**
P_s	Sample gas pressure, absolute (in. Hg)	29.5588	29.4279	29.4353	29.4868	**29.4936**
P_v	Vapor pressure, actual (in. Hg)	29.5588	29.4279	29.4353	29.4868	**29.4936**
B_{wo}	Moisture measured in sample (% by volume)	21.6086	20.7391	20.9618	20.1481	**20.9062**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.6086	20.7391	20.9618	20.1481	**20.9062**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6506	0.6732	0.6587	0.6662	**0.6585**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1500	30.1104	30.0612	30.1300	**30.1137**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5246	27.5988	27.5330	27.6860	**27.5812**
V_s	Velocity of sample (ft/sec)	44.9893	46.5867	45.5828	45.9533	**45.5085**
%I	Isokinetic sampling (%)	99.9457	100.9604	100.4132	97.9896	**99.4495**
Q_a	Volumetric flow rate, actual (acfm)	172,759	178,893	175,038	176,461	**174,753**
Q_s	Volumetric flow rate, standard (scfm)	117,485	121,121	118,810	119,878	**118,724**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,098	96,002	93,905	95,725	**93,910**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,828	83,017	78,164	84,362	**81,452**
Q_a	Volumetric flow rate, actual (acf/hr)	10,365,543	10,733,581	10,502,280	10,587,630	**10,485,151**
Q_s	Volumetric flow rate, standard (scf/hr)	7,049,098	7,267,251	7,128,595	7,192,703	**7,123,465**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,525,886	5,760,091	5,634,313	5,743,514	**5,634,571**
Q_a	Volumetric flow rate, actual (m^3/hr)	293,558	303,981	297,431	299,848	**296,946**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,635	205,813	201,886	203,702	**201,741**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,496	163,129	159,567	162,660	**159,574**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	139,045	141,066	132,819	143,351	**138,405**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,023	191,780	188,121	189,813	**187,986**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,826	152,007	148,687	151,569	**148,694**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	129,565	131,448	123,764	133,577	**128,969**

Comments:

Average includes 3 runs. * indicates that the run is not included in the average.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 23 Parameters (NDs & EMPCs counted as Zero)
Total Tetra- through Octa-PCDD/F Results (using USEPA/INTL 1989 TEFs)

Run No.		1	2	3	4	Average
Date (2009)		Mar 10	Mar 11	Mar 11	Mar 12	
Start Time (approx.)		10:08	06:26	11:26	06:42	
Stop Time (approx.)		14:30	11:05	15:45	11:13	
Process Conditions						
R_P	Steam Production Rate (Klbs/hour)	184.0	184.5	183.6	184	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	320	322	320	319	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	**8,760**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.5500	8.8800	9.3300	8.6500	**8.8525**
CO_2	Carbon dioxide (dry volume %)	11.3000	10.9700	10.5500	11.1500	**10.9925**
T_s	Sample temperature (°F)	307.0	307.0	305.3	306.0	**306.3**
B_w	Actual water vapor in gas (% by volume)	21.6086	20.7391	20.9618	20.1481	**20.8644**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	172,759	178,893	175,038	176,461	**175,788**
Q_s	Volumetric flow rate, standard (scfm)	117,485	121,121	118,810	119,878	**119,324**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,098	96,002	93,905	95,725	**94,433**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,828	83,017	78,164	84,362	**81,843**
Q_a	Volumetric flow rate, actual (acf/hr)	10,365,543	10,733,581	10,502,280	10,587,630	**10,547,259**
Q_s	Volumetric flow rate, standard (scf/hr)	7,049,098	7,267,251	7,128,595	7,192,703	**7,159,412**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,525,886	5,760,091	5,634,313	5,743,514	**5,665,951**
Q_a	Volumetric flow rate, actual (m^3/hr)	293,558	303,981	297,431	299,848	**298,705**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,635	205,813	201,886	203,702	**202,759**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,496	163,129	159,567	162,660	**160,463**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	139,045	141,066	132,819	143,351	**139,070**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,023	191,780	188,121	189,813	**188,934**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,826	152,007	148,687	151,569	**149,522**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	129,565	131,448	123,764	133,577	**129,588**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	138.6788	146.0241	142.0613	141.3194	**142.0209**
%I	Isokinetic sampling (%)	99.9457	100.9604	100.4132	97.9896	**99.8272**
Laboratory Data from USEPA Method 23						
	Total PCDDs (ng)	1.29100		1.29600	1.04200	
	Total PCDFs (ng)	0.91205		1.11340	0.71810	
m_n	Total PCDDs & PCDFs (ng)	2.20000		2.41000	1.76000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.02360		0.02370	0.01840	
Total PCDD/F Results (TEF=1)						
C_{sd}	PCDD/F Concentration (ng/dscm)	5.6016E-01		5.9902E-01	4.3975E-01	**5.3298E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	6.3046E-01		7.1965E-01	4.9898E-01	**6.1636E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	5.9486E-01		6.8135E-01	4.7328E-01	**5.8316E-01**
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	6.0115E-01		6.4285E-01	4.7193E-01	**5.7197E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	6.7659E-01		7.7231E-01	5.3550E-01	**6.6146E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	6.3838E-01		7.3120E-01	5.0791E-01	**6.2583E-01**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.9330E-07		2.1076E-07	1.5772E-07	**1.8726E-07**
$E_{g/s}$	PCDD/F Rate (g/s)	2.4351E-08		2.6551E-08	1.9869E-08	**2.3590E-08**
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	8.4664E-07		9.2313E-07	6.9083E-07	**8.2020E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	5.6652E-10		6.4666E-10	4.4838E-10	**5.5385E-10**
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	5.6340E-10		6.4531E-10	4.4825E-10	**5.5232E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)						
C_{sdTEQ}	TEQ Concentration (ng/dscm)	6.0090E-03		5.8907E-03	4.5974E-03	**5.4990E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	6.7631E-03		7.0770E-03	5.2167E-03	**6.3523E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	6.3812E-03		6.7004E-03	4.9479E-03	**6.0098E-03**
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	6.4486E-03		6.3218E-03	4.9338E-03	**5.9014E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	7.2580E-03		7.5949E-03	5.5984E-03	**6.8171E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	6.8481E-03		7.1906E-03	5.3099E-03	**6.4496E-03**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	2.0735E-09		2.0726E-09	1.6489E-09	**1.9317E-09**
$E_{g/sTEQ}$	TEQ Rate (g/sec)	2.6122E-10		2.6110E-10	2.0773E-10	**2.4335E-10**
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	9.0821E-09		9.0781E-09	7.2223E-09	**8.4608E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	6.0772E-12		6.3592E-12	4.6876E-12	**5.7080E-12**
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	6.0437E-12		6.3460E-12	4.6862E-12	**5.6920E-12**

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Wheelabrator North Broward, Inc. **Max**
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 23 Maximum Emissions Parameters (NDs & EMPCs included)
Total Tetra- through Octa-PCDD/F Results (TEQ based on USEPA/INTL 1989 TEFs)

Run No.		1	2	3	4	Average
Date (2009)		Mar 10	Mar 11	Mar 11	Mar 12	
Start Time (approx.)		10:08	06:26	11:26	06:42	
Stop Time (approx.)		14:30	11:05	15:45	11:13	
Process Conditions						
R_P	Production rate - (units/hour)	184	185	184	184	**184**
P_1	Process data - (units)	320	322	320	319	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	**8,760**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.5500	8.8800	9.3300	8.6500	**8.8525**
CO_2	Carbon dioxide (dry volume %)	11.3000	10.9700	10.5500	11.1500	**10.9925**
T_s	Sample temperature (°F)	307.0	307.0	305.3	306.0	**306.3**
B_w	Actual water vapor in gas (% by volume)	21.6086	20.7391	20.9618	20.1481	**20.8644**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	172,759	178,893	175,038	176,461	**175,788**
Q_s	Volumetric flow rate, standard (scfm)	117,485	121,121	118,810	119,878	**119,324**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,098	96,002	93,905	95,725	**94,433**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,828	83,017	78,164	84,362	**81,843**
Q_a	Volumetric flow rate, actual (acf/hr)	10,365,543	10,733,581	10,502,280	10,587,630	**10,547,259**
Q_s	Volumetric flow rate, standard (scf/hr)	7,049,098	7,267,251	7,128,595	7,192,703	**7,159,412**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,525,886	5,760,091	5,634,313	5,743,514	**5,665,951**
Q_a	Volumetric flow rate, actual (m^3/hr)	293,558	303,981	297,431	299,848	**298,705**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,635	205,813	201,886	203,702	**202,759**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,496	163,129	159,567	162,660	**160,463**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	139,045	141,066	132,819	143,351	**139,070**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,023	191,780	188,121	189,813	**188,934**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,826	152,007	148,687	151,569	**149,522**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	129,565	131,448	123,764	133,577	**129,588**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	138.6788	146.0241	142.0613	141.3194	**142.0209**
%I	Isokinetic sampling (%)	99.9457	100.9604	100.4132	97.9896	**99.8272**
Laboratory Data from USEPA Method 23, including NDs and EMPCs						
m_n	Total PCDDs & PCDFs (ng)	2.26000		2.55000	1.89000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.02420		0.02720	0.01990	
Total PCDD/F Results (TEF=1)						
C_{sd}	PCDD/F Concentration (ng/dscm)	5.7543E-01		6.3381E-01	4.7223E-01	**5.6049E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	6.4766E-01		7.6145E-01	5.3584E-01	**6.4832E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	6.1108E-01		7.2093E-01	5.0823E-01	**6.1341E-01**
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	6.1754E-01		6.8019E-01	5.0679E-01	**6.0151E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	6.9504E-01		8.1717E-01	5.7505E-01	**6.9575E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	6.5579E-01		7.7368E-01	5.4542E-01	**6.5830E-01**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.9857E-07		2.2300E-07	1.6937E-07	**1.9898E-07**
$E_{g/s}$	PCDD/F Rate (g/s)	2.5015E-08		2.8093E-08	2.1337E-08	**2.4815E-08**
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	8.6973E-07		9.7676E-07	7.4186E-07	**8.6278E-07**
E_{Fd}	PCDD/F - F_d-based (lb/MMBtu)	5.8197E-10		6.8422E-10	4.8149E-10	**5.8256E-10**
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	5.7876E-10		6.8280E-10	4.8135E-10	**5.8097E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)						
C_{sdTEQ}	TEQ Concentration (ng/dscm)	6.1617E-03		6.7607E-03	4.9722E-03	**5.9649E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	6.9351E-03		8.1222E-03	5.6419E-03	**6.8997E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	6.5434E-03		7.6899E-03	5.3513E-03	**6.5282E-03**
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	6.6126E-03		7.2554E-03	5.3360E-03	**6.4013E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	7.4425E-03		8.7165E-03	6.0548E-03	**7.4046E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	7.0222E-03		8.2526E-03	5.7428E-03	**7.0059E-03**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	2.1263E-09		2.3787E-09	1.7834E-09	**2.0961E-09**
$E_{g/sTEQ}$	TEQ Rate (g/sec)	2.6786E-10		2.9966E-10	2.2466E-10	**2.6406E-10**
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	9.3130E-09		1.0419E-08	7.8111E-09	**9.1810E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	6.2317E-12		7.2984E-12	5.0697E-12	**6.1999E-12**
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	6.1974E-12		7.2832E-12	5.0682E-12	**6.1829E-12**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0028	1.0028	1.0028	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-2.2000	-2.2000	-2.2000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
O_2	Oxygen (dry volume %)	7.7900	8.1200	8.1900	**8.0333**
CO_2	Carbon dioxide (dry volume %)	11.6800	11.3900	11.6400	**11.5700**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5300	80.4900	80.1700	**80.3967**
V_{lc}	Total Liquid collected (ml)	139.50	140.20	146.00	
V_m	Volume metered, meter conditions (ft^3)	32.1300	33.7200	35.0500	
T_m	Dry gas meter temperature (°F)	73.5000	79.5417	84.2083	
T_s	Sample temperature (°F)	495.6667	499.3333	498.2500	**497.7500**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0192	1.1150	1.1667	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	6.5649	6.5978	6.8708	**6.6778**
V_{mstd}	Volume metered, standard (dscf)	32.2532	33.4780	34.5044	**33.4119**
P_s	Sample gas pressure, absolute (in. Hg)	30.0382	30.0382	30.0382	**30.0382**
P_v	Vapor pressure, actual (in. Hg)	30.0382	30.0382	30.0382	**30.0382**
B_{wo}	Moisture measured in sample (% by volume)	16.9119	16.4633	16.6060	**16.6604**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	16.9119	16.4633	16.6060	**16.6604**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1804	30.1472	30.1900	**30.1725**
M_s	MW of sample gas, wet (lb/lb-mole)	28.1205	28.1474	28.1657	**28.1445**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	183.6	183.8	**183.8**
P_1	Fabric Filter Inlet Temperature (°F)	320	317	320	**319**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.7900	8.1200	8.1900	**8.0333**
CO_2	Carbon dioxide (dry volume %)	11.6800	11.3900	11.6400	**11.5700**
T_s	Sample temperature (°F)	495.6667	499.3333	498.2500	**497.7500**
B_w	Actual water vapor in gas (% by volume)	16.9119	16.4633	16.6060	**16.6604**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	32.2532	33.4780	34.5044	**33.4119**
Laboratory Data					
m_n	Total HCl collected (mg)	711.8015	610.9163	602.0750	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.8663E-05	4.0237E-05	3.8476E-05	**4.2459E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	5.1595E-05	4.3764E-05	4.2078E-05	**4.5812E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	4.9996E-05	4.2392E-05	3.9665E-05	**4.4018E-05**
C_{sd}	HCl Concentration (ppmdv)	514.4898	425.4145	406.7864	**448.8969**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	545.4926	462.6965	444.8726	**484.3539**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	528.5854	448.1978	419.3674	**465.3836**
C_w	HCl Concentration (ppmwv)	427.4798	355.3771	339.2354	**374.0308**
C_{sd}	HCl Concentration (mg/dscm)	779.2632	644.3467	616.1320	**679.9139**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	826.2210	700.8153	673.8186	**733.6183**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	800.6128	678.8552	635.1876	**704.8852**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	836.2824	691.4940	661.2148	**729.6637**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	886.6762	752.0944	723.1224	**787.2977**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	859.1943	728.5275	681.6648	**756.4622**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.7424	0.6297	0.6055	**0.6592**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.7583	0.6430	0.6016	**0.6676**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Modified Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9916	0.9916	0.9916	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-9.7000	-9.7000	-9.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
O_2	Oxygen (dry volume %)	8.9000	9.1400	8.8900	**8.9767**
CO_2	Carbon dioxide (dry volume %)	10.7300	10.5100	10.9500	**10.7300**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.3700	80.3500	80.1600	**80.2933**
V_{lc}	Total Liquid collected (ml)	226.90	233.20	231.50	
V_m	Volume metered, meter conditions (ft^3)	40.4650	41.9400	42.6800	
T_m	Dry gas meter temperature (°F)	72.3333	76.7500	79.8750	
T_s	Sample temperature (°F)	307.2500	304.4167	306.2500	**305.9722**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.6779	10.9744	10.8944	**10.8489**
V_{mstd}	Volume metered, standard (dscf)	40.3015	41.4268	41.9137	**41.2140**
P_s	Sample gas pressure, absolute (in. Hg)	29.4868	29.4868	29.4868	**29.4868**
P_v	Vapor pressure, actual (in. Hg)	29.4868	29.4868	29.4868	**29.4868**
B_{wo}	Moisture measured in sample (% by volume)	20.9455	20.9430	20.6301	**20.8396**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.9455	20.9430	20.6301	**20.8396**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0728	30.0472	30.1076	**30.0759**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5441	27.5242	27.6098	**27.5593**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Modified Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	183.6	183.8	**183.8**
P_1	Fabric Filter Inlet Temperature (°F)	320	317	320	**319**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9000	9.1400	8.8900	**8.9767**
CO_2	Carbon dioxide (dry volume %)	10.7300	10.5100	10.9500	**10.7300**
T_s	Sample temperature (°F)	307.2500	304.4167	306.2500	**305.9722**
B_w	Actual water vapor in gas (% by volume)	20.9455	20.9430	20.6301	**20.8396**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.3015	41.4268	41.9137	**41.2140**
Laboratory Data					
m_n	Total HCl collected (mg)	33.4232	21.9550	19.7170	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.8287E-06	1.1686E-06	1.0373E-06	**1.3448E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	2.1182E-06	1.3812E-06	1.2005E-06	**1.5666E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	2.0451E-06	1.3343E-06	1.1367E-06	**1.5054E-06**
C_{sd}	HCl Concentration (ppmdv)	19.3338	12.3550	10.9667	**14.2185**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	22.3950	14.6033	12.6925	**16.5636**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	21.6221	14.1065	12.0183	**15.9156**
C_w	HCl Concentration (ppmwv)	15.2842	9.7675	8.7042	**11.2520**
C_{sd}	HCl Concentration (mg/dscm)	29.2836	18.7133	16.6105	**21.5358**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	33.9201	22.1186	19.2244	**25.0877**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	32.7496	21.3662	18.2032	**24.1063**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	31.4263	20.0825	17.8259	**23.1116**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	36.4021	23.7370	20.6311	**26.9234**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	35.1459	22.9296	19.5352	**25.8702**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0305	0.0199	0.0173	**0.0225**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0310	0.0202	0.0172	**0.0228**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9886	0.9886	0.9886	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.7000	-10.7000	-10.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.4000	80.2800	80.0300	**80.2367**
V_{lc}	Total Liquid collected (ml)	420.20	404.10	406.40	
V_m	Volume metered, meter conditions (ft^3)	73.1250	69.6350	70.2850	
T_m	Dry gas meter temperature (°F)	79.5800	83.1800	85.5600	
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1360	1.0240	1.0480	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	19.7746	19.0169	19.1252	**19.3056**
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
P_s	Sample gas pressure, absolute (in. Hg)	29.4132	29.4132	29.4132	**29.4132**
P_v	Vapor pressure, actual (in. Hg)	29.4132	29.4132	29.4132	**29.4132**
B_{wo}	Moisture measured in sample (% by volume)	21.6482	21.9337	21.9457	**21.8425**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6748	0.6527	0.6598	**0.6624**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0572	29.9540	30.2040	**30.0717**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4470	27.3320	27.5257	**27.4349**
V_s	Velocity of sample (ft/sec)	45.7671	44.3621	44.6967	**44.9420**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00010	0.00030	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00099	0.00105	0.00075	
m_n	Total particulate matter collected (g)	0.00099	0.00135	0.00075	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	3.0622E-08	4.4007E-08	2.4339E-08	**3.2990E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	3.5739E-08	5.6171E-08	2.6766E-08	**3.9558E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	3.4634E-08	5.4386E-08	2.4942E-08	**3.7987E-08**
C_a	Particulate Concentration (lb/acf)	1.6160E-08	2.3136E-08	1.2788E-08	**1.7361E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0002	0.0003	0.0002	**0.0002**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0003	0.0004	0.0002	**0.0003**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0002	0.0004	0.0002	**0.0003**
C_a	Particulate Concentration (gr/acf)	0.0001	0.0002	0.0001	**0.0001**
C_{sd}	Particulate Concentration (mg/dscm)	0.4904	0.7047	0.3898	**0.5283**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.5723	0.8995	0.4286	**0.6335**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	0.5546	0.8709	0.3994	**0.6083**
C_a	Particulate Concentration (mg/m^3(actual,wet))	0.2588	0.3705	0.2048	**0.2780**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	0.5263	0.7563	0.4183	**0.5669**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	0.6142	0.9653	0.4600	**0.6798**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	0.5952	0.9346	0.4286	**0.6528**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.1704	0.2365	0.1317	**0.1795**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.0773	0.1072	0.0597	**0.0814**
$E_{T/yr}$	Particulate Rate (Ton/yr)	0.7464	1.0357	0.5768	**0.7863**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0005	0.0008	0.0004	**0.0006**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0005	0.0008	0.0004	**0.0006**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Laboratory Data					
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	21.7723	16.7306	18.4327	
$m_{n\text{-}3a}$	Fraction 3A (µg)	0.5279	<0.2000	0.2274	
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	22.3002	16.7306	18.6602	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	6.8704E-10	5.4504E-10	6.0488E-10	**6.1232E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	8.0183E-10	6.9569E-10	6.6518E-10	**7.2090E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	7.7705E-10	6.7358E-10	6.1986E-10	**6.9016E-10**
C_a	Concentration (lb/acf)	3.6257E-10	2.8654E-10	3.1781E-10	**3.2231E-10**
C_{sd}	Concentration (µg/dscm)	1.1002E+01	8.7280E+00	9.6864E+00	**9.8055E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.2840E+01	1.1140E+01	1.0652E+01	**1.1544E+01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.2443E+01	1.0786E+01	9.9262E+00	**1.1052E+01**
C_{sd}	Concentration (mg/dscm)	1.1002E-02	8.7280E-03	9.6864E-03	**9.8055E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.2840E-02	1.1140E-02	1.0652E-02	**1.1544E-02**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.2443E-02	1.0786E-02	9.9262E-03	**1.1052E-02**
C_a	Concentration (µg/m^3 (actual,wet))	5.8061E+00	4.5886E+00	5.0892E+00	**5.1613E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	1.1807E+01	9.3667E+00	1.0395E+01	**1.0523E+01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.3780E+01	1.1956E+01	1.1431E+01	**1.2389E+01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.3354E+01	1.1576E+01	1.0653E+01	**1.1861E+01**
$E_{lb/hr}$	Rate (lb/hr)	3.8232E-03	2.9287E-03	3.2728E-03	**3.3416E-03**
$E_{g/s}$	Rate (g/s)	4.8164E-04	3.6895E-04	4.1229E-04	**4.2096E-04**
$E_{T/yr}$	Rate (Ton/yr)	1.6746E-02	1.2828E-02	1.4335E-02	**1.4636E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1538E-05	1.0011E-05	9.5716E-06	**1.0373E-05**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.1785E-05	1.0216E-05	9.4013E-06	**1.0467E-05**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Front Half Results

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Mercury Results - Front Half					
C_{sd}	Concentration (lb/dscf)	<3.0809E-12	<3.2577E-12	<3.2416E-12	**<3.1934E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.5956E-12	<4.1582E-12	<3.5647E-12	**<3.7728E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.4845E-12	<4.0261E-12	<3.3218E-12	**<3.6108E-12**
C_a	Concentration (lb/acf)	<1.6259E-12	<1.7127E-12	<1.7031E-12	**<1.6806E-12**
C_{sd}	Concentration (µg/dscm)	<4.9336E-02	<5.2168E-02	<5.1909E-02	**<5.1138E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.7579E-02	<6.6588E-02	<5.7084E-02	**<6.0417E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.5799E-02	<6.4472E-02	<5.3195E-02	**<5.7822E-02**
C_{sd}	Concentration (mg/dscm)	<4.9336E-05	<5.2168E-05	<5.1909E-05	**<5.1138E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.7579E-05	<6.6588E-05	<5.7084E-05	**<6.0417E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.5799E-05	<6.4472E-05	<5.3195E-05	**<5.7822E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.6036E-02	<2.7426E-02	<2.7273E-02	**<2.6912E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<5.2946E-02	<5.5985E-02	<5.5707E-02	**<5.4880E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<6.1792E-02	<7.1460E-02	<6.1261E-02	**<6.4838E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<5.9882E-02	<6.9189E-02	<5.7087E-02	**<6.2053E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.7144E-05	<1.7505E-05	<1.7539E-05	**<1.7396E-05**
$E_{g/s}$	Rate (g/s)	<2.1598E-06	<2.2053E-06	<2.2095E-06	**<2.1915E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.5092E-05	<7.6674E-05	<7.6821E-05	**<7.6195E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<5.1739E-08	<5.9834E-08	<5.1294E-08	**<5.4289E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.2848E-08	<6.1062E-08	<5.0381E-08	**<5.4764E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 1-3 Results

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Mercury Results - Impingers 1-3 Solution					
C_{sd}	Concentration (lb/dscf)	6.7078E-10	5.4504E-10	5.9751E-10	**6.0444E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	7.8285E-10	6.9569E-10	6.5707E-10	**7.1187E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	7.5865E-10	6.7358E-10	6.1231E-10	**6.8151E-10**
C_a	Concentration (lb/acf)	3.5399E-10	2.8654E-10	3.1393E-10	**3.1815E-10**
C_{sd}	Concentration (µg/dscm)	1.0742E+01	8.7280E+00	9.5683E+00	**9.6793E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.2536E+01	1.1140E+01	1.0522E+01	**1.1400E+01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.2149E+01	1.0786E+01	9.8053E+00	**1.0913E+01**
C_{sd}	Concentration (mg/dscm)	1.0742E-02	8.7280E-03	9.5683E-03	**9.6793E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.2536E-02	1.1140E-02	1.0522E-02	**1.1400E-02**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.2149E-02	1.0786E-02	9.8053E-03	**1.0913E-02**
C_a	Concentration (µg/m^3 (actual,wet))	5.6686E+00	4.5886E+00	5.0272E+00	**5.0948E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	1.1528E+01	9.3667E+00	1.0268E+01	**1.0388E+01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.3454E+01	1.1956E+01	1.1292E+01	**1.2234E+01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.3038E+01	1.1576E+01	1.0523E+01	**1.1712E+01**
$E_{lb/hr}$	Rate (lb/hr)	3.7327E-03	2.9287E-03	3.2329E-03	**3.2981E-03**
$E_{g/s}$	Rate (g/s)	4.7023E-04	3.6895E-04	4.0727E-04	**4.1549E-04**
$E_{T/yr}$	Rate (Ton/yr)	1.6349E-02	1.2828E-02	1.4160E-02	**1.4446E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1265E-05	1.0011E-05	9.4549E-06	**1.0243E-05**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.1506E-05	1.0216E-05	9.2867E-06	**1.0336E-05**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 4 Results

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Mercury Results - Impinger 4 Solution					
C_{sd}	Concentration (lb/dscf)	1.6263E-11	<6.5155E-12	7.3729E-12	**<1.0051E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.8981E-11	<8.3164E-12	8.1079E-12	**<1.1802E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.8394E-11	<8.0521E-12	7.5555E-12	**<1.1334E-11**
C_a	Concentration (lb/acf)	8.5827E-12	<3.4254E-12	3.8737E-12	**<5.2939E-12**
C_{sd}	Concentration (µg/dscm)	2.6044E-01	<1.0434E-01	1.1807E-01	**<1.6095E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.0395E-01	<1.3318E-01	1.2984E-01	**<1.8899E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	2.9455E-01	<1.2894E-01	1.2099E-01	**<1.8150E-01**
C_{sd}	Concentration (mg/dscm)	2.6044E-04	<1.0434E-04	1.1807E-04	**<1.6095E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.0395E-04	<1.3318E-04	1.2984E-04	**<1.8899E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	2.9455E-04	<1.2894E-04	1.2099E-04	**<1.8150E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.3744E-01	<5.4852E-02	6.2032E-02	**<8.4775E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	2.7949E-01	<1.1197E-01	1.2671E-01	**<1.7272E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.2619E-01	<1.4292E-01	1.3934E-01	**<2.0282E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.1611E-01	<1.3838E-01	1.2984E-01	**<1.9478E-01**
$E_{lb/hr}$	Rate (lb/hr)	9.0502E-05	<3.5011E-05	3.9892E-05	**<5.5135E-05**
$E_{g/s}$	Rate (g/s)	1.1401E-05	<4.4105E-06	5.0255E-06	**<6.9457E-06**
$E_{T/yr}$	Rate (Ton/yr)	3.9640E-04	<1.5335E-04	1.7473E-04	**<2.4149E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.7312E-07	<1.1967E-07	1.1667E-07	**<1.6982E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.7898E-07	<1.2212E-07	1.1459E-07	**<1.7190E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 5-6 Results

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Mercury Results - Filtered Permanganate Solution					
C_{sd}	Concentration (lb/dscf)	<1.5404E-11	<1.6289E-11	<1.6208E-11	**<1.5967E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7978E-11	<2.0791E-11	<1.7824E-11	**<1.8864E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7422E-11	<2.0130E-11	<1.6609E-11	**<1.8054E-11**
C_a	Concentration (lb/acf)	<8.1293E-12	<8.5634E-12	<8.5156E-12	**<8.4028E-12**
C_{sd}	Concentration (µg/dscm)	<2.4668E-01	<2.6084E-01	<2.5955E-01	**<2.5569E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8790E-01	<3.3294E-01	<2.8542E-01	**<3.0208E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7900E-01	<3.2236E-01	<2.6597E-01	**<2.8911E-01**
C_{sd}	Concentration (mg/dscm)	<2.4668E-04	<2.6084E-04	<2.5955E-04	**<2.5569E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8790E-04	<3.3294E-04	<2.8542E-04	**<3.0208E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7900E-04	<3.2236E-04	<2.6597E-04	**<2.8911E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.3018E-01	<1.3713E-01	<1.3637E-01	**<1.3456E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6473E-01	<2.7993E-01	<2.7854E-01	**<2.7440E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0896E-01	<3.5730E-01	<3.0630E-01	**<3.2419E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9941E-01	<3.4595E-01	<2.8544E-01	**<3.1026E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.5722E-05	<8.7527E-05	<8.7695E-05	**<8.6981E-05**
$E_{g/s}$	Rate (g/s)	<1.0799E-05	<1.1026E-05	<1.1047E-05	**<1.0958E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.7546E-04	<3.8337E-04	<3.8410E-04	**<3.8098E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5870E-07	<2.9917E-07	<2.5647E-07	**<2.7145E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6424E-07	<3.0531E-07	<2.5191E-07	**<2.7382E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate					
C_{sd}	Concentration (lb/dscf)	<1.2323E-11	<1.3031E-11	<1.2966E-11	**<1.2774E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.4383E-11	<1.6633E-11	<1.4259E-11	**<1.5091E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.3938E-11	<1.6104E-11	<1.3287E-11	**<1.4443E-11**
C_a	Concentration (lb/acf)	<6.5035E-12	<6.8507E-12	<6.8125E-12	**<6.7222E-12**
C_{sd}	Concentration (µg/dscm)	<1.9734E-01	<2.0867E-01	<2.0764E-01	**<2.0455E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.3032E-01	<2.6635E-01	<2.2833E-01	**<2.4167E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.2320E-01	<2.5789E-01	<2.1278E-01	**<2.3129E-01**
C_{sd}	Concentration (mg/dscm)	<1.9734E-04	<2.0867E-04	<2.0764E-04	**<2.0455E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.3032E-04	<2.6635E-04	<2.2833E-04	**<2.4167E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.2320E-04	<2.5789E-04	<2.1278E-04	**<2.3129E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.0414E-01	<1.0970E-01	<1.0909E-01	**<1.0765E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.1178E-01	<2.2394E-01	<2.2283E-01	**<2.1952E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.4717E-01	<2.8584E-01	<2.4504E-01	**<2.5935E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.3953E-01	<2.7676E-01	<2.2835E-01	**<2.4821E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.8577E-05	<7.0021E-05	<7.0156E-05	**<6.9585E-05**
$E_{g/s}$	Rate (g/s)	<8.6391E-06	<8.8210E-06	<8.8380E-06	**<8.7660E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.0037E-04	<3.0669E-04	<3.0728E-04	**<3.0478E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.0696E-07	<2.3934E-07	<2.0518E-07	**<2.1716E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.1139E-07	<2.4425E-07	<2.0153E-07	**<2.1905E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.5404E-12	<1.6289E-12	<1.6208E-12	**<1.5967E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7978E-12	<2.0791E-12	<1.7824E-12	**<1.8864E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7422E-12	<2.0130E-12	<1.6609E-12	**<1.8054E-12**
C_s	Concentration (lb/acf)	<8.1293E-13	<8.5634E-13	<8.5156E-13	**<8.4028E-13**
C_{sd}	Concentration (µg/dscm)	<2.4668E-02	<2.6084E-02	<2.5955E-02	**<2.5569E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8790E-02	<3.3294E-02	<2.8542E-02	**<3.0208E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7900E-02	<3.2236E-02	<2.6597E-02	**<2.8911E-02**
C_{sd}	Concentration (mg/dscm)	<2.4668E-05	<2.6084E-05	<2.5955E-05	**<2.5569E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8790E-05	<3.3294E-05	<2.8542E-05	**<3.0208E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7900E-05	<3.2236E-05	<2.6597E-05	**<2.8911E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.3018E-02	<1.3713E-02	<1.3637E-02	**<1.3456E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6473E-02	<2.7993E-02	<2.7854E-02	**<2.7440E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0896E-02	<3.5730E-02	<3.0630E-02	**<3.2419E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9941E-02	<3.4595E-02	<2.8544E-02	**<3.1026E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.5722E-06	<8.7527E-06	<8.7695E-06	**<8.6981E-06**
$E_{g/s}$	Rate (g/s)	<1.0799E-06	<1.1026E-06	<1.1047E-06	**<1.0958E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7546E-05	<3.8337E-05	<3.8410E-05	**<3.8098E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5870E-08	<2.9917E-08	<2.5647E-08	**<2.7145E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6424E-08	<3.0531E-08	<2.5191E-08	**<2.7382E-08**

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Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	0.2028	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	<6.1617E-12	6.6056E-12	<6.4831E-12	**<6.4168E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<7.1913E-12	8.4314E-12	<7.1294E-12	**<7.5840E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.9690E-12	8.1635E-12	<6.6437E-12	**<7.2587E-12**
C_a	Concentration (lb/acf)	<3.2517E-12	3.4728E-12	<3.4062E-12	**<3.3769E-12**
C_{sd}	Concentration (µg/dscm)	<9.8672E-02	1.0578E-01	<1.0382E-01	**<1.0276E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.1516E-01	1.3502E-01	<1.1417E-01	**<1.2145E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1160E-01	1.3073E-01	<1.0639E-01	**<1.1624E-01**
C_{sd}	Concentration (mg/dscm)	<9.8672E-05	1.0578E-04	<1.0382E-04	**<1.0276E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.1516E-04	1.3502E-04	<1.1417E-04	**<1.2145E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1160E-04	1.3073E-04	<1.0639E-04	**<1.1624E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<5.2072E-02	5.5611E-02	<5.4546E-02	**<5.4077E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.0589E-01	1.1352E-01	<1.1141E-01	**<1.1028E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.2358E-01	1.4490E-01	<1.2252E-01	**<1.3033E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.1976E-01	1.4029E-01	<1.1417E-01	**<1.2474E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.4289E-05	3.5495E-05	<3.5078E-05	**<3.4954E-05**
$E_{g/s}$	Rate (g/s)	<4.3196E-06	4.4715E-06	<4.4190E-06	**<4.4034E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.5018E-04	1.5547E-04	<1.5364E-04	**<1.5310E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.0348E-07	1.2132E-07	<1.0259E-07	**<1.0913E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0570E-07	1.2381E-07	<1.0076E-07	**<1.1009E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:29	08:58	11:39	
Stop Time (approx.)		08:40	11:20	13:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.7	184.3	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9900	10.0100	8.2600	**9.0867**
CO_2	Carbon dioxide (dry volume %)	10.6100	9.7100	11.7100	**10.6767**
T_s	Sample temperature (°F)	310.6400	310.7600	311.1200	**310.8400**
B_w	Actual water vapor in gas (% by volume)	21.6482	21.9337	21.9457	**21.8425**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,746	170,351	171,635	**172,577**
Q_s	Volumetric flow rate, standard (scfm)	118,372	114,720	115,531	**116,208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,746	89,558	90,177	**90,827**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,468	70,164	82,003	**77,212**
Q_a	Volumetric flow rate, actual (acf/hr)	10,544,732	10,221,033	10,298,111	**10,354,625**
Q_s	Volumetric flow rate, standard (scf/hr)	7,102,302	6,883,206	6,931,875	**6,972,461**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,564,783	5,373,461	5,410,626	**5,449,624**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,633	289,466	291,649	**293,249**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,141	194,936	196,315	**197,464**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,598	152,180	153,232	**154,337**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,035	119,226	139,342	**131,201**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,427	181,645	182,930	**184,001**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,853	141,804	142,784	**143,814**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,828	111,097	129,841	**122,255**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.5708	67.6848	68.0226	**69.0927**
%I	Isokinetic sampling (%)	100.9176	98.8364	98.6473	**99.4671**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.5592	0.8264	0.5117	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	1.7229E-11	2.6922E-11	1.6589E-11	**2.0246E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.0107E-11	3.4363E-11	1.8242E-11	**2.4238E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.9486E-11	3.3271E-11	1.6999E-11	**2.3252E-11**
C_a	Concentration (lb/acf)	9.0921E-12	1.4154E-11	8.7157E-12	**1.0654E-11**
C_{sd}	Concentration (µg/dscm)	2.7589E-01	4.3112E-01	2.6564E-01	**3.2422E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.2199E-01	5.5028E-01	2.9212E-01	**3.8813E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.1204E-01	5.3279E-01	2.7222E-01	**3.7235E-01**
C_{sd}	Concentration (mg/dscm)	2.7589E-04	4.3112E-04	2.6564E-04	**3.2422E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.2199E-04	5.5028E-04	2.9212E-04	**3.8813E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.1204E-04	5.3279E-04	2.7222E-04	**3.7235E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.4560E-01	2.2665E-01	1.3957E-01	**1.7061E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	2.9608E-01	4.6266E-01	2.8508E-01	**3.4794E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.4555E-01	5.9054E-01	3.1350E-01	**4.1653E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.3487E-01	5.7178E-01	2.9214E-01	**3.9960E-01**
$E_{lb/hr}$	Rate (lb/hr)	9.5873E-05	1.4466E-04	8.9755E-05	**1.1010E-04**
$E_{g/s}$	Rate (g/s)	1.2078E-05	1.8224E-05	1.1307E-05	**1.3870E-05**
$E_{T/yr}$	Rate (Ton/yr)	4.1992E-04	6.3363E-04	3.9313E-04	**4.8223E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.8933E-07	4.9447E-07	2.6250E-07	**3.4876E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.9553E-07	5.0461E-07	2.5782E-07	**3.5266E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		07:30	11:28	13:12	
Stop Time (approx.)		08:48	12:46	14:24	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9886	0.9886	0.9886	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-9.5000	-9.5000	-9.5000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
D_n	Nozzle diameter (in.)	0.2720	0.2720	0.2720	
O_2	Oxygen (dry volume %)	8.3900	9.2000	9.0500	**8.8800**
CO_2	Carbon dioxide (dry volume %)	10.8100	10.7100	10.7600	**10.7600**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.8000	80.0900	80.1900	**80.3600**
V_{lc}	Total Liquid collected (ml)	237.20	220.20	240.20	
V_m	Volume metered, meter conditions (ft^3)	38.7760	38.3400	41.5450	
T_m	Dry gas meter temperature (°F)	78.5000	89.7600	103.3000	
T_s	Sample temperature (°F)	317.8400	311.8000	313.5200	**314.3867**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.3000	1.1968	1.3840	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	11.1626	10.3626	11.3038	**10.9430**
V_{mstd}	Volume metered, standard (dscf)	38.0431	36.8357	38.9732	**37.9507**
P_s	Sample gas pressure, absolute (in. Hg)	29.5015	29.5015	29.5015	**29.5015**
P_v	Vapor pressure, actual (in. Hg)	29.5015	29.5015	29.5015	**29.5015**
B_{wo}	Moisture measured in sample (% by volume)	22.6856	21.9555	22.4831	**22.3747**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.6856	21.9555	22.4831	**22.3747**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.7102	0.6951	0.7313	**0.7122**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0652	30.0816	30.0836	**30.0768**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3281	27.4290	27.3668	**27.3747**
V_s	Velocity of sample (ft/sec)	49.1973	47.8804	50.4853	**49.1877**
%I	Isokinetic sampling (%)	98.8115	96.6310	97.8406	**97.7610**
Q_a	Volumetric flow rate, actual (acfm)	188,918	183,861	193,864	**188,881**
Q_s	Volumetric flow rate, standard (scfm)	126,444	124,022	130,479	**126,982**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	97,759	96,793	101,143	**98,565**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	87,983	81,473	86,227	**85,228**
Q_a	Volumetric flow rate, actual (acf/hr)	11,335,063	11,031,640	11,631,817	**11,332,840**
Q_s	Volumetric flow rate, standard (scf/hr)	7,586,644	7,441,343	7,828,743	**7,618,910**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,865,565	5,807,560	6,068,602	**5,913,909**
Q_a	Volumetric flow rate, actual (m^3/hr)	321,016	312,423	329,420	**320,953**
Q_s	Volumetric flow rate, standard (m^3/hr)	214,858	210,743	221,715	**215,772**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	166,116	164,474	171,866	**167,485**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	149,505	138,442	146,519	**144,822**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,209	196,374	206,598	**201,060**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	154,790	153,259	160,148	**156,066**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	139,311	129,003	136,529	**134,948**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		07:30	11:28	13:12	
Stop Time (approx.)		08:48	12:46	14:24	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.4	184.0	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	330	320	320	**323**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.3900	9.2000	9.0500	**8.8800**
CO_2	Carbon dioxide (dry volume %)	10.8100	10.7100	10.7600	**10.7600**
T_s	Sample temperature (°F)	317.8400	311.8000	313.5200	**314.3867**
B_w	Actual water vapor in gas (% by volume)	22.6856	21.9555	22.4831	**22.3747**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	188,918	183,861	193,864	**188,881**
Q_s	Volumetric flow rate, standard (scfm)	126,444	124,022	130,479	**126,982**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	97,759	96,793	101,143	**98,565**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	87,983	81,473	86,227	**85,228**
Q_a	Volumetric flow rate, actual (acf/hr)	11,335,063	11,031,640	11,631,817	**11,332,840**
Q_s	Volumetric flow rate, standard (scf/hr)	7,586,644	7,441,343	7,828,743	**7,618,910**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,865,565	5,807,560	6,068,602	**5,913,909**
Q_a	Volumetric flow rate, actual (m^3/hr)	321,016	312,423	329,420	**320,953**
Q_s	Volumetric flow rate, standard (m^3/hr)	214,858	210,743	221,715	**215,772**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	166,116	164,474	171,866	**167,485**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	149,505	138,442	146,519	**144,822**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,209	196,374	206,598	**201,060**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	154,790	153,259	160,148	**156,066**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	139,311	129,003	136,529	**134,948**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.0431	36.8357	38.9732	**37.9507**
%I	Isokinetic sampling (%)	98.8115	96.6310	97.8406	**97.7610**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0246	<0.0235	<0.0242	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<1.4282E-09	<1.4045E-09	<1.3693E-09	**<1.4007E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<1.5868E-09	<1.6686E-09	<1.6062E-09	**<1.6205E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<1.5854E-09	<1.5737E-09	<1.5271E-09	**<1.5620E-09**
C_a	HF Concentration (lb/acf)	<7.3903E-10	<7.3939E-10	<7.1439E-10	**<7.3094E-10**
C_{sd}	HF Concentration (ppmdv)	<0.0275	<0.0271	<0.0264	**<0.0270**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0306	<0.0322	<0.0309	**<0.0312**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0305	<0.0303	<0.0294	**<0.0301**
C_w	HF Concentration (ppmwv)	<0.0213	<0.0211	<0.0205	**<0.0209**
C_{sd}	HF Concentration (mg/dscm)	<0.0229	<0.0225	<0.0219	**<0.0224**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0254	<0.0267	<0.0257	**<0.0260**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0254	<0.0252	<0.0245	**<0.0250**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0118	<0.0118	<0.0114	**<0.0117**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0245	<0.0241	<0.0235	**<0.0241**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0273	<0.0287	<0.0276	**<0.0278**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0272	<0.0270	<0.0262	**<0.0268**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0084	<0.0082	<0.0083	**<0.0083**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0038	<0.0037	<0.0038	**<0.0038**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0367	<0.0357	<0.0364	**<0.0363**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000023	<0.000024	<0.000023	**<0.000023**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000024	<0.000024	<0.000023	**<0.000024**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0028	1.0028	1.0028	
P_g	Static pressure (in. H_2O)	-2.1000	-2.1000	-2.1000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.25	30.25	30.25	**30.2500**
O_2	Oxygen (dry volume %)	7.1900	9.1500	8.3600	**8.2333**
CO_2	Carbon dioxide (dry volume %)	12.1300	10.4500	11.3000	**11.2933**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6800	80.4000	80.3400	**80.4733**
V_{lc}	Total Liquid collected (ml)	177.70	149.60	150.00	
V_m	Volume metered, meter conditions (ft^3)	34.2000	33.7900	32.8700	
T_m	Dry gas meter temperature (°F)	71.0833	78.7500	85.0833	
T_s	Sample temperature (°F)	503.1667	508.0833	508.3333	**506.5278**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2167	1.1108	1.0858	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	8.3626	7.0402	7.0590	**7.4872**
V_{mstd}	Volume metered, standard (dscf)	34.5608	33.6520	32.3534	**33.5221**
P_s	Sample gas pressure, absolute (in. Hg)	30.0956	30.0956	30.0956	**30.0956**
P_v	Vapor pressure, actual (in. Hg)	30.0956	30.0956	30.0956	**30.0956**
B_{wo}	Moisture measured in sample (% by volume)	19.4825	17.3011	17.9106	**18.2314**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.4825	17.3011	17.9106	**18.2314**
M_d	MW of sample gas, dry (lb/lb-mole)	30.2284	30.0380	30.1424	**30.1363**
M_s	MW of sample gas, wet (lb/lb-mole)	27.8460	27.9553	27.9676	**27.9230**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.8	184.1	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	319	322	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.1900	9.1500	8.3600	**8.2333**
CO_2	Carbon dioxide (dry volume %)	12.1300	10.4500	11.3000	**11.2933**
T_s	Sample temperature (°F)	503.1667	508.0833	508.3333	**506.5278**
B_w	Actual water vapor in gas (% by volume)	19.4825	17.3011	17.9106	**18.2314**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	34.5608	33.6520	32.3534	**33.5221**
Laboratory Data					
m_n	Total HCl collected (mg)	510.8082	510.6186	584.4054	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.2590E-05	3.3458E-05	3.9829E-05	**3.5292E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	3.3041E-05	3.9580E-05	4.4149E-05	**3.8923E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	3.2241E-05	3.8420E-05	4.2297E-05	**3.7652E-05**
C_{sd}	HCl Concentration (ppmdv)	344.5593	353.7339	421.0995	**373.1309**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	349.3344	418.4597	466.7690	**411.5210**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	340.8666	406.2016	447.1853	**398.0845**
C_w	HCl Concentration (ppmwv)	277.4305	292.5341	345.6780	**305.2142**
C_{sd}	HCl Concentration (mg/dscm)	521.8809	535.7770	637.8112	**565.1563**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	529.1134	633.8128	706.9837	**623.3033**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	516.2878	615.2463	677.3216	**602.9519**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	560.0673	574.9802	684.4803	**606.5092**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	567.8290	680.1893	758.7142	**668.9108**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	554.0649	660.2643	726.8817	**647.0703**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.4754	0.5695	0.6353	**0.5601**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.4890	0.5827	0.6415	**0.5711**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Modified Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9886	0.9886	0.9886	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-9.0000	-9.0000	-9.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.25	30.25	30.25	**30.2500**
O_2	Oxygen (dry volume %)	8.7800	9.5500	9.0000	**9.1100**
CO_2	Carbon dioxide (dry volume %)	10.6600	10.0600	10.6700	**10.4633**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5600	80.3900	80.3300	**80.4267**
V_{lc}	Total Liquid collected (ml)	256.50	229.20	237.10	
V_m	Volume metered, meter conditions (ft^3)	40.6850	40.9150	41.4450	
T_m	Dry gas meter temperature (°F)	75.7917	86.4167	95.8750	
T_s	Sample temperature (°F)	311.5000	312.6667	312.7500	**312.3056**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	12.0709	10.7862	11.1579	**11.3383**
V_{mstd}	Volume metered, standard (dscf)	40.2035	39.6446	39.4748	**39.7743**
P_s	Sample gas pressure, absolute (in. Hg)	29.5882	29.5882	29.5882	**29.5882**
P_v	Vapor pressure, actual (in. Hg)	29.5882	29.5882	29.5882	**29.5882**
B_{wo}	Moisture measured in sample (% by volume)	23.0914	21.3881	22.0370	**22.1721**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	23.0914	21.3881	22.0370	**22.1721**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0568	29.9916	30.0672	**30.0385**
M_s	MW of sample gas, wet (lb/lb-mole)	27.2727	27.4268	27.4080	**27.3692**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Modified Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	183.8	184.1	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	319	322	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7800	9.5500	9.0000	**9.1100**
CO_2	Carbon dioxide (dry volume %)	10.6600	10.0600	10.6700	**10.4633**
T_s	Sample temperature (°F)	311.5000	312.6667	312.7500	**312.3056**
B_w	Actual water vapor in gas (% by volume)	23.0914	21.3881	22.0370	**22.1721**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.2035	39.6446	39.4748	**39.7743**
Laboratory Data					
m_n	Total HCl collected (mg)	30.4028	20.3235	17.7085	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.6675E-06	1.1304E-06	9.8917E-07	**1.2623E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	1.9124E-06	1.3843E-06	1.1554E-06	**1.4840E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	1.8771E-06	1.3484E-06	1.1125E-06	**1.4460E-06**
C_{sd}	HCl Concentration (ppmdv)	17.6295	11.9510	10.4581	**13.3462**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	20.2187	14.6361	12.2158	**15.6902**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	19.8456	14.2557	11.7617	**15.2877**
C_w	HCl Concentration (ppmwv)	13.5586	9.3949	8.1535	**10.3690**
C_{sd}	HCl Concentration (mg/dscm)	26.7022	18.1014	15.8402	**20.2146**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	30.6239	22.1682	18.5024	**23.7648**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	30.0588	21.5921	17.8146	**23.1552**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	28.6561	19.4259	16.9992	**21.6937**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	32.8646	23.7903	19.8562	**25.5037**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	32.2582	23.1721	19.1182	**24.8495**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0275	0.0199	0.0166	**0.0214**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0285	0.0205	0.0169	**0.0219**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0079	1.0079	1.0079	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.5000	-10.5000	-10.5000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6800	80.1300	80.1800	**80.3300**
V_{lc}	Total Liquid collected (ml)	380.40	397.10	392.70	
V_m	Volume metered, meter conditions (ft^3)	70.9500	75.1250	73.3650	
T_m	Dry gas meter temperature (°F)	73.1200	79.7400	94.1800	
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0416	1.1316	1.0744	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	17.9016	18.6875	18.4805	**18.3565**
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
P_s	Sample gas pressure, absolute (in. Hg)	29.4279	29.4279	29.4279	**29.4279**
P_v	Vapor pressure, actual (in. Hg)	29.4279	29.4279	29.4279	**29.4279**
B_{wo}	Moisture measured in sample (% by volume)	19.9927	19.9593	20.5914	**20.1811**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6567	0.6776	0.6568	**0.6637**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0400	30.1004	30.1212	**30.0872**
M_s	MW of sample gas, wet (lb/lb-mole)	27.6329	27.6852	27.6253	**27.6478**
V_s	Velocity of sample (ft/sec)	44.2921	45.6597	44.3855	**44.7791**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00060	0.00050	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00312	0.00070	0.00112	
m_n	Total particulate matter collected (g)	0.00372	0.00120	0.00112	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.1436E-07	3.5244E-08	3.4574E-08	**6.1393E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	1.3094E-07	4.1133E-08	3.9554E-08	**7.0542E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	1.2995E-07	3.8872E-08	3.7479E-08	**6.8769E-08**
C_a	Particulate Concentration (lb/acf)	6.1905E-08	1.9080E-08	1.8505E-08	**3.3163E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0008	0.0002	0.0002	**0.0004**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0009	0.0003	0.0003	**0.0005**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0009	0.0003	0.0003	**0.0005**
C_a	Particulate Concentration (gr/acf)	0.0004	0.0001	0.0001	**0.0002**
C_{sd}	Particulate Concentration (mg/dscm)	1.8313	0.5644	0.5537	**0.9831**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.0968	0.6587	0.6334	**1.1296**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	2.0810	0.6225	0.6002	**1.1012**
C_a	Particulate Concentration (mg/m^3(actual,wet))	0.9913	0.3055	0.2963	**0.5311**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	1.9653	0.6057	0.5942	**1.0551**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	2.2502	0.7069	0.6798	**1.2123**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	2.2333	0.6680	0.6441	**1.1818**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.6317	0.2007	0.1892	**0.3406**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.2865	0.0910	0.0858	**0.1545**
$E_{T/yr}$	Particulate Rate (Ton/yr)	2.7670	0.8792	0.8289	**1.4917**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0019	0.0006	0.0006	**0.0010**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0020	0.0006	0.0006	**0.0010**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	11.5809	8.1043	6.8887	
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
m_{n-3c}	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	11.5809	8.1043	6.8887	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	3.5645E-10	2.3845E-10	2.1313E-10	**2.6935E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.0813E-10	2.7830E-10	2.4383E-10	**3.1009E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.0506E-10	2.6300E-10	2.3104E-10	**2.9970E-10**
C_a	Concentration (lb/acf)	1.9295E-10	1.2909E-10	1.1408E-10	**1.4537E-10**
C_{sd}	Concentration (µg/dscm)	5.7081E+00	3.8185E+00	3.4130E+00	**4.3132E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	6.5356E+00	4.4565E+00	3.9046E+00	**4.9656E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.4865E+00	4.2116E+00	3.6998E+00	**4.7993E+00**
C_{sd}	Concentration (mg/dscm)	5.7081E-03	3.8185E-03	3.4130E-03	**4.3132E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	6.5356E-03	4.4565E-03	3.9046E-03	**4.9656E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.4865E-03	4.2116E-03	3.6998E-03	**4.7993E-03**
C_a	Concentration (µg/m^3 (actual,wet))	3.0899E+00	2.0672E+00	1.8268E+00	**2.3279E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	6.1257E+00	4.0979E+00	3.6628E+00	**4.6288E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.0138E+00	4.7826E+00	4.1903E+00	**5.3289E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	6.9611E+00	4.5197E+00	3.9705E+00	**5.1504E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.9691E-03	1.3580E-03	1.1666E-03	**1.4979E-03**
$E_{g/s}$	Rate (g/s)	2.4806E-04	1.7108E-04	1.4696E-04	**1.8870E-04**
$E_{T/yr}$	Rate (Ton/yr)	8.6245E-03	5.9482E-03	5.1096E-03	**6.5608E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	5.8727E-06	4.0045E-06	3.5086E-06	**4.4620E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.1434E-06	3.9888E-06	3.5041E-06	**4.5454E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Front Half Results

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Mercury Results - Front Half					
C_{sd}	Concentration (lb/dscf)	<3.0779E-12	<2.9423E-12	<3.0939E-12	**<3.0381E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.5241E-12	<3.4339E-12	<3.5396E-12	**<3.4992E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.4976E-12	<3.2452E-12	<3.3539E-12	**<3.3656E-12**
C_a	Concentration (lb/acf)	<1.6661E-12	<1.5929E-12	<1.6560E-12	**<1.6383E-12**
C_{sd}	Concentration (µg/dscm)	<4.9289E-02	<4.7117E-02	<4.9545E-02	**<4.8650E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.6434E-02	<5.4990E-02	<5.6681E-02	**<5.6035E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.6010E-02	<5.1968E-02	<5.3708E-02	**<5.3895E-02**
C_{sd}	Concentration (mg/dscm)	<4.9289E-05	<4.7117E-05	<4.9545E-05	**<4.8650E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.6434E-05	<5.4990E-05	<5.6681E-05	**<5.6035E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.6010E-05	<5.1968E-05	<5.3708E-05	**<5.3895E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.6681E-02	<2.5508E-02	<2.6518E-02	**<2.6236E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<5.2895E-02	<5.0565E-02	<5.3171E-02	**<5.2210E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<6.0564E-02	<5.9014E-02	<6.0829E-02	**<6.0135E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<6.0108E-02	<5.5770E-02	<5.7637E-02	**<5.7839E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.7003E-05	<1.6757E-05	<1.6935E-05	**<1.6898E-05**
$E_{g/s}$	Rate (g/s)	<2.1419E-06	<2.1110E-06	<2.1334E-06	**<2.1288E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.4472E-05	<7.3397E-05	<7.4174E-05	**<7.4014E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<5.0710E-08	<4.9413E-08	<5.0932E-08	**<5.0352E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.3048E-08	<4.9219E-08	<5.0867E-08	**<5.1045E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 1-3 Results

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Mercury Results - Impingers 1-3 Solution					
C_{sd}	Concentration (lb/dscf)	3.5645E-10	2.3845E-10	2.1313E-10	**2.6935E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.0813E-10	2.7830E-10	2.4383E-10	**3.1009E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.0506E-10	2.6300E-10	2.3104E-10	**2.9970E-10**
C_a	Concentration (lb/acf)	1.9295E-10	1.2909E-10	1.1408E-10	**1.4537E-10**
C_{sd}	Concentration (µg/dscm)	5.7081E+00	3.8185E+00	3.4130E+00	**4.3132E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	6.5356E+00	4.4565E+00	3.9046E+00	**4.9656E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.4865E+00	4.2116E+00	3.6998E+00	**4.7993E+00**
C_{sd}	Concentration (mg/dscm)	5.7081E-03	3.8185E-03	3.4130E-03	**4.3132E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	6.5356E-03	4.4565E-03	3.9046E-03	**4.9656E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.4865E-03	4.2116E-03	3.6998E-03	**4.7993E-03**
C_a	Concentration (µg/m^3 (actual,wet))	3.0899E+00	2.0672E+00	1.8268E+00	**2.3279E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	6.1257E+00	4.0979E+00	3.6628E+00	**4.6288E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.0138E+00	4.7826E+00	4.1903E+00	**5.3289E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	6.9611E+00	4.5197E+00	3.9705E+00	**5.1504E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.9691E-03	1.3580E-03	1.1666E-03	**1.4979E-03**
$E_{g/s}$	Rate (g/s)	2.4806E-04	1.7108E-04	1.4696E-04	**1.8870E-04**
$E_{T/yr}$	Rate (Ton/yr)	8.6245E-03	5.9482E-03	5.1096E-03	**6.5608E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	5.8727E-06	4.0045E-06	3.5086E-06	**4.4620E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.1434E-06	3.9888E-06	3.5041E-06	**4.5454E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 4 Results

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Mercury Results - Impinger 4 Solution					
C_{sd}	Concentration (lb/dscf)	<6.1559E-12	<5.8847E-12	<6.1879E-12	**<6.0761E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<7.0483E-12	<6.8679E-12	<7.0792E-12	**<6.9985E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.9953E-12	<6.4904E-12	<6.7077E-12	**<6.7312E-12**
C_a	Concentration (lb/acf)	<3.3323E-12	<3.1858E-12	<3.3119E-12	**<3.2767E-12**
C_{sd}	Concentration (µg/dscm)	<9.8577E-02	<9.4235E-02	<9.9091E-02	**<9.7301E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.1287E-01	<1.0998E-01	<1.1336E-01	**<1.1207E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1202E-01	<1.0394E-01	<1.0742E-01	**<1.0779E-01**
C_{sd}	Concentration (mg/dscm)	<9.8577E-05	<9.4235E-05	<9.9091E-05	**<9.7301E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.1287E-04	<1.0998E-04	<1.1336E-04	**<1.1207E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1202E-04	<1.0394E-04	<1.0742E-04	**<1.0779E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<5.3361E-02	<5.1016E-02	<5.3036E-02	**<5.2471E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.0579E-01	<1.0113E-01	<1.0634E-01	**<1.0442E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.2113E-01	<1.1803E-01	<1.2166E-01	**<1.2027E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.2022E-01	<1.1154E-01	<1.1527E-01	**<1.1568E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.4005E-05	<3.3514E-05	<3.3869E-05	**<3.3796E-05**
$E_{g/s}$	Rate (g/s)	<4.2839E-06	<4.2220E-06	<4.2667E-06	**<4.2575E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4894E-04	<1.4679E-04	<1.4835E-04	**<1.4803E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.0142E-07	<9.8825E-08	<1.0186E-07	**<1.0070E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0610E-07	<9.8438E-08	<1.0173E-07	**<1.0209E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 5-6 Results

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Mercury Results - Filtered Permanganate Solution					
C_{sd}	Concentration (lb/dscf)	<1.5390E-11	<1.4712E-11	<1.5470E-11	**<1.5190E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7621E-11	<1.7170E-11	<1.7698E-11	**<1.7496E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7488E-11	<1.6226E-11	<1.6769E-11	**<1.6828E-11**
C_a	Concentration (lb/acf)	<8.3306E-12	<7.9645E-12	<8.2798E-12	**<8.1916E-12**
C_{sd}	Concentration (µg/dscm)	<2.4644E-01	<2.3559E-01	<2.4773E-01	**<2.4325E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8217E-01	<2.7495E-01	<2.8341E-01	**<2.8018E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8005E-01	<2.5984E-01	<2.6854E-01	**<2.6948E-01**
C_{sd}	Concentration (mg/dscm)	<2.4644E-04	<2.3559E-04	<2.4773E-04	**<2.4325E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8217E-04	<2.7495E-04	<2.8341E-04	**<2.8018E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8005E-04	<2.5984E-04	<2.6854E-04	**<2.6948E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.3340E-01	<1.2754E-01	<1.3259E-01	**<1.3118E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6448E-01	<2.5282E-01	<2.6585E-01	**<2.6105E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0282E-01	<2.9507E-01	<3.0414E-01	**<3.0068E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.0054E-01	<2.7885E-01	<2.8819E-01	**<2.8919E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.5013E-05	<8.3786E-05	<8.4673E-05	**<8.4491E-05**
$E_{g/s}$	Rate (g/s)	<1.0710E-05	<1.0555E-05	<1.0667E-05	**<1.0644E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.7236E-04	<3.6698E-04	<3.7087E-04	**<3.7007E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5355E-07	<2.4706E-07	<2.5466E-07	**<2.5176E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6524E-07	<2.4610E-07	<2.5434E-07	**<2.5522E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate					
C_{sd}	Concentration (lb/dscf)	<1.2312E-11	<1.1769E-11	<1.2376E-11	**<1.2152E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.4097E-11	<1.3736E-11	<1.4158E-11	**<1.3997E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.3991E-11	<1.2981E-11	<1.3415E-11	**<1.3462E-11**
C_a	Concentration (lb/acf)	<6.6645E-12	<6.3716E-12	<6.6239E-12	**<6.5533E-12**
C_{sd}	Concentration (µg/dscm)	<1.9715E-01	<1.8847E-01	<1.9818E-01	**<1.9460E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.2574E-01	<2.1996E-01	<2.2673E-01	**<2.2414E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.2404E-01	<2.0787E-01	<2.1483E-01	**<2.1558E-01**
C_{sd}	Concentration (mg/dscm)	<1.9715E-04	<1.8847E-04	<1.9818E-04	**<1.9460E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.2574E-04	<2.1996E-04	<2.2673E-04	**<2.2414E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.2404E-04	<2.0787E-04	<2.1483E-04	**<2.1558E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.0672E-01	<1.0203E-01	<1.0607E-01	**<1.0494E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.1158E-01	<2.0226E-01	<2.1268E-01	**<2.0884E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.4225E-01	<2.3605E-01	<2.4332E-01	**<2.4054E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.4043E-01	<2.2308E-01	<2.3055E-01	**<2.3135E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.8011E-05	<6.7029E-05	<6.7738E-05	**<6.7593E-05**
$E_{g/s}$	Rate (g/s)	<8.5677E-06	<8.4440E-06	<8.5334E-06	**<8.5151E-06**
$E_{T/yr}$	Rate (Ton/yr)	<2.9789E-04	<2.9359E-04	<2.9669E-04	**<2.9606E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.0284E-07	<1.9765E-07	<2.0373E-07	**<2.0141E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.1219E-07	<1.9688E-07	<2.0347E-07	**<2.0416E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.5390E-12	<1.4712E-12	<1.5470E-12	**<1.5190E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7621E-12	<1.7170E-12	<1.7698E-12	**<1.7496E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7488E-12	<1.6226E-12	<1.6769E-12	**<1.6828E-12**
C_a	Concentration (lb/acf)	<8.3306E-13	<7.9645E-13	<8.2798E-13	**<8.1916E-13**
C_{sd}	Concentration (µg/dscm)	<2.4644E-02	<2.3559E-02	<2.4773E-02	**<2.4325E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8217E-02	<2.7495E-02	<2.8341E-02	**<2.8018E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8005E-02	<2.5984E-02	<2.6854E-02	**<2.6948E-02**
C_{sd}	Concentration (mg/dscm)	<2.4644E-05	<2.3559E-05	<2.4773E-05	**<2.4325E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8217E-05	<2.7495E-05	<2.8341E-05	**<2.8018E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8005E-05	<2.5984E-05	<2.6854E-05	**<2.6948E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.3340E-02	<1.2754E-02	<1.3259E-02	**<1.3118E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6448E-02	<2.5282E-02	<2.6585E-02	**<2.6105E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0282E-02	<2.9507E-02	<3.0414E-02	**<3.0068E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.0054E-02	<2.7885E-02	<2.8819E-02	**<2.8919E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.5013E-06	<8.3786E-06	<8.4673E-06	**<8.4491E-06**
$E_{g/s}$	Rate (g/s)	<1.0710E-06	<1.0555E-06	<1.0667E-06	**<1.0644E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7236E-05	<3.6698E-05	<3.7087E-05	**<3.7007E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5355E-08	<2.4706E-08	<2.5466E-08	**<2.5176E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6524E-08	<2.4610E-08	<2.5434E-08	**<2.5522E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.2826	<0.2000	0.2161	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	8.6990E-12	<5.8847E-12	6.6873E-12	**<7.0903E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	9.9602E-12	<6.8679E-12	7.6505E-12	**<8.1595E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	9.8852E-12	<6.4904E-12	7.2491E-12	**<7.8749E-12**
C_a	Concentration (lb/acf)	4.7089E-12	<3.1858E-12	3.5792E-12	**<3.8246E-12**
C_{sd}	Concentration (µg/dscm)	1.3930E-01	<9.4235E-02	1.0709E-01	**<1.1354E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.5950E-01	<1.0998E-01	1.2251E-01	**<1.3066E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.5830E-01	<1.0394E-01	1.1608E-01	**<1.2611E-01**
C_{sd}	Concentration (mg/dscm)	1.3930E-04	<9.4235E-05	1.0709E-04	**<1.1354E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.5950E-04	<1.0998E-04	1.2251E-04	**<1.3066E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.5830E-04	<1.0394E-04	1.1608E-04	**<1.2611E-04**
C_a	Concentration (µg/m^3 (actual,wet))	7.5407E-02	<5.1016E-02	5.7317E-02	**<6.1246E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	1.4950E-01	<1.0113E-01	1.1492E-01	**<1.2185E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.7117E-01	<1.1803E-01	1.3148E-01	**<1.4022E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.6988E-01	<1.1154E-01	1.2458E-01	**<1.3533E-01**
$E_{lb/hr}$	Rate (lb/hr)	4.8054E-05	<3.3514E-05	3.6603E-05	**<3.9390E-05**
$E_{g/s}$	Rate (g/s)	6.0537E-06	<4.2220E-06	4.6111E-06	**<4.9623E-06**
$E_{T/yr}$	Rate (Ton/yr)	2.1048E-04	<1.4679E-04	1.6032E-04	**<1.7253E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.4332E-07	<9.8825E-08	1.1009E-07	**<1.1741E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.4993E-07	<9.8438E-08	1.0995E-07	**<1.1944E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:46	09:24	11:58	
Stop Time (approx.)		08:58	11:38	14:10	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.1	184.0	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7600	8.9900	8.7500	**8.8333**
CO_2	Carbon dioxide (dry volume %)	10.5600	10.8800	11.0700	**10.8367**
T_s	Sample temperature (°F)	307.5600	307.8000	310.4800	**308.6133**
B_w	Actual water vapor in gas (% by volume)	19.9927	19.9593	20.5914	**20.1811**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,082	175,333	170,440	**171,952**
Q_s	Volumetric flow rate, standard (scfm)	115,074	118,590	114,880	**116,181**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,068	94,920	91,224	**92,737**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,410	81,331	79,739	**80,494**
Q_a	Volumetric flow rate, actual (acf/hr)	10,204,907	10,519,996	10,226,424	**10,317,109**
Q_s	Volumetric flow rate, standard (scf/hr)	6,904,448	7,115,406	6,892,783	**6,970,879**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,524,062	5,695,222	5,473,466	**5,564,250**
Q_a	Volumetric flow rate, actual (m^3/hr)	289,009	297,932	289,618	**292,187**
Q_s	Volumetric flow rate, standard (m^3/hr)	195,538	201,512	195,208	**197,419**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	156,445	161,292	155,012	**157,583**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	136,636	138,201	135,496	**136,777**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	182,206	187,773	181,898	**183,959**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	145,778	150,295	144,443	**146,839**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	127,320	128,778	126,258	**127,452**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.6391	74.9407	71.2682	**72.6160**
%I	Isokinetic sampling (%)	101.7587	103.2492	102.1675	**102.3918**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	1.4108	0.4894	0.4760	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	4.3423E-11	1.4399E-11	1.4728E-11	**2.4183E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.9718E-11	1.6805E-11	1.6849E-11	**2.7791E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.9344E-11	1.5882E-11	1.5965E-11	**2.7063E-11**
C_a	Concentration (lb/acf)	2.3505E-11	7.7954E-12	7.8827E-12	**1.3061E-11**
C_{sd}	Concentration (µg/dscm)	6.9535E-01	2.3059E-01	2.3584E-01	**3.8726E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.9616E-01	2.6911E-01	2.6981E-01	**4.4503E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	7.9017E-01	2.5432E-01	2.5566E-01	**4.3338E-01**
C_{sd}	Concentration (mg/dscm)	6.9535E-04	2.3059E-04	2.3584E-04	**3.8726E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	7.9616E-04	2.6911E-04	2.6981E-04	**4.4503E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	7.9017E-04	2.5432E-04	2.5566E-04	**4.3338E-04**
C_a	Concentration (µg/m^3 (actual,wet))	3.7640E-01	1.2483E-01	1.2623E-01	**2.0916E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	7.4623E-01	2.4746E-01	2.5310E-01	**4.1560E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	8.5442E-01	2.8880E-01	2.8956E-01	**4.7759E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	8.4799E-01	2.7293E-01	2.7436E-01	**4.6509E-01**
$E_{lb/hr}$	Rate (lb/hr)	2.3987E-04	8.2007E-05	8.0612E-05	**1.3416E-04**
$E_{g/s}$	Rate (g/s)	3.0218E-05	1.0331E-05	1.0155E-05	**1.6901E-05**
$E_{T/yr}$	Rate (Ton/yr)	1.0506E-03	3.5919E-04	3.5308E-04	**5.8763E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	7.1541E-07	2.4182E-07	2.4245E-07	**3.9989E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	7.4838E-07	2.4087E-07	2.4214E-07	**4.1046E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		08:17	11:31	13:16	
Stop Time (approx.)		10:32	12:49	14:30	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0079	1.0079	1.0079	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-10.9000	-9.3000	-9.3000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.21	30.25	30.25	**30.2367**
D_n	Nozzle diameter (in.)	0.2720	0.2720	0.2720	
O_2	Oxygen (dry volume %)	8.8500	8.7500	8.9400	**8.8467**
CO_2	Carbon dioxide (dry volume %)	10.7000	11.0400	10.9300	**10.8900**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.4500	80.2100	80.1300	**80.2633**
V_{lc}	Total Liquid collected (ml)	241.80	224.00	191.60	
V_m	Volume metered, meter conditions (ft^3)	37.7130	36.8750	35.1000	
T_m	Dry gas meter temperature (°F)	74.4400	96.3400	102.2800	
T_s	Sample temperature (°F)	309.6400	308.8000	313.1600	**310.5333**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2100	1.0372	0.9864	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	11.3791	10.5414	9.0167	**10.3124**
V_{mstd}	Volume metered, standard (dscf)	38.0133	35.7377	33.6539	**35.8017**
P_s	Sample gas pressure, absolute (in. Hg)	29.4085	29.5662	29.5662	**29.5136**
P_v	Vapor pressure, actual (in. Hg)	29.4085	29.5662	29.5662	**29.5136**
B_{wo}	Moisture measured in sample (% by volume)	23.0382	22.7779	21.1309	**22.3157**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	23.0382	22.7779	21.1309	**22.3157**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6903	0.6518	0.6246	**0.6556**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0660	30.1164	30.1064	**30.0963**
M_s	MW of sample gas, wet (lb/lb-mole)	27.2862	27.3565	27.5482	**27.3970**
V_s	Velocity of sample (ft/sec)	47.6782	44.8215	42.9221	**45.1406**
%I	Isokinetic sampling (%)	101.5878	100.6013	97.4111	**99.8667**
Q_a	Volumetric flow rate, actual (acfm)	183,084	172,115	164,821	**173,340**
Q_s	Volumetric flow rate, standard (scfm)	123,455	116,808	111,227	**117,163**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	95,013	90,201	87,724	**90,980**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,368	78,845	75,480	**78,898**
Q_a	Volumetric flow rate, actual (acf/hr)	10,985,055	10,326,882	9,889,259	**10,400,399**
Q_s	Volumetric flow rate, standard (scf/hr)	7,407,305	7,008,472	6,673,626	**7,029,801**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,700,799	5,412,086	5,263,428	**5,458,771**
Q_a	Volumetric flow rate, actual (m^3/hr)	311,103	292,463	280,070	**294,545**
Q_s	Volumetric flow rate, standard (m^3/hr)	209,779	198,484	189,001	**199,088**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	161,450	153,273	149,063	**154,596**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	139,962	133,976	128,259	**134,066**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	195,476	184,951	176,115	**185,514**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	150,442	142,823	138,900	**144,055**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,419	124,842	119,514	**124,925**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		08:17	11:31	13:16	
Stop Time (approx.)		10:32	12:49	14:30	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.8	184.6	183.9	**184.4**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.8500	8.7500	8.9400	**8.8467**
CO_2	Carbon dioxide (dry volume %)	10.7000	11.0400	10.9300	**10.8900**
T_s	Sample temperature (°F)	309.6400	308.8000	313.1600	**310.5333**
B_w	Actual water vapor in gas (% by volume)	23.0382	22.7779	21.1309	**22.3157**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	183,084	172,115	164,821	**173,340**
Q_s	Volumetric flow rate, standard (scfm)	123,455	116,808	111,227	**117,163**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	95,013	90,201	87,724	**90,980**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,368	78,845	75,480	**78,898**
Q_a	Volumetric flow rate, actual (acf/hr)	10,985,055	10,326,882	9,889,259	**10,400,399**
Q_a	Volumetric flow rate, standard (scf/hr)	7,407,305	7,008,472	6,673,626	**7,029,801**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,700,799	5,412,086	5,263,428	**5,458,771**
Q_a	Volumetric flow rate, actual (m^3/hr)	311,103	292,463	280,070	**294,545**
Q_s	Volumetric flow rate, standard (m^3/hr)	209,779	198,484	189,001	**199,088**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	161,450	153,273	149,063	**154,596**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	139,962	133,976	128,259	**134,066**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	195,476	184,951	176,115	**185,514**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	150,442	142,823	138,900	**144,055**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,419	124,842	119,514	**124,925**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.0133	35.7377	33.6539	**35.8017**
%I	Isokinetic sampling (%)	101.5878	100.6013	97.4111	**99.8667**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0280	<0.0267	<0.0234	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<1.6230E-09	<1.6504E-09	<1.5337E-09	**<1.6024E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<1.8722E-09	<1.8881E-09	<1.7825E-09	**<1.8476E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<1.8202E-09	<1.7939E-09	<1.6838E-09	**<1.7660E-09**
C_a	HF Concentration (lb/acf)	<8.4228E-10	<8.6492E-10	<8.1629E-10	**<8.4116E-10**
C_{sd}	HF Concentration (ppmdv)	<0.0313	<0.0318	<0.0296	**<0.0309**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0361	<0.0364	<0.0343	**<0.0356**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0351	<0.0346	<0.0324	**<0.0340**
C_w	HF Concentration (ppmwv)	<0.0241	<0.0246	<0.0233	**<0.0240**
C_{sd}	HF Concentration (mg/dscm)	<0.0260	<0.0264	<0.0246	**<0.0257**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0300	<0.0302	<0.0285	**<0.0296**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0291	<0.0287	<0.0270	**<0.0283**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0135	<0.0139	<0.0131	**<0.0135**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0279	<0.0284	<0.0264	**<0.0275**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0322	<0.0324	<0.0306	**<0.0318**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0313	<0.0308	<0.0289	**<0.0303**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0093	<0.0089	<0.0081	**<0.0088**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0042	<0.0041	<0.0037	**<0.0040**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0405	<0.0391	<0.0354	**<0.0383**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000027	<0.000027	<0.000026	**<0.000027**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000028	<0.000027	<0.000026	**<0.000027**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0028	1.0028	1.0028	
P_g	Static pressure (in. H_2O)	-2.2000	-2.2000	-2.2000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
O_2	Oxygen (dry volume %)	8.2200	8.2100	8.2200	**8.2167**
CO_2	Carbon dioxide (dry volume %)	11.0900	11.3000	11.5900	**11.3267**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6900	80.4900	80.1900	**80.4567**
V_{lc}	Total Liquid collected (ml)	134.40	134.40	133.30	
V_m	Volume metered, meter conditions (ft^3)	32.1700	32.2100	33.7300	
T_m	Dry gas meter temperature (°F)	70.0417	75.2083	81.0000	
T_s	Sample temperature (°F)	487.1667	495.3333	495.8333	**492.7778**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0800	1.0358	1.1150	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	6.3249	6.3249	6.2731	**6.3076**
V_{mstd}	Volume metered, standard (dscf)	32.5088	32.2316	33.3977	**32.7127**
P_s	Sample gas pressure, absolute (in. Hg)	30.0382	30.0382	30.0382	**30.0382**
P_v	Vapor pressure, actual (in. Hg)	30.0382	30.0382	30.0382	**30.0382**
B_{wo}	Moisture measured in sample (% by volume)	16.2871	16.4042	15.8129	**16.1680**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	16.2871	16.4042	15.8129	**16.1680**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1032	30.1364	30.1832	**30.1409**
M_s	MW of sample gas, wet (lb/lb-mole)	28.1319	28.1455	28.2567	**28.1781**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	182.9	183.9	**183.7**
P_1	Fabric Filter Inlet Temperature (°F)	321	321	320	**321**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.2200	8.2100	8.2200	**8.2167**
CO_2	Carbon dioxide (dry volume %)	11.0900	11.3000	11.5900	**11.3267**
T_s	Sample temperature (°F)	487.1667	495.3333	495.8333	**492.7778**
B_w	Actual water vapor in gas (% by volume)	16.2871	16.4042	15.8129	**16.1680**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	32.5088	32.2316	33.3977	**32.7127**
Laboratory Data					
m_n	Total HCl collected (mg)	698.7197	595.7498	572.4612	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.7393E-05	4.0756E-05	3.7795E-05	**4.1981E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	5.1952E-05	4.4642E-05	4.1432E-05	**4.6009E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	5.1281E-05	4.3281E-05	3.9132E-05	**4.4565E-05**
C_{sd}	HCl Concentration (ppmdv)	501.0626	430.8962	399.5951	**443.8513**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	549.2721	471.9825	438.0419	**486.4321**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	542.1777	457.5889	413.7309	**471.1658**
C_w	HCl Concentration (ppmwv)	419.4543	360.2113	336.4075	**372.0244**
C_{sd}	HCl Concentration (mg/dscm)	758.9258	652.6495	605.2398	**672.2717**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	831.9455	714.8801	663.4726	**736.7661**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	821.2002	693.0792	626.6504	**713.6432**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	814.4570	700.4044	649.5256	**721.4623**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	892.8196	767.1884	712.0194	**790.6758**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	881.2880	743.7923	672.5028	**765.8610**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.7476	0.6424	0.5962	**0.6620**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.7778	0.6564	0.5935	**0.6759**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Modified Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9897	0.9897	0.9897	
P_g	Static pressure (in. H_2O)	-10.5000	-10.5000	-10.5000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.20	30.20	30.20	**30.2000**
O_2	Oxygen (dry volume %)	9.2100	9.1800	9.0100	**9.1333**
CO_2	Carbon dioxide (dry volume %)	10.0400	10.2500	10.7600	**10.3500**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7500	80.5700	80.2300	**80.5167**
V_{lc}	Total Liquid collected (ml)	210.80	221.70	211.60	
V_m	Volume metered, meter conditions (ft^3)	40.3100	40.9350	40.9350	
T_m	Dry gas meter temperature (°F)	75.4167	81.0000	86.2083	
T_s	Sample temperature (°F)	309.1667	310.5000	309.3333	**309.6667**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	9.9202	10.4332	9.9579	**10.1038**
V_{mstd}	Volume metered, standard (dscf)	39.8394	40.0396	39.6578	**39.8456**
P_s	Sample gas pressure, absolute (in. Hg)	29.4279	29.4279	29.4279	**29.4279**
P_v	Vapor pressure, actual (in. Hg)	29.4279	29.4279	29.4279	**29.4279**
B_{wo}	Moisture measured in sample (% by volume)	19.9363	20.6709	20.0700	**20.2258**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.9363	20.6709	20.0700	**20.2258**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9748	30.0072	30.0820	**30.0213**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5875	27.5252	27.6571	**27.5899**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Modified Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	182.9	183.9	**183.7**
P_1	Fabric Filter Inlet Temperature (°F)	321	321	320	**321**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.2100	9.1800	9.0100	**9.1333**
CO_2	Carbon dioxide (dry volume %)	10.0400	10.2500	10.7600	**10.3500**
T_s	Sample temperature (°F)	309.1667	310.5000	309.3333	**309.6667**
B_w	Actual water vapor in gas (% by volume)	19.9363	20.6709	20.0700	**20.2258**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	39.8394	40.0396	39.6578	**39.8456**
Laboratory Data					
m_n	Total HCl collected (mg)	7.9377	13.6807	13.2000	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.3933E-07	7.5340E-07	7.3393E-07	**6.4222E-07**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	5.2238E-07	8.9354E-07	8.5800E-07	**7.5797E-07**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	5.2509E-07	8.8203E-07	8.1851E-07	**7.4188E-07**
C_{sd}	HCl Concentration (ppmdv)	4.6448	7.9654	7.7595	**6.7899**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	5.5229	9.4470	9.0713	**8.0138**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	5.5516	9.3254	8.6538	**7.8436**
C_w	HCl Concentration (ppmwv)	3.7188	6.3189	6.2022	**5.4133**
C_{sd}	HCl Concentration (mg/dscm)	7.0352	12.0647	11.7529	**10.2843**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	8.3652	14.3088	13.7397	**12.1379**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	8.4086	14.1245	13.1073	**11.8801**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	7.5500	12.9475	12.6128	**11.0368**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	8.9773	15.3558	14.7450	**13.0260**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	9.0239	15.1580	14.0663	**12.7494**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0075	0.0129	0.0123	**0.0109**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0080	0.0134	0.0124	**0.0113**

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
CleanAir Project No. 10735
Lime Silo

Visible Emission Parameters

Run	**1**
Date (2009)	Mar 12
Start Time	8:16

Time (min)	Time (sec) 15	30	45	60
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

Time (min)	Time (sec) 15	30	45	60
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56				
57				
58				
59				

Average Opacity	**0**
Minimum Reading	**0**
Maximum Reading	**0**
No. of Readings >5%	**0**

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SS EPA M9 Version 01-2003

QA/QC DATA

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	1	2	3	
	Date (2009)	Mar 10	Mar 10	Mar 10	
	Start Time (approx.)	06:48	09:25	11:59	
	Stop Time (approx.)	09:03	11:37	14:13	
	Total Duration of Test Run (min.)	135	132	134	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	268-1	268-1	268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	66-6	66-6	66-6	
Y_d	Meter Box Yd - Field Sheet	0.9916	0.9916	0.9916	
	Meter Box Yd - Database	0.9916	0.9916	0.9916	
	Meter Box ΔH@ - Field Sheet	1.8053	1.8053	1.8053	
	Meter Box ΔH@ - Database	1.8053	1.8053	1.8053	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0210	0.0225	0.0224	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	65.915	69.187	67.923	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	0.9789	1.0196	1.0168	
Y_{qa}	Alternative Meter Calibration Factor	1.0130	0.9952	1.0043	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	2.2%	0.4%	1.3%	**1.3%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.02	99.07	96.74	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	1	0	
	Number of points >110%	0	1	0	
	Number of points <80%	1	0	0	
	Number of points >120%	0	0	0	

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

	Run No.	1	2	3	
	Date (2009)	Mar 12	Mar 12	Mar 12	
	Start Time (approx.)	11:47	13:09	14:33	
	Stop Time (approx.)	12:59	14:19	15:43	
	Total Duration of Test Run (min.)	72	70	70	
	Net Sampling Time (min.)	63	63	63	
	Sampling System Calibration Summary				
	Nozzle ID No:	272-1	272-1	272-1	
D_n	Nozzle Diameter (in):	0.272	0.272	0.272	
	Probe ID No:	67-8-7	67-8-7	67-8-7	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	66-6	66-6	66-6	
Y_d	Meter Box Yd - Field Sheet	0.9916	0.9916	0.9916	
	Meter Box Yd - Database	0.9916	0.9916	0.9916	
	Meter Box ΔH@ - Field Sheet	1.8053	1.8053	1.8053	
	Meter Box ΔH@ - Database	1.8053	1.8053	1.8053	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0248	0.0247	0.0259	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0030	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	38.083	37.501	39.555	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.1293	1.0731	1.1790	
Y_{qa}	Alternative Meter Calibration Factor	1.0006	0.9610	1.0033	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.9%	-3.1%	1.2%	**-0.3%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.52	102.18	98.71	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	1	
	Number of points >110%	1	1	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Method 23 (PCDD/F)
QA/QC Results

	Run No.	1	2*	3	4	
	Date (2009)	Mar 10	Mar 11	Mar 11	Mar 12	
	Start Time (approx.)	10:08	06:26	11:26	06:42	
	Stop Time (approx.)	14:30	11:05	15:45	11:13	
	Total Duration of Test Run (min.)	262	279	259	271	
	Net Sampling Time (min.)	250	250	250	250	
	Sampling System Calibration Summary					
	Nozzle ID No:	266-1	266-1	266-1	266-1	
D_n	Nozzle Diameter (in):	0.266	0.266	0.266	0.266	
	Probe ID No:	67-8-17	67-8-17	67-8-17	67-8-17	
C_p	Pitot Coefficient:	0.8330	0.8330	0.8330	0.833	
	Meter Box ID. No:	66-22	66-22	66-22	61-6	
Y_d	Meter Box Yd - Field Sheet	0.9937	0.9937	0.9937	0.9875	
	Meter Box Yd - Database	0.9937	0.9937	0.9937	0.9875	
	Meter Box ΔH@ - Field Sheet	1.7498	1.7498	1.7498	1.6981	
	Meter Box ΔH@ - Database	1.7498	1.7498	1.7498	1.6981	
	QA/QC					
	Final Leak Check					
	(a) 4% of Sampling Rate (cfm)	0.0229	0.0235	0.0234	0.0234	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0060	0.0040	0.0030	0.0040	
	Sample Volume					
	Minimum Volume Required (dscf)	30.00	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	138.679	146.024	142.061	141.319	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)					
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	0.9999	1.0391	1.0189	1.0191	
Y_{qa}	Alternative Meter Calibration Factor	0.9836	0.9830	0.9805	0.9934	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-1.0%	-1.1%	-1.3%	0.6%	**-0.7%**
	Mean Isokinetic Sampling Rate Variation					
	Minimum Allowable (%)	90	90	90	90	
	Maximum Allowable (%)	110	110	110	110	
%I	Actual Variation (%)	99.95	100.96	100.41	97.99	
	Point-by-Point Isokinetic Variation					
	Number of points <90%	0	0	2	1	
	Number of points >110%	0	0	2	0	
	Number of points <80%	0	0	1	0	
	Number of points >120%	0	0	1	0	

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Total Duration of Test Run (min.)		60	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	NA	NA	NA	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-7	66-7	66-7	
Y_d	Meter Box Yd - Field Sheet	1.0028	1.0028	1.0028	
	Meter Box Yd - Database	1.0028	1.0028	1.0028	
	Meter Box ΔH@ - Field Sheet	1.7673	1.7673	1.7673	
	Meter Box ΔH@ - Database	1.7673	1.7673	1.7673	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0214	0.0225	0.0234	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0030	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	32.253	33.478	34.504	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0056	1.0539	1.0797	
Y_{qa}	Alternative Meter Calibration Factor	1.0375	1.0423	1.0310	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	3.5%	3.9%	2.8%	**3.4%**

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 1 FF Outlet

USEPA Modified Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 12	Mar 12	Mar 12	
Start Time (approx.)		06:36	08:25	10:10	
Stop Time (approx.)		07:36	09:25	11:10	
Total Duration of Test Run (min.)		60	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	5G-48-1	5G-48-1	5G-48-1	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-6	66-6	66-6	
Y_d	Meter Box Yd - Field Sheet	0.9916	0.9916	0.9916	
	Meter Box Yd - Database	0.9916	0.9916	0.9916	
	Meter Box ΔH@ - Field Sheet	1.8053	1.8053	1.8053	
	Meter Box ΔH@ - Database	1.8053	1.8053	1.8053	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0270	0.0280	0.0285	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{msld}	Actual Sample Volume (dscf)	40.301	41.427	41.914	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	0.9928	0.9622	0.9473	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.1%	-3.0%	-4.5%	**-2.4%**

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	1	2	3	
	Date (2009)	Mar 12	Mar 12	Mar 12	
	Start Time (approx.)	06:29	08:58	11:39	
	Stop Time (approx.)	08:40	11:20	13:49	
	Total Duration of Test Run (min.)	131	142	130	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	268-1	268-1	268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	61-7	61-7	61-7	
Y_d	Meter Box Yd - Field Sheet	0.9886	0.9886	0.9886	
	Meter Box Yd - Database	0.9886	0.9886	0.9886	
	Meter Box ΔH@ - Field Sheet	1.7796	1.7796	1.7796	
	Meter Box ΔH@ - Database	1.7796	1.7796	1.7796	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0234	0.0223	0.0225	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	71.571	67.685	68.023	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0574	1.0063	1.0197	
Y_{qa}	Alternative Meter Calibration Factor	1.0026	1.0073	1.0092	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.4%	1.9%	2.1%	**1.8%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.92	98.84	98.65	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	1	0	
	Number of points >110%	1	1	0	
	Number of points <80%	0	1	0	
	Number of points >120%	1	1	0	

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Total Duration of Test Run (min.)		72	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	NA	NA	NA	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-7	66-7	66-7	
Y_d	Meter Box Yd - Field Sheet	1.0028	1.0028	1.0028	
	Meter Box Yd - Database	1.0028	1.0028	1.0028	
	Meter Box ΔH@ - Field Sheet	1.7673	1.7673	1.7673	
	Meter Box ΔH@ - Database	1.7673	1.7673	1.7673	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0228	0.0225	0.0219	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0030	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	34.561	33.652	32.353	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.1002	1.0517	1.0393	
Y_{qa}	Alternative Meter Calibration Factor	1.0619	1.0382	1.0591	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	5.9%	3.5%	5.6%	**5.0%**

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QA/QC _____
Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Modified Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		06:51	08:38	10:04	
Stop Time (approx.)		08:03	09:38	11:04	
Total Duration of Test Run (min.)		72	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	5G-48-1	5G-48-1	5G-48-1	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	61-7	61-7	61-7	
Y_d	Meter Box Yd - Field Sheet	0.9886	0.9886	0.9886	
	Meter Box Yd - Database	0.9886	0.9886	0.9886	
	Meter Box ΔH@ - Field Sheet	1.7796	1.7796	1.7796	
	Meter Box ΔH@ - Database	1.7796	1.7796	1.7796	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0271	0.0273	0.0276	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	40.203	39.645	39.475	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	0.9972	1.0024	0.9969	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.9%	1.4%	0.8%	**1.0%**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 2 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		07:30	11:28	13:12	
Stop Time (approx.)		08:48	12:46	14:24	
Total Duration of Test Run (min.)		78	78	72	
Net Sampling Time (min.)		63	63	63	
Sampling System Calibration Summary					
	Nozzle ID No:	272-1	272-1	272-1	
D_n	Nozzle Diameter (in):	0.272	0.272	0.272	
	Probe ID No:	67-8-7	67-8-7	67-8-7	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	61-7	61-7	61-7	
Y_d	Meter Box Yd - Field Sheet	0.9886	0.9886	0.9886	
	Meter Box Yd - Database	0.9886	0.9886	0.9886	
	Meter Box ΔH@ - Field Sheet	1.7796	1.7796	1.7796	
	Meter Box ΔH@ - Database	1.7796	1.7796	1.7796	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0248	0.0245	0.0266	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0030	0.0040	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{msld}	Actual Sample Volume (dscf)	38.043	36.836	38.973	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.1377	1.0875	1.1724	
Y_{qa}	Alternative Meter Calibration Factor	1.0159	0.9922	0.9989	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	2.8%	0.4%	1.0%	**1.4%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	98.81	96.63	97.84	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	0	0	
	Number of points >110%	1	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2009)	Mar 11	Mar 11	Mar 11	
	Start Time (approx.)	06:46	09:24	11:58	
	Stop Time (approx.)	08:58	11:38	14:10	
	Total Duration of Test Run (min.)	132	134	132	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	268-1	268-1	268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	61-8	61-8	61-8	
Y_d	Meter Box Yd - Field Sheet	1.0079	1.0079	1.0079	
	Meter Box Yd - Database	1.0079	1.0079	1.0079	
	Meter Box ΔH@ - Field Sheet	1.7934	1.7934	1.7934	
	Meter Box ΔH@ - Database	1.7934	1.7934	1.7934	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0227	0.0240	0.0235	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0040	0.0060	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	71.639	74.941	71.268	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0114	1.0588	1.0318	
Y_{qa}	Alternative Meter Calibration Factor	0.9791	0.9730	0.9836	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-2.9%	-3.5%	-2.4%	**-2.9%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	101.76	103.25	102.17	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

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Date _____

Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 10	Mar 10	Mar 10	
Start Time (approx.)		08:17	11:31	13:16	
Stop Time (approx.)		10:32	12:49	14:30	
Total Duration of Test Run (min.)		135	78	74	
Net Sampling Time (min.)		63	63	63	
Sampling System Calibration Summary					
	Nozzle ID No:	272-1	272-1	272-1	
D_n	Nozzle Diameter (in):	0.272	0.272	0.272	
	Probe ID No:	67-8-7	67-8-7	67-8-7	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	61-8	61-8	61-8	
Y_d	Meter Box Yd - Field Sheet	1.0079	1.0079	1.0079	
	Meter Box Yd - Database	1.0079	1.0079	1.0079	
	Meter Box ΔH@ - Field Sheet	1.7934	1.7934	1.7934	
	Meter Box ΔH@ - Database	1.7934	1.7934	1.7934	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0241	0.0236	0.0225	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0080	0.0020	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	38.013	35.738	33.654	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0958	1.0169	0.9919	
Y_{qa}	Alternative Meter Calibration Factor	0.9983	0.9654	0.9948	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.9%	-4.2%	-1.3%	**-2.2%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	101.59	100.60	97.41	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	1	
	Number of points >110%	1	1	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	1	0	

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Total Duration of Test Run (min.)		60	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	NA	NA	NA	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-7	66-7	66-7	
Y_d	Meter Box Yd - Field Sheet	1.0028	1.0028	1.0028	
	Meter Box Yd - Database	1.0028	1.0028	1.0028	
	Meter Box ΔH@ - Field Sheet	1.7673	1.7673	1.7673	
	Meter Box ΔH@ - Database	1.7673	1.7673	1.7673	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0214	0.0215	0.0225	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	32.509	32.232	33.398	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0368	1.0135	1.0539	
Y_{qa}	Alternative Meter Calibration Factor	1.0661	1.0454	1.0428	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	6.3%	4.2%	4.0%	**4.8%**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10735
Unit 3 FF Outlet

USEPA Modified Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2009)		Mar 11	Mar 11	Mar 11	
Start Time (approx.)		06:57	08:29	10:02	
Stop Time (approx.)		07:57	09:29	11:02	
Total Duration of Test Run (min.)		60	60	60	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	5G-48-1	5G-48-1	5G-48-1	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-11	66-11	66-11	
Y_d	Meter Box Yd - Field Sheet	0.9897	0.9897	0.9897	
	Meter Box Yd - Database	0.9897	0.9897	0.9897	
	Meter Box ΔH@ - Field Sheet	1.8958	1.8958	1.8958	
	Meter Box ΔH@ - Database	1.8958	1.8958	1.8958	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0269	0.0273	0.0273	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	39.839	40.040	39.658	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	0.9769	0.9665	0.9699	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-1.3%	-2.3%	-2.0%	**-1.9%**

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Nozzle Calibration Sheet

Client	Wheelabrator N/S Broward	Project Number	10735
Calibrated by		Unit	1-3
Date	3/10-18/2009	Runs	1-3

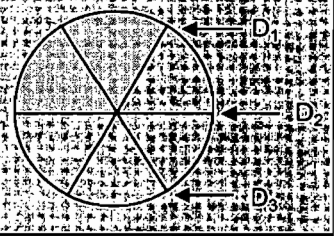
	Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
5/29	0.268-1	0.269	0.267	0.268	0.002	0.268
13B	0.272-1	0.272	0.272	0.272	0.000	0.272
23	0.266-1	0.265	0.266	0.266	0.001	0.266
29.N	0.275-1	0.275	0.275	0.275	0.000	0.275

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters

$\Delta D \leq 0.004$ inches

D_{ave} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

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Date_____

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-6

Date of Calibration: 7/23/2008

Meter Box Y_d: 0.9875

Calibration Conducted by: OLEG

Meter Box ΔH@: 1.6981

Barometric Pressure: 29.34

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.390	0.50	-1.30	1.0000	0.000	5.000	5.000	106.300	111.448	5.148	77.5	77.5	77.50	92.0	90.0	91.00	12.35	0.9912	1.7422
0.390	0.50	-1.30	1.0000	0.000	5.000	5.000	111.448	116.601	5.153	77.5	77.5	77.50	92.0	90.0	91.00	12.34	0.9902	1.7393
0.977	3.00	-1.80	1.0000	0.000	10.000	10.000	142.791	153.152	10.361	77.5	77.5	77.50	98.0	91.0	94.50	9.86	0.9838	1.6627
0.971	3.00	-1.90	1.0000	0.000	10.000	10.000	153.152	163.500	10.348	77.5	77.5	77.50	97.0	91.0	94.00	9.92	0.9839	1.6830
0.688	1.50	-1.50	1.0000	0.000	10.000	10.000	166.689	177.024	10.335	77.5	77.5	77.50	95.0	90.0	92.50	14.00	0.9871	1.6791
0.688	1.50	-1.50	1.0000	0.000	10.000	10.000	177.024	187.323	10.299	77.5	77.5	77.50	94.0	89.0	91.50	14.00	0.9888	1.6821
																Averages	0.98750	1.69807

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.8	5.0
10.6	10.0
15.8	15.0
20.4	20.0
25.6	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-6 Office: _____

Calibrated by: OLEG Client: _____

Date: 7/23/08 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	50	48	52				
100	100	98	102				
150	150	148	152				
200	201	198	202				
250	251	248	252				
300	300	298	302				
350	350	348	352				
400	400	398	401				
450	450	449	452				
500	501	500	501				
550	550	549	551				
600	600	599	601				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Date Calibrated: 10/7/2007

Calibration Report No: R044701

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10735 Meter No. 61-6 Orifice A-2

Location warehouse Meter Yd 0.9875 Orifice K' 0.4506

Test Date 03/25/09 Meter ΔH@ 1.6981 Orifice Cal. Date 01/21/09

Operator r. vicere Full Test Cal. Date 07/23/08

Barom. Press. (P_b) 28.94 in. Hg

Leak Checks

Negative Pressure ☑ Pass

No movement of manometer in one-minute

Positive Pressure ☑ Pass

No movement of manometer in one-minute

Important: All leak checks must pass in order for calibration to be valid.

Run	Elapsed Time - θ (minutes)	Meter Volume - V_m (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. - T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run - T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation - ΔY
	0.0	838.10	71	68								
1	5.0	841.08	72	69	75	1.00	20	5.0	2.98	70.0	0.9796	0.1%
2	10.0	844.06	72	69	76	1.00	20	5.0	2.98	70.5	0.9796	0.1%
3	15.0	847.05	73	70	76	1.00	20	5.0	2.99	71.0	0.9772	-0.2%
										Average Y_i	0.9788	
										Cal. Error	-0.9%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + {}^{\Delta H}/_{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir. ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-7

Date of Calibration: 11/17/2008

Meter Box Y_d: 0.9886

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7796

Barometric Pressure: 29.42

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.952	3.00	-1.80	1.0000	0.000	10.000	10.000	508.848	519.093	10.245	68.0	68.0	68.00	81.0	76.0	78.50	10.32	0.9836	1.8019
0.951	3.00	-1.80	1.0000	0.000	10.000	10.000	519.093	529.355	10.262	68.0	68.0	68.00	84.0	77.0	80.50	10.34	0.9857	1.8055
0.395	0.50	-1.20	1.0000	0.000	5.000	5.000	534.052	539.168	5.116	68.0	68.0	68.00	79.0	77.0	78.00	12.43	0.9916	1.7395
0.396	0.50	-1.20	1.0000	0.000	5.000	5.000	539.168	544.282	5.114	68.0	68.0	68.00	79.0	77.0	78.00	12.42	0.9920	1.7367
0.673	1.50	-1.60	1.0000	0.000	10.000	10.000	548.819	559.068	10.249	68.0	68.0	68.00	82.0	77.0	79.50	14.60	0.9893	1.7999
0.674	1.50	-1.60	1.0000	0.000	10.000	10.000	559.068	569.323	10.255	68.0	68.0	68.00	82.0	78.0	80.00	14.59	0.9896	1.7941
																Averages	0.98863	1.77958

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure differential (in. H_2O)
ΔP	Inlet Pressure Differential (in. H_2O)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
Θ	Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.3	5.0
10.3	10.0
15.0	15.0
19.7	20.0
24.8	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-7 Office: _____

Calibrated by: OLEG LAVROV Client: _____

Date: 11/17/08 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	50	48	49				
100	100	98	99				
150	150	148	149				
200	200	198	199				
250	250	248	248				
300	300	298	299				
350	350	348	349				
400	400	398	399				
450	450	448	449				
500	500	498	499				
550	550	548	549				
600	600	598	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date: 10/13/2009

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10735	Meter No.	61-7	Orifice	B-3
Location	warehouse	Meter Yd	0.9886	Orifice K'	0.4534
Test Date	03/25/09	Meter ΔH@	1.7796	Orifice Cal. Date	02/13/09
Operator	r. vicere	Full Test Cal. Date	11/17/08		

Leak Checks

Negative Pressure ☑ Pass

No movement of manometer in one-minute

Positive Pressure ☑ Pass

No movement of manometer in one-minute

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 28.94 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor Y_i	Percent Variation ΔY_i
	0.0	747.20	73	70								
1	5.0	750.09	73	70	73	1.00	19	5.0	2.89	71.5	1.0212	-0.3%
2	10.0	752.97	74	71	74	1.00	19	5.0	2.88	72.0	1.0247	0.1%
3	15.0	755.85	75	72	74	1.00	19	5.0	2.88	73.0	1.0266	0.2%
										Average Y_i	1.0242	
										Cal. Error	3.6%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + {}^{\Delta H}/_{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-8

Date of Calibration: 10/10/2008

Meter Box Y_d: 1.0079

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7934

Barometric Pressure: 29.41

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.962	3.00	-1.70	1.0000	0.000	10.000	10.000	178.888	188.822	9.934	70.0	70.0	70.00	78.0	73.0	75.50	10.18	1.0052	1.7772
0.957	3.00	-1.70	1.0000	0.000	10.000	10.000	188.822	198.772	9.950	70.0	70.0	70.00	81.0	74.0	77.50	10.23	1.0074	1.7913
0.381	0.50	-1.00	1.0000	0.000	5.000	5.000	216.571	221.528	4.957	70.5	70.5	70.50	79.0	76.0	77.50	12.82	1.0182	1.8720
0.382	0.50	-1.00	1.0000	0.000	5.000	5.000	221.528	226.500	4.972	70.5	70.5	70.50	80.0	77.0	78.50	12.81	1.0170	1.8656
0.686	1.50	-1.30	1.0000	0.000	10.000	10.000	231.519	241.649	10.130	70.5	70.5	70.50	84.0	79.0	81.50	14.26	1.0006	1.7275
0.685	1.50	-1.30	1.0000	0.000	10.000	10.000	241.649	251.820	10.171	70.5	70.5	70.50	86.0	80.0	83.00	14.27	0.9993	1.7267
																Averages	1.00794	1.79338

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.2	5.0
9.7	10.0
14.3	15.0
19.7	20.0
24.1	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-8 Office: _____

Calibrated by: OLEG LAVROV Client: _____

Date: 10/10/08 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	50	50				
100	99	100	100				
150	149	150	150				
200	199	200	200				
250	249	250	250				
300	299	300	300				
350	349	350	350				
400	399	400	400				
450	449	450	450				
500	499	500	500				
550	549	550	551				
600	599	600	601				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date: 10/13/2009

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10735 | Meter No. 61-8 | Orifice A-4

Location warehouse | Meter Yd 1.0079 | Orifice K' 0.4959

Test Date 03/25/09 | Meter ΔH@ 1.7934 | Orifice Cal. Date 01/21/09

Operator r. vicere | Full Test Cal. Date 10/10/08

Barom. Press. (P_b) 28.94 in. Hg

Leak Checks

Negative Pressure — *No movement of manometer in one-minute* ☑ Pass

Positive Pressure — *No movement of manometer in one-minute* ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Run	Elapsed Time, θ (minutes)	Meter Volume (dcf)	Meter Temperature		Ambient Temp., T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run, T_m (°F)	DGM Calibration Factor, Y_i	Percent Variation, ΔY_i
			Inlet (°F)	Outlet (°F)								
	0.0	255.80	73	70								
1	5.0	259.11	74	70	75	1.30	18	5.0	3.31	71.8	0.9731	-0.1%
2	10.0	262.41	74	71	75	1.30	18	5.0	3.30	72.3	0.9769	0.3%
3	15.0	265.73	75	71	75	1.30	18	5.0	3.32	72.8	0.9719	-0.2%
										Average Y_i	0.9740	
										Cal. Error	-3.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + {}^{\Delta H}/_{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \leq \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \leq \pm 5\%$$

CleanAir. ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-6

Date of Calibration: 2/23/2009

Meter Box Y_d: 0.9916

Calibration Conducted by: M. Vaquero

Meter Box ΔH@: 1.8053

Barometric Pressure: 29.88

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.979	3.00	-1.90	1.0000	0.000	10.000	10.000	562.625	572.791	10.166	65.0	65.0	65.00	75.0	73.0	74.00	10.25	0.9886	1.7401
0.979	3.00	-1.90	1.0000	0.000	10.000	10.000	572.791	582.945	10.154	65.0	65.0	65.00	75.0	73.0	74.00	10.26	0.9897	1.7435
0.384	0.50	-1.20	1.0000	0.000	5.000	5.000	625.330	630.420	5.090	65.0	65.0	65.00	73.0	72.0	72.50	13.07	0.9922	1.8897
0.384	0.50	-1.20	1.0000	0.000	5.000	5.000	630.420	635.515	5.095	65.0	65.0	65.00	73.0	72.0	72.50	13.07	0.9912	1.8897
0.684	1.50	-1.50	1.0000	0.000	10.000	10.000	639.532	649.665	10.133	65.0	65.0	65.00	74.0	72.0	73.00	14.68	0.9945	1.7880
0.685	1.50	-1.50	1.0000	0.000	10.000	10.000	649.665	659.807	10.142	65.0	65.0	65.00	74.0	72.0	73.00	14.65	0.9937	1.7807
																Averages	0.99165	1.80528

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.0	5.0
10.2	10.0
15.2	15.0
20.0	20.0
24.4	24.5

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-6 Office: _____

Calibrated by: M. Vaquero Client: _____

Date: 2/23/09 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	48	48	49				
100	98	98	99				
150	148	148	149				
200	198	199	199				
250	248	249	249				
300	298	298	299				
350	348	349	349				
400	398	399	399				
450	448	449	449				
500	498	499	499				
550	548	549	549				
600	598	599	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Date Calibrated: 10/13/2009

Calibration Report No: R044701

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10735	Meter No.	66-6	Orifice	A-4
Location	warehouse	Meter Yd	0.9916	Orifice K'	0.4959
Test Date	03/24/09	Meter ΔH@	1.8053	Orifice Cal. Date	01/21/09
Operator	r. vicere	Full Test Cal. Date	02/23/09		

Barom. Press. (P_b) 28.95 in. Hg

Leak Checks

Negative Pressure — *No movement of manometer in one-minute* ☑ Pass

Positive Pressure — *No movement of manometer in one-minute* ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Run	Elapsed Time, θ (minutes)	Meter Volume, V_m (dcf)	Meter Temperature, T_m (°F) Inlet	Meter Temperature, T_m (°F) Outlet	Ambient Temp., T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run, T_m (°F)	DGM Calibration Factor, Y_i	Percent Variation, ΔY_i
	0.0	697.90	72	71								
1	5.0	701.17	72	69	77	1.30	17	5.0	3.27	71.0	0.9817	0.7%
2	10.0	704.48	72	69	79	1.30	17	5.0	3.31	70.5	0.9672	-0.8%
3	15.0	707.76	73	70	80	1.30	17	5.0	3.28	71.0	0.9760	0.1%
										Average Y_i	0.9750	
										Cal. Error	-1.7%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H / 13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-7

Date of Calibration: 2/20/2009

Meter Box Y_d: 1.0028

Calibration Conducted by: Martin Vaquero

Meter Box ΔH@: 1.7673

Barometric Pressure: 29.36

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.960	3.00	-1.80	1.0000	0.000	10.000	10.000	930.751	940.869	10.118	65.5	65.5	65.50	80.0	73.0	76.50	10.27	0.9970	1.7812
0.961	3.00	-1.80	1.0000	0.000	10.000	10.000	940.869	950.970	10.101	65.5	65.5	65.50	80.0	73.0	76.50	10.26	0.9987	1.7777
0.394	0.50	-1.00	1.0000	0.000	5.000	5.000	954.620	959.686	5.066	65.5	65.5	65.50	77.0	74.0	75.50	12.51	1.0020	1.7587
0.394	0.50	-1.00	1.0000	0.000	5.000	5.000	959.686	964.737	5.051	65.5	65.5	65.50	76.0	74.0	75.00	12.51	1.0040	1.7587
0.681	1.50	-1.40	1.0000	0.000	10.000	10.000	980.882	990.970	10.088	65.5	65.5	65.50	80.0	75.0	77.50	14.47	1.0066	1.7614
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	990.970	1001.037	10.067	65.5	65.5	65.50	80.0	75.0	77.50	14.49	1.0087	1.7663
																Averages	1.00282	1.76732

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure differential (in. H_2O)
ΔP	Inlet Pressure Differential (in. H_2O)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
Θ	Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.0	5.0
10.2	10.0
15.2	15.0
19.8	20.0
25.2	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-7 Office: _____

Calibrated by: Martin Vaquero Client: _____

Date: 2/20/09 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	51	51	51				
100	100	100	101				
150	151	151	151				
200	201	201	201				
250	252	250	251				
300	302	301	301				
350	352	351	351				
400	401	400	401				
450	450	450	451				
500	500	500	501				
550	550	550	551				
600	601	600	601				

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date: 10/13/2009

Calibration Report No: R044791

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10735 Meter No. 66-7 Orifice B-5

Location warehouse Meter Yd 1.0028 Orifice K' 0.5612

Test Date 03/25/09 Meter ΔH@ 1.7673 Orifice Cal. Date 02/13/09

Operator r. vicere Full Test Cal. Date 02/20/09

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 28.94 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run - T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation - ΔY_i
	0.0	632.90	73	70								
1	5.0	636.47	73	70	71	1.50	18	5.0	3.57	71.5	1.0238	-0.2%
2	10.0	640.02	74	70	72	1.50	18	5.0	3.55	71.8	1.0291	0.3%
3	15.0	643.59	74	71	72	1.50	18	5.0	3.57	72.3	1.0243	-0.1%
										Average Y_i	1.0257	
										Cal. Error	2.3%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + {}^{\Delta H}/_{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir. ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-11

Date of Calibration: 10/29/2008

Meter Box Y_d: 0.9897

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.8958

Barometric Pressure: 29.38

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.938	3.00	-1.90	1.0000	0.000	10.000	10.000	17.805	27.997	10.192	69.0	69.0	69.00	83.0	75.0	79.00	10.44	0.9875	1.8570
0.938	3.00	-1.90	1.0000	0.000	10.000	10.000	27.997	38.210	10.213	69.0	69.0	69.00	84.0	76.0	80.00	10.44	0.9873	1.8536
0.371	0.50	-1.30	1.0000	0.000	5.000	5.000	42.333	47.433	5.100	69.0	69.0	69.00	80.0	77.0	78.50	13.22	0.9935	1.9777
0.371	0.50	-1.30	1.0000	0.000	5.000	5.000	47.433	52.542	5.109	69.0	69.0	69.00	80.0	77.0	78.50	13.21	0.9918	1.9747
0.660	1.50	-1.50	1.0000	0.000	10.000	10.000	67.288	77.585	10.297	69.0	69.0	69.00	85.0	80.0	82.50	14.84	0.9885	1.8587
0.661	1.50	-1.50	1.0000	0.000	10.000	10.000	77.585	87.887	10.302	69.0	69.0	69.00	86.0	81.0	83.50	14.83	0.9898	1.8528
																Averages	0.98974	1.89577

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.5	5.0
9.7	10.0
14.9	15.0
20.3	20.0
25.3	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-11 Office: _____

Calibrated by: OLEG LAVROV Client: _____

Date: 10/29/08 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	50	50				
100	99	100	100				
150	149	150	150				
200	199	200	200				
250	249	250	250				
300	299	300	300				
350	349	350	350				
400	399	400	399				
450	449	450	449				
500	499	499	499				
550	549	549	549				
600	599	600	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date 10/13/2009

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10715 Meter No. 66-11 Orifice A-2

Location warehouse Meter Yd 0.9897 Orifice K' 0.4506

Test Date 03/26/09 Meter ΔH@ 1.8958 Orifice Cal. Date 01/21/09

Operator r. vicere Full Test Cal. Date 10/29/08

Barom. Press. (P_b) 29.07 in. Hg

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation - ΔY_i
	0.0	587.30	72	69								
1	5.0	590.28	73	70	75	1.10	20	5.0	2.98	71.0	0.9812	0.0%
2	10.0	593.26	73	70	76	1.10	20	5.0	2.98	71.5	0.9812	0.0%
3	15.0	596.24	74	71	77	1.10	20	5.0	2.98	72.0	0.9812	0.0%
										Average Y_i	0.9812	
										Cal. Error	-0.9%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-22

Date of Calibration: 11/13/2008

Meter Box Y_d: 0.9937

Calibration Conducted by: Martin Vaquero

Meter Box ΔH@: 1.7498

Barometric Pressure: 29.01

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.966	3.00	-1.90	1.0000	0.000	10.000	10.000	937.916	948.134	10.218	69.5	69.5	69.50	87.0	79.0	83.00	10.00	0.9912	1.7160
0.966	3.00	-1.90	1.0000	0.000	11.000	11.000	948.134	959.364	11.230	69.5	69.5	69.50	87.0	80.0	83.50	11.00	0.9930	1.7128
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	962.944	968.050	5.106	69.5	69.5	69.50	80.0	79.0	79.50	12.55	0.9937	1.8018
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	968.050	973.153	5.103	69.5	69.5	69.50	80.0	79.0	79.50	12.55	0.9943	1.8018
0.679	1.50	-1.40	1.0000	0.000	10.000	10.000	974.427	984.641	10.214	69.5	69.5	69.50	85.0	79.0	82.00	14.23	0.9948	1.7373
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	984.641	994.859	10.218	69.5	69.5	69.50	85.0	80.0	82.50	14.21	0.9954	1.7293
																Averages	0.99374	1.74982

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.0	5.0
10.1	10.0
14.7	15.0
19.3	20.0
24.0	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-22 Office: _____

Calibrated by: Martin Vaquero Client: _____

Date: 11/13/08 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	49	49				
100	99	99	99				
150	149	149	149				
200	199	199	199				
250	249	249	249				
300	299	299	299				
350	349	349	349				
400	399	399	399				
450	449	449	449				
500	499	499	499				
550	549	549	549				
600	599	599	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date: 10/13/2009

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10735 Meter No. 66-22 Orifice A-2

Location warehouse Meter Yd 0.9937 Orifice K' 0.4506

Test Date 03/24/09 Meter ΔH@ 1.7498 Orifice Cal. Date 01/21/09

Operator r. vicere Full Test Cal. Date 11/13/08

Barom. Press. (P_b) 28.95 in. Hg

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Run #	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation ΔY_i
	0.0	324.90	72	68								
1	5.0	327.89	74	68	75	1.10	21	5.0	2.99	70.5	0.9770	-0.6%
2	10.0	330.86	75	69	78	1.10	21	5.0	2.97	71.5	0.9827	0.0%
3	15.0	333.81	77	70	81	1.10	21	5.0	2.95	72.8	0.9889	0.6%
										Average Y_i	0.9829	
										Cal. Error	-1.1%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + {}^{\Delta H}/_{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-4
Project Number: 10735

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	66	68	-2	0.38%	
2	200°F-250°F	250	255	-5	0.70%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ YES

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**	Specification
1	0.546	0.836	0.801	0.008	Avg. C_p Deviations ≤ 0.01
2	0.553	0.826	0.810	0.001	
3	0.546	0.806	0.815	0.007	
		Side 'A' Average Probe $C_{p(A)}$=	0.8085	0.0053	

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**	Specification
1	0.550	0.823	0.810	0.006	Avg. C_p Deviations ≤ 0.01
2	0.550	0.810	0.816	0.000	
3	0.553	0.803	0.822	0.006	
		Side 'B' Average Probe $C_{p(B)}$=	0.8157	0.0039	

'A' Average C_p		'B' Average C_p		Difference	Specification
0.809	—	0.816	=	-0.007	|Difference| ≤ 0.01

Does assembly meet specifications? YES ⟶ If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P(A\text{ or }B)}\right|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.812 Calibrated by: W. Berry Date: 01/06/2009

CleanAir. ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-4

Project Number:

Thermocouple Calibration

Reference Type: Thermometer Reference I.D. No: Pyrometer I.D. No: Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Within spec?
1	Ambient					
2	200°F-250°F					

* Based on Absolute Temperature (Rankine) %Difference ≤ 1.5

Geometric Pitot Calibration

Is pitot assembly in good repair? ◉ Yes ○ No If no, explain:

"S" Pitot

Dimensions		Dimensions		Specifications	Within Spec?
α1=	2	α2=	1	<=10 °	YES
β1=	0	β2=	0	<=5°	YES
γ=	1	θ=	2	None	N/A
A=	0.713			None	N/A
Dt=	0.244			0.1875"<=Dt<=0.375"	YES

	Calculations	Specifications	Within Spec?
A/2=Pa=Pb=	0.357 inches	None	N/A
Pa/Dt=Pb/Dt=	1.461 inches	1.05<P/Dt<1.5	YES
z = A sin γ =	0.012 inches	<=0.125"	YES
w = A sin θ =	0.025 inches	<=0.03125"	YES

Pitot Cp= 0.84 according to 40 CFR 60 section 10.1

Standard Pitot

	Measurement	Specification	Calculation	Within Spec?
Tube O.D.		None		
Static Hole I.D.		within 10% of (0.1*O.D.)		
Tip to Static		>=6*O.D.		
Static to Bend		>=8*O.D.		

Pitot Cp=

Calibrated by: Danial Luckhard Date: 1/6/2009

CleanAir

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-7
Project Number: 10735

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	72.0	79.0	-7	1.32%	
2	200°F-250°F	213.0	213.0	0	0.00%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 50ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.563	0.822	0.820	0.009
2	0.568	0.800	0.834	0.006
3	0.571	0.811	0.830	0.002
		Side 'A' Average Probe $C_{p(A)}$=	0.8281	0.0057

Specification Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.573	0.822	0.827	0.005
2	0.574	0.832	0.822	0.001
3	0.570	0.839	0.816	0.006
		Side 'B' Average Probe $C_{p(B)}$=	0.8216	0.0040

Specification Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.828	−	0.822	=	0.006	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C_{P\,(\text{A or B})}}\right|$$

All specifications are from EPA-600/9-76-005, Section 3

Probe Cp= 0.825 Calibrated by: W. Berry Date: 03/05/2009

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-7

Project Number: 10735

Thermocouple Calibration

Reference Type: Thermometer Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Within spec?
1	Ambient	72.0	79.0	-7.0	1.32%	YES
2	200°F-250°F	213.0	213.0	0.0	0.00%	YES

* Based on Absolute Temperature (Rankine) %Difference ≤ 1.5

YES

Geometric Pitot Calibration

Is pitot assembly in good repair? ◉ Yes ○ No If no, explain:

"S" Pitot

Dimensions		Dimensions		Specifications	Within Spec?
α1=	2	α2=	1	<=10 °	YES
β1=	2	β2=	1	<=5°	YES
γ=	2	θ=	1	None	N/A
A=	0.716			None	N/A
Dt=	0.250			0.1875"<=Dt<=0.375"	YES

Calculations		Specifications	Within Spec?
A/2=Pa=Pb=	0.358 inches	None	N/A
Pa/Dt=Pb/Dt=	1.432 inches	1.05<P/Dt<1.5	YES
z = A sin γ =	0.025 inches	<=0.125"	YES
w = A sin θ =	0.012 inches	<=0.03125"	YES

Pitot Cp= 0.84 according to 40 CFR 60 section 10.1

Standard Pitot

	Measurement	Specification	Calculation	Within Spec?
Tube O.D.		None		
Static Hole I.D.		within 10% of (0.1*O.D.)		
Tip to Static		>=6*O.D.		
Static to Bend		>=8*O.D.		

Pitot Cp=

Calibrated by: N. Hitchins Date: 3/4/2009

CleanAir.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-17
Project Number: 10735

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	73.0	74.0	-1	0.19%	
2	200°F-250°F	221.0	219.0	2	0.29%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.566	0.801	0.832	0.006
2	0.570	0.794	0.839	0.001
3	0.566	0.781	0.843	0.005
		Side 'A' Average Probe $C_{p(A)}$=	0.8381	0.0039

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.573	0.815	0.830	0.001
2	0.565	0.808	0.828	0.000
3	0.566	0.809	0.828	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8288	0.0007

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.838	−	0.829	=	0.009	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** ⟶ **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA-600/9-76-005, Section 3

Probe Cp= 0.833 Calibrated by: W. Berry Date: 03/05/2009

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-17

Project Number: 10735

Thermocouple Calibration

Reference Type: Thermometer Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Within spec?
1	Ambient	73.0	74.0	-1.0	0.19%	YES
2	200°F-250°F	221.0	219.0	2.0	0.29%	YES

* Based on Absolute Temperature (Rankine) %Difference ≤ 1.5

YES

Geometric Pitot Calibration

Is pitot assembly in good repair? ◉ Yes ○ No If no, explain:

"S" Pitot

	Dimensions		Dimensions	Specifications	Within Spec?
$\alpha 1$=	1	$\alpha 2$=	1	<=10 °	YES
$\beta 1$=	1	$\beta 2$=	1	<=5°	YES
γ=	0	θ=	1	None	N/A
A=	0.714			None	N/A
Dt=	0.250			0.1875"<=Dt<=0.375"	YES

	Calculations	Specifications	Within Spec?
A/2=Pa=Pb=	0.357 inches	None	N/A
Pa/Dt=Pb/Dt=	1.428 inches	1.05<P/Dt<1.5	YES
$z = A \sin \gamma$ =	0.000 inches	<=0.125"	YES
$w = A \sin \theta$ =	0.012 inches	<=0.03125"	YES

Pitot Cp= 0.84 according to 40 CFR 60 section 10.1

Standard Pitot

	Measurement	Specification	Calculation	Within Spec?
Tube O.D.		None		
Static Hole I.D.		within 10% of (0.1*O.D.)		
Tip to Static		>=6*O.D.		
Static to Bend		>=8*O.D.		

Pitot Cp=

Calibrated by: N. Hitchins Date: 3/4/2009

CleanAir.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-1

Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	68.0	71.0	-3	0.57%	
2	200°F-250°F	232.0	224.0	8	1.16%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.571	0.826	0.823	0.003
2	0.572	0.816	0.829	0.002
3	0.570	0.816	0.828	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8265	0.0021

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.564	0.830	0.816	0.003
2	0.571	0.829	0.822	0.002
3	0.568	0.827	0.821	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8193	0.0023

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.827	—	0.819	=	0.008	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA 600/9-76-005, section 5

Probe Cp= 0.823 Calibrated by: W. Berry Date: 03/04/2009

CleanAir. ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-1

Project Number: 10735

Thermocouple Calibration

Reference Type: Thermometer Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Within spec?
1	Ambient	68.0	71.0	-3.0	0.57%	YES
2	200°F-250°F	232.0	224.0	8.0	1.16%	YES

* Based on Absolute Temperature (Rankine) %Difference ≤ 1.5

YES

Geometric Pitot Calibration

Is pitot assembly in good repair? ◉ Yes ○ No If no, explain:

"S" Pitot

	Dimensions		Dimensions	Specifications	Within Spec?
α1=	1	α2=	1	<=10 °	YES
β1=	2	β2=	1	<=5°	YES
γ=	1	θ=	1	None	N/A
A=	0.714			None	N/A
Dt=	0.250			0.1875"<=Dt<=0.375"	YES

	Calculations	Specifications	Within Spec?
A/2=Pa=Pb=	0.357 inches	None	N/A
Pa/Dt=Pb/Dt=	1.428 inches	1.05<P/Dt<1.5	YES
z = A sin γ =	0.012 inches	<=0.125"	YES
w = A sin θ =	0.012 inches	<=0.03125"	YES

Pitot Cp= 0.84 according to 40 CFR 60 section 10.1

Standard Pitot

	Measurement	Specification	Calculation	Within Spec?
Tube O.D.		None		
Static Hole I.D.		within 10% of (0.1*O.D.)		
Tip to Static		>=6*O.D.		
Static to Bend		>=8*O.D.		

Pitot Cp=

Calibrated by: N. Hitchins Date: 3/4/2009

CleanAir.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-4
Project Number: 10735

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	69.0	71.0	-2	0.38%	
2	200°F-250°F	223.0	217.0	6	0.88%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.561	0.822	0.818	0.002
2	0.568	0.822	0.823	0.003
3	0.564	0.822	0.820	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8204	0.0020

Specification: Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.568	0.815	0.826	0.001
2	0.563	0.816	0.823	0.002
3	0.574	0.825	0.826	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8249	0.0015

Specification: Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.820	−	0.825	=	-0.005	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** ⟶ **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C_{P\,(\text{A or B})}}\right|$$

All specifications are from EPA-600/9-76-005, Section 3

Probe Cp= 0.823 Calibrated by: W. Berry Date: 03/04/2009

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-4

Project Number: 10735

Thermocouple Calibration

Reference Type: Thermometer Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Within spec?
1	Ambient	69.0	71.0	-2.0	0.38%	YES
2	200°F-250°F	223.0	217.0	6.0	0.88%	YES

* Based on Absolute Temperature (Rankine) %Difference ≤ 1.5

YES

Geometric Pitot Calibration

Is pitot assembly in good repair? ◉ Yes ○ No If no, explain:

"S" Pitot

	Dimensions		Dimensions	Specifications	Within Spec?
$\alpha 1$=	2	$\alpha 2$=	1	<=10 °	YES
$\beta 1$=	0	$\beta 2$=	2	<=5°	YES
γ=	2	θ=	1	None	N/A
A=	0.724			None	N/A
Dt=	0.250			0.1875"<=Dt<=0.375"	YES

	Calculations	Specifications	Within Spec?
A/2=Pa=Pb=	0.362 inches	None	N/A
Pa/Dt=Pb/Dt=	1.448 inches	1.05<P/Dt<1.5	YES
z = A sin γ =	0.025 inches	<=0.125"	YES
w = A sin θ =	0.013 inches	<=0.03125"	YES

Pitot Cp= 0.84 according to 40 CFR 60 section 10.1

Standard Pitot

	Measurement	Specification	Calculation	Within Spec?
Tube O.D.		None		
Static Hole I.D.		within 10% of (0.1*O.D.)		
Tip to Static		>=6*O.D.		
Static to Bend		>=8*O.D.		

Pitot Cp=

Calibrated by: N. Hitchins Date: 3/4/2009

CleanAir.

AIR LIQUIDE Air Liquide America Specialty Gases LLC SCOTT™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 57134-71-65000
Project No.: 05-72060-003

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM045493 **Certification Date:** 13Jan2009 **Exp. Date:** 13Jan2012
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	14.0 %	+/- 1%	Direct NIST and NMi
OXYGEN	6.05 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2000	01Jul2009	K026898	5.006 %	CARBON DIOXIDE
NTRM 2350	01Dec2011	K016398	23.20 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	13Jan2009	NDIR
CAI/110P/V03018	22Dec2008	PARAMAGNETIC

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis | **Second Triad Analysis** | **Calibration Curve**

CARBON DIOXIDE

Date: 13Jan2009	Response Unit:MV	
Z1 = 0.00000	R1 = 39.30000	T1 = 83.10000
R2 = 39.40000	Z2 = 0.00000	T2 = 83.10000
Z3 = 0.00000	T3 = 83.10000	R3 = 39.40000
Avg. Concentration:	14.00 %	

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999998
Constants: A = -0.0052472
B = 0.108852633 C = 0.0002522
D = 5.75883E-06 E = 0

OXYGEN

Date: 13Jan2008	Response Unit:%	
Z1 = 0.00000	R1 = 23.20000	T1 = 6.05000
R2 = 23.20000	Z2 = 0.00000	T2 = 6.05000
Z3 = 0.00000	T3 = 6.06000	R3 = 23.20000
Avg. Concentration:	6.053 %	

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999999
Constants: A = -0.00558057
B = 0.999821643 C = 0
D = 0 E = 0

APPROVED BY: _____
JEFF CROTEAU

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: 55647-71-65000
Project No.: 05-53475-001

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: AAL9828 **Certification Date:** 05Apr2007 **Exp. Date:** 04Apr2010
Cylinder Pressure***: 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	6.054	%	+/- 1%	Direct NIST and NMi
OXYGEN	14.02	%	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE			

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	01Nov2010	1D002807	23.04 %	CARBON DIOXIDE
NTRM 2350	01May2009	K026542	23.48 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/3400/10693	04Apr2007	THERMAL CONDUCTIVITY
CALIFORNIA/110P/S02041	05Apr2007	PARAMAGNETIC

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

CARBON DIOXIDE

Date: 04Apr2007	Response Unit:AREA	
Z1 = 0.00000	R1 = 1165892.	T1 = 305456.0
R2 = 1166031.	Z2 = 0.00000	T2 = 305856.0
Z3 = 0.00000	T3 = 305949.0	R3 = 1166669.
Avg. Concentration:	6.054	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999996

Constants:	A = 0.010560
B = 0.000020	C = 0
D = 0	E = 0

OXYGEN

Date: 05Apr2007	Response Unit:%	
Z1 = 0.00000	R1 = 23.48000	T1 = 14.03000
R2 = 23.48000	Z2 = 0.00000	T2 = 14.03000
Z3 = 0.00000	T3 = 14.02000	R3 = 23.49000
Avg. Concentration:	14.02	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999999

Constants:	A = -0.002923
B = 0.999759	C = 0
D = 0	E = 0

APPROVED BY: _____

AIR LIQUIDE Scott Specialty Gases
Air Liquide America Specialty Gases LLC

Shipped From:
1290 COMBERMERE STREET
TROY MI 48083
Phone: 248-589-2950 Fax: 248-589-2134

C E R T I F I C A T E O F A N A L Y S I S

WAREHOUSE/STOCK
WAREHOUSE/STOCK/
CHICAGO WAREHOUSE
868 SIVERT
WOOD DALE IL 60191

PROJECT #: 05-69004-002
PO#: GENERAL STOCK
ITEM #: 0501813 AL
DATE: 15Sep2008

CYLINDER #: ALM061790
FILL PRESSURE: 02000 PSIG

PURE MATERIAL: NITROGEN CAS# 7727-37-9

GRADE: ZERO GAS

PURITY: 99.998%

IMPURITY	MAXIMUM CONCENTRATIONS
THC	0.5 PPM

ANALYST: _____